ФЕДЕРАЛЬНОЕ АГЕНТСТВО ПО ОБРАЗОВАНИЮ

ГОСУДАРСТВЕННОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ
ВЫСШЕГО ПРОФЕССИОНАЛЬНОГО ОБРАЗОВАНИЯ
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Составители: ***И.К. Протченко, А.Г. Лещенко***

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Данные методические указания состоят из 10 уроков по тематике 1-3 факультетов, целью которых является обучить студентов навыкам чтения научно-технической литературы, разговорным навыкам, также навыкам реферирования и аннотирования текстов.

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U N I T I

Task 1

1. Read and memorize the following words and word combinations:

Soar (v.) – парить, высоко летать
Setback (n.) – неудача
Remedial (adj.) – лечебный
Succeed (v.) – добиваться успеха
Stipulation (n.) – условие
To stay aloft – держаться в воздухе
Trial run – испытательный полет
Ominous (adj.) – зловещий, угрожающий
Lurch – крениться
Scrutinize – внимательно изучать

2. Read Text I.

AVIATION FIRST SETBACK

In 1908, flying was a miracle that had suddenly become solid reality. After centuries of dreams it was at last for man a fantastic escape from the limitations of earth-bound existence. Aviation enthusiasts left their imaginations soar, and it seemed at first that all the most formidable obstacles had been overcome.

Then on September 18, 1908, the newspapers headlined: "Wright Plane Falls. Army Lieutenant, a Passenger, Killed".

It was a shocking blow, especially to all flying enthusiasts, who had been expecting a perhaps slow but steady growth of flying techniques which would carry man, step by step and mile by mile, farther and higher into the firmament - those wide reaches that symbolize all that is above our hopes on earth. For the visionary businessman it meant setback to an incalculably vast new industry. For the experimenters whose imagination and time and energy had been devoted to making flight possible, it was a keenly felt disappointment. For the skeptic, it meant another, "I told you flying machines would never really work."

Nowadays, many years later, the crush of a plane brings into play the detective and remedial efforts of hundreds of specialists, months of detailed study, the sifting of bits and shreds of metal, engines, instruments, weather and flight techniques, and all the relevant human factors that could have any bearing on why any single elaborately designed and skillfully operated plane of the thousands in the air at that moment should have gone down.

Up to September of 1908, after four years of work on the Wright and other machines, despite many minor mishaps, not one drop of passenger blood had been spilled. The Wright's was a do-it-yourself project, requiring intelligence, stubbornly, maintained imagination, observation, and skill, carried on with extremely limited funds. The brothers had succeeded where many others with greater backing had failed. The first Wright plane flown was a simple contraption, and no one knew better that Orville and Wilbur that it was a primitive type of a better machine yet to come. But it flew, and with each minor refinement and each test it flew better, and farther.

The world's first powered flight took place on December 17, 1903 – a straight-away run of about a hundred feet. It was followed by developments in the control of balance, and with practice the Wrights learned to make banked turns, teaching themselves to guide their ungainly machine though the vagaries of air currents. With a slightly more powerful engine they felt the machine could bear the weight of another seat and a passenger.

By 1908, Wilbur had taken one plane to Europe for demonstration, and Orville, using a sister plane, prepared for a series of tests at Fort Meyer, Virginia, to prove to somewhat skeptical Army officers the machine's ability to meet government contract specifications. One of the Army's stipulations was that it must carry a passenger a certain distance and return to the starting point.

Some days before the test, Orville had managed to stay aloft for an hour and five minutes – then the world's record – and he had carried Lieut. Frank Lahm on shorter flight.

On the afternoon of September 17 Lieut. Thomas Selfridge of the U.S. Army was given permission to take part in one of Wright's trial runs. He scaled 173 pounds, which was a greater weight than the plane had ever carried. But Wright's craft left the launching rail easily, and by the time it had made three circuits of the parade grounds it had reached an altitude of about one hundred and twenty-five feet.

At that height, Wright suddenly heard on ominous tapping sound behind him. He turned his head to look back over his shoulder and through the birdcage structure saw that a propeller blade had splintered and cut vital control wires.

With his critical controls gone, Wright was helpless. The machine lurched upward for a second, turned and then dived in a sweeping plunge. However, some of the shock was absorbed by the elevators which were set on a framework forward so that Orville suffered only broken ribs and a fractured left leg and pelvis, although Selfridge was pinned beneath the engine and fatally injured.

The twisted tangle of wood, cloth, and wire was roped off from the curious mobs that gathered and was carefully scrutinized by Army people. There were no aviation experts then; Wright and Charley Taylor, who had helped build the engine and the airplane, were the only men on the spot qualified by experience to judge the cause of the accident. Wright, after his quick backward glance, had surmised instantly where the seat of the trouble lay.

Notes to the text:

Firmament – (поэт.) небо, небосвод
Ungainly – неловкий, неуклюжий
Vagaries – причуды, капризы

3. *Find synonyms:*

firmament	test flight
setback	to investigate
remedial	to roll
stipulation	medical
to stay aloft	condition
trial run	sky
to lurch	failure
to scrutinize	to keep in the air

4. *Read Text 1 again, find sentences with the words to memorize and translate these sentences.*

5. *Make up sentences of your own with the words to be memorized.*

6. *Use in the short situation of your own:*

a) trial run, to stay aloft, to lean ominous, setback;
b) to scrutinize, stipulation, contraption, to succeed, ungainly.

7. *Speak on*: a) the Wright brothers first plane;
b) the test flight of September 17, 1908.

8. *Prepare at home and present in the classroom any interesting fact from the Early History of Aviation. You may choose a success or a failure. Time: approximately 3 minutes. Use as many new words from Text 1 as you can.*

Task 2.

1. Read Text 2.

BIOGRAPHY OF A RELUCTANT SUBJECT
(On "Einstein. The Life and Times" by R. Clark)

Every biographer of Einstein must be uncomfortably unaware of the potentially disapproving judgment implicit in a remark from Einstein's own "Autobiographical Notes": "That which is essential in the life of a man of my sort lies in "What he thinks"", and "How he thinks", and "not in what he does or suffers". "This can be read as casting doubt on the whole biographical enterprise, and we do know that Einstein was not particularly enterprise, and we do know that Einstein was not particularly enthusiastic about any of the biographies written about him while he was alive. It can also be read as a challenge to the biographer".

The great thing in his life – its very core – was his scientific work, and it is up to the biographer to make this real to us. To do so takes much more that exposition, popular or technical, of Einstein's scientific achievement as they appear from the standpoint of present-day physics. We have to see his ideas developing, his work in progress, and to see this work in the context of the scientific problems of his time. The goal is to grasp or at least to appreciate what Einstein meant when he wrote, "But the years of anxious searching in the dark, with their intense longing, alternations of confidence and exhaustion, and the final emergence into the light-only those have experienced it can understand that". This is not to deny the legitimacy of our interest in the personal or the public life of Einstein. It could hardly be otherwise: this man whose scientific achievements are the only parallel to Newton's was an extraordinary human being in many other ways as well. Of course we want to know as many details as we can find about how he lived and what his relationships with his family and friend were like and what he did day by day, all in the hope of understanding how this particular instance of supreme human achievement came about. And Einstein's unique role as a public figure is both part of the history of our times and a major aspect of his life after 1919. It is the easiest part of his life to document, and the natural favorite of popular biographers.

Clark in his book recognizes and says repeatedly that Einstein scientific work meant more to him than anything else in his life, but his book does not often show us Einstein at work. Being not a scientific himself, Clark is simply not able to handle Einstein's physics with the understanding and assurance that are as much needed for popularization as they are for teaching. He is in no position to make an independent appraisal of the scientific importance of Einstein's paper and the judgments he does express are often misleading.

The real interest in Clark's book lies in the wealth of material that he presents concerning Einstein's external life. He follows Einstein's concern for peace from his dissenting opinion on the German war effort in 1914 to his advocacy of armed collective security against Hitler and his fight for nuclear disarmament after 1945.

Notes to the text:

To deny – отрицать
To handle – (здесь) разбираться, обсуждать
Challenge – вызов
To gasp – схватить суть, постичь
To be anaware of – не осознавать, не отдавать себе отчета в…
To be in progress – развиваться
To be in no position – не иметь права
To cast doubt – бросить тень сомнения
The vary core of – самая суть
Merely – просто, только
Appraisal – оценка

2. *Make sure you understand everything properly. Read the text again or/and use a dictionary if necessary.*

3. *When everything is perfectly clear, try to say:*

a) Why is it particularly difficult to write a biography of a scientist?
b) How do you interpret the title of the text?

Task 3

1. *The following text is the first part of "747 Accident".*

Translate it orally or in writing (as your teacher recommends you) using English-Russian Aviation Dictionary.

2. *Give the title to this text*

3. *Render its contents in a few written sentences in English.*

747 ACCIDENT

The accident was notified to the Accidents Investigation Branch at 19.10 hr. (All times in this report are GMT based on a 24-hr. clock) on Dec. 27, 1979 and an investigation commenced that night. The United States Accredited Representative together with his advisers arrived in London the following day and participated fully in the investigation.

The accident happened while the aircraft was being landed on runway 23 at London's Heathrow airport. At touchdown No. 4 pylon forward bulkhead, which supports the front of the engine began to break free of the pylon because of weakening by fatigue and other preexisting damage.

The resulting downwards movement of the engine during the landing roll ruptured the engine fuel pipe and several other connections with the engine monitoring and fire warning circuitry. The high volume of fuel issuing from the ruptured fuel pipe caused a severe fire to develop under the No. 4 pylon. The fire continued until the crew physically observed the fire as the aircraft was being turned off the run-way at block 77(0), at which point the fire drill was carried out. This resulted in the closure of the fuel shut-off valve in the wing. The aircraft was brought to a halt and the airport fire service quickly brought the residential fire under control.

The report notes that the No. 4 engine was involved in a collision with a baggage container (igloo) at Chicago Airport three years prior to the accident. It concludes that this collision may have been the initiating event in the chain of structural breakdown which culminated in the separation of the pylon forward bulkhead, which was the direct cause of the accident. The report analyzes the bulkhead failure and concludes that the failure of the bulkhead did not arise from any defect of design or deficiency in the certification process. However, deficiencies in the approved maintenance inspection procedures are considered to have contributed to the defect in the forward bulkhead progressing to the failure point of failure.

The report reviews the concept whereby the pylon is designed to separate cleanly at a predetermined load level in order to protect the wing structure from damage. The concept itself is not questioned, but the lack of any form of automatic fuel shut-off: that would operate coincidently with pylon or nacelle separation is criticized and recommendation is made to that affect.

(to be continued)

Notes to the text:

Shut-off valve – отсечной клапан

UNIT II

Task 1.

1. Memorize the following words and word combinations:

1. minute (adj.) – мелкий, незначительный
2. malfunction – неисправная работа, отказ
3. to handle – (зд.) управлять
4. to put in force – вводить в действие
5. flyability – пригодность к полетам
6. to amend – исправлять, улучшать
7. freight – груз
8. consecutive – последующий
9. fallibility – подверженность неисправности
10. crate (жарг.) – самолет, автомобиль
old crate (амер.) – драндулет (об автомобиле), гроб (о самолете)

2. Read the following text:

Today before a plane is allowed to go into service on the world's airlines, it must be certified to make sure that no minute part shows a sign of weakness that could interfere with safe operation, and later regular inspection by a bevy of experts is required, so that any indication of malfunction can be corrected at once. Experts check each crew's ability to handle the type of craft it is to fly. And when an accident does occur, a special trained group – detectives of the air – move in to ferret out the cause, and new regulations are put in force to prevent that kind of trouble from reoccurring.

There are today over 1700 United State airlines of a dozen different types carrying passengers across the United States airlines of a dozen different types carrying passengers across the U.S. and overseas under the strictest observation, and supervision applies also to innumerable foreign carriers landing in the U.S., which must be registered for flyability.

The United States government agencies responsible for controlling this multiple traffic of skies are the Civil Aeronautics Administration – CAA – under the Secretary of Commerce, which issues license for aircraft and their crews and provides facilities for control over the country's airways, and the Civil Aeronautics Board – CAB. Both were brought into being by the Civil Aeronautics Act of 1938 – amended for greater effectiveness later.

The CAB derives its authority directly from Congress as an independent agency with quasi-judicial powers including the initiation of legislative acts; promulgates into low all U.S. Civil Air Regulations under which all commercial aviation in the country operates. Thus it enforces all safety rules for all air carriers of any sort – either passenger or freight – and it is the Bureau of Safety which investigates and analyzes accidents. Although it brings in, either officially or unofficially other experts from every field of airplane manufacture, it is this board which handles every minute factor involved.

The 1986 U.S. safety record for air carriers is a continuation of a consecutive six-year period in which there occurred less then one fatality per 100 million passenger miles flown. In contrast to this there were about two and a half per 100 million for private automatics travel; 0.21 fatalities per 100 million passenger miles in railroad transport; and about 0.40 per the same equation for busses.

The number of safe flights relative to the accident toll is apt to go unnoticed by the flights follow their airy courses in darkness and far, far away. For instance, nearly ninety loaded planes cross the Atlantic Ocean in any given twenty-four hours. According to the Director of Flight Safety Research of the U.S. Air Force, the American military alone keeps between 1100 and 1200 planes in the worldwide air twenty-four hours round the clock. And traveling much the same air space, an even greater number of commercial and private air carriers are simultaneously aloft.

The need for controls in this traffic volume is obvious and has for a long time been one of the major subjects for study and rulings by responsible agencies. Transport accident, involved as it is with both occasional human error and the fallibility of working parts under extreme conditions, is and always has been one of the difficulties of advancing civilizations.

It is recognized that air accidents are due to the three main causes: weather; structural or design failure, and human error. The pilots who flew the open-air crates that had barely evolved from the primitive Wright models in World War I, and the test pilots who since that time, have flown the experimental planes of the recent past, know all too well the extent of structural and design improvement that have been considered superhuman technological flying achievements. It is no wonder then that flying craft, which were at first endowed with mysticism in the lay mind should sometimes nowadays seem almost too complex for the welfare of mankind. Actually, in this period, the recommended fantasy of the air battles of the two great wars of our day have probably done as much as anything else to perpetuate the public's feeling toward flying. In reality, the manufacture and flight control of present day air transports is as well-conceived and regulated a business as the building and running of trains and ships by railroad and shipping companies. The interrelation among the three main cause of the air accidents that do occur to planes creates a problem for the CAB and all those responsible for flight safety, and it is the CAB's job to discover what one failure or combination of failures brought about each crash. Become some small structural failure or human error occasionally leaves no recognizable trace, the origin of a disaster may never be determined, but there have been very few accidents whose causes could not be explained, and even when the determined factor in the disaster cannot be proved any suspected for the trouble and the suspected weakness is eliminated in all planes of the same type.

Notes the text:

1. to perpetuate – увековечивать, сохранить навсегда
2. bevy (n) – компания, собрание
3. to ferret out – разведывать, собрание
4. legislative acts – законодательные акты
5. to promulgate – обнародовать, распространять
6. precipitous – стремительный

3. *Find synonyms:*

Minute	to investigate
Bevy	air worthiness
Malfunction	cargo
To handle	to improve
To ferret out	minor
Flyability	to control
To amend	failure
Freight	group

4. *Find the proper equivalents to the words:*

To perpetuate	make smth known to the public
Crate	coming one after the other
To promulgate	an old automobile or plane
Consecutive	to prevent smth or smb from being forgotten

5. *Make up a situation in which you might use the following words:*

Minute, malfunction, to ferret out, flyability, to amend, fallibility, crate.

6. *Speak on:*

   a) the man administrative bodies responsible for air traffic in the USA;

   b) reasons for greater traffic controls;

   c) causes of air accidents.

7. *Give the title to Text 1.*

Task 2.

1. Read Text 2.

MANNED STATION IN SPACE – WILL IT FLY?

A space station has long been on NASA's wish list, but many potential users are unenthusiastic. The National Academy of Science, for example, sees "no scientific need for a space station in this century", contending it would consume funds for such ventures as unmanned planetary probes.

Analysts at the Office of Management and Budget content that NASA's 8-billion-dollar project estimate is far too low. OMB experts testified that costs might hit 20 billion.

NASA argues that the project could lead to a lucrative factory in the sky making such products as electronic crystals that can be manufactured only in weightlessness.

Already, engineers at NASA and eight aerospace companies have designs on the drawing boards. Plane call for a station resembling a Tinkertoy arrangement of manned modules, fuel cells, platform and solar panels. It would be built in stages at an altitude of nearly 250 miles. Once completed, it would house six to eight persons who would stay in orbit for up to six months.

A key to its success is the space shuttle, which would ferry astronauts and supplies to it.

Several law makers are against funding to start the project. Senator William Proxmire (D-Wis.) denounced the plan as a "white elephant". Representative Bruce Vento (D-Minn) declared that Reagan is "willing to spend billions to house astronauts in space, but he won't support housing for needy Americans on earth".

Notes to the text:

Lucrative – прибыльный, доходный

To ferry = to carry

Lawmakers – законодатели

"white elephant" – «белый слон» - почетный, но очень обременительный дар

2. Find English equivalents for:

Беспилотный

Пилотируемый

Обитаемый (жилой) отсек

Сверхпрочные материалы

Невесомость

3. Answer the following questions:

a) What organizations and individuals were involved into the discussion concerning the space station?

b) Who of them supported it and what were their reasons?

c) Who was against the station and why?

Task 3

1. This part of the text is to be translated orally.

2. Write an abstract of the following text in English.

747 ACCIDENT
FACTUAL INFORMATION
History of the flight

The aircraft was engaged in a scheduled international cargo flight from JFK airport New York to Heathrow. The only occupants were the three flight crew members, namely the commander, copilot and flight engineer. The aircraft departed from New York at 12.01 hr. on Dec. 27 and after an uneventful flight, was landed manually by the commander on runway 23 at Heathrow at 18.39 hr.

After a heavy touchdown, the commander applied reverse thrust and the flights data recorder (FDR) readout indicated that maximum reverse engine pressure ratio (EPR) was obtained on all four engines. Shortly afterwards the flight engineer reported that the exhaust gas temperature (EGT) was approaching limits on No. 4 engine, whereupon the commander began to reduce reverse thrust on all engines. As he did so, he felt the No. 4 thrust lever gave a sudden jerk and thereafter was immovable.

After reverse thrust had been canceled on the other three engines, it became apparent to the crew that No. 4 was not delivering reverse thrust, notwithstanding the position of the thrust lever. All the instrument indications were that the engine had run down and flamed out. The FDR read out showed that No. 4 engine had ceased to deliver reverse thrust some 15 sec. after selection and some 10 sec. before reverse was canceled on the other three engines.

The indicated air speed (IAS) at the time reverse thrust was lost on No. 4 was 80 kt. While the aircraft was moving slowly clear of the runway to the right, the copilot observed a large fire in the region of No. 4 engine, although there was no fire warning indication of this on the flight deck. The copilot immediately reported the fire to air traffic control (ATC) who had by then already activated the crash alarm. The crew carried out the engine fire drill and stopped the aircraft clear of the runway an a link taxiway at Block 77(0). The other engines were shut down.

The fire was brought rapidly under control by the airport fire services which arrived on the scene as the aircraft cleared the runway. An emergency evacuation was therefore considered by the commander to be unnecessary.

Injures to persons. None.

Damage to airport. There was substantial damage to the No. 4 engine support structure and fire damage to the outer starboard wing, engine and pylon fairings.

Other damage. None.

Personal information. Commander: Male, age 58. License: Airline Transport Pilot issued in Nov. 19, 1976. A first-class medical certificate was last issued on July 17, 1979. Aircraft ratings: DC4, DC8, C46, B707, B 720, B727, B747. Flying experience: Total on all types: 29,900 hr. Total on the B747: 1,423 hr.

Copilot: Male, age 44. License: Airline Transport Pilot issued on Apr. 26, 1973. A first-class medical certificates was last issued on July 12, 1979. Aircraft ratings: DC8, B 707, B720, B747. Flying experience: Total on all types: 8,158 hr. Total on the B747: 3,559hr.

Flight engineer: Male, age 56. License: Commercial Pilot issued on Apr. 1, 1965. Flight Engineer issued on Apr. 12, 1967, rated for turbojet aircraft. A second-class medical certificate last was issued in Mar. 16, 1979. Flying experience: Total on all types: 18,634 hr. Total on the B747: 4,642hr. Rest and duty periods: Each crew member had been on duty for 7hr. 39 min. at the time of accident. Prior to reporting for duty at New York, each crew member had a rest period of at least 24hr.

Aircraft information. General information:

Type: Boeing 747-121 – Freight Transport. U.S. Registration: N771PA. Serial No: 19661. Date of manufacture: Aug. 1, 1790. Registered owner: Pan American World Airways, Inc., since Aug. 20, 1970. Certificate of Airworthiness: dated Aug. 1, 1970. Validity subject to the aircraft being maintained in accordance with approved maintenance procedures. Conversion to cargo configuration: 9,505. Total cycles: 9,505. Total hour No. 4 pylon: 34,615. Type of engines: Four Pratt and Whitney JT9D-7D. No. 4 engine: Serial No. 662388. Manufactured: Feb. 9, 1970. Installed in N 771PA: Sept. 2, 1979. Hours since installation: 1,269. Hours since new: 27,924.

Aircraft weight and loading: the maximum takeoff weight was 749,000 lb. and the maximum landing weight was 630,000 lb. Actual weights were 743,000 lb and 547,000 lb. respectively. The permitted range of the center of gravity (CG) was between 15% and 31% of mean aerodynamic chord (MAC).CG position was 21% MAC at landing.

Maintenance: A review of the Maintenance in accordance with approved maintenance under existing Federal Aviation Regulation. All application airworthiness directives were recorded and had been compiled with, and service difficulty reports and mechanical interruption summary reports were in order.

The aircraft maintenance logs were examined in detail for a period of six months prior to the accident. The review noted a number of discrepancies recorded relating to No. 4 engine reversal. Also on Aug. 9, 1978, the forward and aft upper mount fittings were found to possess "excessive" play during the preinstallation inspection of No. 4 engine.

On Jan. 6, 1979, during the engine preinstallation inspection of No. 4 pylon the inspector observed a missing bushing and excessive play in the forward mounts and that excessive play exited in the aft mount fitting.

The aircraft was cleared to fly in this condition until the next engine change. An unscheduled engine change was carried out on Aug. 26, 1979, when a "loaner" engine from another airline was installed as a result of high exhaust gas temperature on No. 4 engine.

On "Sept. 12, 1979, the aircraft returned to JFP where the "loaner" engine was removed and replaced by the unit which remained in service until the accident. At this time, the aft engine mount was found to be beyond manufacture's limits and a repair was carried out involving the installation of new bolts and bushings in the pylon strut aft mount to reduce the play within permissible limits. A replacement aft engine mount fitting was ordered, which was programmed for installation at the next scheduled engine change."

The Pan American maintenance inspection schedules with respect to the pylon structure require it to be inspected both externally and internally, but the forward "doghouse" fairing, which covers the front face of the forward bulkhead, was not scheduled for the removal preliminary to these inspections. The interior of the pylon was inspected via the nacelle equipment access doors (NEAD), and these permit the rear face of the forward bulkhead only to be viewed. The forward fairing is scheduled for removal for the internal inspection of the fairing itself and also its latching mechanism, part of which is located on the forward face of the forward bulkhead.

The locking mechanism of the bolts on the forward mount are "key pointed" during this inspection. There is no structure inspection of the forward bulkhead that specifically addresses the forward side of the forward bulkhead. However, it is understood that it is frequently examined on an opportunity basis, together with other areas of the aircraft's structure at times not necessarily dictated by the inspection schedule.

The inspections schedule during power plant removal/replacement do call for a detailed structural inspection of the horizontal and vertical firewalls, i.e. the forward bulkhead and the forward spar web, and these are carried out approximately every 2,575 flight hr., this being the average engine removal time.

The NEADs were removed during the B19 check on Dec. 12, 1979, during which time no discrepancies were noted. The forward failing was last removed during a C-7 inspection on June 8, 1979, again with no recorded discrepancies. The aircraft had not been included in the Pan American strut sampling program during the six-month period prior to the accident.

The Boeing 747 Maintenance Program Development (BMPD) is derived from the Handbook Maintenance Evaluation and Program Development MSG – 1 and the FAA MRB Report, Boeing 747/747SP Maintenance Program. The airplane maintenance program is, in turn, derived from the BMPD. The BMPD requires a number of inspection of the forward bulkhead region and these as follows:

- Check engine mount support fittings and thrust links via the NEAD.
- Check nacelle strut interiors, firewalls and sealant (ribs, spars and fittings) electrical, tubing etc. via the NEAD.
- A leak check of the horizontal fire walls at 20,000 hr.
- Check fail safe bolts (forward mount).
- Check engine mounts, fireseal, cowl support structure, component heat shielding and drag struts.

UNIT III

Task 1

1. Memorize the following words and words combinations:

1. ditch – кювет
2. to cause – быть причиной
3. disaster – беда, несчастье, катастрофа
4. scrutiny – внимательное изучение
5. pinpoint – точно определять, указывать
6. shortcoming – недостаток, слабое место
7. to remedy – исправлять
8. assigned – заданный
9. r.p.m. = revolution per minute

10. dial – прибор
11. needle – стрелка прибора
12. manifestly – очевидно, явно
13. bevel gear – коническое зубчатое колесо
14. to decouple – отсоединять
15. to err – ошибаться

2. *Read Text 1*

MECHANICAL FAULTS

Non-air-minded car owners sometimes say: "If anything happens to my car I can pull over to the side of the road and fix it. But an airplane..." This isn't literally true, of course; mechanical failures do drive cars into ditches. But it is true that mechanical failure in the air is justly viewed with considerably more than ordinary seriousness both by the industry and passengers. Small defects can cause disasters, and unfortunately, after such air disaster the length of time that a board of inquiry sometimes takes to track down the cause tends to clothe the matter an aura of mystery which compounds the disturbing effect. When any new type, or new model of an older type of aircraft is developed, both the manufacturer and the licensing boards painstakingly test every mechanical and structural part to assure its capacity for reliable performance. When, despite this pre-service scrutiny and testing, a fault does make trouble it is the safety investigators' duty to pinpoint where the troubles lies. In some cases, although the faulty part may be minute and apparently beyond suspicion, an inquiry into the accident it has caused can be just as long-drawn-out as when an accident is due to the failure of one of the plane's larger systems. Mechanical malfunctions are often detected in flight and can usually be corrected in the air. The "squawk" sheet the crew brings back from each flight points out shortcomings to be remedied by the maintenance men on the ground. It is only the uncorrected malfunctions that we hear about.

In July of 1956 Trans-Canada Air Lines plane was on its way from Chicago to Montreal with thirty-one passengers. While it was cruising at 19,000 feet above Flat Rock, Michigan, one of its propellers began to act strangely and presently went out of control.

The airliner, a Vickers Viscount, was a relatively new type of ship on the North American routes; built in England, it was powered by four Rolls Royce Dart jet engines driving propellers, and it had received thoroughgoing flight reliability tests in Europe before being certified for service in the U.S. and Canada.

The Viscount which found itself in trouble over Michigan had been in service a little more that a year and in that time had spent 2500 hours in the air. It had that morning made the trip from Montreal to Chicago and was on its way back again.

The weather was good and there had been no intimation of anything wrong. The two pilots, men had had about 300 hours on Viscount. The second pilot had been certified as an aircraft commander, but on this day he was being checked put by the ship's captain over that particular route – a rule of airline administration before a pilot takes command of his own ship over a course with which he is not completely familiar. The captain was occupying the copilot's seat for the flight.

The plane had been moving smoothly aloft at its assigned altitude when the right outboard engine began to lose speed, a dropped well below its normal 13,600 rpm for cruising. As the dial registered this aberration in No. 4's speed, the two men fixed their attention on it and were relived when the needle swung back to normal and remained there for five minutes. But as they watched, they saw the engine revolutions rise to 14,000, and realizing after a short time that some element of the engine was manifestly not functioning properly, they attempted to "feather" the propeller of that unit. They were appalled to find it impossible to stop the run away overspeed by either automatic or manual methods.

Faced now with an unquestionably dangerous situation and with the urgency of maintaining flying speed, they increased the power of the three remaining engines, but this did nothing to lessen the alarming rate at which No. 4 continued to accelerate. A quick radio plea to Traffic Control Center at Detroit gave the crew permission to make an emergency landing at Windsor, Ontario.

Making an unusually rapid descend from 19,000 feet, the captain ordered the cabin depressurized. At 9,000 feet real trouble overtook the craft. No. 4 propeller wrenched lose and one of its blades hurtled into No. 3 jet engine, passed completely though the engine's oil cooler, and a portion of it crashed into the passenger cabin wall near the first row of seats. For the next nine minutes the two captains were wholly occupied trying to control newly shattered No. 3 engine, dealing with the fire hazard in that power plant, and struggling to get the plane down safely. Not until they were on the ground did they discover that the propeller blade had sliced into the fuselage, killed one of the passengers, and injured five others.

So obscure was the cause of the propellers disintegration that it was not until eight months later that the Canadian and CAB investigators were able to issue a report explaining it.

The trouble has begun with the failure of a set of bevel gears to fulfill their functions – to drive the fuel pump, propeller control-unit, and oil pump – which caused oil starvation in the parts the gears were there to serve. Aeronautical annals showed no record of any malfunction of that kind before.

Unfortunately, however, the ultimate catastrophe of the sheared propeller was not, the investigators believed, an inevitable outcome of the trouble that developed with the engine's sudden overspeed.

It had been a natural and ordinarily correct reaction of the pilots to try to get their craft to the ground at the earliest possible moment. But by pushing the airspeed in the rapid descent to make a landing from an altitude of 19,000 feet, they had, in fact, said experts on the two investigating boards, aggravated the condition that began in the failure of the gears. If the ailing propeller had been "feathered" immediately, when it began to behave abnormally, the controls actuating the feathering unit would still have worked. In the beginning, the propeller withstood the pressure of what was very nearly maximum rotation speed, but as the airspeed increased, a strain was put on the propeller which it was not designed to stand. And with strain created a hazard that would not have existed if the craft had not been brought down at an emergency rate of descend.

The final report, in which both the U.S. and Canadian boards concurred, was arrived at after searching study of the engine parts and of the broken propeller components which were recovered along the plane's course. Its official language: "... the probable cause of this accident was the inflight separation of the No. 4 propeller as a result of excessive loads induced by a descent at too high an airspeed while the propeller was wind-milling decoupled from the engine and its rpm was known to be uncontrolled."

When the investigators' work is done, the question in many minds remains: Who was to blame? In most cases of accidents to aircraft it would be unjust to place the blame on the acts of any specific individual; more often it is the conjunction of the sudden elements of malfunction, time pressure, and the force of an habitual reaction that comes from excellent training in handling flight troubled. For, trained as a crew may be to meet all kinds of possible emergencies the unforeseeable factor exists as in all things. A pilot in one instance may err by doing what in ninety-nine cases out a hundred would be the right thing.

Notes to the text:

An aura of mystery – покров тайны
Painstakingly – старательно, тщательно
"Squawk" sheet – отставший кусок
Intimation – намек, признак
To be revived – испытать облегчение
To be appalled – испытать испуг, потрясение
To hurtle – нестись со свистом, шумом
To shatter – разбивать в дребезги
To blame – винить

3. Find synonyms:

To cause	To make mistake
Disaster	To disconnect
Painstakingly	Clearly
Shortcoming	Catastrophe
To remedy	Disadvantage
Manifestly	Thoroughly
To decouple	To lead to
To err	To repair

4. In Point 1 and in the notes to Text 1 find the words corresponding to the explanations:

- to brake into small fragments;
- to move at tremendous speed;

- to find smth (e.g. on the map or plan) accurately;
- a narrow channel made at the side of the road to carry off water;
- great or sudden misfortune, accident.

5. *Think of short situations in which you could use the following words and word groups:*

a. shortcoming, to cause, disaster, to err, manifestly;

b. dial, needle, to decouple, to remedy, assigned.

6. *Speak on:*

a. how the flight of the Vickers Viscount was going on;

b. how the crew behaved during the flight;

c. who you think was to blame;

d. who the author believes to be guilty.

Task 2

1. *Read Text 2.*

BUILDING A SPACE STATION

By 1998, people will work and live on NASA's way station to the stars.

Building the nineteen billion space station Freedom will be an adventure in itself. Between 1995 and 1998, twenty shuttle flights will lift parts of the half-million-pound station into Earth orbit. Like kinds with Tinkertoys, astronauts will assemble 16-foot carbon-fiber tubes into a 236-foot truss to from the basic structure. At each end, huge, power generating solar panels will swivel to face the sun. A mobile servicing center, a sort of remote-control traveling crane, will inch along the truss. Its Canadian-made arm will manoeuvre heavy pieces, such as the habitation module and three laboratory pods from the U.S., Japan and European Space Agency.

Once Freedom is ready, eight international crew members will spend ninety-day tours on board to study the effects of micro gravity, make exotic new materials and observe the Universe. Each will have a bedroom (the "bed" is a sleeping bag strapped to a wall). They'll exercise on a treadmill and eat microwaved food. Showers will consist of a quick squirt, soap and rinse; a vacuum will suck up the drops for recycling. And a rescue vehicle is been designed in case of emergency. NASA added the lifeboat after challenger exploded.

<u>Notes to the text:</u>

To inch – медленно передвигаться, ползти
Treadmill – тренажер, "беговая дорожка"
Squirt – тонкая струя
Rinse – полоскание, смывание

2. *Answer the questions:*
   a. What main parts will the station consist of?
   b. What will be the living conditions for crew?

3. *Use the information of this text and Text 2 from Unit 2 and give as many details as you can concerning the space station.*

Task 3

Now turn to the next part of "747 accident". Follow the teacher's instructions in oral or written translation. Write down some sentences to give the summary of the part. Try to minimize the number of the sentences.

747 ACCIDENT

The BMPD defines a check as through examination of an item, component and/or system for general condition, as applicable, with special emphasis, into alia, on proper attachment, fasteners obvious damage and cracks.

The leak check referred to in the BMPD schedule involves the flooding of the lower forward firewall area in order to check the integrity of the joints between the spar web and the adjacent chord members. This inspection did not form part of the Pan American inspection schedule until mid. 1978. It had not been performed on N771PA up to the time of the accident through it was scheduled to be carried out at a later date.

B747 engine and strut designed criteria: The ultimate design load factor for the JT9D engine and pylon installation in every case exceed those set out in part 25 of the Federal Aviation Requirements (FAR). In the case of landing loads, the structure is assessed as "not critical" against the FAR part 25 requirement of ten FPS vertical velocity.

The nacelle and pylon structure was designed to accept reverse thrust loads multiplied by a factor of 2.5. The maximum design load of the front engine mount on an outboard pylon is 61,700 lb, in the downwards direction.

A typical vertical load peak on touchdown is approximately 10,000 lb., which increases with the application of reverse thrust to approximately 15,000 lb. The greatest in-flight loads on the forward mount in the downwards direction are met during the descent when the engine thrust is at a minimum.

Previous incident: The aircraft was in collision with a baggage igloo at Chicago airport on Nov. 5th, 1976, resulting in light damage to the No. 4 engine nacelle. At the time the aircraft had flown 22,696 hr. and 6,295 cycles.

Meteorological information: After the accident, the meteorological office provided a description of the weather of Heathrow for the relevant period. The description contained the following information:

General situation: Warm sector conditions with a strong moist SW airflow over the London area.

Weather: Moderate rain.

Cloud: 8/8 nimbostratus at 1500 ft. with varying scattered to broken stratus at 1000 ft. below the nimbostratus.

Visibility: 5 km. (3.11 miles).

Wind: The anemometer readings from the side nearest the point of touchdown indicated a relatively steady wind in the period immediately proceeding the landing. Average wind values measured at 30-sec. in intervals for the 2 min. leading up to the moment of touchdown were as follows:

203 deg. / 24 kt.
202 deg. / 20 kt.
204 deg. / 18 kt.
200 deg. / 18 kt.

A gale warning was in force as was significant meteorological information (sigmet) regarding occasional severe turbulence.

The latter was included in the broadcast by the Automatic Terminal Information Service (ATIS) which the crew had received before commencing their approach to lend. After the accident, the crew reported that wind and turbulence had not presented any problem during the approach and landing.

The accident occurred during the hours of darkness.

Aids to navigation. Not relevant.

Communications. Before the aircraft's approach ATIS information had been satisfactorily received and communications established in turn with Heathrow Approach on 199.5 MHz., Heathrow Tower on 118.7 MHz., the latter frequency being the own in use at the time of the accident.

After they had closed the engines down the crew were advised that the Flight Deck / Fire Service Communication Frequency of 121.6 MHz was available, but although they acknowledged this message, no communication on that frequency was subsequent fly established, presumably because the flight deck was evacuated shortly afterwards.

Aerodrome and ground facilities. Heathrow Airport is at an elevation of 80 ft. and has word runways, 28L/10R, 28R/10N and 23/05. At the time of the accident single runway operation was in force, using Runway 23, but with Runway 28L available on request, Runway 23, the one used by N771 PA, is 2357 meters (7733 ft.) long and 91 meters (299 ft.) in width, with the whole length available for landing. Construction is of concrete. Approach lighting consists of high-intensity center-line lights with four cross-bars. Threshold lights are low-intensity greens, and runway lights are high-intensity bidirectional edge lights. Visual Approach Slope Indicators (VASIs) and three-bar VASIs are both installed, and both set at 3 deg.

At that time of the accident all lighting systems were operating and serviceable. The runway was wet.

Flight Recorders

Flight data recorder (FDR). The aircraft was fitted with a Lockheed 209 digital flight data recorder, to Arine 573 standard. It was mounted in the aft equipment bay in the pressurized cabin. Twenty parameters plus 27 discrete switch positions were recorded. Readout was carried out at the premises of the National Transpotation Safety Board in Washington D.C., as facilities did not exist in the U.K.

The whole 25-hr. record was replayed, outputting a limited number of parameters in order to check if any heavy "g" loads had been encountered and in fact none had. A full replay of all parameters was carried out for the descend on the accident flight. The replays obtained were of very good quality with few "dropouts".

The FDR indicates that the aircraft touched down with about 1,5 deg. of nose-up pitch and 4 deg. of bank angle to starboard and at a speed of 140 kt. IAS. The peak normal acceleration and recorded on touchdown was 1.55 g. although as the sampling rate was only 4 per sec. it is possible that the maximum normal acceleration experienced was slightly higher that this. A hard lending is one involving a normal acceleration in excess of 1.7 g. The peak lateral g recorded was 0.12 to port and the descent rate on touchdown (from the radio altimater) was 540 ft./min.

By some 3-4 sec. after touchdown all four thrust reverses had been deployed and maximum reverse engine pressure ratio was obtained some 6-9 sec. after touchdown. Between 12.5 and 16.5 sec. after touchdown No. 4 engine's pressure ratios reduced and the reverted position indications for that engines reverted to stowed, without any in-transit indications. The aircraft continued its run with three engines in reverse thrust until some 26-28 sec. after touchdown. The indications were that engine two's reverses remained in the deployed position.

Cockpit voice recorder (CVR). A Fairchild A100 CVR was fitted to the aircraft and was mounted beside the FDR. The last 3 min. of recording, which was of fair quality, were transcribed.

(to be continued)

Supplementary text

X-WING AIRCRAFT

The x-wing is the mystery ship of the convertiplane world. It is designed to land and take off like a helicopter. In forward flight, the rotor is stopped and the aircraft accelerates like a fixed-wing airplane. Its success depends on the combination of many techniques, including circulating-controlled left; flight control by means of cycling variation of lift, rather that blade pitch; higher-harmonic control to damp vibration; application of composites to produce a virtually rigid four-blade rotor/wing; forward-sweep aerodynamics; use of offset engine efflux to produce both forward thrust in wing-borne flight and shaft drive in the helicopter mode.

The idea has been under development for more then a decade by Kaman and Lockheed. Boeing Vertol has been investigating the rotor and control system since 1980. Sikorsky is testing a full-scale X-wing and will fit one to one of the Rotor Systems Research Aircraft (RSRA), which should fly in two years time, or later.

Circulation-controlled lift applied to rotors was first development by the National Gas Turbine Establishment in Britain and applied to the X-wing by the U.S. David Taylor Naval Ship Research and Development Center. X-Wing is now a joint venture shared between the Defense Advanced Research Projects Agency and the U.S. Navy.

The X-wing has four thick blades, each with a symmetric oval aerofoil section and very precise spanwise slots above both the leading and training edges. The ratio of slot width to chord is critical. Air from an engine-driven blower passes via the rotor hub into the blade roots through stationary ring of ports (whose area can be individually regulated by valves). These ports control the cycling distribution of the airflow which is then ducted to the slots in the blades. Boeing employs 16 ports. Sikorsky more. The blown air varies the lift of the blade to produce control without mechanical pitch change.

Some researches believe that the Coanda effect, in which the circulation-control effect, develops shock-waves close to the blowing slots, which so reduce the theoretical lift coefficients of the blades as to make them unacceptably inefficient. Boeing Vertol claims that them the losses are not great enough to invalidate the concept.

The X-Wing compares well with a normal helicopter. Rotor tip-speed is about 700 ft/sec (213 m/sec), some ten per cent slower that average in helicopters. The disc loading is 15 lb/sq ft (73 kg/sq m), which is little more than of a CH-53E, but less than that of the JVX. The equivalent flapping hinge off-set, which determines the control response (or over-response) is a very large 50 per cent, compared with 30 per cent for the rigid rotor Sikorsky ABC and five per cent or less for a normal single-rotor helicopter. This requires the X-Wing to have to have automatic stabilization and to apply higher-harmonics control in the rotor to damp the 3/rev and 5/rev vibrations, in order to reduce blade-root moments, and the 4/rev vibration in order to damp vertical oscillations. The blowing ports in the rotor hub can be operated to super impose this frequency control over the normal cyclic blowing variations.

If 4,000 HP is needed for rotor shaft drive during hover, it takes a further 500 HP to drive the compressor supplying the air jets. As forward speed builds up, required shaft power declines, but blower power increases. However, the overall power requirement declines steadily, until some 2, 500 HP is sufficient for both shaft and blower drive at 200 kN (370 km/hr).

Although the X-Wing blades normally have no hinges at all applications in the form of trimming control of from 1,5 dg to 6,5 dg of collective pitch could improve hover performance by 10 per cent.

The most difficult flight phase is conversion, which is performed at around 200 kN (270 km/hr). And X-Wing has been spotted in the NASA Ames full-scale tunnel, with all controls operating in 8 sec using of rotor brake.

UNIT IV

An-124 - the WORLD'S LARGEST AIRCRAFT

Основной словарь: performance, appearance, capability, to haul, payload, to achieve, cross-section, advanced wing section, fly-by-wire system, faxed-incidence tailplane, composite material, consumption, hold, slot, slat, to smooth, vortex generator, to swing, fence, to tilt, to suspend, lobe, failure, range.

Упражнения:

I. Прочтите текст и отметьте абзацы, содержащие конкретную информацию по теме.

II. Ответьте на следующие вопросы:

1 .What are the capabilities of the An-124?

2. What payload can this plane carry?

3. What are the most important design features of the aircraft?

4. How can the An-124 be controlled?

5. How is the weight reduction achieved?

6. What are the wing modifications?

7. Is the lending gear construction of the An-124 similar to that of the C-5?

8. How are the passengers accommodated?

9. What routes is the An-124 designed for?

III. Проанализируйте полученную информацию и составьте реферативную аннотацию на русском языке.

IV. Перескажите реферативную аннотацию на английском языке.

Text 1

The An-124 is significantly more advanced in its technology and has a much better performance than anyone expected. The An-124 is clearly a replacement for the An-22 Antea, itself the largest aircraft in the world at the appearance. The An-124 is due to enter service early next year. The An-124's capability in this area appears significantly superior to that of the C-5 - "an older design". The An-124 appears to be able to haul 25,000 1b (11,000) kg) more than the US aircraft over the same distance, or to carry a similar payload 500 nmi (900 km) farther than the C-5. To Soviet type can carry a 25 per cent greater maximum payload and has a significantly larger cabin cross-section. Moreover, all this has been achieved within a maximum take-off weight.

One of the single most important features of the design is an advanced wing section, with the flat top and undercut trailing edge. Such a section makes it possible to design a wing of greater span for a given weight, while providing more internal volume for fuel.

Important weight reductions also result from the use of artificial stability, provided by a four-channel analogue fly-by-wire system. There is a mechanical back-up in the pitch axis, but this is restricted in authority through the use of very high stick forces. The result is that the An-124 can be effectively controlled with a relatively small, low-set, fixed-incidence tailplane, further reducing structural weight, drag and system complexity.

More weight is saved[1] by using 12,125 1b (5,500 kg) of composite material. While this is not used for the primary structure or the control surfaces, it is used for much of the rest of the aircraft.

The attention to weight is also apparent in the cabin. Both weight and fuel consumption are cut by the simple but unusual expedient of accepting[2] a lower pressure differential in the main hold (0,25 bar/3.6 lb/in^2) than in the upper cabins. This reduces fuel burn.

In detail, the An-124 is clean and straight-forward. The wing is with full-span slats and simple slotted fowler flaps in three spanwise sections on each side. There is a small slot built into the outer end of the two inboard flap sections on each side to smooth the flow between them. The wing is completely free from vortex generators and fences, a particularly marked contrast to previous large Soviet aircraft.

Like the C-5, the An-124 features a complex landing gear which allows operations from semi-prepared surfaces and moves the aircraft vertically for loading. The An-124 gear features twelve independent twin-wheel members: two forward-retracting nose units, and five main gears on each side. Each main gear unit swings upwards and inwards. The An-124 is designed to operate from hard but semiprepared surfaces such as the packed-tundra runways of Siberia.

On the ground, the suspension of each main unit can be raised or lowered under central control to tilt the aircraft for loading. Loading is also facilitated[3] by the quartet of 5-tonne electric cranes travelling on rails in the cabin ceiling.

Power for the An-124 is provided by four Lotarev D-18T turbofans.

The onboard data and diagnosis system. Based on a digital computer, this is a multi-purpose device which monitors systems, detects and diagnoses failures in flight, and can be used to calculate the most efficient way to load the aircraft.

<u>Notes to the text:</u>

1. is saved - (зд.) сэкономлено
2. to accept - принимать, допускать
3. to facilitate - облегчать

UNIT V

IL-86

Основной словарь: rate, nacelle, stairway, footprint pressure, thrust reverser, sound suppressor, low-bypass ratio, volumetric capacity, runway, bogle, to retract, wing root, high-lift device, rack.

Упражнения:

I. *Просмотрите текст, определите о чём идёт речь, о каком конкретно явлении; конструкции.*

II. *Назовите предмет, о котором идет речь в тексте, определите более широкую область, к которой относится эта информация.*

III. *Прочтите текст еще раз, в каждом абзаце найдите факты, характеризующие предмет.*

IV. *Ответьте на вопросы:*

1. What new information about the IL-86 application and performance have you got?
2. What basic engine characteristics are given in the test?
3. How many engines has he plane and where are they placed?
4. How does the landing gear function?
5. How many passengers can H-8G carry?
6. What airfields is IL-86 designed for?
7. When does the crew consist of?
8. Does the plane meet the modern world requirements?
9. On what airlines has IL-86 been put into service?

V. *Найдите в тексте или сформулируйте сами главный вывод из информации.*

VI. Укажите на новизну, актуальность, информативность прочитанного вами текста.

VII. Кратко изложите устно или письменно содержание текста.

Text 2

Ilyushin IL-86 wide-body transport is powered by four NK-86 low-bypass turbofan engines rated at approximately 25,000 lb thrust each. Aircraft's range with 350 passengers on board is 4,100 km. The Soviet transport had engine nacelles located on its wing in the original design, but now nacelles are tail mounted. Note the location of the forward passenger entry door. IL-86 was got into service with Aeroflot not so long ago. The IL-86 design has a number of innovative features, including:

- Walk-on baggage holds on the lower deck, which the passenger enters via[1] a fold-down stairway contained in the entrance door.
- Third main landing gear bogie designed to lower the aircraft's footprint pressure so that it can use thin or lightly stressed runways.
- Combined engine thrust reversers and sound suppressors.
- Airframe designed for 40,000 flight hours or 20,000 landings.

The IL-86 has a maximum gross weight of 206,000 kg and can carry 350 passengers 4,100 km. It can carry its maximum payload of 40,000 kg 3,600 km.

Powerplants are four NK-86 low-bypass-ratio turbofan engines rated at 28,800 lb take off thrust each.

Both the range of the aircraft and the engine power output have been increased since the aircraft was developed. Range with 40,000 kg of payload was expected to be 2,350 km and the engines were rated at 12,066 kg takeoff thrust.

The IL-86 range is based on a runway of 2,500 meters, which limits the amount of fuel carried. If a longer runway is available the volumetric capacity of the fuel tanks will permit a "significantly greater" range. Host of the airports IL-86 will operate from in the heavy-volume traffic between major cities and vacation resorts[2].

Maximum fuel capacity of the IL-86 is 86,000 kg of which 53,000 kg is carried in the fuselage wing box.

The aircraft is 59.54 m long, has a wingspan of 48.06 m and a height of 15.81 m. Main landing gear track is 11.15 meters.

The aircraft was designed to operate from low density or soft runways, and this necessitated adding a third main landing gear bogie. The central bogie retracts forward up into the fuselage, while the two outboard main gear bogies retract inward into the fuselage under the wing root. Nose gear retracts forward.

The wing has double-slotted flaps that extend 40 deg. and leading edge slats that extend 35 deg., but it does not make use of Krueger flaps or other high-lift devices.

The two-deck fuselage can carry eight standard cargo containers in addition to all passenger baggage, which will be carried on board by the passengers and checked into lower deck baggage racks.

The four-man cockpit has a modern panel that includes some vertical tape instruments and an area-navigation system with a moving map display.

The operating crew consists of a pilot, copilot/navigator and flight engineer, plus a fourth crewman who can be a second engineer, navigator or instructor. The fourth crewmember's seat is moved on a track between a cockpit station and a specialized instrument panel on either side of the cockpit at the rear of the flight deck.

A thrust reverser/sound suppressor has been developed for the engine and is installed in a redesigned engine nacelle, which was modified to reduce aerodynamic drag.

Up-to-date[3] aircraft is put into service of our Aeroflot.

Notes to the text:

1. via - через
2. vacation resort - курорт
3. up-to-date = modern

U N I T VI

DORNIER 228

Основной словарь: power-to-weight ratio, improvement, fatigue test, to claim, to obtain, complication, push-rod, friction, to droop, centring spring, circuit, trimming, to reinforce, stall, substantial, bus, inverter, boost pump, cut-off, cross-feed switch, nozzle, steering, throttle, flat-rated, torque limit.

Упражнения:

I. Просмотрите текст и ответьте на следующие вопросы:

1. What does the text deal with?
2. What is described in detail?
3. What is considered briefly?
4. What is the key idea of the text?

II. Составьте описательную аннотацию на русском и английском языках на базе полученных ответов на вопросы.

III. Прочтите текст внимательно, отметьте абзацы, содержащие конкретную информацию и ответьте на следующие вопросы:

1. Is Dornier 228 settled into service?
2. What makes Dornier 228 to move into higher weights without serious loss of performance?
3. What improvements are being introduced?
4. The tests have shown that the operating weight can be yet further increased without modifications, haven't they?
5. Are the flight controls all mechanical parts with minimum complications?
6. What are the ailerons provided with?
7. What are the elevators provided with?

8. What is the rudder controlled by?

IV. Проанализируйте полученную информацию и составьте реферативную аннотацию на русском языке.

V. Перескажите реферативную аннотацию на английском языке.

DORNIER 228: THE COMMUTERS' NEW FRIEND

The Dornier 228 is now well settled into service[1] and orders for 40 aircraft have been received. 24 of them have been delivered. The production line is running at two to three aircraft a month. In addition, India has signed up for 150 220s, eight of which will be delivered complete, 16 in kit form[2] and the rest will be made under license.

The TNT wing is paying off in offering good short-field performance combined with high cruising speed and excellent rate of climb. In fact, the new wing and the high power-to-weight ratio of 8.8 lb/HP are already allowing Dornier to move into higher weights without serious loss of performance.

Certification

A variety of improvements are already being introduced. First of all, the landing weight has been increased from 5,500 kg (12,125 lb) to the same level as maximum take-off weight, 5,700 kg (12,630 lb), so that minimum stage length is no longer determined by the landing weight.

Dornier's fatigue tests have now reached more than 180,000 flight cycles and the company claims it can now guarantee four lives of 30,000 flight cycles. These tests have shown that the operating weights can be yet further increased without modifications and Dornier should now be obtaining German certification for an increase in take-off weight to 5,980 kg, a landing weight of 5,750 kg and a zero-fuel weight of 5,590 kg. It is now clear that weight increases beyond those already mentioned could be achieved with only minor[3] airframe modifications.

Dornier claims that the 228 requires 0.71 maintenance man-hours (that is, actual hands-on time), per flying hour, including 0.1 hours for the engines.

Systems

The 228 is a simple aircraft, even to the extent of being certificated for single-pilot operation for those who want it. The flight controls are all mechanical with minimum complications. Elevator and ailerons are controlled through push-rods which make them light and free of friction. The ailerons droop with the flaps. A light centring spring in the aileron circuit can be offset by an electric motor to apply aileron trim.

The elevator circuit contains a spring giving a permanent nose-down effort to reinforce natural static stability. The surface is mounted on the movable tailplane, whose electric actuator motor is controlled from conventional twin-gang switches on the aileron wheels. The tailplane motor will stall when the out-of-trint effort becomes equivalent to a pull or push force of 110 lb (50 kg). British certification has required automatic, trimming when the flaps are lowered or raised, because the trim change caused by the first five degrees of flap is substantial and in the opposite direction to that expected. The rudder is controlled by cables and has a plain, mechanically actuated trim tab.

The electrical system has two engine-driven generators, two static inverters, two batteries, essential and non-essential buses end an external supply. The fuel system has two boost pumps, two engine cut-offs end a cross-feed switch. The two main tanks in each wing are interconnected and transfer into a feeder tank behind each engine nacelle. Normal refuelling is over-wing, but a low-mounted, single-point pressure refuelling nozzle is optional.

The flaps are electrically operated. A self-contained hydraulic system operates the undercarriage, wheel-brakes and nose-wheel steering. Pressure is raised to about 3,000 lb/in^2 (210 bar) by an electric pump as soon as the gear lever is selected down. The system is switched off as soon as the gear is retracted, but some pressure is stored in an accumulator. There is a manual pump for emergency undercarriage lowering. The aircraft can be taxied with brakes and asymmetric throttle if nosewheel steering fails.

The Garrett TPE331-5 engines are flat-rated at 715SHP and top temperature and torque limits are automatically controlled. The full power is maintained at up to ISA +18° at sea level or up to 7,300 ft in ISA. The propellers normally turn at just under 1,600 rev/min. The propeller pitch is also automatically adjusted to prevent reverse thrust if an engine loses power.

The standard flight control system is the King KFC-250, which has an integrated flight director.

At the controls

Pilots should like this aircraft. It has that quality of smooth responsiveness[4] and excellent control harmony which is a trademark of German aircraft design. The stalls are absolutely classically pure and single-engined handling seems to be quite viceless[5].

Notes to the text:

1. to settle into service - ввести в эксплуатацию
2. in kit form - (зд.) комплектом
3. minor - незначительный
4. smooth responsiveness - плавная управляемость
5. viceless = safe

VI. Переведите текст письменно за 30 минут, используя следующие слова:

1. to offer - предлагать
2. to be confident - быть уверенным
3. to mill - выделывать
4. spanwise - по размаху
5. stiffener - элемент жесткости, подкрепляющий элемент
6. wing box – коробка крыла

7. billet - заготовка

8. missile - ракета

Text 2

The 228 is being offered to India for licence production, in competition with the Havilland Canada Twin Otter and CASA C-212. Dornier is confident that it has something extra to offer: the chance for India to get involved at the beginning of a project with significant advances in aerodynamic and manufacturing technology, Dornier has made great efforts to stay in the forefront of manufacturing technology and the techniques developed for Alpha Jet manufacture have been applied to the 228, and taken a stage further. Thus, Alpha Jet wing panels are integrally milled with spanwise stiffeners only but on the 228 wingbox the skins are milled with integral ribs and stringers. Dornier's experience with complex, numerically-controlled machining tasks has won it an Airbus subcontract for the production of A310 flaptracks, which are milled from solid titanium billets. The company is keeping up with composite materials technology, too, and is studying the use of Kevlar or carbon-fibre composite for the 228 wing secondary structure.

Advanced production techniques and materials are not used for their own sake, however. The aim is to reduce production costs by more efficient use of labour, which is expensive in Germany.

For a company of Dormer's size, the scope of its activity is astonishing - being little less than that of the much larger MBB. Military aircraft, civil aircraft, space activities, rotorcraft (unmanned drones), missiles (the private venture Tirailleur study), and remotely-piloted aircraft all fall within the company's orbit. In addition, Dornier is involved in energy (solar, wind and nuclear), information systems, construction materials, urban transport systems, medical technology and textile machinery (the textile machinery division, Lindauer Cornier, operates in a highly competitive industry and accounted for 14 per cent of the groups turnover).

Dornier will only enter a new field if it already has the basic capability in its existing activities; and is not pursuing advanced technology as an end it itself - "we aim to produce market-oriented products, not toys".

VII. *Озаглавьте текст и перескажите его.*

VIII. *Переведите пересказ на английский язык.*

UNIT VII

TECHNOLOGY FOR TOMORROWS BUSINESS AIRCRAFT

Основной словарь: to concern, to get away, rivetting, bonding, to incorporate, carbon fibre material, stress, to persevere, certification program, residual strength, winglet, canard foreplane, transonic, camber, tunnel test, sweep, spin, boundary layer.

Упражнения:

I. *Прочтите и переведите название текста.*

II. *Просмотрите текст, определите, о чем идет речь: о каком явлении, проблеме, процессе.*

III. *Назовите проблему текста. Соотнесите эту информацию с более широкой областью знаний.*

IV. *Прочтите текст еще раз. В каждом абзаце найдите факты, характеризующие новое в изготовлении самолета, новое в применении материалов. Найдите в тексте или сформулируйте сами главный вывод из информации о предмете.*

V. *Выразите ваше отношение к полученной информации укажите на новизну и актуальность темы.*

VI. *Изложите в письменном или устном виде*

1. What is the text about?
2. What is described in detail?
3. What is given in short?
4. What is the key idea of the text?

VII. Составьте описательную аннотацию, переведите её на английский язык.

<u>*Structures*</u>

As far as structures are concerned, the manufacturers are going to try to get away from the traditional methods of working with metal. There was first the move from rivetting to bonding, followed by the transfer from mechanical to chemical milling. The next move, which has already begun and which is going to increase, is towards composite materials. Their intensive use should produce a reduction in the empty weight of an aircraft of about 20 per cent Each part made of composite material is 20 to 30 per cent lighter than the same part made in metal.

Several types of business aircraft already incorporate various parts made of Kevlar, glass, carbon or other fibre composite materials. This is especially true for the Canadair Challenger, and development managers of this Canadian company told INTERAVIA that while Kevlar would continue to be used for the manufacture of secondary structures, increasing attention was going to be paid in the future to the possibilities offered by carbon fibre materials, which can be used to produce components subjects to high stresses and which are still made of metal today. There will be a resultant simplification of this manufacturing process and, as a result, reduction in cost. This is a point of view, which is currently developing a wing box to be tested on the Falcon 10 as part of a research program into the application of carbon fibres. This program is being carried out jointly with Aerospatiale. In spite of a number of difficulties, winch have recently arisen in the program, the two French manufacturers have decided to persevere as they are convinced that they will make definite progress in the medium term.

Another project which should not be omitted is the Lear Fan, which is successfully continuing its test flights. Manufactured almost completely from composite materials based on carbon fibre/Kevlar, this aircraft has a planned minimum service of 15,000 hours and typifies one of the objectives of the whole industry, which is waiting for the results of its certification program with some interest, and in particular, the solution of the problem of residual strength after damage.

Another problem which arises in the production of aircraft using parts made of carbon fibre is testing, not of the material itself but of the finished part. Unlike metal components, it is not sufficient to use statistical methods of checking. It is necessary to carry out a quality check on every part. In addition, the manufacturers will have to develop methods of checking the whole production process, step-by-step[1], before they can really launch large-scale composite production of primary structures.

Aerodynamics

Innovation in aerodynamics is likely to produce the greatest changes in the external appearance of future light and business aircraft. In the course of the past few years, winglets have gained considerable ground[2] and this tendency will probably continue; likewise we may see the appearance of new canard foreplanes and other aerodynamic devices, as well as the development of new aerofoil sections or wing shapes. In this connection, one of the preoccupations[3] of the design departments is to develop a transonic wing with drag at least 20 per cent lower than current wings, within the next five or six years. Several thicknesses and cambers are being examined and, from the first wind tunnel tests, it seems that the move is towards thicker sections than those used at present (relative thickness exceeding[4] 15 per cent at the root) as well as towards wings with high aspect ratios (more than 10) and increased sweep (35 per cent and more).

Canards are the subject of some controversy with some designers maintaining that they represent an ideal aerodynamic solution while others remain more sceptical and feel that this still needs to be proved. NASA, which is currently carrying out tests and performance measurements with a modified Varieze aircraft, has already established that the foreplane appears to be a potentially useful device (improving safety by eliminating nearly all risk of stalling and going into a spin).

The only limitation is that, in the case of aircraft with a high maximum weight, to keep the centre of gravity in the correct position, the installation of a foreplane requires a reduction in the dimensions of the wing. As a result, the capacity of the wings to carry fuel is reduced appreciably[5].

As for the so-called active techniques used in aerodynamics, such as control of the boundary layer or the various methods of over-wing blowing, some manufacturers believe in these very strongly, and it is certainly not likely that NASA is going to contradict them, bearing in mind that the agency has launched a research project for a four-jet business aircraft with over-wing blowing.

Notes to the text:

1. step-by-step - постепенный
2. to gain ground - (зд.) распространять(ся)
3. preoccupation - забота
4. to exceed - превышать
5. appreciably = considerably, greatly

UNIT VIII

THE COMPUTERIZED COCKPIT FOR THE ONE-MANCREW

Основной словарь: fighter, keyboard, guidance, hardware, timing, software, data highway, frequency, navaids, to select, waypoint, to insert, to identify, to ensure, to take into account, descent angle, to fit, execution, to couple (to), beam, altitude, warning, touchdown, beacon, leg, endurance, to estimate, to arrive, manifold pressure, cowl, to disengage, datum attitude, to release.

Упражнения:

I. *Прочтите текст.*

II. *Ответьте на вопросы:*

1. What's the aim of placing the computer on board the plane?
2. Why is the computer used in the one-man crew plane?
3. How many programs are necessary for the navigation?
4. What extra operations may be performed by the computer?

III. *Составьте план пересказа I и 2 части текста.*

IV. *Составьте описательную и реферативную аннотацию на русском и английском языках.*

Text 1

With the aid of computers, data highways, some relatively straightforward hardware and a year or two of programming, you can revolutionize life in the general aviation cockpit. It has already been done in fighters and airliners. How it is the turn of the kind of light aircraft that a private pilot is likely to fly solo on airways. Virtually[1] every pro-flight and in-flight job can be reduced to a keyboard routine and an integrated computer system can be organized to produce information, guidance and control in a volume altogether disproportionate to the amount of hardware used.

The reason behind the NASA exercise, called Demonstration Advanced Avionics System (DAAS), is that the general aviation pilot is going to have to live in a more and more complex airspace system, but may not have room or money to install all the new equipment which would make this safe and effective. Present moves towards reducing cockpit work-load are efforts to automate radio tuning and to integrate the autopilot and flight director. But NASA believes that modern computers, data highways and software, together with shared displays and controls, allow far more productive use of the basic information already available in light twins. Particularly, the navigation system can be made more responsive to flight planning requirements, and the navigation instructions in both horizontal and vertical modes can be passed directly to the autopilot.

In the DAAS system, the locations, call signs, frequencies and elevations of a set of VORs and DMEs are stored in the navigation computer and the computer will automatically select which ever of the navaids is best suited to[2] define a succession[3] of geographical waypoints inserted by the pilot. DAAS will cause the navaids to be tuned automatically at the right moment. It will constantly compare the signals from the navaids by Kalman filtering to identify the best signals and ensure that they are adequate for navigation, and it will tell the pilot which aid is being used. Very little additional hardware is needed to do this job.

The navigation system can also take into account the safe or flight-planned altitude over the stored geographical area and can calculate descent angles required when changing altitudes. Not fitted in DAAS, but foreseeable, is an autothrottle to automate the execution of climbs and descents. The DAAS system is designed to couple to ILS and to capture the localizer beam from acute[4] angles. With a radio altimeter, the system could even be extended to automatic landing.

Extra help

The kind of extra help DAAS gives the pilot is that it will decide from the navaid frequency whether it should treat the appropriate altitude input as an airways minimum descend altitude at which it will level the aircraft off and sound the warning, or as a decision height, at which it also sounds a warning, but allows the aircraft to continue down towards touchdown. It will also automatically generate intermediate[5] waypoints close to good beacons along the line between the starting and finishing waypoints of a long leg.

All the required information is inserted on individual "pages" in the display system of the main computer. The pilot selects from a "menu" of pages by pressing buttons beside the display and can select information for display on a separate keyboard.

On two "flight status" pages, DAAS will, whenever asked, list true airspeed, groundspeed, wind speed and direction (calculated from TAS and groundspeed), percentage engine power (taken from engine indications), fuel remaining in pounds and in minutes of endurance, distance and time to next waypoint and estimated time of arrival overhead. Greenwich Mean Times[6] is preset in the system.

On the cruise performance page, DAAS tells the pilot his propeller rev/min, manifold pressure and percentage power, fuel flow, miles/lb of fuel, TAS, groundspeed, ETA and fuel required to the next waypoint

The checklist display is already a familiar feature in weather radars, but DAAS goes a long way further. After the pilot has inserted take-off gross weight and fuel load and detailed the location and weight of people and other items on board, DAAS tells him his centre of gravity location. This can be transferred to the initial departure page and becomes available for use during cruise control. Similarly, DAAS will work out take-off speeds, normal and single-engined rates of climb and airspeeds, accelerate-stop distance, ground run and distance to 50ft for the actual aircraft weight, airfield elevation, and temperature.

The DAAS warning system checks and warns of aircraft configuration items such as gear, flaps, doors, cowl flaps, trim settings and fuel pump settings, and also monitors that engine settings are within limits. It warns if low and high airspeed limits are reached and provides full altitude alert[7] service. Conventional warning lights and sounds are supplemented by written messages in the electronic display.

The autopilot is actually based on a digital King general aviation system. Its main additional mode, apart from being integrated with the navigation system, is control wheel steering. The pilot can fly manually without disengaging the autopilot and the aircraft is brought back to datum attitude or settles at a new height when the controls are released.

Notes to the text:

1. virtually = in fact
2. to suit to - подходить к ...
3. succession - последовательность
4. acute angle - острый угол
5. intermediate - промежуточный
6. Greenwich Mean Time (GMT) - среднее время по гринвичскому меридиану
7. alert - (зд.) быстрый

UNIT IX

HISTORY OF AERONAUTICS

Approaching the Topic

Quiz Time

1. *You are taking part in an International Olympiads on Aeronautics as a representative of SSAU. Do the following quiz and mark the statements as true (**T**) or false (**F**).*

2.

1	Aeronautics is an ancient science.	**T**	**F**	**7**	Airplanes Tu and Il were named after the names of their inventors.	**T**	**F**
2	M.V.Lomonosov was an outstanding scientist, developing aircraft design.	**T**	**F**	**8**	The astronaut that made the first human step on the surface of the Moon was Armstrong.	**T**	**F**
3	Leonardo da Vinci made the first drawings of flying machines.	**T**	**F**	**9**	Popov invented the first artificial satellite.	**T**	**F**
4	K.E. Tsiolkovsky was famous because he was deaf.	**T**	**F**	**10**	The first cosmonaut in the history of mankind was Yu.Gagarin.	**T**	**F**

5		T	F	11		T	F
	The first cosmonaut in history was a woman.				The Wright brothers made the first Zeppelin, named after one of the brothers.		
6		T	F	12		T	F
	Belka and Strelka were the heroic dogs, having made the space journey.				Americans launched the first earth satellite in 1967.		

3. *Compare your answers with those of your partner's. Add one sentence of your own to each statement.*

4. *In groups, think about 5 sciences the future aircraft designer should know very well.*

Sharing Information

1. a) Select the qualities you think an aircraft designer should possess. Use the dictionary.

- creative thinking
- luxuriant imagination
- assiduity
- patience
- independence
- decisiveness
- industry
- strength of mind

- neophilia

- riskiness

b) Rate the qualities from most important to least important (1-10).

2. Together with a partner, briefly share your opinion concerning the traits of character the future aircraft designer should have.

- interrupt your partner's opinion
- encourage him/her to say more
- try to show your personal opinion

These phrases might be helpful:

Expressing opinion

- To my mind …
- As far as I know …
- In my opinion …
- You are quite right …
- You are not quite right …
- I think so …
- I don't think so …
- It seems to me that …

Conquering the Sky

Preparing to Read

1. Answer the questions below.

1) What aircraft designers do you know?
2) Which of them are connected with the very beginning of the flying machine era?
3) What were the types of the first flying machines?
4) What are the useful and useless aerodynamic forces, the aircraft designer should consider?

2. Scan the below telegram to answer the questions:

THE WESTERN UNION TELEGRAPH COMPANY.

INCORPORATED

23,000 OFFICES IN AMERICA. CABLE SERVICE TO ALL THE WORLD.

[illegible]

ROBERT C. CLOWRY, President and General Manager.

RECEIVED at

176 C KA CS 33 Paid. Via Norfolk Va

Kitty Hawk N C Dec 17

Bishop M Wright

7 Hawthorne St

Success four flights thursday morning all against twenty one mile wind started from Level with engine power alone average speed through air thirty one miles longest 57 seconds inform Press home #### Christmas .

Orevelle Wright 525P

1) Who was the telegram from?

2) Who was the telegram addressed to?

3) When was it sent?

4) How many flights were mentioned in it?

5) What telegram company was this telegram sent by?

Reading

*Read the following text. Match the subtitles **1-8** with parts of the text **A-E**. Mind there's 3 extra subtitles you do not need.*

1. Family Life

2. A Toy Helicopter

3. A Historic Event

4. A Famous Astronomer

5. An Elegant Machine

6. Observation Birds

7. Weight and Power: the Critical Equation

8. Great Fame

Conquering the Sky

A. The flying machine designed and built by the Wright brothers back in Dayton, Ohio was delivered to Kitty Hawk in pieces. They began by digging out and repairing the wooden hangar they had built to house themselves and the glider they had tested the previous year. The weather was just right: on the first day they carried out 75 flights from the highest dunes, relieved to see they hadn't lost their piloting skills in the meantime. They knew that if they wanted to fly under power, they had to master the still mysterious art of piloting.

Local workers constructed a new wooden hangar, where Wilbur and Orville could assemble their new machine. The engine-powered "Flyer", as they had christened it, was too heavy to roll down the beach for a takeoff. So they built a 60-foot takeoff "monorail" of iron-clad wood beams. The Flyer would use this rail to take off.

B. The Flyer weighted in at 700 pounds – still too much, since according to their calculations, it could weigh no more than 625 pounds including engine, propeller and pilot. The excess weight had them worried. The engine had a certain power reserve, but they weren't sure how much. In fact, the engine was both a major concern and a source of pride. Since no manufacturer had been able to supply them with a powerplant meeting their specifications for a reasonable price, they had machined all the parts themselves. Back in 1900, the brothers had traveled to New York to look at the engines powering two early French cars. They immediately reached several conclusions: they would need four cylinders to develop the necessary 20 horsepower; but automotive engines were too heavy and the front-mounted radiator wasn't exactly aerodynamic!

They would have to start from scratch, especially to reduce weight. The result was a mixture of some very modern techniques, and some that were more conventional. The engine block was made of aluminum, an extremely lightweight material, but still relatively unknown at the time. They replaced the carburetor by what they called a "fuel injection device". Transmission to the propeller would be by bicycle chains and gears! The radiator was made of long, flat tubes. From today's perspective, is still surprising that it took most other constructors nearly 20 years to learn their lesson from the Wright's efforts to reduce aerodynamic drag, and finally get rid of the frontal, non-faired radiators. On the other hand, cooling was neglected on the Wrights' engine, and the ignition device not very effective. In the end, the engine weighed in at 81.4 kilos and delivered 16 horsepower at 1,090 rpm on startup. Once the engine warmed up, power declined rapidly, in just a minute or so, to a steady 12 horsepower.

The Wright brothers made the first flight in history on December 17 and almost the first thing they did was to send a telegram home to their father. The next day, the brothers finished dismantling their Flyer and returned to their home city of Dayton, to celebrate Christmas with their family.

C. Wilbur and Orville were very close as children and had the same penchant for tinkering with mechanical objects. They claimed that their interest in aviation dated back to 1878, when their father brought home a toy helicopter. The helicopter became their favorite toy. Starting out as printers, they would later open a bicycle shop and create their own brand in 1896. Both imaginative and manually dexterious, they had a number of inventions to their credit, including a piston engine to drive the machine tools in their workshops. They would prove to be very clever mechanics, and at the same time, they were building up extensive experience in their own workshops.

Then Wilbur wrote to the famous research organization, requesting the bibliography of publications on aeronautics. The book "Experiments in Aerodynamics" became bedside reading for Wilbur. For some time already, the two brothers had returned to their teenage dream of building a heavier-than-air flying machine. The accidental death of German aviation pioneer had awakened their interest, along with their discovery of an ornithology manual by French professor. Why, they asked themselves couldn't man reproduce the mechanisms that allowed birds to fly?

D. Wilbur and Orville began to study a safer way of controlling and guilder. By observing the wing warping principle that certain predecessors had already discovered independently. They would apply this concept to the construction of their first kite.

The Wrights became obsessed with a single thought: flight! They began to construct a man-carrying glider.

In September 1900, on the recommendation of weather services, they decided to carry out glider experiments. The machine they tested the first year was a biplane. Flown without a pilot, it proved to be very satisfactory. It was controlled by ropes, like a huge kite. The following year they made a new machine. Wilbur noted that they had carried out 17 gliding flights without pilot and then the manned flight began.

E. In early October they began a long series of manned flight, lasting until the beginning of November. Over the thousand flights the pilot would lose control of the machine only once, breaking some of the wooden struts in rough landing. The longest flight lasted 26 seconds and stretched 622 feet. Orville and Wilbur were learning the art of piloting, which demands skilled control over the rudder and wings at every single moment. Reflexes have to be both fast and sure. The many photos taken by the brothers show an elegant glider, with wings as diaphanous as those of a butterfly, and with an "airframe" similar to that of future biplanes, very different in fact from the complicated and unrealistic machines imagined by utopian writers in previous centuries.

During the winter of 1902-03, they turned to the design of an engine for their planned aeroplane. Having analyzed and resolved various aerodynamic issues, they focused on questions of the propeller shape and engine power.

After December 17, 1903, they could no longer escape publicity or celebrity. A new life had begun.

Comprehension Check

1. *Define the main idea of the part **Weight and Power: the Critical Equation**. (Note: It should be a complete sentence.) Find the supporting details that help to develop the main idea.*

2. *a) Look through the following list of word combinations, translate making use of a dictionary.*

Meantime, to assemble, wooden hangar, mysterious, art of piloting, local, to christen, major concern, immediately, automotive four cylinder engines, relatively, to get rid of, front-mounted, to neglect, ignition device, rpm, a gust of wind, to desintegrate the machine, to dismantle the machine, to celebrate Christmas, teenage dream, ornithology, to guide a glider, wing warping principle, to carry out experiments, a long series of, to take photos, to escape publicity.

b) Divide them into:

1) expressions to be used when speaking about aviation

2) general expressions

c) Reproduce the context with these expressions.

d) Use the phrases in your own contexts.

3. Complete the sentences:

1. The engine-powered "Flyer", as they had christened it, was ...
2. The radiator was made of...
3. The engine block was made of ...
4. They replace the carburetor by ...
5. Transmission to the propeller would be ...
6. The machine they tested the first year was a ...
7. Flown without pilot, a biplane proved ...
8. Having analyzed and resolved various aerodynamic issues, they focused on ...
9. The many photos taken by the brothers show ...

4. Answer the questions below.

1) Did the Wright brothers only design the flying machine or they also build it?
2) Why it was necessary to build a "monorail"?
3) What advantages and disadvantages did the Wrights' engine have?
4) Why was it necessary to reduce the weight of the machine?
5) Did the Wrights first test the machine with or without a pilot?
6) When did they successfully test their first machine?
7) How long did the first flight last?

5. Put 3 more questions to the text.

Focus on Writing

1. *a) The following sentences are about the steps the Wrights took on the prominent day of testing the airplane. But the sentences are mixed. Rewrite them in the correct order.*

1) The landing broke the elevator control.
2) A neighbor had been instructed to take a photograph as soon as the aircraft left the ground.
3) On December 17, despite a wind of 20 knots, stronger than they would have liked, they rolled out the Flyer.
4) In twenty minutes they had made the repairs, and the brothers made three more flights.
5) The flight had lasted just 12 seconds, but it was a real, sustained, controlled flight, in front of witnesses.
6) At 10:35 am, Orville climbed into place and took the controls.
7) The last flight had started with the aircraft wavering, then achieving perfectly level flight as the pilot brought it under control.
8) The Flyer rolled down the rail, rose into the air to an altitude of about 10 feet and traveled forward some 120 feet before nosing into a dune.
9) However, barely had the aircraft returned to the ground when a gust of wind upened it and rolled it over, desintegrating the machine.
10) The neighbor tried to save the Flyer and was luckily injured, but would always remind listeners that he had survived the world's first airplane crash!

b) *Compare it with you peers.*

Tell Your Story

Tell your own story about any other aircraft designer. Follow the plan.

1. Family and childhood.
2. Education.
5. What had influenced his choice to become an aircraft designer.
6. Who his colleagues and friends were.
7. Tell about the advantages of his most famous models.
8. Name his progenies and stalwarts.
9. Tell if his invention is modern or obsolete.

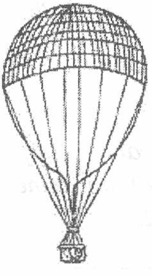
UNIT X

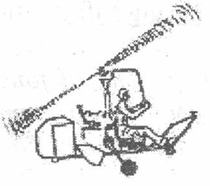
TYPES OF FLYING APPARATUS

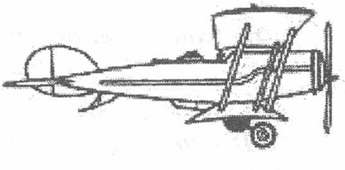
Approaching the Topic

A. Quiz Time

1. Look through the pictures a-h very carefully. Do you know the names of each flying device? Name them. For the help look at the list, given below, but there are some extra models.

a) 

b) 

c) 

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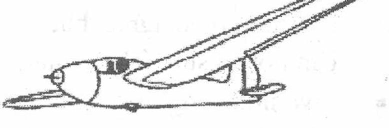
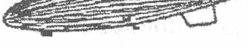
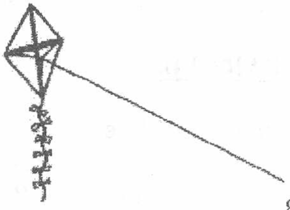
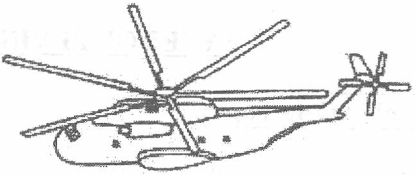
e) 

f) 





g) h)

Flying boat, glider, biplane, VTOL, kite, autogyro, balloon, tailess airplane, rigid airship, parachute, tractor airplane.

2. *If you were a traveller and had at you disposal any passenger-carrying apparatus, by which one would you prefer to travel?*

B. <u>Sharing Information</u>

1. *In groups of four, discuss pros and cons of the above apparatus. Provide reasoning. Use conventional formulae of agreement and disagreement. The verbs in the box might be helpful.*

allow	enable	force	may	stop	faster	save
make it easier	make it more difficult	suffer from travel sickness				

Agreeing

- I quite agree.
- You're right.
- That's true.
- Absolutely!
- No doubt about it!
- That's just what I was thinking.

Disagreeing

- I don't agree.
- I don't think so.
- I wish I could agree, but …
- I'm not so sure (about that).
- I wouldn't say that.
- Wouldn't you say that …?

Preparing to Read

1. Answer the questions below.

1) How many meanings of the word *balloon* do you know?
2) Why were people, especially scientists interested in the composition of the atmosphere?
3) How do we call scientists studying the atmospheric phenomena?
4) Which countries are known to be the pioneers in early flights and atmosphere studies?

Reading

Read the text below. Think of a suitable title. Provide reasoning.

The earliest form of air transport was balloons, which are sometimes called "free balloons" because they are forced to drift by the wind flow without any engine. This fact alone makes balloons not reliable enough for carrying people. If they were safer they would be used more for transportation, but at present the scientists use the balloons mostly for obtaining information about upper atmosphere, its density and other scientific subjects. Weather balloons are particularly used by meteorologists. They carry instruments whose readings are automatically sent back to the ground by the radio. The position of the balloon is obtained by radar.

The first balloons were done by Montgolfier brothers in the 18-th century.

Etienne and Joseph Montgolfier lived in a little village in France where their father had a paper factory. The two brothers took paper bags from their father, filled them with smoke over a fire and watched them go up into the air.

After numerous experiments they were ready to show how their balloons worked. On the day of the flight people from different places came to the little village to see the spectacle. The brothers had constructed a bag some thirty feet in diameter. That big bag was held over a fire. When it was in the air for ten minutes and then as the air bag became cold the balloon went down.

The news about the experiment reached the king who wanted to see it himself. So on September 19, 1783 Montgolfier brothers repeated their experiment in the presence of the King and Queen of France. This time the balloon carried a cage with a sheep, a cock and a duck who were thus the first air travellers. The flight was successful. The balloon came down some distance off with the sheep, the cock and the duck unharmed.

If the animals could live through this men could risk too. A month later a balloon was sent up with a Frenchman, Rozier by name. He stayed up in the air for twenty-five minutes at a height of about one hundred feet above the ground, and then came down saying that he had greatly enjoyed the view of the country.

A month later he and Arlandes made the first free balloon flight. Their friends who came to say good-bye to them were very sad as if the two men were going to certain death, but they went up several hundred feet, were carried by the wind over Paris and came down in safety.

In 1785 a Frenchman and an American crossed the English Channel in a balloon. When they had covered three quarters of the way the balloon began to go down. They threw everything they could overboard. If they had not done it, they would have never reached the French coast.

Comprehension Check

Quiz Time

*1. Check you knowledge on the history of the balloons. Do the following quiz and mark the statements as true (**T**) or false (**F**).*

1	The earliest form of air transport was dirigible.	**T**	**F**	**8**	The first balloon was in the air for 15 minutes.	**T**	**F**
2	"Free balloons" are moving without any engine.	**T**	**F**	**9**	The first air travellers were domestic animals.	**T**	**F**
3	Balloons are reliable vehicles.	**T**	**F**	**10**	The first man lifted by the balloon was a Frenchman, Rozier by name.	**T**	**F**
4	Balloons are used for carrying people.	**T**	**F**	**11**	Rozier and Arlandes safely landed after the flight.	**T**	**F**
5	Weather balloons are used by meteorologists.	**T**	**F**	**12**	In 1785 an American crossed the English Channel in a balloon.	**T**	**F**

6	The first balloons were made in Germany.	T	F	13	The air travellers had certain trouble during their flight across the English Channel.	T	F
7	Montgolfier's father had a paper factory.	T	F	14	Balloons are widely used nowdays.	T	F

2. Compare your answers with those of your partner's.

3. *Define the main idea of the first paragraph. Find the supporting details that help to develop the main idea.*
4. *Explain the meaning of the following words and word combinations from the text. Make use of a dictionary if necessary.*

Reliable enough, to be safer, density, particularly, the readings of the instruments, village, smoke, numerous experiments, to be held over, in the presence of, cage, sheep, cock, unharmed, at a height of, to come down in safety.

5. Choose the one word that best keeps the content of the text.

1) The earliest form of air transport was
   a) dirigible
   b) helicopter
   c) glider
   d) balloon

2) The scientists use balloons mostly for
   a) experiments
   b) transportation of the instruments
   c) making calculations
   d) obtaining information about atmosphere

3) The position of the balloon is obtained by

a) satellite
b) radio
c) sensor
d) radar

4) Montgolfier's big bag was held over

a) gas
b) gasoline
c) smoke
d) fire

5) The first air travellers were

a) people
b) domestic animals
c) objects
d) beasts

6. Complete the following sentences using the content of the text.

1) "Free balloons" are forced to drift by …

2) This fact alone makes the balloons not …

3) If they were safer they would …

4) They carry instruments whose readings are …

5) Etienne and Joseph Montgolfier lived in …

6) After numerous experiments they were ready to …

7) The brothers had constructed a bag …

8) The news about the experiment reached …

9) The next time the balloon carried a cage with …

10) If the animals could live through this …

11) He stayed up in the air for twenty-five minutes …

12) A month later he and Arlandes made …

Focus on Writing

1. Read the following encyclopedia articles about the balloons. There are several names of the scientists and writers closely connected with flying on the balloon. Write one short story on the people exploring the balloon. Use the materials of all three articles.

Balloon

Large airtight bag filled with hot air or a lighter-than-air gas such as helium or hydrogen that can rise and float in the atmosphere.

Experimental attempts may have begun by 1709, but not until 1783 did J.-M. and J.-E. Montgolfier develop a fabric-bag balloon that would rise when filled with hot air. Balloons provided military aerial observation sites in the 19th century and were used in the 20th century by scientists such as Auguste Piccard to gather high-altitude data. The first round-the-world balloon flight was achieved in 1999 by Bertrand Piccard and Brian Jones.

Gay-Lussac, Joseph
born Dec. 6, 1778,
Saint-Leonard-de-Noblat, France
died May 9, 1850, Paris

French chemist and physicist.

He showed that all gases expand by the same fraction of their volume for a given temperature increase; this led to devising of a new temperature scale whose profound thermodynamic significance was later established by Lord Kelvin. Taking measurements from a balloon flying more than 20,000 ft (6,000m) high, he concluded that Earth's magnetic intensity and atmospheric composition were constant to that altitude. With Alexander von Humboldt, he remembered as a pioneer investigator of the behaviour of gases and techniques of chemical analysis and a founder of meteorology.

Verne, Jules
born Feb. 8, 1828, Nantes, France
died March 24, 1905, Amiens

French writer.

He studied law then worked as a stockbrocker while writing plays and stories. The first of his romantic adventures, *Five Weeks in a Balloon* (1863), was highly successful. His subsequent voyages – with increasingly fantastic yet carefully conceived scientific wonders that often anticipated 20-th century technological achievements – include *A Journey to the Centre of the Earth* (1864). *Twenty Thousand Leagues Under the Sea* (1870), and *Around the World in Eighty Days* (1873). Verne's work shaped the entire development of science fiction.

2. Write your own encyclopedia article on ***glider.***

Tell Your Story

You are going on a balloon flight. Tell who and what you would like to take with you. Follow the plan.

1. Place of Destination
2. Approximate Flight Duration
3. Membership
4. Food
5. Clothes
6. Any other things

Учебное издание

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Составители: Ирина Константиновна Протченко,
Артур Геннадьевич Лещенко

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Самарский государственный аэрокосмический университет.
443086 Самара, Московское шоссе, 34

Изд-во Самарского государственного аэрокосмического университета.
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