Unit 1

Forces acting on the airplane in flight

When in flight, there are certain favorable and unfavorable forces acting on the airplane. It is the primary task of a pilot to control these forces so as to direct the airplane`s speed and flight path in a safe and efficient manner. To do this the pilot must understand these forces and their effects.

Airplane is an engine-driven fixed-wing aircraft heavier than air that is supported in flight by the dynamic reaction of the air against its wings. Among the aerodynamic forces acting on an airplane during flight, four are considered to be basic because they act upon the airplane during all maneuvers. These basic forces are lift, the upward acting force; weight (or gravity), the downward acting force; thrust, the forward acting force; and drag, the rearward acting, or retarding, force.

While in steady flight the attitude, direction, and speed of the airplane remain constant until one or more of the basic forces changes in magnitude. In unaccelerated flight (steady flight) the opposing forces are in equilibrium. Lift and thrust are considered as positive forces (+), while weight and drag are considered as negative forces (-), and the sum of the opposing forces is zero. In other words, lift equals weight and thrust equals drag.

When pressure is applied to the airplane controls, one or more of the basic forces change in magnitude and become greater than the opposing force, causing the airplane to accelerate or move in the direction of the applied force. For example, if power is applied (increasing thrust) and altitude is maintained, the airplane accelerates.

As speed increases, drag increases, until a point is reached where drag again equals thrust, and the airplane will continue in steady flight at a higher speed.

In straight-and-level flight (constant altitude) lift counterbalances the airplane weight. When lift and weight are in equilibrium, the airplane neither gains nor loses altitude. If lift becomes less than weight, the airplane will enter a descent; if lift becomes greater than weight, the airplane will enter a climb.

A number of the factors that influence lift and drag include: wing area, shape of the airfoil, angle of attack, speed of the air passing over the wing (airspeed), and density of the air moving over the wing. A change in any of these factors affects the relationship between lift and drag. When lift is increased, drag is increased, or when lift is decreased, drag is decreased.

Airplanes are designed in such a manner that the torque effect is not noticeable to the pilot when the airplane is in straight-and-level flight with a cruise power setting.

By definition, “torque” is a force, or combination of forces, that produces or tends to produce a twisting or rotating motion of an airplane.

Airplane designers make an effort to increase the performance of the airplane by increasing the efficiency of the desirable forces of lift and thrust while reducing, as much as possible, the undesirable forces of weight and drag. Nevertheless, compromise must be made to satisfy the function and desired performance of the airplane.

Exercise 1. Answer the questions:

1. What is the primary task of a pilot?
2. How can you define an airplane?
3. What are the basic forces acting on an airplane during flight?
4. When are the opposing forces in equilibrium?
5. How does drag depend on the speed?
6. What is necessary to overcome lift?
7. What factors influence lift and drag?
8. Give the definition of “torque”.

Exercise 2. Read and translate the following word combinations:

Favorable and unfavorable forces; an engine-driven fixed-wing aircraft; heavier than air; changes in magnitude; to apply pressure; to maintain altitude; to enter a climb; a twisting or rotating motion of an airplane; to increase the performance of the airplane; the opposing forces angle of attack; speed of the air passing over the wing; straight-and-level flight.

Exercise 3. Find the English equivalents to the following expressions:

Установившийся полет; угол атаки; скорость воздуха, проходящего над крылом; начинать набор высоты; улучшать летно-технические характеристики самолета; самолет, приводимый в действие двигателем; воздушное судно с крылом постоянной стреловидности; благоприятные силы; неблагоприятные силы; тяжелее воздуха; изменения по величине; вращательное движение; выдерживать высоту.

Exercise 4. Find in the text the sentences with the verbs in the Passive Voice, explain their usage.

Unit 2

Airplane stability. Axes of rotation.

Stability is the inherent ability of a body, after its equilibrium is disturbed, to develop forces or moments that tend to return the body to its original position. In other words, a stable airplane tends to return to the original condition of flight if disturbed by a force such as turbulent air. This means that a stable airplane is easy to fly; however, this does not mean that a pilot can depend entirely on stability to return the airplane to the original condition. Even in the most stable airplanes, there are conditions that will require the use of airplane controls to return the airplane to the desired attitude.

Stability is classified into three types: (1) positive, (2) neutral, and (3) negative.

Positive stability can be illustrated by a ball inside of a bowl. If the ball is displaced from its normal resting place at the bottom of the bowl, it will eventually return to its original position at the bottom of the bowl.

Neutral stability can be illustrated by a ball on a flat plane. If the ball is displaced, it will come to rest at some new, neutral position and show no tendency to return to its original position.

Negative stability is in fact instability and can be illustrated by a ball on the top of an inverted bowl. Even the slightest displacement of the ball will activate greater forces which will cause the ball to continue moving in the direction of the applied force.

It should be obvious that airplanes should display positive stability, or perhaps neutral stability, but never negative stability.

Stability may be further classified as static and/or dynamic. *Static* stability means that if the airplane`s equilibrium is disturbed, forces will be activated which will initially tend to return the airplane to its original position. However, these restoring forces may be so great that they will force the airplane beyond the original position and continue in that direction.

On the other hand, *dynamic* stability is a property which dampers the oscillations set up by a statically stable airplane, enabling the oscillations to become smaller and smaller in magnitude until the airplane eventually settles down to its original condition of flight.

Therefore an airplane should possess *positive* stability which is both *static* and *dynamic* in nature.

Axes of rotation. The airplane has three axes of rotation around which movement takes place. These are (1) lateral axis – an imaginary line from wingtip, (2) longitudinal axis – an imaginary line from the nose to the tail, and (3) vertical axis – an imaginary line extending vertically through the intersection of the lateral and longitudinal axes. The airplane can rotate around all three axes simultaneously or it can rotate around just one axis. These axes are imaginary axes around which the airplane turns, much as a wheel would turn around axes positioned in these same three planes.

The three axes intersect at the center of gravity and each one is perpendicular to the other two.

Rotation about the lateral axis is called pitch, and is controlled by the elevators. This rotation is referred to as longitudinal control or longitudinal stability.

Rotation about the longitudinal axis is called roll, and is controlled by the ailerons. This rotation is referred to as lateral control or lateral stability.

Rotation about the vertical axis is called yaw and is controlled by the rudder. This rotation is referred to as directional control or directional stability.

Stability of the airplane then, is the combination of forces that act around these three axes to keep the pitch attitude of the airplane in a normal level flight attitude with respect to the horizon, the wings level, and the nose of the airplane directionally straight along the desired path of flight.

Exercise 1. Answer the questions:

1. What is stability?
2. What are the types of stability?
3. Explain what static stability means?
4. What are the axes of rotation of the airplane?
5. What are the three basic aerodynamic movements?

Exercise 2. Read and translate the following word combinations:

To disturb equilibrium; to develop forces or moments; to return to the original condition of flight; to move in the direction of the applied force; to become smaller in magnitude; axes of rotation; from wingtip to wingtip; from the nose to the tail; an imaginary line extending vertically through the intersection of the lateral and longitudinal axes; to intersect at the center of gravity; in a normal level flight attitude.

Exercise 3. Find the English equivalents to the following expressions:

Развивать силы или моменты; оси вращения; уменьшиться по величине; вращаться вокруг оси; нарушить равновесие; возвращаться в исходное состояние; двигаться в направлении приложенной силы; пересекаться в центре тяжести; сохранять тангаж самолета; боковая и продольная оси; нормальный горизонтальный полет.

Exercise 4. Make up all possible types of questions to the following sentences:

1. Positive stability can be illustrated by a ball inside of a bowl.
2. Some conditions require the use of airplane controls in order to return the airplane to the desired attitude.

Unit 3

Airframe

(Part I)

The goal of airplane designers and manufacturers is to obtain maximum efficiency, combined with adequate strength. Excessive strength requires additional weight which lowers the efficiency of the airplane by reducing its speed and the amount of useful load it can carry.

Airframe means the fuselage, booms, nacelles, cowlings, fairings, airfoil surfaces (including rotors but excluding propellers and rotating airfoils of engines), and landing gear of an aircraft and their accessories and controls.

Airplane structure. The required structural strength is based on the intended use of the airplane. An airplane which is to be used for normal flying does not need the strength of an airplane which is intended to be used for acrobatic flight or other special purposes, some of which involve severe in-flight stresses.

Numerous wing designs were developed in an effort to determine the best type for a specific purpose. Basically, all wings are similar to those used by the Wright brothers and other pioneers. Modifications have been made, however, to increase lifting capacity, reduce friction, increase structural strength, and generally improve flight characteristics.

Airplane strength is measured basically by the total load which the wings are capable of carrying without permanent damage to the wing structure. The load imposed upon the wings depends upon the type of flight in which the airplane is engaged. The wing must support not only the weight of the airplane, but the additional loads caused during certain flight maneuvers such as turns and pullouts from dives. Turbulent air also creates additional loads and these loads increase as the severity of the turbulence increases.

The type of wing design for a particular airplane depends almost entirely on the purpose for which that airplane is to be used. If speed is the prime consideration, a tapered wing is more desirable than a rectangular wing, but a tapered wing with no twist has undesirable stall characteristics.

Assuming equal wing area, the tapered wing produces less drag than the rectangular wing because there is less area at the tip of the tapered wing. The elliptical wing is more efficient (greater lift for the amount of drag), but does not have as good stall characteristics as the rectangular wing.

Wing flaps. Wing flaps are a movable part of the wing, normally hinged to the inboard trailing edge of each wing. Flaps are extended or retracted by the pilot. Extending the flaps increases the wing camber, wing area (some types), and the angle of attack of the wing. This increases wing lift and also increases induced drag. The increased lift enables the pilot to make steeper approaches to a landing without an increase in airspeed. Their use at recommended settings also provides increased lift under certain takeoff conditions. When the flaps are no longer needed, they can be retracted.

Pilots are cautioned to operate the flaps within the airspeed limitations set for the particular airplane being flown. If the speed limitations are exceeded, the increased drag forces created by extending the flaps could result in structural damage to the airplane.

The practical effect of the flap is to permit a steeper angle of descent without an increase in airspeed. Extended flaps also permit a slower speed to be used on an approach and landing, thus reducing the distance of the landing roll.

Slats. There are two types of slats:

1. Movable portion of leading edge of airfoil, especially wing, which in cruising flight is recessed against main surface and forms part of profile; at high angle of attack either lifts away under its own aerodynamic load or is driven hydraulically to move forward and down and leave intervening slots.

2. Fixed leading edge portion of airfoil, is a wing or tailplane, forming slot ahead of main surface.

Both types of slats postpone flow breakaway at high angle of attack and thus delay stall.

Ailerons. Lateral control is obtained through the use of ailerons, and on some airplanes the aileron trim tabs. The ailerons are movable surfaces hinged to the outer trailing edge of the wing, and attached to the cockpit control column by mechanical linkage.

When an aileron is lowered it increases the curvature of a portion of the wing and thereby increases the angle of attack. Raised ailerons reduce lift on the wing by decreasing the curvature of a portion of the wing and decrease the angle of attack.

Exercise 1. Answer the questions:

1. What is the goal of airplane designers and manufacturers?
2. What does excessive strength require?
3. What does airframe mean?
4. Why were different wing designs developed?
5. How is an airplane strength measured?
6. What must the wing support during the flight?
7. What does the type of wing design depend on?
8. What is the function of wing flaps?
9. Give the definition of the ailerons.

Exercise 2. Read and translate the following word combinations:

To obtain maximum efficiency; severe in-flight stresses; to increase lifting capacity; without permanent damage; additional loads; a tapered wing; a rectangular wing; stall characteristics, extending the flaps; to make steeper approaches; to retract flaps; to permit a steeper angle of decent; movable portion of leading edge of airfoil; a high angle of attack; lateral control; to increase the curvature of a portion of the wing.

Exercise 3. Find the English equivalents to the following expressions:

Балка; количество; избыточный вес; кривизна; шасси самолета; вспомогательное оборудование; уменьшить трение; улучшить летные характеристики; общая загрузка; вес самолета; дополнительные нагрузки; трапециевидное крыло; прямоугольное крыло; характеристики сваливания; эллиптическое крыло; шарнир; убрать закрылки; выпускать закрылки;

увеличивать изогнутость крыла; превышать предельное значение воздушной скорости; структурное повреждение самолета; поперечное управление самолетом; уменьшать угол атаки.

Exercise 4. Find in the text the nouns with the suffixes –er, -tion and say what verbs they are derived from.

Unit 4

Airframe

(Part II)

Elevator. The controls used to give the pilot longitudinal control around lateral axis are the elevators and the elevator trim tabs. On most airplanes the elevators are movable control surfaces hinged to the horizontal stabilizer, and attached to the control column in the cockpit by mechanical linkage. This allows the pilot to change the angle of attack of the entire horizontal stabilizer.

The elevator trim tab is a small auxiliary control surface hinged at the trailing edge of the elevators. The elevator trim tab acts on the elevators, which in turn acts upon the entire airplane. This trim tab is a part of the elevator but may be moved upward or downward independently of the elevator itself.

Rudder. Directional control of the airplane is obtained through the use of the rudder. The rudder is a movable surface hinged to the trailing edge of the vertical stabilizer (fin) and attached by mechanical linkage to the rudder pedals located in the cockpit. It should be understood that the purpose of the rudder in flight is to control yaw and not to turn the airplane. Some airplanes are equipped with a rudder trim tab, which reacts in a similar manner on the rudder as does the elevator trim tab on the elevator and the aileron trim tab on the aileron.

Stabilizer. Directional stability is accomplished by placing a vertical stabilizer or fin to the rear of the center of gravity on the upper portion of the tail section.

Landing gear. The landing gear system supports the airplane during the takeoff run, landing, taxiing, and when parked. These ground operations require that the landing gear be capable of steering, braking, and absorbing shock.

A steerable nose gear or tailwheel permits the airplane to be controlled by the pilot throughout all operations while on the ground. Individual brakes installed on each main wheel permit the pilot to use either brake individually as an aid to steering or, by applying both brakes simultaneously, the pilot can decelerate or stop the airplane. Hydraulic shock struts or springs are installed in the various types of landing gear systems to absorb the impact of landings, or the shock of taxiing over rough ground.

There are two basic types of landing gear used on light airplanes. These are the conventional landing gear and the tricycle landing gear.

The conventional landing gear, which was used on most airplanes manufactured years ago, is still used on some airplanes designed for operations on rough fields. This landing gear system consists of two main wheels and a tailwheel. Shock absorption is usually provided on the main landing gear by inflated tires and shock absorbers while it is provided on the tailwheel by a spring assembly to which the tailwheel is bolted. The tailwheel is usually steerable by the rudder pedals.

The tricycle landing gear is used on most airplanes produced today. This gear has advantages over the conventional gear because it provides easier ground handling characteristics. The main landing gear is constructed similar to the main landing gear on the conventional system, but is located further rearward on the airplane. The nose gear is usually steerable by the rudder pedals.

This permits sharper turns during taxiing. Shock absorption is provided on the nose gear by a shock strut.

Some light airplanes are equipped with retractable landing gear. Retracting the gear reduces the drag, and increases the airspeed without additional power. The landing gear normally retracts into the wing or fuselage through an opening which is covered by doors after the gear is retracted. This provides for the unrestricted flow of air across the opening which houses the gear. The retraction or extension of the landing gear is accomplished either electrically or hydraulically by landing gear controls from within the cockpit. Warning indicators are usually provided in the cockpit to indicate whether the wheels are extended and locked, or retracted. In nearly all retractable landing gear installations, a system is provided for emergency gear extension in the event landing gear mechanism fails to lower the gear.

Exercise 1. Answer the questions:

1. Through the use of what device is longitudinal control obtained?
2. How is directional control of the airplane obtained?
3. What is the purpose of the rudder in flight?
4. What is the function of the landing gear system?
5. How can the pilot decelerate or stop the airplane?

6. What are the types of landing gear used on light airplanes?
7. What are the advantages of the tricycle landing gear?
8. How to reduce the drag during the flight?
9. How are pilots informed whether the wheels are extended or retracted?

Exercise 2. Read and translate the following word combinations:

Longitudinal control; movable control surfaces; to move upward or downward independently; center of gravity; directional control; the purpose of the rudder; landing gear; steerable nose gear; individual brakes; to apply both brakes simultaneously; hydraulic shock struts; to absorb the impact of landings; conventional landing gear; tricycle landing gear; shock absorption; inflated tires; ground handling characteristics; unrestricted flow of air; the retraction or extension of the landing gear; warning indicators; emergency gear extension.

Exercise 3. Find the English equivalents to the following expressions:

С помощью механической проводки; продольное управление самолетом; движущиеся поверхности управления; задняя кромка руля высоты; назначение руля направления в полете; управлять рысканьем; центр тяжести; управляемый посредством педалей руля направления; применять оба тормоза одновременно; поглощать удар при приземлении; руление по неровной поверхности; контролироваться пилотом во время работы на земле; для аварийного выпуска шасси; выпуск или уборка шасси; в случае отказа механизма выпуска шасси; трехопорное шасси.

Exercise 4. Make up all possible types of questions to the following sentences:

1. Retracting the gear reduces the drag, and increases the airspeed without additional power.
2. The tricycle landing gear is used on most airplanes produced today.
3. The antiskid system can detect and correct a skidding condition much faster than a pilot can through his pedals.

Unit 5

Aircraft systems

(Part I)

Flight control systems

The flight control systems in most general aviation airplanes consist of the cockpit controls, cables, pulleys, and linkages connected to the movable control surfaces outside the airplane. There are three primary and two secondary flight control systems.

The primary flight control systems consist of the elevator, aileron, and rudder, which are essential in controlling the aircraft. The secondary control systems consist of the trim tabs and wing flaps. The trim tabs enable the pilot to trim out control pressures, and the flaps enable the pilot to change the lifting characteristics of the wing and also to decrease the speed at which the wing stalls.

Answer the questions:

1. What does the primary flight control system consist of?
2. What are the components of the secondary flight control system?

Electrical system

Electrical energy is required to operate navigation and communication radios, lights, and other airplane equipment.

Most airplanes are equipped with a direct-current (DC) electrical system and an alternating-current (AC) electrical system.

A basic airplane electrical system consists of the following components:

1. Generator.
2. Battery.
3. Master switch or battery switch.
4. Bus bar, fuses, and circuit breakers.
5. Voltage regulator.
6. Ammeter.
7. Starting motor.
8. Associated electrical wiring.
9. Accessories.

Engine-driven generators or alternators supply electric current to the electrical system and also maintain a sufficient electrical charge in the battery which is used primarily for starting.

Electrical energy stored in a battery provides a source of electricity for starting the engine and a limited supply of electricity for use in the event the generator fails.

Some airplanes are equipped with receptacles to which external auxiliary power units (APU) can be connected to provide electrical energy for starting. These are very useful, especially during cold weather starting. Care must be exercised in starting engines using auxiliary power units when the battery is dead. If this is done, electrical energy will be forced into the dead battery, causing the battery to overheat and possibly explode, resulting in damage to the airplane.

A master switch is installed on airplanes to provide a means for the pilot to turn the electrical system “on” and “off”. Turning the master switch “on” provides electrical energy to all the electrical equipment circuits with the exception of the ignition system.

Although additional electrical equipment may be found in some airplanes, the following lists the equipment most commonly found which uses the electrical system for its source of energy:

1. Position lights.
2. Landing lights.
3. Taxi lights.
4. Anti-collision lights.
5. Interior cabin lights.
6. Instrument lights.
7. Radio equipment.
8. Turn indicator.
9. Fuel gauges.
10. Stall warning system.
11. Pitot heat.

Some airplanes are equipped with a battery switch which controls the electrical power to the airplane in a manner similar to the master switch. In addition, a generator switch is installed which permits the pilot to exclude the generator from the electrical system in the event of generator failure. With the generator switch “off”, the entire electrical load is placed on the battery. Therefore, all nonessential electrical equipment should be turned off to conserve the energy stored in the battery.

A bus bar is used as a terminal in the airplane electrical system to connect the main electrical system to the equipment using electricity as a source of power. This simplifies the wiring system and provides a common point from which voltage can be distributed throughout the system.

Fuses or circuit breakers are used in the electrical system to protect the circuits and equipment from electrical overload. Circuit breakers have the same function as a fuse but can be manually reset, rather than replaced, if an overload condition occurs in the electrical system.

An ammeter is an instrument used to monitor the performance of the airplane electrical system.

An ammeter shows if the generator is producing an adequate supply of electrical power to the system by measuring the amperes of electricity. This instrument also indicates whether the battery is receiving an electrical charge.

A voltage regulator controls the rate of charge to the battery by stabilizing the electrical output which is usually slightly higher than the battery voltage.

An inverter is installed on airplanes to change direct current to alternating current.

Exercise 1. Answer the questions:

1. What do the flight control systems consist of?
2. How many flight control systems do you know?
3. What are the components of the primary and secondary flight control systems?
4. What are the basic electrical system components?
5. Does electrical system remain operative in case of generator failure?
6. What is the purpose of a master switch and a battery switch?
7. What is the purpose of circuit breakers?
8. What is the function of an ammeter and a voltage regulator?

Exercise 2. Read and translate the following word combinations:

Auxiliary power unit; primary flight control system; secondary control system; lifting characteristics of the wing; to decrease the speed at which the wing stalls; airplane equipment; a direct current (DC) electrical system; an alternating-current (AC) electrical system; engine-driven generators; voltage regulator; trim tabs;

maintain a sufficient electrical charge in the battery; to turn master switch on; to provide a source of electricity for starting the engine; to be equipped with receptacles; a dead battery; causing the battery to overheat; in the event the generator fails; to result in damage to the airplane with the exception of the ignition system; to use the electrical system for the source of energy; to protect the circuits and equipment from electrical overload; to produce an adequate supply of electrical power to the system; to control the rate of charge to the battery.

Exercise 3. Find the English equivalents to the following expressions:

Разряженный аккумулятор; в случае отказа генератора; генераторы, работающие от двигателя; система электропитания переменным током; поддерживать достаточный электрический заряд в аккумуляторах за исключением системы зажигания; подавать электрический ток в систему электропитания; система электропитания по постоянному току; приводить к повреждению самолета; контролировать скорость заряда аккумулятора; автомат защиты сетей; обеспечивать источник электроэнергии для запуска двигателя, переустанавливать в ручном режиме.

Exercise 4. Find in the text the sentences with Infinitive or Gerund, explain the usage.

Unit 6

Aircraft systems

(Part II)

Fuel system

The function of the fuel system is to provide a means of storing fuel in the airplane and transferring this fuel to the airplane engine. Fuel systems are classified according to the method used to furnish fuel to the engine from the fuel tanks. The two classifications are the “gravity feed” and the “fuel pump system”.

The gravity feed system utilizes the force of gravity to transfer the fuel from the tanks to the engine. This system can be used on high-wing airplanes if the fuel tanks are installed in the wings. This places the fuel tanks above the carburetor and the fuel is gravity fed through the system and into the carburetor.

If the design of the airplane is such that gravity cannot be used to transfer fuel, fuel pumps are installed. This is true on low-wing airplanes where the fuel tanks in the wings are located below the carburetor.

Two fuel pump systems are used on most airplanes. The main pump system is engine driven and an auxiliary electric driven pump is provided for use in the event the engine pump fails. The auxiliary pump, commonly known as the “boost pump”, provides added reliability to the fuel system, and is also used as an aid in engine starting. The electric auxiliary pump is controlled by a switch in the cockpit.

Most airplanes are designed to use space in the wings to mount fuel tanks. All tanks have filler openings which are covered by a cap. This system also includes lines connecting to the engine, fuel gauges indicating the pressure in the fuel lines, strainers, and vents which permit air to replace the fuel.

Fuel overflow vents are provided to discharge fuel in the event the fuel expands because of high temperatures. Drain plugs or valves (sumps) are located at the bottom of the tanks from which water and other sediment can be drained from the tanks.

Fuel lines pass through a selector assembly located in the cockpit which provides a means for the pilot to turn the fuel “off”, “on”, or to select a particular tank from which to draw fuel. The fuel selector assembly may be a simple on/off valve, or a more complex arrangement which permits the pilot to select individual tanks or use all tanks at the same time.

Many airplanes are equipped with fuel strainers, called sumps, located at the low point in the fuel lines between the fuel selector and the carburetor. The sumps filter the fuel and trap water and sediment in a container which can be drained to remove foreign matter from the fuel.

Exercise 1. Answer the questions:

1. What is the function of the fuel system?
2. How are fuel systems classified?
3. How does the gravity feed system transfer the fuel to the engine?
4. What is the purpose of the installation of the fuel pumps?
5. Where is fuel stored on the aircraft?
6. How is fuel delivered to the engines?
7. Why are the airplanes equipped with fuel strainers?

Exercise 2. Read and translate the following word combinations:

Fuel transfer pump; fuel gauge; booster pump; drain plug; in the event the fuel expands; because of high temperatures; to be equipped with fuel strainers or sumps; to trap water and sediment; to remove foreign matter from the fuel; to provide a means of storing fuel in the airplane; gravity feed system; auxiliary pump; to provide added reliability to the fuel system; drain plugs; fuel selector; to be used as an aid in engine starting; low-wing airplanes; high-wing airplanes; indicating the pressure in the fuel lines; strainers and vents; to be controlled by a switch in the cockpit.

Exercise 3. Find the English equivalents to the following expressions:

Воздушный клапан; дренажное отверстие топливного бака; топливный манометр; подача топлива самотеком; топливный насос перекачки; топливные баки; установленные в крыльях; для перекачки топлива; для подачи топлива; в случае, если топливо будет расширяться из-за высоких температур; обеспечивать дополнительную надежность топливной системы; удалить посторонние вещества из топлива; располагаться на дне топливного бака; сливная пробка; воздушный клапан; использовать силу гравитации.

Exercise 4. Find the antonyms to the following words:

Cooling, increase, inside, below, complicate, internal, turn on, simple, automatically, trailing edge, start, include, input, exterior, high-wing, auxiliary,

Exercise 5. Find the synonyms to the following words:

To end, to allow, to place, suitable, to find out, harm, to keep, to check, to get, basic, to link, to supply, to indicate.

Unit 7

Aircraft systems

(Part III)

Oil system

Proper lubrication of the engine is essential to the extension of engine life and prevention of excessive maintenance.

The oil system provides a means of storing and circulating oil throughout the internal components of the engine. Lubricating oil serves two purposes: (1) it furnishes a coating of oil over the surfaces of the moving parts, preventing direct metal-to-metal contact and the generation of heat, and (2) it absorbs and dissipates, through the oil cooling system, part of the engine heat produced by the internal combustion process.

Usually the engine oil is stored in a sump at the bottom of the engine crankcase. An opening to the oil sump is provided through which oil can be added and a dip stick is provided to measure the oil level in the sump.

A pump forces oil from the sump to the various parts of the engine that require lubrication. The oil then drains back to the sump for recirculation.

Each engine is equipped with an oil pressure gauge and an oil temperature gauge which are monitored to determine that the oil system is functioning properly.

The oil pressure indication varies with the temperature of the oil. If the oil temperature is cold the pressure will be higher than if the oil is hot.

A loss of oil pressure is usually followed by engine failure. If this occurs while on the ground, the pilot must shut the engine down immediately; if in the air, land at a suitable emergency landing site.

It is important to check the oil level before each flight. Starting a flight with an insufficient oil supply can lead to serious consequences. The airplane engine will burn off a certain amount of oil during operation, and beginning a flight when the oil level is low will usually result in an insufficient supply of oil before the flight terminates.

A more sophisticated aircraft is equipped with some other vital systems: hydraulic system, air conditioning and pressurization system, anti-icing (or deicing) system, fire extinguishing system, and galley equipment.

Anti-icing system is designed to prevent ice formation on aircraft vital areas and permits aircraft operation without restriction by icing conditions. The aircraft ice protection is provided by heating of critical areas (engine air intakes, leading edge, windshields, pitot tubes, static ports, etc.) using hot air or electrical power.

Air conditioning and pressurization system provides maintaining the air in the pressurized compartments at the desired level of pressure, temperature and freshness. The required bleed air for the system is supplied either by engine compressors or APU or a high pressure ground air supply unit.

The bleed air is cooled, conditioned and distributed to the individual compartments (flight compartment, passenger compartments and cargo compartments) and then discharged overboard through outflow valves.

Hydraulic system is designed to operate undercarriage, wheel brakes, nose wheel steering, control surfaces, etc. This system is normally divided into at least two systems with maximum degree of independence. Each system comprises engine driven pumps, accumulators, valves, heat exchangers and filters. A non-inflammable liquid is the usual working fluid.

Exercise 1. Answer the questions:

1. What is the function of the oil system?
2. Where is the engine oil stored?
3. What is the purpose of a dip stick?
4. Why is a loss of oil pressure so dangerous?
5. Why is it important to check the oil level before the flight?
6. What is anti-icing system designed for?
7. What is the function of air conditioning and pressurization system?
8. What is hydraulic system designed for?

Exercise 2. Read and translate the following word combinations:

A sophisticated aircraft; to check the oil level; to lead to serious consequences; vital systems; anti-icing system; fire extinguishing system; galley equipment; to control pressurization; a loss of oil pressure; to land at a suitable emergency landing site; proper lubrication of the engine; to prevent direct metal-to-metal contact and the generation of heat; internal combustion process; to be stored in a sump at the bottom of the engine crankcase; at least; maximum degree of independence; bleed air; heat exchangers; non-inflammable liquid; at the bottom of the engine crankcase; through outflow valves; to drain back to the sump for recirculation.

Exercise 3. Find the English equivalents to the following expressions:

Немедленно выключить двигатель; система пожаротушения; трубка Пито; хранение и циркуляция масла; для рециркуляции; проверить уровень масла; система кондиционирования и наддува; оборудование бортовой кухни; отбираемый воздух; привести к серьезным последствиям; процесс внутреннего сгорания; противообледенительная система; предотвратить чрезмерную эксплуатацию; быть оборудованным масляным манометром; недостаточное количество масла; грузовой отсек; пассажирский салон; через выпускной клапан; по крайней мере; теплообменники и фильтры; управлять шасси; система управления передней стойкой; предотвращать образование льда; лобовое стекло.

Exercise 4. Form nouns from the verbs:

To equip, to select, to arrange, to permit, to provide, to know, to act, to create, to move, to communicate, to stabilize, to exist, to anticipate, to refer, to locate, to clear, to consume, to protect, to store, to add, to continue, to occur, to determine.

Exercise 5. Make up all possible types of questions to the following sentences:

1. The oil pressure indication varies with the temperature of the oil.
2. Starting a flight with an insufficient oil supply can lead to serious consequences.
3. The airplane engine will burn off a certain amount of fuel during operation.

Reader

Text 1

Fuel system description

General

The fuel system supplies fuel for the engines and APU. The wing structure contains left and right main tanks. The center tank is in the fuselage section of the wing structure and the left and right inboard wing sections. Each tank has two AC operated fuel boost pumps. Additionally, the left main tank contains a DC fuel pump. Surge tanks are provided in each wingtip. Fuel from the surge tanks is drained to the center tank.

Fuel quantity

Fuel quantity data, measured by probes in each tank, is fed to the Fuel Quantity Processor where it is corrected for density then displayed on a Fuel Quantity Indicator for each tank. Total fuel quantity, from a separate calculation is shown on the Total Fuel Quantity Indicator and is also provided to the FMC.

When total usable fuel in either main tank drops below approximately 1000 kilograms, the FUEL CONFIG light illuminates and the LOW FUEL caution message is displayed.

Fuel temperature

Temperature of the fuel in the left fuel tank is displayed on the Fuel Temperature Indicator.

Text 2

Tank capacity

Fuel pumps

Each main tank contains two AC motor driven pumps. Each pump has the capacity of supplying adequate fuel to one engine for all thrust conditions.

One AC motor driven pump is installed in each center tank section. These center fuel pumps have approximately twice the output pressure of the main tank fuel pumps. When all six pumps are operating, center tank pumps override main tank pumps to provide fuel to the engines.

The pumps provide fuel under pressure to the engine driven fuel pumps. There is a low pressure sensor for each pump located between the pump outlet and the discharge check valve. If any pump has low output pressure, the appropriate PRESS light illuminates and an EICAS message such as “L FWD FUEL PUMP” is displayed. If the main tank pump switches are OFF, the low pressure lights are illuminated and EICAS messages for the pumps are displayed. When the center pump switches are OFF, the low pressure lights and EICAS messages for the pumps are inhibited.

To reduce electrical loads, the center tank pumps are inhibited in flight or on the ground when the associated N2 is less than 50% RPM. Thus both center tank pumps are inhibited with the engines shutdown. As an engine is started and N2 RPM increases above 50%, the inhibit is removed for the associated center tank pump.

EICAS caution messages “L or R FUEL SYS PRESS” indicate low fuel pressure in the left or right fuel manifold. The fuel pump low pressure messages are inhibited by the corresponding L or R FUEL SYS PRESS messages.

The left main tank contains a DC fuel pump which has no controls or indicators in the cockpit. The DC pump operates automatically to provide fuel to the APU when AC power is not available and the APU Switch is ON. In addition, the pump operates automatically inflight to provide fuel to the left engine when left engine N2 RPM drops below 72%, the APU Switch is OFF and left engine fuel manifold pressure is low. When N2 RPM increases above 83%, the DC pump shuts down.

Text 3

Crossfeed

Engine fuel manifolds are connected in such a manner that any tank pump may supply fuel to either engine. A crossfeed valve isolates the left fuel manifold from the right. This valve is normally closed providing fuel feed from tank to engine. The valve may be opened any time it becomes necessary to feed an engine from an opposite fuel tank. If the valve position does not agree with the switch position, a valve disagreement light illuminates and the EICAS advisory message FUEL CROSSFEED is displayed. The L or R FUEL SYS PRESS messages are inhibited with the crossfeed valve open.

Fuel configuration light

The Fuel Configuration Light illuminates and a FUEL CONFIG advisory message appears on EICAS under the following conditions:

- Center fuel pump switches are OFF with greater than 500 kg in the center tank.
- A fuel unbalance of 900 kg ± 200 between main tanks.

The Fuel Configuration Light also illuminates when the LOW FUEL EICAS message is displayed.

APU fuel feed

Fuel is supplied to the APU from the left fuel manifold. APU fuel feed can be provided by any operating AC fuel pump or the DC pump. With the APU switch ON and AC power on the airplane, the left forward fuel pump operates automatically regardless of its switch position and cannot be turned off on the ground. In flight, the left forward pump can be turned off with the pump switch.

Text 4

Fueling

Normal fueling is accomplished through dual fuel nozzle adapters located on the left wing leading edge spar at the fueling station. All fueling operations, except fuel pump control, are accomplished at the fueling station. Opening the station access door applies DC power to the fueling system and removes the center tank pump operating inhibit.

Fuel flows through the dual nozzles to pressurize a fueling manifold. Fueling valves control the flow of fuel from the fueling manifold into each of the three fuel tanks. The fueling valves may be operated by switches on the fueling panel. A fuel quantity may be preselected for each tank. The fueling valves close automatically when the preselected quantity is reached or when the tank is full, whichever occurs first.

A tank overfill system is provided to prevent fuel spillage. If any fuel is sensed in the surge tanks during fueling, a signal is sent to close all fueling valves.

The airplane is filled automatically by hydrant or tank truck pressure. All tanks may be fueled at the same time. The main tanks may also be fueled manually through over wing fill ports. There are no over wing fill ports for the center tank.

Defueling

Left and right defueling valves connect their respective engine fuel manifolds with the fueling manifold. A center tank defueling valve connects the center tank to the fueling manifold.

Fuel can be pumped from any tank to the corresponding engine fuel manifold by operating the tank fuel pump(s). Opening the appropriate defueling valve routes the fuel from the corresponding engine fuel manifold to the fueling manifold.

For defueling, the flow in the fueling manifold is reserved for fuel to flow back into a truck or hydrant.

Suction defueling can be accomplished by opening the respective defueling valve and applying an outside suction source to the fueling nozzles. The center tank defueling valve is for suction defueling only.

Ground transfer

On the ground fuel can be transferred from a source tank to a receiving tank by operating the fuel pump(s) in the source tank and opening the appropriate defueling valve which pressurizes the fueling manifold. Opening the fueling valves in the receiving tank completes the transfer circuit.

Text 5

System description

Autoflight System

The Autoflight System (AFS) consists of the Autopilot Flight Director System (AFDS) and the Autothrottle System (A/T). The Flight Management Computers (FMCs) automatically manage pitch, roll and thrust through simultaneous control of the AFDS and A/T.

Control of the AFDS is accomplished through the AFDS Mode Control Panel (MCP). The A/T is controlled through the MCP and the Thrust Mode Select Panel (TMSP).

Normally, the AFDS and A/T are controlled automatically by the FMCs to perform optimized lateral and vertical flight path guidance through climb, cruise and descent.

Autopilot Flight Director System

The AFDS is a triple system consisting of three individual Flight Control Computers (FCCs) and a single Mode Control Panel (MCP). The MCP provides coordinated control of autopilot, flight director, altitude alert and auto throttle functions.

The three FCCs, identified as left, center and right, send control signals to their respective A/P control servos which operate the flight controls through the three separate hydraulic systems. The A/P controls the ailerons and elevator and adds rudder only during a multi-A/P approach. Nose wheel steering is also added during rollout from an automatic landing. During an ILS approach with all three A/Ps engaged, the three FCCs are powered from separate electrical sources.

Autopilot engagement requires at least two operable FCCs. Commands from the two FCCs are compared to prevent one FCC from commanding an autopilot hard over. The left AC bus normally powers the left and center FCCs except during auto land operations after bus isolation occurs. When the electrical busses are isolated for an automatic landing, the center FCC receives power from the hot battery bus and standby inverter (REF 10.20.08). If left AC bus power is lost inflight, the left and center FCCs will be unpowered. With only the right FCC powered, no autopilots can be engaged. The right flight director, however, will operate with only the right FCC powered.

The FCCs also provide inputs for AFDS operating mode displays and FD commands on the ADI.

MCP Mode Selector Switches

MCP mode selector switches are pushed to select a mode. A light bar in the lower half of each switch illuminates to indicate that the mode has been requested. Mode engagement is indicated by flight mode displays on the ADIs.

In general, all modes can be disengaged by selecting another mode, or disengaging the A/P and turning both FDs OFF. The exception is APP mode after LOC and G/S capture. In this situation APP mode can only be disengaged by disengaging the A/P and turning both FD’s OFF, or engaging GA. VNAV, LNAV, LOC, B/CRS and APP modes when only armed can be disarmed by pushing the mode switch a second time.

Text 6

AFDS Failures

During single A/P operation, failures affecting the engaged mode are annunciated on the ADI. If the failure affects only the operating mode, the A/P remains engaged in an attitude stabilizing mode, an amber line is drawn through the mode and an A/P caution condition is annunciated. Failures degrading all A/P operational modes result in an A/P disconnect.

An FD failure in either pitch or roll causes the respective command bar to disappear. If both axes become unusable, both command bars disappear.

Autoland Status Annunciators (ASA)

Autoland Status Annunciators provide information relative to the status of the A/P systems for CAT II and III approaches with automatic landing and rollout. An ASA is located on each pilot’s panel to display this information. Each ASA has an upper and lower display which shows one of three indications. Except during test, both ASAs show the same indication.

Monitoring of the A/P systems is initiated by the autoland status system when the electrical system is powered. A fault which limits the A/P system is shown as NO LAND 3 or NO AUTOLND on the ASAs. Should the limiting fault(s) clear prior to the selection of APP mode, the ASA will blank when APP mode is selected. Faults that do not require immediate crew action or cognizance are annunciated after touchdown.

With a LAND 3 indication the level of redundancy of the A/P system is such that the occurrence of any single fault would not prevent the A/P system from making an automatic landing (fail operational). With a LAND 2 indication the level of redundancy is such that any single fault does not cause a significant deviation from the flight path (fail passive).

During autoland operations, the FCC detects ILS system anomalies. LAND 3 and LAND 2 annunciations do not necessarily mean that the localizer and glide slope signals are being received. If the ILS station fails or goes off the air, the airplane continues on an inertial track. After a short delay, an amber line is drawn through the affected ADI mode annunciation (G/S or LOC) and the affected flight director commands are removed from view. Also, the AUTOPILOT and master CAUTION lights illuminate, and the caution beeper sounds. The ASA annunciation may or may not change.

Below 200 feet RA the ASA display cannot change except to indicate a NO AUTOLND condition.

The ASA system does not monitor the status of all ground and airborne equipment required for CAI II and III operations. It is primarily an autopilot and autopilot support system monitor.

Aviation vocabulary

Aircraft structures

aileron	элерон
aspect ratio	относительное удлинение (крыла)
balance tab	компенсатор
bulkhead	шпангоут
cable	трос
cargo compartment	грузовой отсек
cargo door	грузовой люк
center of gravity	центр тяжести
cockpit	кабина экипажа
control cable	тросовая проводка управления
control tab	сервокомпенсатор
crank	качалка
datum	линия, относительно которой производится расчет центровки
delta wing	треугольное крыло
dihedral angle	угол поперечного V
directional stability	путевая устойчивость
dual-slotted flap	двухщелевой закрылок

elevator	руль высоты
empty weight	вес пустого самолета
flap	закрылок
flight control surfaces	управляющие поверхности
fowler flap	закрылок Фаулера (одновременно выдвигающийся и отклоняющийся)
fuselage	фюзеляж
high wing	высокоплан
landing gear	шасси
lateral axis	поперечная ось самолета
leading edge	передняя кромка крыла
lift surface	несущая поверхность
longitudinal axis	продольная ось самолета
longitudinal stability	продольная устойчивость
low wing	низкоплан
main landing gear (MLG)	основная стойка шасси
main rotor	несущий винт (у вертолета)
maximum gross weight	максимальный взлетный вес
mean aerodynamic chord (MAC)	средняя аэродинамическая хорда (САХ)
mid wing	среднеплан
nacelle	обтекатель, гондола
nose landing gear (NLG)	передняя стойка шасси
passenger cabin	пассажирский салон
plain flap	отклоняющийся закрылок

propeller	воздушный винт
push-pull rod	тяга управления
radome	радиопрозрачный обтекатель
relative wind	набегающий поток
rib	нервюра
rudder	руль направления
slat	предкрылок
spar	лонжерон
speed brakes (or dive flaps)	воздушные тормоза, использующиеся на пробеге (устанавливаются не обязательно на крыле, в отличие от спойлеров)
split flap	щиток
spoiler	спойлер
stabilizer(s)	стабилизатор (ы)
stall	срыв потока
straight wing	прямое крыло
stringer	стрингер
sweptback angle	угол стреловидности
sweptback wing	стреловидное крыло
tail rotor	хвостовой винт (у вертолета)
trailing edge	задняя кромка крыла
trim tab	триммер
useful load	полезная нагрузка
vertical axis	продольная ось самолета
vertical stabilizer	киль

vortex generator	аэродинамический гребень (или система гребней)
wheel well	ниша шасси
wing	крыло
wingspan	размах крыла
wingtip	законцовка крыла
yaw damper	демпфер рысканья
zero fuel weight	вес самолета без топлива

Hydraulic and pneumatic power system

accumulator	гидроаккумулятор
actuating cylinder	силовой цилиндр
air bleed	отбор воздуха
air bottle	воздушный баллон
air duct	воздухопровод
check valve	обратный клапан
constant-delivery pump	насос постоянной подачи
gear type pump	шестеренчатый насос
gerotor type pump	центробежный насос с эксцентриситетом ротора
hand pump	ручной насос
hydraulic fluid	гидравлическая жидкость (обычно на минеральной основе)
jet pump	стуйный насос
manifold	коллектор (например fuel manifold)
piston type pump	поршневой насос

power driven pump	насосная станция
pressure regulator	регулятор давления
pressure relief valve	ограничительный клапан
restrictor	дроссель
selector valve	гидропереключатель
skydrol	гидравлическая жидкость (синтетическая)
vane type pump	центробежный насос
variable-delivery pump	насос переменной подачи

Landing gear system

'LG down and locked'	шасси выпущены и на замке
'LG in transit'	шасси в промежуточном положении
'LG up and locked'	шасси убраны и на замке
anti-skid system	антиюзовая автоматика
anti-skid transducer	датчик юза
brake system	тормозная система
brake unit	тормоз
emergency extension system	система аварийного выпуска (шасси)
nosewheel steering system	система управления разворотом передней ноги
parking brake	стояночный тормоз
retraction-extension system	система уборки - выпуска (шасси)
shimmy damper	демпфер шимми
shock strut	амортизатор
skid	юз

tubeless tire	бескамерная шина

Fire protection system

fire	огонь, пожар
fire extinguisher	огнетушитель
fire extinguisher bottle	противопожарный баллон
flame	пламя, пожар
flame arrestor	пламегаситель
overheat	перегрев
smoke	задымление
smoke detector	детектор дыма
thermal sensing loop	петлевой датчик пожара
thermocouple sensor	термопарный датчик пожара

Electrical system

alternating current (AC)	переменный ток
alternator	преобразователь постоянного тока в переменный
anti-collision light (или beacon light)	проблесковый маяк
circuit breaker	автомат защиты сети (АЗС)
conduit	оболочка проводки (обычно трубка)
direct current (DC)	постоянный ток
fuse	плавкий предохранитель
landing light	посадочная фара
lights	освещение, сигнальные лампы
plug (receptacle, connector)	разъем
recognition lights	строевые огни

rectifier	выпрямитель переменного тока
relay	реле
selector	переключатель
strobe light	крыльевой проблесковый огонь
switch	выключатель
tail position light	хвостовой аэронавигационный огонь
taxi light	рулежная фара
transformer	трансформатор
TRU (transformer-rectifier unit)	выпрямительное устройство (ВУ)
wingtip position light	крыльевой аэронавигационный огонь
wire	провод, проводка
wiring	жгут проводов, "кабельный план"

Instrument systems

airspeed indicator	указатель скорости
altimeter	высотомер
altitude selector	задатчик высоты
angle-of-attack sensor	датчик угла атаки
annunciator system ("Nancy" [амер.])	система сигнализации
attitude indicator (или gyro-horizon)	авиагоризонт
aural warning	сигнальная сирена, речевой информатор
feedback	обратная связь
flight recorder	бортовой самописец, записывающий параметры полета
fuel flowmeter	указатель расхода топлива
gauge (или gage [амер.])	прибор, указатель

ground proximity warning system	система предупреждения о сближении с землей
gyroscop (или gyro)	гироскоп
heading selector	задатчик курса
Mach indicator	указатель числа « **М** »
pitot-static system	приемники полного и статического давления
rate-of-climb indicator	вариометр
stall warning system	система предупреждения о превышении угла атаки
tachometer	тахометр
take-off warning system	система предупреждения о неправильной взлетной конфигурации самолета
turn-and-bank indicator	указатель скольжения
voice recorder	магнитофон, записывающий переговоры в кабине

Commutication and navigation systems

ADF antenna	антенна автоматического радиокомпаса (АРК)
airborne weather radar (или weatherscop)	бортовая метео - РЛС
bonding jumper	"металлизационные" перемычки (для соединения с корпусом самолета)
course deviation indicator	объединенный указатель системы VOR
DME antenna	антенна приемника измерителя наклонной дальности

doppler navigation system	допплеровский измеритель скорости и угла сноса (ДИСС)
glidescop antenna	антенна приемника "**курс - глиссада**"
inertial navigation system	инерциальная навигационная система
loop antenna	петлевая антенна АРК
marker antenna	антенна приемника ILS
radar beacon transponder	радиолокационный ответчик
radio altimeter	радиовысотомер
receiver	приемник
sense antenna	всенаправленная антенна АРК
shock mount	амортизационные монтажные устройства
static discharger wicks	статические разрядники
transmitter	передатчик

Cabin atmosphere control systems

absolute pressure	абсолютное давление (относительно полного вакуума)
air cycle machine (ACM)	турбохолодильник
air-conditioning unit	блок кондиционирования воздуха
air-to-air heat exchanger	воздухо-воздушный радиатор (ВВР)
altitude	высота
ambient temperature	температура забортного воздуха
by centigrade	по шкале Цельсия
by Fahrenheit	по шкале Фаренгейта
bypass valve	перепускной клапан
cabin altitude	"высота в кабине"

continuous-flow regulator	дыхательный кислородный прибор без отсечки (обычно для пассажиров)
Depressurization	разгерметизация
diluter-demand regulator	дыхательный кислородный прибор с отсечкой (обычно для экипажа)
emergency depressurization	аварийная разгерметизация
heat exchanger	теплообменник
isolation valve	перекрывной клапан
negative pressure valve	клапан отрицательного перепада
outflow valve	выпускной клапан
overpressure	перенаддув
oxygen	кислород
oxygen generator	химический источник кислорода
oxygen mask	кислородная маска
pressure	давление
pressure relief valve	предохранительный клапан
pressure-reducer valve	редукционный клапан
pressurization system	система регулирования давления в кабине
ram-air temperature rise	температура торможения (на суб - и сверхзвуке)
supercharger	компрессор наддува (на высотных поршневых самолетах)
vapor cycle system	фреоновый охладитель (на поршневых самолетах)
water separator	водоотделитель

Engine

accessory drive gearbox	коробка приводов самолетных агрегатов
annular-type combustion chamber	кольцевая камера сгорания
axial-flow compressor	осевой компрессор
bearing	подшипник
blade (или vane)	лопатка (компрессора или турбины)
bottom dead center	нижняя мертвая точка
can-type combustion chamber	трубчатая камера сгорания
centrifugal-flow compressor	центробежный компрессор
combustion chamber	камера сгорания
compression ring	компрессионное кольцо
compression stroke	сжатие
connecting rod	шатун
cowling	капот
crankshaft	коленчатый вал
exhaust collector	выпускной коллектор
exhaust pipe	выхлопная труба
exhaust stroke	выхлоп
exhaust valve	выпускной клапан
four-stroke cycle engine	четырехтактный двигатель
gearbox	коробка приводов (в общем случае)
ignitor plug (или spark plug)	свеча зажигания
inlet duct	воздухозаборник
intake stroke	всасывание
jet pipe (или jet nozzle)	реактивное сопло

piston	поршень
pulse-jet engine	пульсирующий реактивный двигатель
radial reciprocating engine	звездообразный двигатель
reciprocating engine	поршневой двигатель
schroud	кожух
shaft	вал
stage	ступень (компрессора или турбины)
surge valves	клапаны перепуска воздуха
thrust reverser	реверсивное устройство
top dead center	верхняя мертвая точка
turbine nozzle vane assembly	сопловой аппарат
V-type reciprocating engine	V-образный двигатель
valve-operating mechanism	механизм газораспределения
variable-geometry inlet duct	воздухозаборник с изменяемой геометрией (обычно сверхзвуковой)
vortex destroyer	система струйной защиты двигателя

Engine fuel and fuel metering systems

accelerating pump	ускорительный насос (в поршневом двигателе)
boost pump	подкачивающий топливный насос
fuel	топливо
fuel control unit	устройство регулирования топлива (в поршневом двигателе)
fuel nozzle	топливная форсунка
fuel tank	топливный бак

fues scheduling system	система управления топливом
gravity fueling	открытая заправка
pressure fueling	централизованная заправка
transfer pump	насос перекачки
vapor lock	"паровая пробка"

Engine starting systems

cranking	прокрутка двигателя
hot start	заброс температуры на запуске
hung start	зависание оборотов на запуске
ignition	зажигание
overheat	заброс температуры
overspeed	заброс оборотов
starter	стартер

Lubrication and cooling systems

breather	система суфлирования
breather centrifuge	центробежный суфлер
fuel-oil heat exchanger	топливно-масляный радиатор (ТМР)
oil	масло
oil cooler	маслорадиатор
oil pump	маслонасос
oil tank	маслобак
pressure oil pump	питающий маслонасос
scavenge oil pimp	маслонасос откачки

Propellers

automatic propeller	винт с изменяемым (автоматически) шагом
blade	лопасть
blade tracking	регулировка относительного положения лопастей
controllable-pitch propeller	винт с изменяемым (вручную) шагом
effective pitch	поступь винта
fixed-pitch propeller	воздушный винт постоянного шага
geometric pitch	шаг винта
ground-adjustable propeller	воздушный винт с регулируемым (только на земле) шагом
pitch	установочный угол лопасти
pitch change mechanism	механизм изменения шага
propeller	воздушный винт
propeller balancing	балансировка винта
pusher propeller	толкающий винт
reduction gear assembly (или reducer)	редуктор
slip	скольжение
tractor propeller	тянущий винт

Aircraft maintenance

chock	упорная колодка
defueling	слив топлива
drill	сверло
engine cranking	холодная прокрутка двигателя

engine run-up	опробование двигателя
engine shutdown	остановка двигателя
engine start	запуск двигателя
fault isolation manual (FIM)	руководство по поиску неисправности
ground power unit (GPU)	аэродромный источник электропитания
illustrated parts catalog (IPC)	каталог деталей и агрегатов
inspection	осмотр, проверка
jack	подъемник
jacking	вывешивание самолета
lockpins	стояночные штыри, блокирующие уборку шасси на земле
maintenance manual (MM)	руководство по техническому обслуживанию
pre-flight check	предполетный осмотр
pushback	"выталкивание", буксировка хвостом вперед
refueling	заправка топливом
rivet	заклепка
screw	винт
screwdriver	отвертка
sump drain	слив отстоя топлива из баков
tiedown	швартовка
tow bar	буксировочное водило
tow tractor	тягач
towing	буксировка

troubleshooting	поиск неисправности
visual inspection	визуальная проверка
walk-around check	осмотр по маршруту

Flight operations

approach	подход
approach pattern	схема захода на посадку
captain	командир корабля
climb	набор высоты
crew (flight crew)	экипаж
descend	снижение
first officer (или co-pilot)	второй пилот
flight	полет, рейс
flight attendant	бортпроводник
flight engineer	бортинженер
flight level	эшелон полета
flight number	номер рейса
glide	глиссада
glide slope	угол наклона глиссады
heading	курс
landing	посадка
liftup	отрыв самолета от полосы
navigator	штурман
pitch	тангаж
roll	крен

runway	взлетно-посадочная полоса (ВПП)
squawk code	код рейса
take-off	взлет
take-off power	взлетный режим работы двигателей
taxiway	рулежная дорожка (РД)
touch-down	касание полосы
tower (control tower)	диспетчерская
turn	поворот
turnback	разворот