МИНИСТЕРСТВО ТРАНСПОРТА РОССИЙСКОЙ ФЕДЕРАЦИИ

ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ ВЫСШЕГО ПРОФЕССИОНАЛЬНОГО ОБРАЗОВАНИЯ

УЛЬЯНОВСКОЕ ВЫСШЕЕ АВИАЦИОННОЕ УЧИЛИЩЕ ГРАЖДАНСКОЙ АВИАЦИИ (ИНСТИТУТ)

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Содержит аутентичные авиационно-окрашенные тексты и упражнения для формирования, развития и закрепления лексических навыков авиационного английского языка.

Разработано в соответствии с государственным общеобразовательным стандартом Российской Федерации и программой обучения студентов высших и средних летных училищ.

Предназначено для проведения практических занятий со студентами по дисциплине «Профессионально-ориентированный английский язык». Рекомендовано для преподавателей авиационных УТЦ, пилотов авиакомпаний.

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ПРЕДИСЛОВИЕ

Учебное пособие «Основы авиационного английского» рассчитано на курсантов высших и средних авиационных училищ, достигших среднего уровня (Intermediate) в области общего английского языка и начинающих изучение дисциплины «Профессионально-ориентированный английский язык».

Настоящее учебное пособие создано на кафедре иностранных языков Ульяновского высшего авиационного училища гражданской авиации (УВАУ ГА) и апробировано в группах курсантов третьего курса факультетов Летной эксплуатации воздушных судов (ЛЭВТ) и Управления воздушным движением (УВД) в 2000-2003 гг. Концепция пособия возникла и приобрела соответствующую форму в процессе решения конкретных задач обучения профессионально-ориентированному английскому языку курсантов летного училища.

Учебный материал, рассчитанный на 120 часов практических занятий, характеризуется достаточно высоким уровнем сложности, соответствующим требованиям, предъявляемым к языковой подготовке будущих авиаспециалистов.

Пособие содержит девять разделов по следующим темам: 1) аэродинамика, 2) планер и силовая установка, 3) системы воздушного судна, 4) приборное оборудование, 5) авиационная метеорология, 6) информация о погоде, 7) воздушная навигация, 8) воздушное законодательство, 9) управление воздушным движением.

Структура пособия выдержана по единой схеме: фонетика; глоссарий; предтекстовые упражнения; текст; вопросы, контролирующие понимание текста; серия послетекстовых упражнений, аннотация/реферат. Основная задача – ввести наиболее частотную тематическую лексику по теме, отработать и закрепить её. Лексические упражнения представлены в двух категориях – упражнения, нацеленные на достижение максимального количества повторных обращений к тексту, и упражнения, основной задачей которых является дальнейшая активизация навыков говорения и письма.

Все разделы включают упражнения на практику письменной речи. В первых двух разделах приводятся примеры оформления аннотации/реферата. В конце учебного пособия имеются англо-русский словарь и приложение – тест по авиационному английскому языку с ключами для самоконтроля. Упражнения, отмеченные *, должны выполняться с помощью словаря; упражнения для самостоятельной работы отмечены символом **.

Несмотря на то, что пособие уже предлагает определенную методику формирования, закрепления и развития лексических навыков в области авиационного регистра английского языка, остается широкое поле для конкретной реализации этого пособия с введением множества дополнительных методических элементов. Многое также определяется теми задачами, которые ставит перед собой конкретный преподаватель, факультет.

Автор выражает искреннюю благодарность:

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Section I. ***AERODYNAMICS***

Phonetics

Ex. 1. Read these words and practise saying them:

[x]	drag, act, altitude, b**a**lance, mass, magnitude, flat, att**a**ck, axis, rapid, manner, attitude
[el]	favourable, basic, weight, accelerate, maintain, straight, gain, safe, tail, rate
[Fq]	airport, airplane, aerodynamic, area, airfoil, airspeed
[R]	task, retard
[qu]	contr**o**l, load, rotate, opp**o**se, roll, motion, total, nose, bowl, impose
[0]	top, b**o**ttom, property, constant, f**o**llow, gross
[e]	eff**e**ct, direction, st**ea**dy, desc**e**nt, density, attempt, l**e**vel
[W]	turbulent, disturb, term, curve, occur, refer, invert, return
[0:]	forward, force, cause, stall, law, ball, torque
[I]	equilibrium, twist, stability, efficiency, particularly, limit
[A]	sum, thrust, structure, rudder, function
[I:]	speed, keep, reach, mean, wheel, exceed, increase, decrease
[ju:]	produce, reduce, neutral, new, longitudinal, centrifugal, assume
[al]	flight, apply, dynamic, divide, horizon, climb, heght
[au]	around, allow, however, counterbalance, outside
[u:]	cruise, manouevre, lose, include, true
[S]	position, pressure, condition, oscillation, inertia, ratio, additional, intersection, combination, establish, relationship
[tS]	pitch, choose, eventually, nature, change
[kw]	equal, equilibrium, require, quick
[N]	along, among, wing, according, during, angle

Ex. 2. Read international words.

Pilot, control, airplane, effect, aerodynamic, basic, manoeuvre, constant, positive, negative, neutral, sum, vertical, horizontal, accelerate, generate, factor, attack, gradient, designer, combination, compromise, function, stability, moment, tendency, original, turbulent, type, normal, illustrate, activate, display, static, dynamic, nose, classify, perpendicular, position, center, mass, ailerons, maximum, minimum, horizon, limit, extra, structure, physics, inertia, plus, minus, term, total, result.

Ex. 3**. Study new words (Glossary 1)

to accelerate (v)	[qk'selreIt]	**ускорять**	
		to accelerate smth	ускорять что-либо.
airfoil (n)	[eqf0Il]	**аэродинамическая поверхность**	
		airfoil outline.	контур профиля крыла.
aircraft (n)	['eq"krRft]	**воздушное судно**	
		cargo aircraft training aircraft	грузовые ВС учебный самолет
altitude (n)	['xltI"tju:d]	**высота (по давлению, приведенному к уровню моря)**	
		at high/low altitudes; to gain altitude; to lose altitude; to reach an altitude of	высоко/низко; набирать высоту; терять высоту; занять высоту
angle of attack (n)	['xNgl 0v q'txk]	**угол атаки**	
		angle of attack indicator	индикатор угла паде-ния/указатель угла атаки
to apply (v)	[q'plaI]	**прикладывать, прилагать**	
		to apply force; to apply for a job	прилагать, прикладывать силу; подавать документы на работу
attitude (n)	['xtI"tju:d]	**положение в пространстве**	
		attitude control; attitude director indica-tor (ADI); attitude flight control.	стабилизация положения в пространстве; командный авиагоризонт; управление пространственным положением (воздушного суд-на) в полете
cause (n, v)	[k0:z]	**причина, вызывать, являться причиной**	
		to cause damage; to be a cause of failure	причинять (наносить) вред, ущерб, убыток; быть причиной отказа.
climb (n,v)	[klaIm]	**набор высоты, набирать высоту**	
		rate of climb; climb indicator (VSI – vertical speed indicator); climb acceleration climb fuel; to climb up	вертикальная скорость набора; указатель; вертикальной скоро-сти; ускорение при наборе высоты; топливо, расходуемое на набор высоты (воздушным судном.); набирать высоту
controls (pl) (n) **to control** (v)	[kqn'trqul]	**органы, рычаги управления, управлять**	
		to control air traffic; controls-fixed flight	управлять воздушным движе-нием; полет с фиксированным управ-лением
to counterbalance (v)	['kauntq"bxlqns]	**уравновешивать**	
		to counterbalance smth.	уравновешивать что-либо
to decelerate (v)	[dI:'selq"reIt]	**замедлять, тормозить**	
		to decelerate the engine	уменьшать обороты
descent (n)	[dI'sent]	**снижение, снижаться**	

to descend (v)	[disend]	rate of descent; top of descent; descent trajectory, path; to descend { to the beacon / at 10 m/s / VMC }	вертикальная скорость снижения; высота начала снижения (с эшелона полета); нисходящая траектория; снижаться { к приводу / по 10 м/с / визуально }
downward (adj, adv)	['daunwqd]	**направленный вниз, нисходящий**	
		downward flow; downward motion	нисходящий поток; нисходящее движение
drag (n)	[drxg]	**лобовое сопротивление**	
		drag coefficient; drag parachute; to drag smth	коэффициент сопротивления; тормозной парашют; волочить что-либо
equilibrium (n)	["Jkwl'lIbrIqm]	**равновесие**	
		equilibrium condition; to establish equilibrium	условие равновесия; устанавливать равновесие
forward (adj, adv, v)	['fLwqd]	**направленный вперед**	
		forward characteristic; forward force.	прямая характеристика; усилие от себя
flight (n)	[flaIt pa:T]	**полет**	
		flight path; flight accident; flight incident; flight altitude **(by QNH)**; flight book/log book; straight and level flight; flight level **(by QNE);** flight conditions	траектория полета; катастрофа; предпосылка к летному происшествию; высота полета (по давлению, приведенному к уровню моря; авиац. бортовой журнал; прямолинейный полет; эшелон, по стандартному давлению 1013,2 mb; условия полета
gain (v, n)	[geIn]	**набирать (высоту, скорость), прирост**	
		to gain power with a gain of speed	увеличивать обороты двигателя; с приростом скорости
gravity (n)	['grxvqtI]	**сила тяжести**	
		gravity navigation	навигация по гравитационному полю Земли
increase (v) (n)	[In'krJz] [inkrIs]	**увеличивать**	
		to increase rate of climb **to** 10 m/s; to increase rate of climb **by** 5 m/s.	увеличить скорость набора до 10 м/с; увеличить скорость набора на 5 м/с
lift (n, v)	[lIft]	**подъемная сила**	
		lifting force	подъемная сила
magnitude (n)	['mxgnitju:d]	**величина**	
		magnitude display	индикация величин
to maintain (v)	[meIn'teIn]	**выдерживать, сохранять**	
		to maintain altitude; to maintain FL	выдерживать высоту; следовать на эшелоне

to move (v) **motion** (n) **movement** (n)	['mquS(q)n]	**двигаться, движение**	
		forward motion	движение вперед
performance (n)	[pq'f0:mqns]	**летно-технические характеристики**	
		performance check	проверка работоспособности; проверка технических характеристик
power setting (n)	['pauq 'setiN]	**установленный режим работы двигателей**	
rearward (adj, adv)	['rIqwqd]	**направленный назад**	
		in/on the rearward of	сзади чего-либо
to retard (v)	[rI'tRd]	**задерживать**	
		to retard smth	замедлять что-либо
to rotate (v) **rotation** (n)	[r0u'teIt] [rou'teISn]	**вращать, вращение**	
		to rotate clockwise/anti(counter)-clockwise; rotation speed (V_R)	вращаться по/против часовой стрелки; скорость подъема передней опоры
thrust (n)	[TrAst]	**тяга, режим работы двигателей**	
		thrust moment; idle thrust; take off thrust	момент тяги; режим малого газа; взлетный режим
torque (n)	[t0:k]	**крутящий момент**	
to twist (v)	[twIst]	**изгибать, сворачивать, скручивать**	
upward (adj, adv)	['Apwqd]	**направленный вверх, восходящий**	
		upward of	свыше, больше, более
weight (n) **to weigh** (v)	[weIt] [weI]	**вес, масса, взвешивать, весить**	
		to lose weight; taxi weight; maximum take off weight; landing weight; ZFW zero fuel weight DOW – dry operating weight	снижать вес; рулежная масса; максимально допустимая взлетная масса; посадочная масса; масса (воздушного судна) без топлива масса пустого снаряженного ВС
wing area (n)	[wIN 'eqrIq]	**площадь крыла**	
		portside wing; starboard wing.	левое крыло; правое крыло
wing span (n)	[wIN sp x n]	**размах крыла**	

Ex. 4. Read and translate word combinations.

Favorable and unfavorable forces, to act on the airplane, an engine-driven fixed-wing aircraft, heavier than air, when in flight, changes in magnitude, to apply pressure, to be considered as, to maintain altitude, to enter a climb, shape of airfoil, speed of the air passing over the wing, a twisting or rotating motion of an airplane, to increase the performance of the airplane, by increasing the efficiency of the desirable forces of lift and thrust, to satisfy the function and desired performance of the airplane.

Reading

Text. FORCES ACTING ON THE AIRPLANE IN FLIGHT

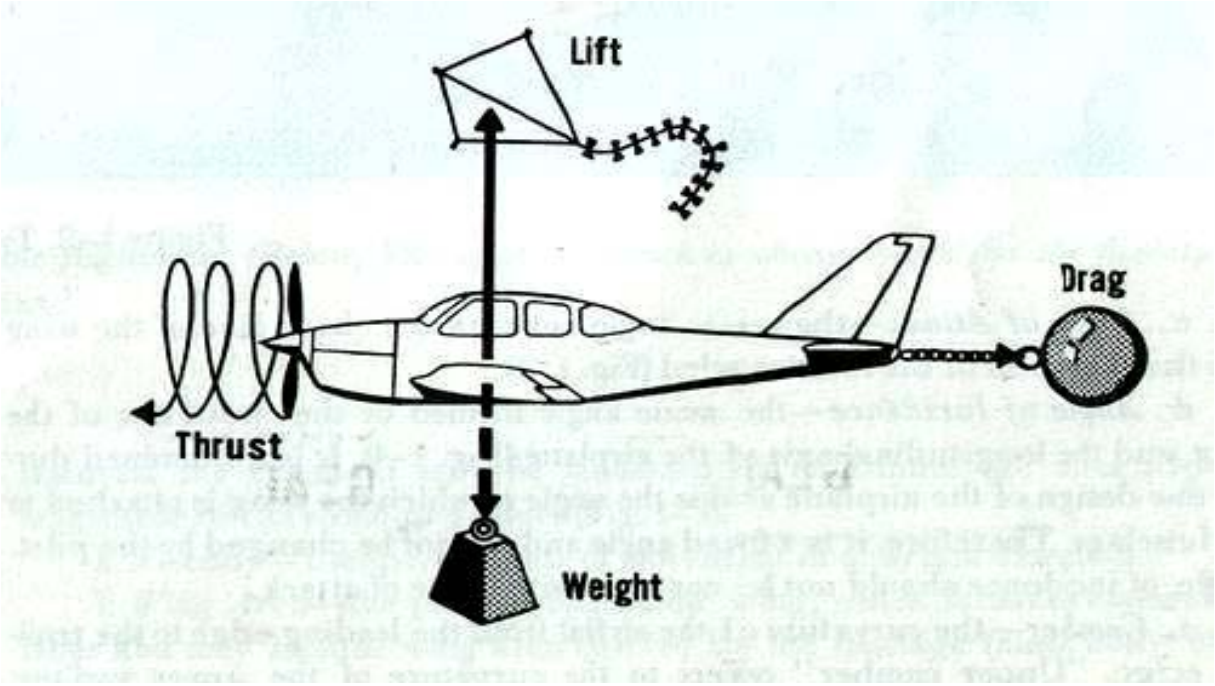


Figure 1-1. Forces acting on the airplane in flight

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 flightpath in a safe and efficient manner. To do this the pilot must understand these forces and their effects (Figure 1-1).

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.

Ex. 5. Comprehension check.

1. What is the primary task of a pilot?
2. How can you define an airplane?
3. Name the aerodynamic forces acting on an airplane during flight.
4. What does lift counterbalance in straight- and-level flight?
5. Specify the number of the factors that influence lift and drag.
6. What is "torque moment"?

Vocabulary practice

Ex. 6. Five of these words can not be used in combination with *force*. Which ones are they?

Favourable, pressure, unfavourable, basic, formation, upward acting, retarding, forward acting, factor, opposing, applied, forcing, negative, positive, desirable, angle, undesirable.

Ex. 7. Cross odd one out.

1. Aircraft, vehicle, airship, glider, air balloon, spacecraft
2. Lift, drag, weight, pressure, thrust.
3. Negative, positive, neutral, additional.
4. Climb, magnitude, straight-and-level flight, descent.
5. Twist, rotation, torque, stability.
6. To reduce, to drop, to decrease, to fall, to increase.
7. To tend, tendency, tending, thrust.

Ex 8*. A: Match the words in column A with those in column B.

Example: h – 2.

B: Learn these word combinations and use them in the sentences of your own.

Example: I made my first solo flight in 2003.

A	B
a. steady flight	1. учебный полет
b. level flight	2. *перегоночный полет*
c. straight-and-level flight	3. самостоятельный полет
d. accelerated flight	4. испытательный полет
e. solo flight	5. установившийся полет
f. check flight	6. прямолинейный полет

g. clean flight
h. *ferry flight*
i. training flight
j. test flight

7. полет с разгоном
8. горизонтальный полет
9. контрольно-проверочный полет, ознакомительный полет
10. полет с убранными закрылками и шасси

Ex. 9. Fill in the gaps with the correct prepositions where necessary.

1. When pressure is applied … the airplane controls, one or more of the basic forces change … magnitude and become greater than the opposing force, causing the airplane to accelerate or move … the direction … the applied force.
2. It is necessary to compromise in order to satisfy … the function and desired performance … the airplane.
3. While steady flight the opposite forces are … equilibrium.
4. Certain favourable and unfavourable forces exist that act … the airplane.
5. It is important to direct the airplane's speed and flightpath … a safe and efficient manner.
6. The airplane enters … a descent, when lift becomes less than weight.
7. The relationship … lift and drag will affect a change … any of these factors.

Ex. 10. Find the English equivalents to the following.

1) в течение полета,
2) выдерживать высоту,
3) тяжелее воздуха,
4) благоприятные силы,
5) увеличивать эффективность,
6) прикладывать давление,
7) изменения по величине,
8) скорость воздуха, проходящего над крылом,
9) вращательное движение,
10) неблагоприятные силы,
11) начинать набор высоты,
12) улучшать летно-технические характеристики самолета,
13) рассматриваться в качестве чего-либо,
14) подъемная сила,
15) требуемая тяга,
16) действовать на воздушное судно,
17) приводимый в действие двигателем,
18) воздушное судно с крылом постоянной стреловидности,
19) назначение и заданные летно-технические характеристики воздушного судна,
20) контур аэродинамической поверхности.

Ex. 11. Define the following terms:

1 **An airplane** …….
2 **Lift** …….
3 **Torque** …….
4 **Thrust** ……
5 **Drag** ……
6 **Weight** ……..

Ex. 12. Study new words** **(Glossary 2)**

to activate (v) **active** (adj)	['xktI"veIt] ['xktIv]	**задействовать, активировать, рабочая**	
		active RW; to activate escape slides; to activate portable fire bottles	рабочая ВПП; задействоовать аварийно-спасательные трапы; активировать переносные огнетушители
aileron (n)	[eIlqr0n]	**элерон**	
		aileron angle; outer aileron	угол отклонения элерона; внешний элерон
axis (n) **(pl. axes)**	['xksIs]	**ось**	
		axis of rotation	ось вращения
course (n)	[k0:s]	**путевой угол, курс**	
		to alter the course for; to climb on course; to deviate from the course; to select the course; aircraft course; approach course; back course; final course; magnetic course; true course; opposite course; selected course	изменять курс на…; набирать высоту при полете по курсу; отклоняться от курса; выбирать курс; курс, путевой угол ВС; курс (направление) на посадку; обратный курс; посадочный курс; МПУ (магнитный путевой угол); ИПУ (истинный путевой угол); встречный курс; выбранный/заданный курс
condition (n)	[kqn'dIS(q)n]	**условие, состояние**	
		flight conditions; **on** /**upon** condition	условия полета; при условии
damper (v,n)	['dxmpq]	**гасить, демпфер**	
		to damper oscillation	гасить колебание
to displace (v) **displacement** (n)	[dIs'pleIs] [dIs'pleIsmqnt]	**смещать, смещение**	
		displaced runway threshold	смещенный порог ВПП
elevator (n)	['elqveItq]	**руль высоты**	
entire (adj)	[In'talq]	**целый, полный**	
		entire length of the RW	полная длина ВПП
to extend (v)	[Ik'stend]	**1. выпускать (шасси, механизацию крыла),** **2. затягивать,** **3. простираться, удлинять**	
		to extend traffic circuit; to extend flaps/slats; to extend landing gears	затягивать круг полетов; выпустить закрылки/ предкрылки; выпускать шасси
flat (adj)	[flxt]	**пологий, плоский, ровный, (зд.)**	
		flat approach path	пологая траектория захода на посадку

heading (n) **to head** (v)	['hedIN]	**курс (полета), направление, текущий, фактический курс ВС, направлять(ся)**	
		aircraft heading **for**; landing heading/direction; RW heading to deviate **from** the heading; magnetic heading true heading	фактический курс ВС; посадочный курс; взлетный курс отклоняться от курса; магнитный курс истинный курс
imaginary (adj)	[I'mxdZin(q)rI]	**воображаемый**	
inherent (adj)	[In'hIqr(q)nt]	**неотъемлемый**	
		inherent in smth	свойственный чему-либо
to intersect (v) **intersection** (n)	["Intq(:)'sekt]	**пересекать(ся), перекресток, пересечение**	
		airway intersection	пересечение воздушных трасс
to invert (v)	["in'vWt]	**перевертывать, переворачивать**	
lateral (adj)	['lxt(q)r(q)l]	**поперечный, боковой**	
		lateral separation	боковое эшелонирование
longitudinal (adj)	["lOndZI'tju:dInl]	**продольный**	
		longitudinal separation	продольное эшелонирование
obvious (adj)	['Obviqs]	**очевидный**	
		for an obvious reason	по вполне понятной причине
origin (n) **original** (adj)	[q'rIdZn(q)l]	**происхождение, исходный**	
		the smoke of unknown origin	дым неизвестного происхождения
oscillation (n)	["OsI'leIS(q)n]	**колебание**	
		oscillation frequency	частота колебаний
pitch (n)	[pItS]	**тангаж, (зд. ось ВС)**	
		pitch attitude; pitch up; pitch down; pitch angle	положение по тангажу; кабрирование; пикирование; угол тангажа
plane (n)	[pleIn]	**1. самолет (разг.)** **2. плоскость, несущая поверхность (зд.)**	
		plane balance	балансировка (центровка) самолета
property (n)	['prOpqtI]	**свойство**	
to require (v) **requirement** (n)	[rI'kwaIq] [rI'kwaIrqment]	**требовать, требование**	
		to require consideration; as required noise abatement requirment	требовать рассмотрения; как требуется; требования по ограничению шума на местности

to restore (v)	[rI'st0:]	**восстанавливать**	
		to restore aircraft attitude	восстанавливать положение ВС
roll (n,v)	[rqul]	**крен, (зд. ось ВС), рулить, катиться**	
		to roll in; to roll out; landing roll	входить в крен; выходить из крена; пробег на посадке
rudder (n)	['rAdq]	**руль направления**	
		rudder angle; rudder control	угол отклонения руля направления; управление рулем направления
simultaneous (adj)	["sIm(q)l"teIniqs]	**одновременный**	
		simultaneous RW operation	одновременная работа взлетно-посадочных полос
to stabilize (v) **stability** (n) **stable** (adj)	[stqbI'laIz] [stq'bIlqtI]	**стабилизировать, устойчивость, устойчивый**	
		stability characteristics	характеристики устойчивости
track (n,v)	[trxk]	**путевой угол, ЛЗП (линия заданного пути), посадочный курс**	
		to track out on course; to be off the track; to change the track; to enter the final approach track; to make good a track of; desired track; **to close with track**	выходить с курсом уклоняться от заданного курса; изменять линию пути; выходить на посадочную прямую; точно следовать курсу; линия заданного пути; **приближаться к посадочному курсу**
wingtip (n)	[wiNtIp]	**законцовка крыла**	
		wingtip aileron	концевой элерон
yaw (n, v)	[j0:]	**курс, (зд. ось ВС), рыскать**	
		yaw damper; yaw acceleration; to prevent aircraft yawing	демпфер рыскания; ускорение рыскания; для предотвращения рыскания воздушного судна

Ex. 13. Read and translate these word combinations.

The inherent ability of a body, to disturb equilibrium, to develop forces or moments, to return to the original condition of flight, to return the airplane to the desired attitude, a ball inside of a bowl, a ball on a flat plane, to show no tendency, to move in the direction of the applied force, to display positive stability, to force the airplane beyond the original position, to become smaller in magnitude, a statically stable airplane, 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 rotate around axes, to intersect at the center of gravity, to keep the pitch attitude of the airplane, in a normal level flight attitude, with respect to the horizon, directionally straight along the desired path of flight

Bits of Grammar

Ex. 14. Complete the chart. Give 4 forms of each verb.

Infinitive	Past Form	Past Participle II	Present Participle I
act	*acted*	***acted***	*acting*
			retarding
			rotating
			flying
			moving
			extending
			applying

Reading

Text. 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 to 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.

Ex. 15. Comprehension check.

1. What is stability?
2. How is stability classified?
3. What does static stability mean?
4. Why should an airplane possess positive stability?
5. How many axes of rotation does an airplane have?
6. What is lateral control?

Vocabulary practice

Ex. 16. Six of these words can be used in combination with *center of*. Which ones are they?

Center of

gravity	pressure	rotation	air
attraction	motion	thrust	lift

Ex. 17*. Form nouns from the verbs.

To descend, to fly, to increase, to weigh, to move, to rotate, to lift, to set, to control, to decelerate, to gain, to activate, to stabilize, to displace, to extend, to oscillate, to intersect, to originate, to act, to pass, to imagine, to apply.

Ex. 18*. Fill in the chart to find the other parts of speech. Use your dictionary where necessary. Check the pronunciation.

NOUN	*VERB*	*ADJECTIVE*
1. application	*apply*	*applicable*
2. …	fly	…
3. acceleration	…	…
4. …	weigh	…
5. …	…	stable
6. …	rotate	…

7. …	…	extensive
8. intersection	…	…
9. …	…	imaginary
10. origin	…	…
11. …	…	oscillating
12. …	move	…
13. …	…	controllable

Ex. 19. Scan Text «Airplane Stability» to find antonyms.

Example: Calm air – turbulent air.

1. Vertical	- …	5. At the bottom	- …
2. …	- Negative	6. Finally	- …
3. Static	- …	7. …	- Disturbed
4. Instability	- …	8. *Calm air*	- …

Ex. 20. Fill in the gaps with the correct prepositions where necessary.

1. The airplane could be forced … the original position and continue … that direction by restoring forces.
2. The airplane can rotate … all three axes simultaneously.
3. Dynamic stability is a property which dampers the oscillations set up … a statically stable airplane, enabling the oscillations to become smaller and smaller … magnitude until the airplane eventually settles down … its original condition of flight.
4. Some conditions require … the use … airplane controls in order to return the airplane … the desired attitude.
5. The location … the center … gravity with respect .. the center … lift determines the longitudinal stability … the plane.
6. There is no inherent pitch moments … the center … gravity that are produced by an airplane with neutral stability

Ex. 21. Cross odd one out.

1. Bank, pitch, torque, yaw, roll.
2. Rotor, rotation, recycle, rotating, rotary.
3. Wing, nose, flightpath, tail, fuselage.
4. Once upon a time, at the same time, simultaneously.
5. Perpendicular, parallel, horizontal, vertical, intersecting, inherent.

Ex. 22. Match the terms on the left with their meanings on the right.

Example: 5 – a

1. stability	**a.** *around them movement takes place*
2. pitch	**b.** an imaginary line from the nose to the tail
3. roll	**c.** rotation about the lateral axis
4. yaw	**d.** an imaginary line from wingtip to wingtip
5. *axes of rotation*	**e.** rotation about the longitudinal axis
6. lateral axis	**f.** an imaginary line extending vertically through the intersection of the lateral and longitudinal axis
7. longitudinal axis	**g.** rotation about the vertical axis
8. vertical axis	**h.** tendency to resume original attitude after upset

Ex. 23. **Find the English equivalents to the following.**

1) вращаться вокруг оси,
2) возвращаться в исходное состояние,
3) нарушить равновесие,
4) развивать силы или моменты,
5)шарик на ровной поверхности,
6) по отношению к горизонту,
7) условная линия, простирающаяся вертикально через пересечение боковой и продольной осей,
8) уменьшиться по величине,
9) от одной законцовки крыла до другой,
10) сохранять тангаж самолета,
11) в нормальном горизонтальном полете,
12) вдоль заданной траектории полета,
13) от носовой части до хвостового оперения самолета,
14) пересекаться в центре тяжести,
15) двигаться в направлении приложенной силы,
16) возвращать воздушное судно в заданное положение,
17) статично устойчивый самолет,
18) демонстрировать тенденцию к,
19) ось вращения,
20) вынуждать воздушное судно выйти за пределы исходного состояния.

Bits of Grammar

Ex. 24. **Translate word combinations using Participle I.**

e.g.: Линия, продолжающаяся вертикально	*Line extending vertically*
Силы, действующие на самолет	.....
Сила, заставляющая самолет разогнаться	.....
Сила, направленная вниз	.....
Восстанавливающая сила	.....
Результирующая сила	.....
Набирающий самолет	.....
Сила, возвращающая тело в исходное положение	.....
Вращательное движение	.....
Воздух, обтекающий крыло	.....
Движущийся шарик	.....

Ex. 25. Test yourself choosing the best answer, "A", "B" or "C".

1. The positive forces are … .

A	lift and thrust	**B**	lift and weight	**C**	lift and drag

2. In straight-and-level flight lift … the airplane weight.

A	exceeds	**B**	counterbalances	**C**	becomes less than

3. A force, or combination of forces, that produces or tends to produce a twisting or rotating motion of an airplane is … .

A	drag	**B**	weight	**C**	torque

4. Airplanes normally display … .

A	negative stability	**B**	positive stability	**C**	imposed stability

5. A property which tends to return the airplane to its original position.

A	dynamic stability	**B**	neutral stability	**C**	static stability

6. Rotation about the lateral axis is called … .

A	roll	**B**	pitch	**C**	yaw

Speaking

Ex. 26. A: Study the typical structure of any presentation.**

- **introduction**
- **main body**
- **conclusion**

Introduction	Greeting the audience; Self-introduction; Outlining the main points of the presentation.
Main body	Defining the purpose of your presentation; The presentation (think of the report format: the use of demonstration materials and handouts).
Conclusion	Repeating briefly the main points of the presentation or giving a summary.
Closing	Thanking people for their attention and inviting them to ask questions

B: Prepare a short presentation on one of the topics below using discourse markers and the table below:

1. Forces acting on the airplane in flight.
2. Airplane stability.
3. Load factor.
4. Axes of rotation.

Discourse markers

1. Focusing and linking With reference to: Talking – speaking of / about Regarding, as regards As far as … is concerned As for …	**2. Balancing/ contrasting points** On the one hand, On the other hand While Whereas
3. Similarity Similarly In the same way	**4. Counter-argument** However Even so But Nevertheless All the same Still
5. Structuring First(ly)/ Second(ly), third(ly) First of all Last(ly) Finally To begin with In the first/second/third place	**6. Adding** Moreover In addition to Another thing is What is more In any case
7. Logical consequence Therefore/ so/ then As a result	**8. Summing up** In conclusion Briefly In short To sum up

Presentation	*LOAD FACTOR*	
Vocabulary	*Plan*	*Notes:*
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
…. …. …. … …	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……

Ex. 27. Think of the best translation.**

Моменты, действующие на воздушное судно

В полете на самолет действуют аэродинамические и неаэродинамические моменты. Аэродинамические моменты создаются всеми аэродинамическими силами, действующими на самолет. Аэродинамически моменты разделяют на две группы:

1. уравновешенные моменты, действующие на воздушное судно в установившемся движении;
2. неуравновешенные моменты или дополнительные, которые разделяются на:
   а) моменты, вызванные действием пилота;
   б) моменты статические;
   в) моменты вращательные.

К моментам, вызванным действиями летчика, относятся моменты, возникающие при отклонении рулей, при выпуске закрылков, выпуске шасси, при изменении режима работы двигателей.

К моментам статическим относятся моменты, вызываемые изменением угла атаки или угла скольжения под действием возмущения.

Моменты вращательные. При вращении самолета вокруг его любой оси сопротивление воздуха проявляется в виде аэродинамического момента сопротивления вращению. Если этот момент направлен против вращения, стремится погасить вращения, он называется демпфирующим моментом, а если момент усиливает вращение, он называется моментом авторотации.

Нестатические моменты – это моменты инерционные и гироскопические, которые возникают при вращении воздушного судна.

Section II. ***AIRFRAME AND ENGINE***

Phonetics

Ex. 28. Read these words and practise saying them:

[eI]	obtain, rate, capable, elevator, aileron, surface, delay, intake
[qu]	rotor, stroke, total, impose, load, roll, approach, postpone, flow
[e]	engine, strength, excessive, propeller, accessories, extend, recess
[I]	hinge, adequate, equip, friction, similar, equal, twist, piston, tip, trim
[au]	cowling, pullout, outer, downward
[Iq]	gear, near, steer, rear
[o:]	support, caution, portion, absorb
[x]	flaps, slats, tab, attached, landing, taxiing, handling, retract, manual, satisfactorily, crankshaft, valve
[aI]	profile, hydraulically, supply, fly, mile
[k]	mechanical, creating, cockpit, curvature, correct

Ex. 29. Read international words:

Adequate, fuselage, rotor, propeller, permanent, portion, profile, compression, gas, cylinder, center, absorb, international, system, electrically, hydraulically, mechanism, instructor, mixture, circulation, indicate, stabilizer, aileron, aviation, aeroplane, aerodrome.

Vocabulary

Ex. 30. Study new words** **(Glossary 3)**

accessories (pl) (n)	[qk'sesq"ris]	**вспомогательное оборудование**	
		engine-driven accessories	агрегаты, приводимые в действие двигателем
airframe (n)	['Fq"freIm]	**планер**	
		clean airframe; high-efficiency airframe	обтекаемый планер; (аэродинамический) эффективный планер
amount (n) + uncountable nouns	[q'maunt]	**количество**	
		amount of feedback:	степень обратной связи (системы управления рулями);
		amount of precipitation; cloud amount	количество осадков; степень облачности
boom (n)	[bu:m]	**балка, штанга**	

caution (v, n)	['k0:S(q)n]	**предупреждать, предостерегать, предупреждение**	
		to caution smb against /about smth	предостерегать о чем-либо
conventional (adj)	[kqn'venSn(q)l]	**условный**	
cowling (n)	['kaulIN]	**кожух**	
		annular cowling; engine cowling; protective cowling	кольцевой обтекатель; кожух двигателя; кожух герметизации, защитный кожух
curve (n) **curvature** (n)	[kq:v]	**кривая, кривизна**	
edge (n)	[edZ]	**край, кромка**	
		leading/trailing edge	передняя/ задняя кромка крыла
excessive (adj)	[Ik'seslv]	**избыточный**	
		excessive weight; excessive pressure	избыточный вес; избыточное давление; давление выше атмосферного
fairing (n)	[fFqrIN]	**обтекатель, зализ**	
		landing gear fairing rear-end fairing; strut fairing; turbine exhaust fairing;	гондола шасси; обтекатель хвостовой части (напр. фюзеляжа); щиток подкоса шасси; стекатель газов, выходящих за турбиной;
hinge	[hindZ]	**шарнир**	
landing gear (n)	['lxndIN glq]	**шасси (синономы = undercarriage, wheels, gear)**	
		main legs; nose wheel	основные стойки шасси; передняя стойка
load (v, n)	[lqud]	**загружать, загрузка**	
		payload	коммерческая загрузка
nacelle (n)	[nxsql]	**мотогондола**	
		aft power nacelle; engine nacelle	хвостовая часть гондолы двигателя; гондола двигателя
outer (adj)	['autq]	**внешний, дальний (зд.)**	
		outer marker	дальний привод
to provide (v)	[prq'vaId]	**обеспечивать**	
		to provide smb with smth	обеспечивать кого-либо чем-либо
to retract (v) **retraction** (n)	[rI'trxkt]	**убирать (зд. шасси, механизацию крыла), уборка**	
		to retract flaps	убирать закрылки
severe (adj)	[sI'vIq]	**сильный (зд. степень выраженности метеоявлений)**	
stall (v, n)	[st0:l]	**сваливаться, сваливание (зд. о ВС)**	
steep (adj)	[stI:p]	**крутая (траектории полета)**	
to strenghten (v) **strength** (n)	['streNTqn] [streNT]	**укреплять, прочность**	
		electric field strength; pavement strength/RW strength; proof strength	напряжение электрического поля; прочность покрытия (ВПП); запас прочности
stress	[stres]	**прочность, натяжение**	
support (v, n)	[sq'p0:t]	**поддерживать, опора, поддержка**	
		crew life support; head support	система жизнеобеспечения экипажа; подголовник

Reading

Ex. 31. Discuss in pairs what you would like to know about an aircraft. Make a list of questions.

Skimming:

Ex. 32. Look through the first sentence of each paragraph and answer questions.

1. Which paragraph do you think will answer your questions?
2. Which questions won't be answered?

Scanning:

Ex. 33. A: Read the text and find answers to your questions.
B: Then read it again and answer the questions (Refer to Ex. 34).

Text

AIRFRAME

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.

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.

Ex. 34. Comprehension check.

1. What does excessive strength require?
2. What does airframe mean?
3. Why were numerous wing designs developed?
4. How is an airplane strength measured?
5. What is the practical effect of the flap?
6. Through the use of what device is lateral control obtained?
7. How is directional control of the airplane obtained?
8. How can the pilot decelerate or stop the airplane?
9. Name two basic types of landing gear used on light airplanes.
10. How is shock absorption provided?

Vocabulary practice

Ex. 35. Fill in the gaps with the correct prepositions where necessary.

1. Designers and manufacturers are trying to obtain maximum efficiency, combined … adequate strength.
2. Pilots are cautioned to operate the flaps … the airspeed limitations set … the particular airplane being flown.
3. The required structural strength is based … the intended use of the airplane.
4. To determine the best type … a wing, numerous wing designs have been developed.
5. Could lateral control be obtained … the use … ailerons?

6. The wings are capable … carrying … permanent damage … the wing structure and an airplane strength is measured basically … the total load of it.
7. The type of wing design … a particular airplane depends almost entirely … the purpose … which that airplane is to be used.
8. While … the ground, a steerable nose gear or tailwheel permits … the airplane to be controlled … the pilot … .
9. The practical effect … the flap is to permit a steeper angle of descent … an increase … airspeed.
10. The elevators are attached … the control column … the cockpit … mechanical linkage.

Ex. 36. Think of the best translation (noun + noun structure).

1	Engine failure	……
2	Instruction manual	……
3	Airplane engine	……
4	Flight instructor	……
5	Oil temperature	……
6	Engine demands	……
7	Fuel/air mixture	……
8	Cylinder head	……
9	Rudder pedal	……
10	Nose gear	……

Ex. 37. Match the terms on the left with their meanings on the right.

Example: 9 – b

1. strength	a. small hinged portion of trailing edge of primary-control surface, whose effect is to hold main surface in desired neutral position for trimmed flight
2. stress	b. solid body designed to move through gaseous medium and obtain useful force reaction other than drag (examples: wing, control surface, fin, turbine blade, etc.)
3. fuselage	c. precise and largely standardized manoeuvres, unnecessary in normal flight
4. acrobatics	d. sudden breakdown in fluid flow previously attached to solid surface, caused by changed angle of either surface or flow
5. friction	e. to fly from top of climb to top of descent en route to destination, usually at altitudes, engine settings and other factors selected for economy and long life
6. dive	f. condition within elastic material caused by applied load, temperature gradient or any other force-producing mechanism
7. stall	g. ability to withstand stress without rupture.
8. trim tab	h. steep descent with or without power
9. airfoil	i. force generated between solids, liquids or gases opposing relative motion
10. to cruise	j. main body of an aircraft, absent in all-wing designs

Ex. 38. Find the English equivalents to the following.

1) в пределах ограничений воздушной скорости,
2) для аварийного выпуска шасси,
3) контролироваться пилотом во время работы на земле,
4) рычаги управления шасси в кабине экипажа,
5) на верхней части хвостового оперения,
6) выполнять заходы по крутой траектории,
7) дополнительная нагрузка,
8) поглощать удар при приземлении,
9) управляемый посредством педалей руля направления,
10) руление по неровной поверхности,
11) величина полезной нагрузки,
12) внешняя задняя кромка крыла,
13) позволять выполнять повороты под более острым углом при рулении,
14) с помощью механической проводки,
15) путем применения элеронов,
16) без повреждения конструкции крыла,
17) движущаяся часть крыла,
18) дополнительные нагрузки, вызванные определенными маневрами во время полета,
19) предлагаемое применение ВС;
20) в попытке определить лучший тип самолета для определенного назначения,
21) в сочетании с адекватной прочностью,
22) вспомогательная рулевая поверхность.

Speaking

Ex. 39. A: Look at the picture and describe the aircraft.
B: Make a presentation on Yak-18T.

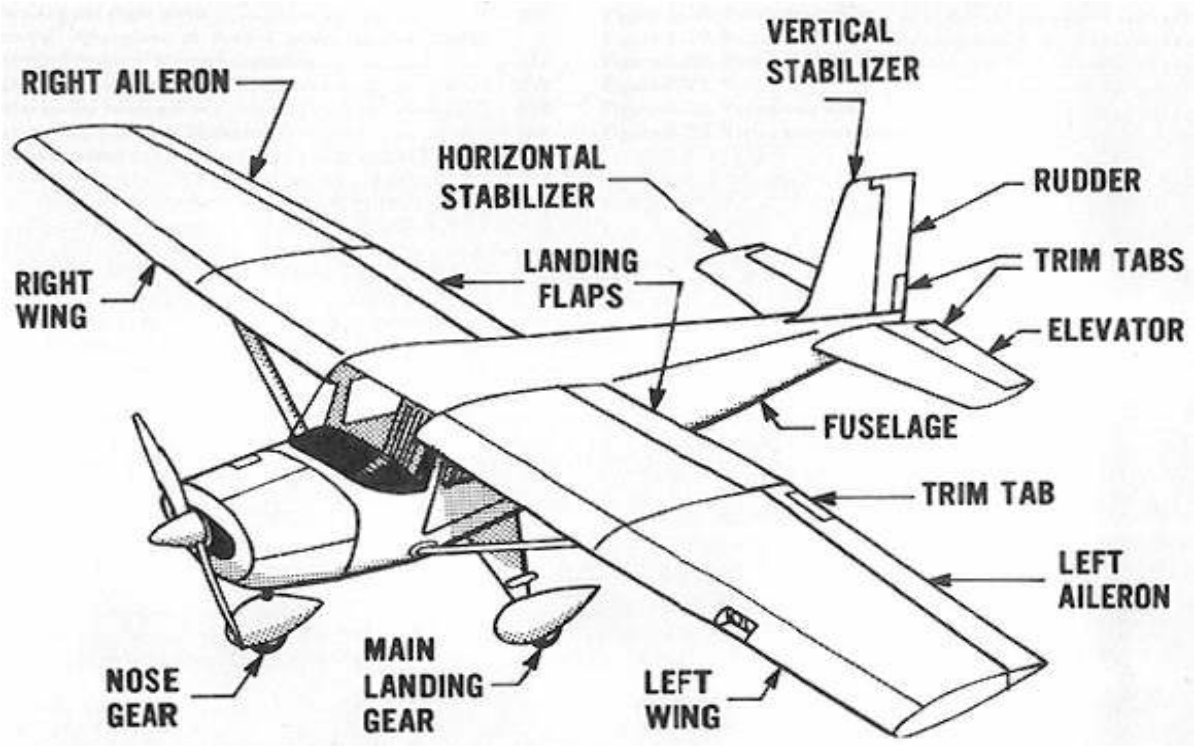


Figure 2-1. Parts of Airplane

Ex. 40. Look at the pictures of different aircraft types and prepare a presentation on one of them.**

Aircraft type ***IL – 76 TD***

Aircraft type ***A - 340***

Aircraft type ***AN – 124 - 100***

Vocabulary

Ex. 41. Read and translate word combinations.

To obtain increased dependability, efficiency from the engine, to help in avoiding engine failure, to provide adequate information, all accessories necessary for functioning, a device for propelling an aircraft, an engine-driven shaft, a plane of rotation, designed for abinitio training,

to convert the straight-line motion of the piston to the rotary motion of the crankshaft, to ignite the fuel, to complete one cycle, expansion of the burning gas, the remaining heat, through openings in front of the engine cowl, under all operating conditions, within the tolerable limits.

Reading for developing language intuition

Ex. 42. **A: Read Text "Engine" without using a dictionary and guess the meaning.**

B: Read the text again and make your own list of unknown words.

C: Read the text for the third time to see if you can guess the meaning of the sentence without misunderstanding the unknown words.

D: Compare your word list with the classmate to help you understand the text.

Text

ENGINE

Knowledge of a few general principles of engine operation will help the pilot obtain increased dependability and efficiency from the engine and, in many instances, this knowledge will help in avoiding engine failure. As different types of aircraft are equipped with different types of engines, it is impractical to discuss in detail the various types of engines here. Information from the manufacturer's instruction manual; familiarity with the operating limitations for the airplane engine; and specific advice from a flight instructor should provide adequate information to operate an airplane engine satisfactorily. ***Aircraft engine*** is an engine that is used or intended to be used for propelling aircraft. The aircraft engine includes all accessories necessary for its functioning, but does not include propellers.

Propeller is a device for propelling an aircraft that has blades on an engine-driven shaft

and that, when rotated, produces by its action on the air, a thrust approximately perpendicular to its plane of rotation.

Most light airplane engines installed on aircraft designed for ab-initio training are internal combustion of the reciprocating type. They are called reciprocating engines because certain parts move back and forth in contrast to a circular motion such as a turbine. The reciprocating engine consists of cylinders, pistons, connecting rods, and a crankshaft. One end of a connecting rod is attached to a piston and the other end to the crankshaft. This converts the straight-line motion of the piston to the rotary motion of the crankshaft, which turns the propeller. At the closed end of the cylinder there are normally two spark plugs which ignite the fuel, and two openings over which valves open and close. One valve (the intake valve) when open admits the mixture of fuel and air, and the other (the exhaust valve) when open permits the burned gases to escape. For the engine to complete one cycle, the piston must complete four strokes. This requires two revolutions of the crankshaft. The four strokes are the intake, compression, power, and exhaust. The following describes one cycle of engine operation.

As the piston moves away from the cylinder head, the intake valve is opened and the fuel/air mixture is drawn into the cylinder. *This is the intake stroke.*

As the piston returns to the top of the cylinder, both valves are closed, and the fuel/air mixture is compressed. *This is the compression stroke.*

When the piston is approximately at the top of the cylinder head, a spark from the plugs ignites the mixture, which burns at a controlled rate. Expansion of the burning gas exerts pressure on the piston, forcing it downward. *This is the power stroke.*

Before the piston completes the power stroke the exhaust valve starts to open, and the burned gases are forced out as the piston returns to the top of the cylinder. *This is the exhaust stroke.*

A spark to ignite the fuel/air mixture in the cylinder is provided by the **ignition system.**

The burning fuel within the cylinders produces intense heat, most of which is expelled through the exhaust. Much of the remaining heat, however, must be removed by the **cooling system** to prevent the engine from overheating

Most light airplane engines are air cooled. The cooling process is accomplished by cool air being forced into the engine compartment through openings in front of the engine cowl.

The **oil system** is used as for storing and circulating oil throughout the internal components of the engine. The oil temperature gauge indicates the temperature of the oil which is heated by the engine.

The **fuel system** is intended to continuously supply fuel to the engines, meeting the engine demands under all operating conditions and maintaining the center of gravity position within the tolerable limits.

Ex. 43. Comprehension check.

1. What is an engine?
2. What is a propeller?
3. What does a reciprocating engine mean?
4. What does the reciprocating engine consist of?
5. How many strokes does the piston make to complete one cycle?
6. What system provides a spark to ignite the fuel/air mixture in the cylinder?
7. Why is it necessary to cool the engine?
8. What is the oil system used for?
9. What system supplies fuel to the engines?
10. Why is it important to maintain the center of gravity position within the tolerable limits?

Ex. 44*. Fill in the chart to find the other parts of speech. Use your dictionary where necessary. Check the pronunciation.

NOUN	*VERB*	*ADJECTIVE*
1. strength	*strengthen*	*strong*
2. …	provide	...
3. ignition	…	…
4. …	…	structural
5. …	propel	...
6. …	…	efficient
7. …	compress	...
8. caution	…	…
9. …	…	specific
10. …	operate	…

Ex. 45*. Form nouns from the verbs.

To provide, to retract, to curve, to supply, to caution, to attach, to absorb, to satisfy, to load, to land, to circulate, to compress, to aviate, to consider, to cause, to intend, to use, to combine, to limit, to avoid, to propel, to complete.

Vocabulary practice

Ex. 46. Fill in the gaps with the correct prepositions where necessary.

1. Dependability and efficiency … the engine could be increased if the pilot obtains … knowledge … a few general principles … engine operation.
2. A spark … the plugs ignites … the mixture, when the piston is approximately … the top … the cylinder head,
3. Being forced … the engine compartment … openings … front … the engine cowl, the cooling process is accomplished … cool air.
4. The oil temperature gauge indicates the temperature … the oil which is heated … the engine.
5. Meeting … the engine demands … all operating conditions, the fuel system is intended to continuously supply fuel … the engines.
6. Propeller is a device … propelling … an aircraft that has blades … an engine-driven shaft and when rotated, produces … its action … the air, a thrust approximately perpendicular … its plane … rotation.
7. Most light airplane engines installed … aircraft designed … ab-initio training are internal combustion … the reciprocating type.
8. One end … a connecting rod is attached … a piston and the other end … the crankshaft.
9. As the piston moves … … the cylinder head, the intake valve is opened and the fuel/air mixture is drawn … the cylinder.
10. It's obvious that most … heat is expelled … the exhaust.

Ex. 47. Give the definitions of the aviation terms and words:

1 Airframe ……
……

2 Fuselage ……
……

3 Stress ……
……

4 Wing flaps ……
……

5 Ailerons ……
……

6 Airfoil ……
……

7 Strength ……
……

8 Aircraft engine ……
……

9 Propeller ……
……

10 Stall ……
……

Ex. 48. Find the English equivalents to the following.

1) эффективность двигателя,
2) в пределах допустимых значений,
3) через отверстие в передней части кожуха двигателя,
4)воспламенять топливо,
5) плоскость вращения,
6) дополнительное вспомогательное оборудование, необходимое для работы,
7) вал, приводимый в действие двигателем,
8) преобразовывать прямолинейное движение поршня во вращательное движение коленчатого вала,
9) завершать цикл,
10) расширение сжигаемого газа,
11) при всех эксплутационных условиях,
12) избежать отказа двигателя,
13) чтобы обеспечить адекватную информацию,
14) спроектированный для первоначального обучения,
15) оставшееся тепло,
16) устройство для создания тяги (продвижения самолета),
17) для достижения повышенной зависимости.
18) эксплутационные ограничения.

Ex. 49. A: Study the principles of a summary writing given below:**

1. Read the text
2. Exclude unnecessary and unimportant information.
3. Think of subject headings which may perform the function of an outline to your abstract.
4. Think of a plan.
5. Use the first point in this outline as a general statement of the problem discussed. It should indicate the source saying whether it is a book, an article or an abstract.
6. Be sure that the second sentence enumerates the most important subject headings.
7. Avoid duplicating the words of the title.
8. Avoid space-consuming phrases.
9. Use short simple sentences.
10. Use Passive voice and the third person present.

B: Write a short summary on Text "Airframe".

Summary	*AIRFRAME*	
Vocabulary	*Plan*	*Notes:*
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……

Ex. 50. Think of the best translation.**

Классификация воздушных судов

По дальности, назначению, пассажировместимости и грузоподъемности воздушные суда (ВС) разделяются на шесть групп: 1 – магистральные ВС; 2 – самолеты местных воздушных линий; 3 – грузовые самолеты; 4 – самолеты для авиационных работ; 5 – вертолеты; 6 – учебно-тренировочные самолеты. Характерными особенностями магистральных ВС являются: большая скорость полета, большой расход топлива, ограниченная коммерческая загрузка.

Самолеты местных воздушных линий по сравнению с магистральными ВС имеют меньшую скорость, высоту полета и расход топлива.

Характерными особенностями грузовых ВС являются большая грузоподъемность, незначительная трудоемкость погрузочно-разгрузочных работ, обеспечение перевозок крупногабаритных грузов и мелких на поддонах и в контейнерах.

Самолеты, выполняющие авиационные работы, используются в сельском хозяйстве, на Крайнем Севере, в МЧС.

В качестве учебно-тренировочного самолета используется самолет ЯК-18Т.

Многие работы (транспортные, сельскохозяйственные, строительно-ремонтные, медицинские) выполняются с помощью вертолетов.

Section III. ***AIRCRAFT SYSTEMS***

Phonetics

Ex. 51. Read these words and practise saying them:

[g]	regulator, ignition, gravity, plug, ground, degree, **g**auge
[dZ]	general, linkage, energy, generator, voltage, engine, charge, damage, change, emergency, edge, undercarriage, gau**g**e
[s]	surfa**c**e, **c**ircuit, electri**c**ity, re**c**eptacle, exception, produce, sour**c**e, performance, force, certain, exercise
[k]	cockpit, cir**c**uit, consist, cable, connect, secondary, check, aircraft, **ch**aracteristics, decrease, electrical, communication, current, basic
[S]	sufficient, especially, essential, navigation, ignition, show, furnish, windshield, extinguish, pressure, position, fresh, communication
[qu]	most, contr**o**l, also, radio, comp**o**nent, m**o**tor, associate, cold, over, explode, process, nose, load, coat, foll**o**w
[0]	operate, cockpit, f**o**llow, voltage, possibly, monitor, b**o**ttom, complex, foreign, loss, proper
[A]	other, one, once, some, done, above, cover
[u:]	move, movable, two, do, too, boost, remove, cool
[0:]	force, store, absorb, important, before, install, alternating, call, warning, source, c**au**se, **au**xiliary, hydr**au**lic, draw
[I]	system, consist, linkage, trim, wing, equip, circuit, engine, taxi, dipstick, galley, extinguish, driven
[e]	connect, protect, method, vent, level, weather, dead, measure
[eI]	basic, elevation, operate, radio, breaker, cable, enable, aileron, maintain, fail, drain, aid, may, gauge
[aI]	primary, provide, vital, flight, light, slightly, high, design, supply, simplify, hydraulic, kind, mild, idle

Ex. 52. Read international words:

Cable, characteristics, electrical energy, navigation, communication, radio, generator, battery, regulator, ammeter, motor, accessories, result, indicator, cabin, instrument, stabilize, function, method, classification, utilization, carburetor, temperature, selector, circulation, component, hydraulic, conditioning, filter.

Vocabulary pre-teaching

Ex. 53. A: Make up your own word list on aircraft systems.
B: Study the glossary (Ex. 54) and compare your word lists.

Ex. 54. Study new words** **(Glossary 4)**

APU -auxiliary power unit (n)	[0:g'zIljqrI 'pauq 'ju:nIt] [el pJ jH]	**ВСУ (вспомогательная силовая установка)**	
bleed air (n,v)	[bII:d Fq]	**отбираемый воздух, отбирать воздух**	
		continuous air bleed	постоянный (непрерывный) отбор воздуха
booster pump (n)	['bu:stq pAmp]	**насос подкачки**	
		booster control	(гидро) усилитель системы управления
burn out , burn off (v)	[bq:n]	**вырабатывать (топливо)**	
bus bar (n)	[bAs bR]	**шина электропитания**	
		to energize the bus	подавать электропитание на шину
charge (v,n)	[tSRdZ]	**(зд.) заряжать, (электрический заряд)**	
		to take charge of; freshening charge	осуществлять контроль; подзаряд (аккумуляторов)
circuit breaker (n)	['sq:kIt 'breIkq]	**АЗС (автомат защиты сетей)**	
connector (n)	[kq'nektq]	**разъем**	
		external power connector; mating connector; plug connector; pressure seal	разъем аэродромного (электро) питания; ответная часть соединителя; (электро) соединитель; герметический разъем, герморазъем
damage (n, v)	['dxmIdZ]	**повреждение, повреждать**	
		consequential damage; extreme impact damage; foreign object damage; liquidated damage; suspected aircraft damage	естественное повреждение; полное разрушение при ударе; повреждение посторонним предметом; возмещенные убытки; предполагаемое повреждение ВС
dip stick (n)	[dIp stIk]	**мерная линейка, мерный щуп**	
to discharge (n,v)	[dIstSRdZ]	**разряжать, выпускать, стравливать**	
		to discharge a battery; cloud-to-cloud discharge	разряжать аккумулятор; (грозовой) разряд между облаками
drain plug (n)	[dreIn plAg]	**сливная пробка**	
to expand (v) **expansion** (n)	[Ik'spxnd]	**расширять(ся), расширение, распространение**	
		to expand gas; foam expansion	расширять газ; вспенивание
to fail (v)	[feIl]	**отказывать, выходить из строя**	
		to fail at take off; fail-safe;	отказывать на взлете; безопасный (полет)

failure (n)	[feIljW]	engine failure; structural failure; sudden failure; failure-free	отказ двигателя; поломка (разрушение) конструкции; внезапный отказ; безотказность, безотказный
fuel transfer pump (n)	['fjHql 'trxnsfW pAmp]	**топливный насос перекачки**	
to furnish (v)	['fq:niS]	**подавать, поставлять**	
fuse (n)	[fju:z]	**предохранитель (плавкий)**	
		to change a fuse	менять предохранители
galley (n)	['gxlI]	**(зд.) бытовое оборудование, кухня (на борту самолета)**	
		aircraft galley	бортовая кухня ВС
gauge (n)	[geIdZ]	**манометр**	
		fuel gauge; oil gauge	топливный манометр; масляный манометр
gravity feed (v, n)	['grxvItI fI:d]	**подача топлива самотеком, питать, снабжать**	
heat exchanger (n)	[hI:t Iks'tSeIndZq]	**теплообменник**	
		heat exchange capacity	теплообменная способность
to install (v)	[In'st0:l]	**устанавливать**	
		to install smth in the aircraft	устанавливать на борту ВС
linkage (n)	['lINkIdZ]	**проводка системы управления**	
		control linkage	проводка системы управления
to lubricate (v)	['lu:brI"keIt]	**смазывать**	
master switch (n)	['mRstq switS]	**основной выключатель**	
		to turn master switch on/off	включать/выключать основной выключатель
to measure (v, n) **measurement** (n)	['meZq] ['meZqment]	**измерять, мера, измерение**	
		to measure actual noise level; ceiling measurement; inflight measurement.	измерять фактический уровень шума; измерение высоты нижней границы облаков; замер (напр. высоты) в полете.
nosewheel steering (n)	['nquz"wI:l 'stIqriN]	**система управления передней стойкой**	
		forward-retracting nosewheel	носовое колесо, убирающееся вперед
output (n)	['aut"put]	**выход**	
		power output; powerplant output.	выходная мощность; мощность силовой установки
overload (v, n)	['quvq"lqud]	**перегружать, перегрузка**	
		control overload	перегрузка системы управления
Pitot tube (n)	['pitou tju:b]	**приемник полного давления**	
		Pitot tube pump	насос, работающий по принципу трубки Пито
to pressurize (v) **pressurization** (n)	['preSq"raIz] [preSq raI'zeISn]	**герметизировать, наддув**	
		to pressurize a cabin; to control pressurization	герметизировать кабину; контролировать наддув

pulley (n)	['pulI]	**шкив, ролик**	
		driving pulley	ведущий шкив
rate of charge (n)	[rqIt 0v tSRdZ]	**зд. скорость заряда**	
		rate of climb	скорость набора (вертикальная)
receptacle (n)	[rI'septqkl]	**розетка**	
		external power receptacle; external power	разъем аэродромного питания; аэродромный источник питания
to reset (v)	["rI:'set]	**возвращать в исходное состояние**	
to restrict (v) **restriction** (n)	[rI'strIkt]	**ограничивать, (ограничение)**	
		weight restrictions altitude rectrictions	ограничение по весу ВС ограничение по высоте
sediment (n)	['sedImqnt]	**осадок топлива, отстой (напр. воды в топливе)**	
		sediment accumulation; sediment formation	скопление осадков; осадкообразование
to shut down (n, v)	[SAt]	**выключать двигатель, глушить, останавливать**	
		to shutdown the engine	выключать двигатель
static port (n)	['stxtik p0:t]	**приемник статического давления**	
strainer (n)	['streInq]	**фильтр**	
		strainer gauze	фильтр с защитной сеткой
sump (n)	[sAmp]	**отстойник**	
		oil sump	маслоотстойник
to trim (v)	[trim]	**триммировать**	
		to trim out; to trim in pitch	сбалансировать положение ВС; балансировать ВС по тангажу
trim tab /trimmer (n)	[trim txb]	**триммер**	
		fixed trim tabs; rudder trim	жесткий триммер; триммер руля направления
valve (n)	[vxlv]	**клапан**	
		air valve; air pressure valve; control valve; fueling valve; oxygen valve; outfrow valve; shutoff valve; starting fuel valve	воздушный клапан; воздушный редуктор; клапан управления; кран заправки топливом; кислородный вентиль; выпускной клапан; перекрывной клапан; клапан пускового топлива
vent (n, v)	[vent]	**дренажное вентиляционное отверстие, выпускать**	
		fuel tank vent; static vent	дренажное отверстие топливного бака; приемник статического давления
wiring (n)	['walqrIN]	**электропроводка**	

Ex. 55. Read and translate word combinations:

Cockpit controls, the movable control surfaces, outside the airplane, secondary flight control systems, essential in controlling the aircraft, to trim out control pressures, to change the lifting characteristics of the wing, to decrease the speed at which the wing stalls, airplane equipment, trim tabs, a direct-current (DC) electrical system, an alternating-current (AC) electrical system, engine-driven generators, maintain a sufficient electrical charge in the battery, to supply electric current to the electrical system, electrical energy stored in a battery, to provide a source of electricity for starting the engine, in the event the generator fails, to be equipped with receptacles, a dead battery, causing the battery to overheat, to result in damage to the airplane, to provide a means for the pilot to turn the electrical system "on" and "off", to conserve the energy stored in the battery, a limited supply of electricity, to use the electrical system for the source of energy, in a manner similar to, to exclude the generator from the electrical system, with the exception of the ignition system, to distribute voltage throughout the system, to protect the circuits and equipment from electrical overload, to be manually reset, to produce an adequate supply of electrical power to the system, to receive an electrical charge, to controls the rate of charge to the battery.

Reading

Ex. 56. Read the text and answer the questions to each part.

Text.

AIRCRAFT SYSTEMS

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.

1. What does the primary flight control system consists 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.
10. 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. Anticollision 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.

1. What is electrical energy required for?
2. What are the basic electrical system components?
3. Does electrical system remain operative in case of generator failure?
4. Describe the purpose of circuit breakers.
5. What is the function of a voltage regulator?

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.

1. What is the fuel system designed for?
2. How are fuel systems classified?
3. Where is fuel stored on the aircraft?
4. How is fuel delivered to the engine(s)?
5. Why is it necessary to filter the fuel?

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 de-icing) system, fire extinguishing system, and galley equipment

1. What is the function of the oil system?
2. What is a dipstick?
3. Why is a loss of oil pressure so dangerous?
4. Why is it important to check the oil level before each flight?
5. What is the function of a fuel selector assembly?
6. Where are usually fuel tanks mounted?
7. What is the function of an auxiliary electric driven pump?

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.

1. What is anti-icing system designed for?
2. How is aircraft ice protection provided?
3. What is the function of air conditioning and pressurization system?
4. What is hydraulic system designed for?

Vocabulary practice

Ex. 57. Scan the text to find antonyms.

Example: turn on – turn off.

1. turn on	- turn off	11. automatically	- …
2. internal	- …	12. trailing edge	- …
3. complicate	- …	13. simple	- …
4. below	- …	14. false	- …
5. top	- …	15. secondary	- …
6. inside	- …	16. exterior	- …
7. increase	- …	17. include	- …
8. DC	- …	18. input	- …
9. cooling	- …	19. contract	- …
10. preceding	- …	20. start	- …

Ex. 58. Scan the text to find synonyms.

Example: basic- essential

1. basic	- essential	11. complete	- …
2. to keep	- …	12. to check	- …
3. to break down	- …	13. to indicate	- …
4. harm	- …	14. to get	- …
5. to burst	- …	15. to supply	- …
6. to use	- …	16. to link	- …
7. to find out	- …	17. to become different	- …
8. suitable	- …	18. complicated	- …
9. to place	- …	19. to end	- …
10. to allow	- …	20. to fix onto a surface	- …

Ex. 59. A: Match the word combinations in column A with the Russian equivalents in column B.
Example: a – 1.

B: Learn these word combinations and use them in the sentences of your own.

A	B
a. *engine-driven pump*	1. *насос с приводом от двигателя*
b. boost pump	2. масляный насос
c. oil pump	3. аварийный насос
d. fuel pump	4. основной насос
e. emergency pump	5. вспомогательный насос
f. auxiliary pump	6. насос перекачки
g. main pump	7. электронасос
h. transfer pump	8. откачивающий насос
i. electric pump	9. топливный насос
j. scavenge pump	10. насос подкачки

Ex. 60. A: Match the word combinations in column A with the Russian equivalents in column B.
Example: a – 1.

B: Learn these word combinations and make up your own sentences using these expressions.

A	B
a. *position lights*	1. *аэронавигационный огни*
b. landing lights	2. рулежные фары
c. interior lights	3. проблесковый огонь
d. approach lights	4. посадочные фары
e. high-intensity lights	5. подсветка приборов
f. taxi guidance lights	6. огни ВПП
g. anticollision lights	7. ОВИ (огни высокой интенсивности)
h. instrument lights	8. рулежные огни
i. RW lights	9. огни подхода
j. taxi lights	10. лампы внутреннего освещения

Ex. 61*. Fill in the chart to find the other parts of speech. Use your dictionary where necessary. Check the pronunciation.

NOUN	*VERB*	*ADJECTIVE*
1. restriction	*restrist*	*restrictive*
2. ….	connect	....
3. linkage	…	….
4.	…	steerable
5. ….	charge	....
6. failure	....	….
7. ….	….	expanding
8. installation	….	…
9. …	....	inclusive
10. permission	….	….
11. …	simplify	....
12. loss	…	...
13. …	equip	…
14. …	…	characteristic
15. accumulator	…	…

Ex. 62*. Form nouns from the verbs.

To damage, to charge, to characterize, to restrict, to install, to fail, to permit, to pump, to lose, to accumulate, to link, to switch, to steer, to trim, to lubricate, to pressurise, to measure, to expand, to exchange.

Ex. 63. Fill in the gaps with the correct prepositions where necessary.

1. There are systems essential … controlling the aircraft, they consist … the elevator, aileron, and rudder.
2. The flaps enable the pilot to change the lifting characteristics … the wing and also to decrease the speed … which the wing stalls.
3. A source … electricity … starting the engine is stored … a battery.
4. APU can be connected … receptacles that some airplanes are equipped … .
5. To connect the main electrical system … the equipment a bus bar is used as a terminal … the airplane electrical system
6. The boost pump provides added reliability … the fuel system, and is also used as an aid … engine starting.
7. Fuel lines pass … a selector assembly located … the cockpit.
8. A sump … the bottom … the engine crankcase is usually the place where the engine oil is stored.
9. Engine failure could be caused … a loss … oil pressure.
10. This system is normally divided … at least two systems … maximum degree … independence.

Ex. 64. Complete the following sentences with infinitive or gerund.

1. The elevator, ailerons and rudder are essential in … the aircraft. (to control).
2. The goal of airplane designers is … maximum efficiency (to obtain).
3. Additional weight lowers the efficiency of the airplane by … its speed. (to reduce).
4. Wings are subjected to thorough analysis before … for use on airplanes (to approve).
5. The increased lift enables the pilot … steeper approaches to a landing without … airspeed. (to make, to increase).
6. When the flaps are no longer needed, they can … (to retract).
7. Mechanical linkage allows the pilot … the angle of attack of the entire horizontal stabilizer (to change).
8. The trim tab is a part of the elevator but may … independently of the elevator (to move).
9. Care must … in … engines using APU when the battery is dead. (to exercise, to start).
10.The oil system provides a means of … and … oil throughout the internal components of the engine (to store, to circulate).

Ex. 65 . Find the English equivalents to the following.

1) триммировать воздушное судно,
2) исключать генератор из системы электропитания,
3) органы управления воздушным судном в кабине экипажа,
4) движущиеся рулевые поверхности,
5) поддерживать достаточный электрический заряд в аккумуляторах,
6) система электропитания переменным током,
7) за исключением системы зажигания,
8) защищать сети и оборудование от электроперегрузки,
9) получать электрический заряд,
10) контролировать скорость заряда аккумулятора,
11) генераторы, работающие от двигателя,
12) подавать электрический ток в систему электропитания,
13) разряженный аккумулятор,
14) в случае отказа генератора,
15) распределять напряжение по всей системе,
16) включать и выключать систему электропитания,
17) уменьшать скорость, при которой наступает сваливание крыла,
18) бортовое оборудование,
19) система электропитания по постоянному току,
20) обеспечивать источник электроэнергии для запуска двигателя,
21) приводить к перегреву аккумулятора,
22) приводить к повреждению самолета,
23) вне самолета,
24) переустанавливать в ручном режиме,
25) изменять характеристики подъемной силы крыла,
26) разъем, к которому может быть подключено ВСУ,
27) плавкие предохранители, используемые для защиты сетей от перегрузки,
28) топливные баки, установленные в крыльях,
29) для подачи топлива,
30) для перекачки топлива,
31) в случае, если топливо будет расширяться из-за высоких температур,
32) немедленно выключить двигатель

Speaking

Ex. 66. Make a presentation on one of the main aircraft systems.**
Refer to section I.

Presentation Topic		
Vocabulary	*Plan*	*Notes:*
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	…….....	……

Ex. 67. Think of the best translation.**

Гидромеханическая система основного управления с автоматизированной бортовой системой управления (АБСУ)

Управление самолетом осуществляется только с помощью рулевого гидропривода. Безопасность полета обеспечивается:

- многократным дублированием рулевого гидропривода и источника питания;
- автономным управлением элеронами и элеронами-интерцепторами, половинками рулей высоты и направления. Это достигается с помощью индивидуальных рулевых приводов и пружинных тяг;
- многократным дублированием рулевого агрегата подключения АБСУ.

Непрерывное использование рулевого гидропривода в течение всего полета обеспечивает:

1) разгрузку экипажа. При этом не требуются триммеры, флетнеры, пружинные сервокомпенсаторы, а при достаточной жесткости системы – и балансировка;
2) отклонение рулей и элеронов по раздельным и суммарным командным сигналам экипажа и АБСУ, корректировку и ограничение предельных режимов полета по устойчивости, управляемости и рулевому флаттеру;
3) изоляцию командных рычагов от переменных аэродинамических нагрузок рулей и демпфирование угловых колебаний ВС;
4) демпфирование ветровой нагрузки на стоянке и ликвидацию специальной системы стопорения.

Section IV. **FLIGHT INSTRUMENTS**

Phonetics

Ex. 68. Read these words and practise saying them:

[e]	n**e**cessary, ess**e**ntial, eff**e**ctive, pressure, separate, t**e**mperature, intend, setting, density, register, error, attempt, heading
[x]	manufacture, altimeter, static, altitude, atmospheric, traffic, standard, actual, manner, impact, flap, passage, landing, gravity, retract, diaphragm, passage, bank
[u]	instrument, should, put, hook, look, pulley, full, foot
[u:]	true, route, rule, absolute, solution, through, cruise, manouevre, suit, suitable, include, move
[ju:]	particular, utilize, new, altitude, use, reduce, calculate, mercury, computer, tubing, popular, numerous
[A]	must, understand, thorough, enough, rough, obstruction, current, adjust, dust, obstruct, abrupt, among, accomplish, compass
[a:]	enhance, advantage, chart, park, part, rather, mark, large, bar, calm, fast, past, vast, raft, card, cargo, spark, starboard, alarm
[au]	mountain, about, surround, found, ground, mouth, encounter, amount, mount, how, however

Ex. 69. Cross the odd one out and pronounce the words.

1. Knob, knot, klaxon, know.
2. Diaphragm, calm, climb, duty.
3. Bearing, heading, weather, measure.
4. Compass, copy, complex, concept.
5. Reason, real, reading, leak.
6. Increase, breaker, feature, heating.
7. Gauge, automatic, cause, hydraulic.
8. Found, encounter, ground, rough.
9. Emergency, general, gear, damage.

Ex. 70. Read international words:

Distance, static, information, principle, atmospheric, temperature, peak, absolute, standard, theoretical, computer, to register, to park, to calibrate, to correct, variation, periodically, vibration, diaphragm, manouevre, turbulence, popular, abbreviation, configuration, gyroscope, vacuum, visual, horizon, miniature, proportional.

Ex. 71. Study new words** **(Glossary 5)**

abrupt (adj)	[q'brApt]	**резкий**	
to align (v) **alignment** (n)	[q'laIn] [q'laInment]	**совмещать, согласовывать**	
		course alignment; RW alignment	1. выравнивание курса; 2. выход на курс; выравнивание ВС при входе в створ ВПП.
aid (n, v)	[eId]	**помощь, средство, помогать, способствовать**	
		air navigaition aids; approach aids; to hold over the aids; ground aids; identification aids; landing aids; radio aids; visual-ground aids	аэронавигационные средства; средства (обеспечения) захода на посадку; выполнять полет в зоне ожидания, оборудованной наземными радиотехническими средствами; наземные средства; средства опознавания; посадочные средства; радиосредства; наземные визуальные средства
approximately (adv)	[q'pr0ksImqtlI]	**приблизительно, примерно**	
calm (adj)	[kQ:m]	**тихий, спокойный (о ветре) – тихо, штиль**	
		calm air; aerodrome calm	штиль отсутствие ветра в районе аэродрома
centrifugal (adj)	["sentrifju:gl]	**центробежный**	
to collide (v) **collision** (n)	[kq'laId]	**сталкиваться (столкновение)**	
		to collide with smth.	столкнуться с чем-либо
current (adj, n)	['kAr(q)nt]	**текущий, поток, ток**	
		current/present altitude; jet current	текущая высота; струйное течение
to determine (v)	[dI'tq:min]	**определять, устанавливать**	
		to determine the cause of smth; to determine delay	определить причину чего-либо; устанавливать задержку
density (n)	['densItI]	**плотность**	
		air traffic flow density	плотность потока воздушного движения
differential	["dIfq'renS(q)l	**перепад давления**	

pressure (n)	'preSq]		
directional gyro (n)	[dI'rekSn(q)l 'dZaIqrqu]	**курсовой гироскоп (гирокомпас направления)**	
drift (v, n)	[drift]	**сносить, снос**	
		to drift off the course;	1. сносить с курса; 2. уходить с курса (в полете), отклоняться от курса (полета);
		drift angle	угол сноса
elevation (n)	["elq'velS(q)n]	**высота превышения**	
		elevation of the aerodrome;	превышение аэродрома;
		RW elevation;	превышение ВПП;
		threshold elevation	превышение порога ВПП
to eliminate (v)	[I'lImI"neIt]	**устранять**	
to encounter (n,v)	[In'kauntq]	**встретиться, натолкнуться, неожиданная встреча**	
		to encounter **with** smth;	столкнуться, встретиться с чем-либо;
		to encounter **into** smth	натолкнуться на что-либо
to enhance (v)	[In'hQ:ns]	**увеличивать, усиливать, повышать**	
error (n)	['erq]	**ошибка, погрешность**	
		to determinate amount of error;	устанавливать величину погрешности;
		to eliminate error;	устранять погрешность;
		airborne equipment error;	погрешность бортового оборудования;
		detected error;	обнаруженная ошибка;
		height-keeping error;	погрешность выдерживания высоты полета;
		lateral error	боковое отклонение (от курса)
favourable (adj)	['felv(q)rqbl]	**благоприятный**	
to incline (v)	[In'klaIn]	**наклонять**	
		inclinometer	угломер
instrument, (n) **indicator** (n)	['Instrumqnt] ['IndIkeItq]	**прибор, указатель**	
		to observe the instruments;	следить за показаниями приборов;
		to pilot by reference to instruments;	пилотировать по приборам;
		to read the instruments;	считывать показания с приборов;
		airborne instrument;	бортовой прибор;
		airspeed instrument;	указатель воздушной скорости;
		indicated air speed (IAS)	приборная воздушная скорость
leak (n,v)	[Il:k]	**утечка, давать течь, пропускать**	

/leakage (n)	['li:kIdZ]	leakproof; to check for leakage; internal leakage; leaky fuel, oil, air } leak	не имеющий утечки; проверять на наличие течи; внутренняя утечка; имеющий течь, имеющий утечку; утечка { топлива, масла, воздуха }
mid-air collision (n)	[mId Fq kq'lIZ(q)n]	**столкновение ВС в воздухе**	
moisture (n)	['mOIstSq]	**влага**	
obstacle (n) **obstruction** (n) **to obstruct** (v)	['Obstqkl] [qb'strAkS(q)n]	**препятствие, преграда, заграждать**	
		to avoid the obstacle; to mark the obstacle; to obstruct the RW	избегать столкновения с препятствием; маркировать препятствие; заграждать ВПП.
pointer (n) **/needle** (n)	['pOIntq]	**стрелка прибора**	
		bank pointer; double pointer; drift pointer; speed pointer.	указатель углов крена; двухстрелочный указатель; указатель угла сноса; указатель скорости.
precession (n)	[prIseS(q)n]	**прецессия**	
		gyro precession	прецессия гироскопа
precisely (adv) **precise** (adj)	[prI'saIsli]	**точно, точный**	
		precisely known	точно известно
range (n)	[reIndZ]	**расстояние, дальность действия, диапазон, маяк**	
		to compute the visual range; to extend the range; to lie **beyond/within** the range; **range of coverage**; range of motion; altitude range; beacon range; direct range; downwind range; **flight range**; gliding range; nonstop range; RW visual range; slant range; takeoff range; transit range	вычислять дальность видимости; увеличивать дальность (полета); находиться **вне** заданного предела/в заданном диапазоне; **радиус действия**; диапазон отклонения; диапазон высот; радиус действия маяка; дальность полета по прямой; дальность полета при попутном ветре; **дальность полета**; дальность планирования; дальность беспосадочного перелета; дальность видимости на ВПП; дальность действия; диапазон взлетных режимов; дальность перелета
to refer (v) **reference** (n)	[rI'fq:] ['refr(q)ns]	**справляться, ссылаться, относиться, ссылка, справка, контрольная точка, начало отсчета**	
		basic flight reference	заданный режим полета
take off power (thrust) (n)	[teIk ov 'pauq]	**взлетный режим двигателей**	
velocity (n)	[vq'lOsItI]	**скорость, вектор скорости**	
		velocity of sound; air velocity; windl velocity	скорость звука; скорость движения воздушной массы; скорость и направление ветра, вектор скорости ветра
vertical gyro (n)	['vq:tIk(q)l dZaIqrqu]	**гировертикаль**	

Ex. 72. Read and translate word combinations.

to operate the airplane more precisely, maximum performance and enhanced safety, to gain the essential knowledge about, to separate the pilot and static sources, to measure the height of the airplane, above a given level, the effect of atmospheric pressure and temperature on the altimeter, to fly high enough to clear the highest terrain or obstruction, to reduce the possibility of a midair collision, to maintain altitudes in accordance with air traffic rules, to take advantage of favorable winds and weather conditions, reference levels from which altitude is measured, to register zero in level flight, the airspeed pointer on the face of the instrument, pressure difference between pitot impact pressure and static pressure, to minimize the stress on the airplane structure, with the remaining engine at takeoff power, to provide the power for the heading and attitude indicators, to drive the gyroscope of the turn needle, to prevent excessive oscillation of the turn needle, the correct angle of bank for the rate of turn, to sense airplane movement about the yaw and roll axis, to display pictorially the resultant motion, proportional to the roll rate of the airplane, to reset the heading indicator to align it with the magnetic compass, to represent the true horizon, to indicate the attitude of the airplane relative to the true horizon.

Reading

Ex.73. Read the text.

Text.

FLIGHT INSTRUMENTS

The use of instruments as an aid to flight enables the pilot to operate the airplane more precisely, and therefore, obtain maximum performance and enhanced safety. This is particularly true when flying greater distances. Manufacturers have provided necessary flight instruments; however, it is the pilot's responsibility to gain the essential knowledge about how the instruments operate so that they can be used effectively.

Some flight instruments utilize the pilot-static system for their operation.

The pilot-static system provides the source of air pressure for the operation of the altimeter, vertical speed indicator (vertical velocity indicator), and the airspeed indicator.

The installation in newer airplanes separates the pilot and static sources.

The Altimeter. The altimeter measures the height of the airplane above a given level. Since it is the only instrument that gives altitude information, the altimeter is one of the most important instruments in the airplane. To use the altimeter effectively, the pilot must thoroughly understand its principle of operation and the effect of atmospheric pressure and temperature on the altimeter. The presentation of altitude varies considerably between different types of altimeters. Some have one pointer while others have more.

Types of Altitude

Knowing the aircraft's altitude is vitally important to the pilot for several reasons. The pilot must be sure that the airplane is flying high enough to clear the highest terrain or obstruction along the intended route; this is especially important when visibility is reduced.

To keep above mountain peaks, the pilot must note the altitude of the aircraft and elevation of the surrounding terrain at all times. To reduce the possibility of a midair collision, the pilot must maintain altitudes in accordance with air traffic rules. Often certain altitudes are selected to take advantage of favorable winds and weather conditions. Also, a knowledge of the altitude is necessary to calculate true airspeeds.

Altitude is vertical distance above some point or level used as a reference. There may be as many kinds of altitude as there are reference levels from which altitude is measured and each may be used for specific reasons. Pilots are usually concerned, however, with five types of altitudes:

Absolute altitude – The vertical distance of an aircraft above the terrain.

Indicated altitude – That altitude is read directly from the altimeter (uncorrected) after it is set to the current altimeter setting.

Pressure altitude – The altitude indicated when the altimeter setting window is adjusted to 1012,3 HPa. This is the standard datum plane, a theoretical plane where air pressure (corrected to 15° C.) is 760 mm of mercury. Pressure altitude is used for computer solutions to determine density altitude, true altitude, true airspeed, etc.

True altitude – The true vertical distance of the aircraft above sea level – the actual altitude. (Often expressed in this manner; 10,900 ft. MSL.) Airport, terrain, and obstacle elevations found on aeronautical charts are true altitudes.

Density altitude – This altitude is pressure altitude corrected for nonstandard temperature variations. When conditions are standard, pressure altitude and density altitude are the same. Consequently, if the temperature is above standard, the density altitude will be higher than pressure altitude. If the temperature is below standard, the density altitude will be lower than pressure altitude. This is an important altitude because it is directly related to the aircraft's takeoff and climb performance.

Vertical Speed Indicator. The vertical speed or vertical velocity indicator indicates whether the aircraft is climbing, descending, or in level flight.

The rate of climb or descent is indicated in feet per minute or meters per second. If properly calibrated, this indicator will register zero in level flight.

Although the vertical speed indicator operates solely from static pressure, it is a differential pressure instrument.

The Airspeed Indicator

The airspeed indicator is a sensitive, differential pressure gauge which measures and shows promptly the difference between (1) pitot, or impact pressure, and (2) static pressure, the undisturbed atmospheric pressure at flight level. These two pressures will be equal when the aircraft is parked on the ground in calm air. When the aircraft moves through the air, the pressure on the pitot line becomes greater than the pressure in the static lines. This difference in pressure is registered by the airspeed pointer on the face of the instrument, which is calibrated in miles per hour, knots, or kilometers per hour.

There are three kinds of airspeed that the pilot should understand: (1) indicated airspeed; (2) calibrated airspeed; and (3) true airspeed.

Indicated Airspeed (IAS*).* The direct instrument reading obtained from the airspeed indicator, uncorrected for variations in atmospheric density, installation error, or instrument error.

Calibrated Airspeed (CAS) is indicated airspeed corrected for installation error and instrument error. Although manufacturers attempt to keep airspeed errors to a minimum, it is not possible to eliminate all errors throughout the airspeed operating range. At certain airspeeds and with certain flap settings, the installation and instrument error may occur. This error is generally greatest at low airspeeds. In the cruising and higher airspeed ranges, indicated airspeed and calibrated airspeed are approximately the same.

The airspeed indicator should be calibrated periodically because leaks may develop or moisture may collect in the tubing. Dirt, dust, ice, or snow collecting at the mouth of the tube may obstruct air passage and prevent correct indications, and also vibrations may destroy the sensitivity of the diaphragm.

True Airspeed (TAS*).* The airspeed indicator is calibrated to indicate true airspeed under standard sea level conditions.

Because air density decreases with an increase in altitude, the airplane has to be flown faster at higher altitudes to cause the same pressure difference between pitot impact pressure and static pressure. Therefore, for a given true airspeed, indicated airspeed decreases as altitude increases or for a given indicated airspeed, true airspeed increases with an increase in altitude.

Airspeed Limitations. There are other important airspeed limitations *not* marked on the face of the airspeed indicator. These speeds are generally found in the Airplane Flight Manual.

One example is the MANEUVERING SPEED. This is the "rough air" speed and the maximum speed for abrupt maneuvers. If during flight, rough air or severe turbulence is encountered, the airspeed should be reduced to maneuvering speed or less to minimize the stress on the airplane structure.

Other important airspeeds include LANDING GEAR OPERATING SPEED, the maximum speed for extending or retracting the landing gear if using aircraft equipped with retractable landing gear; the BEST ANGLE OF CLIMB SPEED, important when a short field takeoff to clear an obstacle is required; and the BEST RATE OF CLIMB SPEED, the airspeed that will give the pilot the most altitude in a given period of time. The pilot who flies the increasingly popular light twin-engine aircraft must know the aircraft's MINIMUM CONTROL SPEED, the minimum flight speed at which the aircraft is satisfactorily controllable when an engine is suddenly made inoperative with the remaining engine at takeoff power.

Gyroscopic Flight Instruments. Several flight instruments utilize the properties of a gyroscope for their operation. The most common instruments containing gyroscopes are the turn indicator, turn coordinator, heading indicator, and the attitude indicator. The gyroscopic instruments can be operated either by a vacuum or an electrical system. In some airplanes, all the gyros are either vacuum or electrically operated; in others, vacuum systems provide the power for the heading and attitude indicators, while the electrical system provides the power to drive the gyroscope of the turn needle.

Turn-and-Slip Indicator. The turn and slip indicator was one of the first instruments used for controlling an airplane without visual reference to the ground or horizon. Its principal uses in airplanes are to indicate turn and to serve as an emergency source of bank information in the event the attitude indicator fails.

The turn and slip indicator is actually a combination of two instruments: the turn needle and the ball or inclinometer. The needle is gyro operated to show rate of turn, and the ball reacts to gravity and/or centrifugal force to indicate the need for directional trim.

The turn needle is operated by a gyro, driven by either vacuum or electricity. The turn needle indicates the rate (number of degrees per second) at which the aircraft is turning about its vertical axis. Unlike the attitude indicator, it does not give a direct indication of the banked attitude of the aircraft. A dampening mechanism prevents excessive oscillation of the turn needle.

The ball is actually a balance indicator, and is used as a visual aid to determine coordinated use of the aileron and rudder control. During a turn it indicates the relationship between the angle of bank and rate of turn. It indicates the "quality" of the turn or whether the aircraft has the correct angle of bank for the rate of turn.

Turn Coordinator. Recently another type of turn indicator has been developed and is used quite extensively. This instrument is referred to as a "Turn Coordinator". In place of the turn needle indication, this instrument shows the movement of the airplane about the longitudinal axis by displaying a miniature airplane on the instrument. The movement of the miniature airplane on the instrument is proportional to the roll rate of the airplane. When the roll rate is reduced to zero, or in other words the bank is held constant, the instrument provides an indication of the rate of turn. This design features a realignment of the gyro in such a manner that it senses airplane movement about the yaw and roll axis and pictorially displays the resultant motion as described above. The conventional inclinometer (ball) is also incorporated in this instrument.

The Heading Indicator (HSI – horizontal situation indicator). The heading indicator (or directional gyro) is fundamentally a mechanical instrument designed to facilitate the use of the magnetic compass.

Errors in the magnetic compass are numerous, making straight flight and precision turns to headings difficult to accomplish, particularly in turbulent air. Heading indicators, however, are not affected by the forces that make the magnetic compass difficult to interpret.

Because of precession, caused chiefly by bearing friction, the heading indicator will creep or drift from a heading to which it is set. Among other factors the amount of drift depends largely upon the condition of the instrument. Pilots shall bear in mind that the heading indicator is not direction-seeking, as is the magnetic compass. It is important to check the indications frequently and reset the heading indicator to align it with the magnetic compass when required.

The Attitude Indicator (ADI/FDI – attitude/flight direction indicator). The attitude indicator, with its miniature aircraft and horizon bar, displays a picture of the attitude of the airplane. The relationship of the miniature aircraft to the horizon bar is the same as the relationship of the real aircraft to the actual horizon.

The instrument gives an instantaneous indication of even the smallest changes in attitude.

The gyro in the attitude indicator is mounted on a horizontal plane and depends upon rigidity in space for its operation. The horizon bar represents the true horizon. This bar is fixed to the gyro and remains in a horizontal plane as the airplane is pitched or banked about its lateral or longitudinal axis, indicating the attitude of the airplane relative to the true horizon.

An adjustment knob is provided with which the pilot may move the miniature airplane up or down to align the miniature airplane with the horizon bar to suit the pilot's line of vision. Normally, the miniature airplane is adjusted so that the wings overlap the horizon bar when the airplane is in straight-and-level cruising flight. The pitch and bank limits depend upon the make and model of the instrument. The attitude indicator is reliable and the most realistic flight instrument on the instrument panel. Its indications are very close approximations of the actual attitude of the airplane.

Ex. 74. Comprehension check.

1. What kind of flight instruments are to be utilizing by the pilot-static system for their operation?
2. What types of altitude do you know?
3. What is an altimeter operation?
4. How does a vertical speed indicator operate?
5. What is airspeed indicator operation?
6. What is a turn-and-slip indicator operation?
7. What is the function of turn coordinator?
8. What is a heading indicator operation?
9. What is an attitude indicator operation?

Ex. 75. Read the text again to prepare a short summary on one of the flight instruments described in the text. Make notes while reading.

Summary		
Vocabulary	*Plan*	*Notes:*
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……

Vocabulary practice

Ex. 76. Read and translate word combinations paying attention to different meanings of the highlighted words.

Power	Performance
The power of the engine	The performance of the system
The power of a bird strike	The performance of the aircraft
The power of the blow	The performance of the crew members

Lift	Bank
The lift in the house	The bank of the city
The lift of an aircraft	The bank of the river
The lift of the wing	The bank of an aircraft

Head	Face
The head of the service	The face of the VIP
The head of the company	The face of the instrument
The head the airline delegation	The face of the clock

Mouth	Role
The mouth of the river	The role of aircraft
The mouth of the man	The role of pilots
The mouth of the tube	The role of thunder

Stress	Bar
The stress on the structure	The bar of the instrument
Stress-related accident	The bus-bar of electrical circuit
Stress on the importance of verbal communication	The bar of the tow-unit

Ex. 77. A: Match the word combinations in column A with the Russian equivalents in column B.

Example: d – 7.

B: Make up sentences of your own using some of the expressions.

	A	B
I	a Air pressure	1. Атмосферное давление
	b. Differential pressure	2. Перепад давлений
	c. Static pressure	3. Стандартное давление
	d. *impact pressure*	4. Давление воздуха
	e. Atmospheric pressure	5. Полное давление
	f. Pitot pressure	6. Статическое давление
	g. Standard pressure	7. *Скоростной напор*

II	**a.** Absolute altitude	1. Истинная высота
	b. Indicated altitude	2. Высота по плотности
	c. Pressure altitude	3. Абсолютная высота
	d. True altitude	4. Приборная высота
	e. Density altitude	5. Барометрическая высота

Ex. 78. A: Study the following abbreviations for performance speeds:
B: Designate the performance speeds.

$\mathbf{V_a}$	-	design maneuvering speed
$\mathbf{V_c}$	-	design cruising speed
$\mathbf{V_{fe}}$	-	maximum flap extended speed
$\mathbf{V_{le}}$	-	maximum landing gear extended speed
$\mathbf{V_{lo}}$	-	maximum landing gear operating speed
$\mathbf{V_{lof}}$	-	lift-off speed
$\mathbf{V_{ne}}$	-	never-exceed speed
$\mathbf{V_r}$	-	rotation speed
$\mathbf{V_s}$	-	the stalling speed or the minimum steady flight speed at which the airplane is controllable
$\mathbf{V_{so}}$	-	the stalling speed or the minimum steady flight speed in the landing configuration
$\mathbf{V_y}$	-	speed for best rate of climb
$\mathbf{V_1}$	-	decision speed

Наивыгоднейшая скорость набора высоты, скорость принятия решения, скорость отрыва передней стойки, расчетная крейсерская скорость, расчетная эволютивная скорость, скорость сваливания или минимальная установившаяся скорость полета управляемого ВС, максимальная скорость с выпущенными закрылками, максимальная скорость полета с выпущенными шасси, непревышаемая скорость, максимальная скорость полета при выпуске и уборке шасси, скорость сваливания или минимальная скорость полета ВС в посадочной конфигурации.

Ex. 79. Scan the text to find synonyms.

1. help	*- aid*	9. turbulent air	- …
2. to get	- …	10. lately	- …
3. detailed	- …	11. too much	- …
4. obstacle	- …	12. to finish successfully	- …
5. according to	- …	13. often	- …
6. now passing, of the present time	- …	14. characteristics, features, qualities	- …
7. mistake	- …	15. extremely quickly	- …
8. exactly	- …	16. to lessen the difficulty	- …

Word building

Ex. 80*. Use a prefix to form the opposites.

Dis-	**Un-**	**In-**
…advantage	…safe	…effective
…ability	…necessary	…operative
…approval	…important	…visible
…agree	…restricted	…directly
…satisfied	…favourable	…frequently
Il-	**Im-**	**Ir-**
…legal	…possible	…responsible
…logical	…patient	…rational
…literate	…measurable	…resistible

Ex. 81*. Put one of the above prefixes in each space to make the opposite.

…concerned, …related, …sensitive, …trust, …disturbed, …corrected, …satisfactory, …honest, …regular, …place, …practical, …reparable, …integration, …legible, …accurate, …respective, …significant, …movable, …recoverable, …moderate, …variable, …replaceable, …perfect, ..countable

Ex. 82. There are many ways of forming nouns from verbs in English with their endings: -tion, -sion, -ment, -ety, -ery, -ance, -ence, -ancy, -ship, -er, -or, etc. Find these endings in the nouns below:

Exchanger, performance, safety, manufacturer, operation, indicator, installation, agryzeement, presentation, pointer, equipment, obstruction, collision, reference, solution,

computer, variation, difference, vibration, coordinator, formation, controller, relationship, movement, alignment, airmanship, precession, instructor, restriction., convenience, development.

Ex. 83*. Form nouns from the verbs.

To intend, to relate, to accommodate, to provide, to prepare, to extend, to connect, to locate, to operate, to develop, to designate, to correct, to cancel, to construct, to abandon, to establish, to achieve, to move, to differ, to exist, to maintain, to clear, to ensure, to perform.

to point, to incline, to allign, to collide, to eliminate, to drift, to refer, to indicate, to head, to precess, to direct, to favour, to minimize, to register, to solve, to optimize, to form, to separate, to calibrate.

Ex. 84* . Fill in the chart to find the other parts of speech. Use your dictionary where necessary. Check the pronunciation.

NOUN	*VERB*	*ADJECTIVE*
1. difference	*differ*	*different*
2. …	indicate	…
3. leakage	…	…
4. …	register	…
5. …	…	obstructing
6. …	precess	…
7. solution	…	…
8. …	determine	…
9. ….	…	favourable
10. optimum	…	…

Speaking

Ex. 85. Give definitions of aviation terms:

1 Altitude ……
……

2 Indicated airspeed ……
……

3 Pressure altitude ……
……

4 Density altitude ……
……

5 Indicated altitude ……
……

6 Calibrated air-speed ……
……

7 True airspeed ……
……

8 True altitude ……
……

Ex. 86. Look at Figure 3-1 and describe instruments supplied by Pitot-static system.

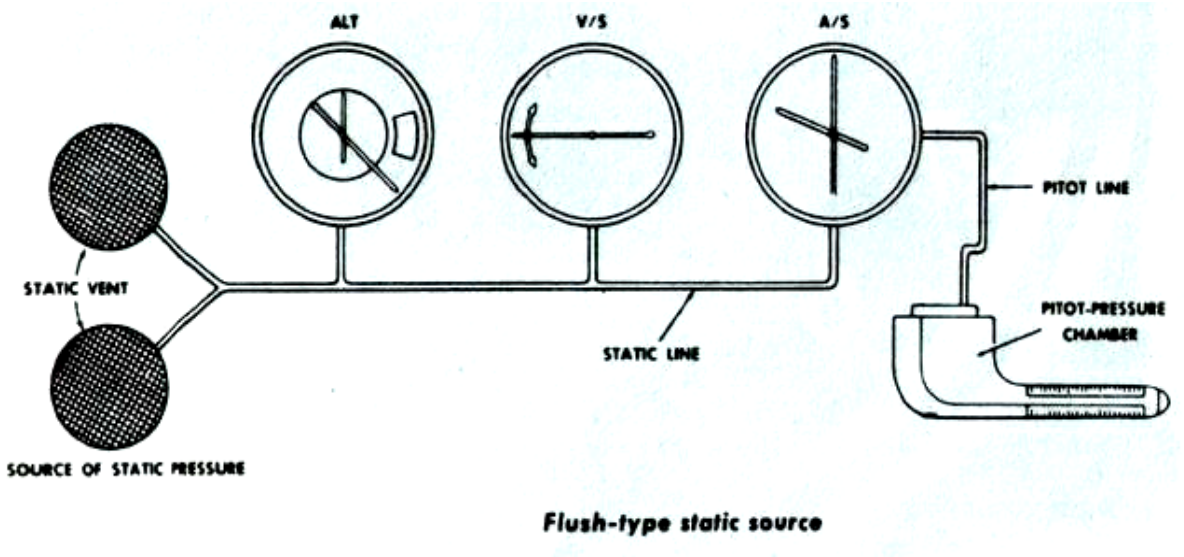


Figure 3-1. Pilot-static system with instruments

Ex. 87. Find the English equivalents to the following.

1) управлять воздушным судном более точно,
2) разделить источники полного и статического давления,
3) показывать положение самолета по отношению к истинному горизонту,
4) переустанавливать задатчик курса, чтобы согласовать его с магнитным компасом,
5) измерять высоту самолета,
6) свести к минимуму нагрузку на прочность конструкции,
7) выше определенного уровня,
8) показать ноль в горизонтальном полете,
9) воспользоваться благоприятными погодными условиями,
10) двигатель, работающий на взлетном режиме,
11) корректировать угол крена скоростью выполнения разворота,
12) выдерживать высоты в соответствии с правилами УВД,
13) стрелка указателя воздушной скорости,
14) на лицевой панели прибора,
15) приводить в действие гироскоп,
16) пропорционально скорости крена,
17) для предотвращения излишних колебаний стрелки,
18) лететь достаточно высоко для обеспечения зазора (высоты пролета) самых высоких точек на местности и препятствий,
19) уменьшить вероятность столкновения в воздухе,
20) влияние атмосферного давления и температуры на высотомер.

Ex. 88. Scan the text again and write a short summary. Refer to section II.**

Summary		
Vocabulary	*Plan*	*Notes:*
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……

Ex. 89. Think of the best translation.**

АВИАЦИОННЫЕ ПРИБОРЫ

Безопасность полета в значительной степени зависит от точности авиационных приборов и надежности их работы. Современные самолеты оснащены большим количеством разнообразных приборов, которые в зависимости от назначения подразделяются на три группы: пилотажно-навигационные приборы, приборы контроля работы двигателей и вспомогательные приборы.

По принципу действия авиационные приборы подразделяются по следующим подгруппам:

- манометрические приборы, принцип действия которых основан на измерении разности давлений – манометры, вариометры, указатели числа М;

- барометрические приборы, работающие на измерении абсолютного давления - барометрические высотомеры, корректоры и датчики высоты;

- гироскопические приборы, основанные на использовании свойств гироскопа с двумя и тремя степенями свободы, - авиагоризонты, указатели поворота, курсовые системы, гировертикали и т.д.;

- магнитные приборы (магнитные компасы), работа которых основана на свойстве ориентировки свободно подвешенного магнита в направлении магнитного меридиана Земли;

- электрические приборы и датчики, работа которых основана на измерении неэлектрических величин электрическим способом, - топливомеры, масломеры, термометры и т. д.;

- механические приборы, работа которых основана на использовании законов механики, - часы, указатели скольжения.

Работа всех авиприборов в конечном счете сводится к тому, чтобы изменение измеряемой физической величины (параметра полета) преобразовать в перемещение стрелки прибора относительно шкалы или в тот или иной электрический сигнал, используемый соответствующими бортовыми потребителями.

Section V. ***AVIATION METEOROLOGY***

Phonetics

Ex. 90. Read these words and practise saying them:

[k]	mechanic, mechanism, characteristics, chord, mach
[T]	earth, thin, thick, both, through, path, thunder, thunderstorm, threat, beneath
[D]	weather, rather, therefore, other, further, farther, although, either, withdraw, smooth
[z]	hazard, design, cause, physical, realize, equalize, horizontal, cruise, result, zone, drizzle, sunrise, size.
[f]	atmosphere, stratosphere, troposphere, physical, phenomenon, peripheral, phase, phrase
[v]	velocity, involve, level, valley, via, vertical, divide, obvious, visibility, behaviour, severe, volume, vapour, vary, cover
[w]	wind, wave, downward, windward, once, weather, whether, warm, wait, wonder, wedge, wisp, water.
[h]	human, humidity, how, however, horizon, horizontal, head, headwind, high, hill, who, whose, whom, heat, height, hydraulic, hail

Ex. 91. Practise reading:

a) water vapour, visible water vapour, wind blowing away, the wind will veer, variable wind, prevailing wind, favourable weather, very warm weather, a very severe winter, a very wide valley, well above ground level;

b) near the earth's surface, on the other hand, both within the clouds and beneath them, the contact with the earth, the air becomes thinner, the weather favourable for flight.

Vocabulary pre-teaching

Ex. 92. Read international words.

Meteorology, meteorologist, turbulence, atmosphere, stratosphere, troposphere, mass, local, station, physical, principles, activity, ocean, mile, limit, contact, temperature, constant, region, normal, ton, person, fact, interest, specific, result, circulation, serious, adequate, contour, canyon, course, problem, phenomenon, front, frontal, potentially, component, reaction, zone, stationary, condensation, concentrate, occlusion, combination, squall, tornado, deviation, intensity, fundamental, crystals, alternative, portion, storm, turbulence, reaction.

Ex. 93. Study new words** **(Glossary 6)**

to anticipate (v) **anticipation** (n)	[xn'tIsI"peIt]	**предвидеть, предвосхищать, ожидать (ожидание, предвидение)**	
		anticipated failure; to anticipate delay	ожидаемый отказ; ожидать задержку
average (v, n, adj)	['xv(q)rIdZe]	**осреднять, среднее значение, средний**	
		on/in average; below the average; above the average; flight data averaging	в среднем; ниже среднего; выше среднего; осреднение полетных данных
bump (n) **bumpiness** (n)	[bAmp]	**болтанка**	
		in-flight bump	воздушная яма на пути полета
crosswind (n)	[krOswInd]	**боковой ветер**	
		crosswind approach; crosswind landing; crosswind takeoff.	заход на посадку при боковом ветре; посадка с боковым ветром; взлет с боковым ветром.
disaster (n)	[dI'zRstq]	**катастрофа (природная)**	
		to prevent a disaster; to cause a disaster	предотвращать природную катастрофу; являться причиной катастрофы.
to disturb (v) **disturbance** (n)	[dI'stq:b]	**нарушать, беспокоить (возмущение)**	
		flow disturbance; noise disturbance; pressure disturbance	возмущение потока; шумовые помехи; помехи от давления
to drop in (v)	[drop In]	**проседать (зд. о ВС)**	
eddy (n)	[edI]	**завихрение**	
		air eddy	завихрение воздуха
to explode (v) **explosion** (n) **explosive** (n)	[Ik'splqud]	**взрывать(ся), взрыв, взрывчатое вещество**	
		explosives on board	взрывчатые вещества на борту
gust (n) **gasty** (adj)	[gAst]	**порыв ветра**	
		gusty to … m/s down(ward)/up(ward) gust; head-on gust; surface wind gust	порывы до …. м/с; нисходящий/восходящий порыв; встречный порыв; порыв ветра у поверхности земли.
headwind (n)	['hed"wInd]	**встречный ветер**	
layer (n)	['leIq]	**слой**	
		layer between levels; cloud layer; protective layer; top layer; turbulent layer.	слой атмосферы между эшелонами; слой [ярус] облачности; защитный слой; верхняя кромка облаков; турбулентный слой.
leeward (adj)	['lI:wqd]	**подветренный (с подветренной стороны)**	
		in leeward of, upon leeward of, to leeward of	с подветренной стороны чего-либо
mountain waves (pl) (n)	['mauntIn weIvs]	**горные волны**	

to predict (v) **prediction** (n)	[prI'dIkt]	**предсказывать**	
		to predict a failure	прогнозировать отказ
ratio (n)	['reISion]	**соотношение, отношение пропорция**	
		power/weight ratio	отношение мощности на единицу веса ВС
ridge (n)	[rIdZ]	**гребень**	
to substitute (v)	['sAbstI"tju:t]	**заменять**	
		to substitute smth for smth	заменять на что-либо
surface wind	['sq:fIs wInd]	**ветер у земли**	
tailwind (n) **(backwind)**	['tail"wind]	**попутный ветер**	
to veer (v)	[vIq]	**отклоняться (от курса)**	
		veering of wind	вращение ветра
wind shear (n)	[wInd SIq]	**сдвиг ветра**	
		wind shear with a loss/ gain of speed; horizontal/vertical wind shear.	сдвиг ветра с потерей/приростом скорости; горизонтальная/вертикальная составляющая сдвига ветра.
wind sock (n)	['wIndƏ s0k]	**ветроуказатель, флюгер**	
		aerodrome wind sock	аэродромный ветроуказатель
windward (adj)	['wIndwqd]	**надветренный**	

Ex. 94. Read and translate word combinations.

To be subject to conditions of limited visibility, turbulence, and icing; to avoid hazardous flight conditions, weather behavior, the predictions of the "weather man", no substitute for experience, the exact upper limit, above the earth, sea-level pressure, vertical movement of ascending and descending currents, conditions of wind and weather occurring at any specific place and time, the result of the general circulation in the atmosphere, to maintain an equal pressure over the entire earth, above level and open ground, to anticipate the bumpy and unsteady flight, to blow up the slope on the windward side, to present a serious hazard during takeoffs and landings, any doubt about having adequate clearance, flow through the passage with increased velocity and turbulence, to be alert for wind shifts, power/weight ratio, powerplant response time, significant low-level wind shear problems, to be spaced widely apart.

Reading

Text.

AVIATION METEOROLOGY

Despite the improvements in aircraft design, powerplants, radio aids, and navigation techniques, safety in flight is still subject to conditions of limited visibility, turbulence, and icing.

To avoid hazardous flight conditions, pilots have to be aware of the atmosphere and of weather behavior.

One may wonder why pilots need more than general information available from the predictions of the "weather man." The answer is well known to all experienced pilots. Meteorologists' predictions are based upon movements of large air masses and local conditions at points where weather stations are located. Air masses at times are unpredictable and weather stations

in some areas are spaced rather widely apart; therefore, pilots have to possess good situational awareness and understand the factors that could cause unfavorable weather to occur between the stations as well as the conditions that could be different from those indicated by weather reports.

Furthermore, a meteorologist can only forecast the weather conditions; pilots have to decide whether the particular flight may be hazardous, taking into account the type of the aircraft, the equipment used, flying ability, experience, and physical limitations.

Pilots have to understand the principles of aviation weather upon which sound judgment can be built. There is no substitute for experience in any flight activity and this is particularly true if good judgment is to be applied to decisions concerning weather.

Nature of the Atmosphere

Life exists at the bottom of the ocean of the air called the atmosphere. This ocean extends upward from the earth's surface for many miles, gradually thinning as it nears the top. The exact upper limit has never been determined. Near the surface, the air is relatively warm from contact with the earth. As altitude increases, the temperature decreases by about 2° C. (3.5° F.) for every 1,000 ft. (normal lapse rate) until air temperature reaches about - 55° C. (-67° F.) at 7 miles above the earth.

For flight purposes, the atmosphere is divided into two layers: the upper layer, where temperature remains practically constant, is the "stratosphere;" the lower layer, where the temperature changes, is the "troposphere". Although jets routinely fly in the stratosphere, the private pilot usually has no occasion to go that high, but usually remains in the lower layer—the troposphere. It is in this region that all weather occurs and practically all light airplane flying is done. The top of the troposphere lies 5 to 10 miles above the earth's surface.

Obviously, a body of air as deep as the atmosphere has tremendous weight. It is difficult to realize that the normal sea-level pressure upon the body is about 20 tons on the average person. The body does not collapse because this pressure is equalized by an equal pressure within the body. In fact, if the pressure were suddenly released, the human body would explode. As altitude is gained, the temperature of the air not only decreases but the air becomes thinner; therefore there is less pressure. At first, pressure is rapidly reduced to about 6,000 m. where the pressure is only half as great as at sea level.

Wind. The pressure and temperature changes produce two kinds of motion in the atmosphere – vertical movement of ascending and descending currents, and horizontal flow known as "wind." Both of these motions are of primary interest to the pilot because they affect the flight of aircraft during takeoff, landing, climbing, and cruising flight. This motion also brings about changes in weather, which may make the difference between a safe flight or a disastrous one. Conditions of wind and weather occurring at any specific place and time are the result of the general circulation in the atmosphere.

The atmosphere tends to maintain an equal pressure over the entire earth, just as the ocean tends to maintain a constant level. When the equilibrium is disturbed, air begins to flow from areas of higher pressure to areas of lower pressure. It has been thought that wind cannot affect an aircraft once it is flying except for drift and groundspeed. This is true with steady winds or winds that change gradually. It isn't true, however, if the wind changes faster than the aircraft mass can be accelerated or decelerated. It is especially true when wind changes direction and speed near the earth's surface.

Surface wind is very important to pilots because of the effect it has on take-offs and landings. Surface wind is measured at 10 meters above level and open ground, i.e. where wind socks and other wind indicators are generally placed. Wind is usually less strong near the surface than at higher levels.

When the wind flows around an obstruction, it breaks into eddies – gusts with sudden changes in speed and direction – which may be carried along some distance from the obstruction. A pilot flying through such turbulence should anticipate the bumpy and unsteady flight that may be encountered. This turbulence – the intensity of which depends upon the size of the obstacle and the velocity of the wind – can present a serious hazard during takeoffs and landings. For example, during landings it can cause a pilot to "drop in"; during takeoffs it could cause the aircraft to fail to gain enough altitude to clear low objects in its path. Any landings or takeoffs

attempted under gusty conditions should be made at higher speeds, to maintain adequate control during such conditions .

This same condition is more noticeable where larger obstructions such as bluffs or mountains are involved. The wind blowing up the slope on the windward side is relatively smooth and its upward current helps to carry the aircraft over the peak. The wind on the leeward side, following the terrain contour, flows definitely downward with considerable turbulence and would tend to force an aircraft into the mountain side. Large mountains or mountain ranges cause an effect on the wind that may extend well above ground level, resulting in **mountain waves.** The stronger the wind, the greater the downward pressure and the accompanying turbulence. Consequently, in approaching a hill or mountain from the leeward side, a pilot should gain enough altitude well in advance. Because of these downdrafts, it is recommended that mountain ridges and peaks be cleared by at least 700 m. If there is any doubt about having adequate clearance, the pilot should turn away at once and gain more altitude. Between hills or mountains, where there is a canyon or narrow valley, the wind will generally veer from its normal course and flow through the passage with increased velocity and turbulence. A pilot flying over such terrain needs to be alert for wind shifts and particularly cautious if making a landing.

Wind Shear. Wind shear is best described as a change in wind direction and/or speed within a very short distance in the atmosphere. Under certain conditions, the atmosphere is capable of producing some dramatic shears very close to the ground. This, however, is not something encountered every day. In fact, it is unusual, which makes it more of a problem

The most prominent meteorological phenomena that cause significant low-level wind shear problems are thunderstorms and certain frontal systems at or near an airport.

Basically, there are two potentially hazardous shear situations. First, a tailwind may shear to either a calm or headwind component. In this instance, initially the airspeed increases, the aircraft pitches up and the altitude increases. Second, a headwind may shear to a calm or tailwind component. In this situation, initially the airspeed decreases, the aircraft pitches down, and the altitude decreases. Aircraft speed, aerodynamic characteristics, power/ weight ratio, powerplant response time, and pilot reactions along with other factors have a bearing on wind shear effects. It is important, however, to remember that shear can cause problems for ANY aircraft and ANY pilot.

Ex. 95. Comprehension check.

1. Why must pilots have knowledge of the atmosphere and of weather behavior?
2. Why do pilots need more than general information available from the predictions of the "weather man?
3. Why is the atmosphere divided into two layers?
4. What kind of motion in the atmosphere do the pressure and temperature changes produce?
5. At what height is surface wind measured?
6. What should a pilot flying through turbulence anticipate?
7. Why must a pilot gain altitude in approaching a hill or mountain from the leeward side?
8. At what height is it recommended to clear mountain ridges and peaks?
9. Name the most prominent meteorological phenomena that cause significant low-level wind shear problems.
10. What is potentially hazardous wind shear situations?

Vocabulary practice

Ex. 96. Fill in the gaps with the correct prepositions where necessary.

1. The atmosphere is capable … producing some dramatic shears very close … the ground … certain conditions.
2. There is no substitute … experience … any flight activity.
3. Air begins to flow … areas … higher pressure … areas … lower pressure when the equilibrium is disturbed.
4. Are meteorologists' predictions based … movements … large air masses and … local conditions … points where weather stations are located?
5. It's important that pilot turns … at once, if there is any doubt … having adequate clearance.
6. The wind breaks … eddies when it flows … an obstruction.
7. Safety … flight is still subject … conditions … limited visibility, turbulence, and icing.
8. The air is relatively warm … contact … the earth near … the surface.
9. Life exists … the bottom … an ocean … air called the atmosphere.

Ex 97. Find the English equivalents to the following.

1) быть подверженным условиям обледенения, турбулентности и ограниченной видимости,
2) значительные проблемы, связанные со сдвигом ветра на низких высотах,
3) представлять серьезную опасность при взлете и посадке,
4) вертикальное движение восходящих и нисходящих потоков,
5) обходить опасные условия полета,
6) верхний предел,
7) сохранять равное давление над поверхностью всей земли,
8) выше земли,
9) давление на уровне моря,
10) ожидать неустойчивый полет в болтанку,
11) результат циркуляции в атмосфере,
12) погодные условия, возникающие в определенном месте в определенное время,
13) быть настороже из-за сдвига ветра,
14) поток воздуха с возрастающей скоростью и турбулентностью,
15) любые сомнения насчет адекватной высоты пролета препятствий,
16) соотношение мощности и массы,
17) время ответной реакции силовой установки.

Ex. 98. Give definitions of aviation terms and words.

1 Wind ……
2 Atmosphere ……
3 Eddies ……
4 Wind shear ……
5 Surface wind ……
6 Spot wind ……

Ex. 99. Study new words** **(Glossary 7)**

alert (v, n, adj)	[q'lq:t]	**объявлять тревогу, поднимать по тревоге (тревога, бдительный, настороженный)**	
		to alert smth to; in alert; to call an alert	приводить в состояние готовности; в режиме готовности; объявлять тревогу
boundary (n)	['baund(q)rI]	**граница (зоны)**	
		FIR boundary (flight information region); airfield boundary; coverage boundary	граница РПИ (района полетной инофрмации); граница летного поля; граница зоны действия.
cell (n)	[sel]	**(зд.) очаг (грозы)**	
		thunderstorm cell	грозовой очаг
conducive (adj)	[kqn'dju:slv]	**способствующий, благоприятный**	
		conducive to smth.	способствующий чему-либо
crust (n) **/ice-crusted**	[krAst]	**корка (покрытый льдом, обледеневший)**	
		ice-crusted runway	обледеневшая ВПП
dew point (n)	[dju: p0Int]	**точка росы**	
to dissipate (v) **dissipation** (n)	[dIsIpeIt]	**рассеивать (рассеивание)**	
		fog dissipation; noise dissipation	рассеивание тумана; рассеивание шума.
downdraft /downwash (n)	[daundrRft]	**нисходящий поток**	
drizzle (n)	['drIzl]	**морось**	
		freezing drizzle; heavy drizzle.	переохлажденный мелкий дождь; сильная изморось
fibrous (adj)	['faIbrqs]	**волокнистый**	
		fibrous type of cloud	волокнистый тип облаков
hail (n)	[heIl]	**град**	
		soft hail	снежная крупа
haze (n)	[heIz]	**мгла, дымка**	
		dust haze	пыльная мгла
humidity (n)	[hju(:)'mIdItI]	**влажность**	
		air humidity	влажность воздуха
interference (n) **to interfere with** (v)	["Intq'flqr(q)ns] [Intq'flq]	**вмешательство, помехи (вмешиваться)**	
		interference with reception; permissible interference; radio interference	помехи при (радио) приеме; допустимые помехи; радиопомехи
landmark (n)	['lxnd"mRk]	**наземный ориентир**	
		definite landmark	четкий [ясный] наземный ориентир
lightning (n)	['laItnIN]	**молния**	
		lightning flash; lightning strike	сверкание молнии; удар молнии
mist (n)	[mIst]	**дымка**	
obscure (adj)	[qb'skjuq]	**неясный, смутный, неотчетливый, затянутый облаками**	

overcast (adj)	['quvq"kRst]	**затянутый облаками**	
		overcast sky	небо, затянутое облаками
particle (n,v)	['pRtIkl]	**частица**	
precipitation (n)	[prI"sIpI'teIS(q)n]	**осадки**	
		heavy/light precipitation; sleet precipitation; drizzle precipitation; hail precipitation; ice pellets precipitation; thundershowers precipitation.	значительные/слабые осадки; мокрый снег; мелкий дождь; град; осадки в виде ледяных крупинок; грозовой ливень.
to reverse (v) **reverser** (n)	[rI'vq:s] [rI'vWsq]	**изменять в обратную сторону (реверсировать)**	
		to reverse the course; **thrust reverser**	изменить курс на обратный; **реверс тяги**
to saturate (v)	['sxtSq"reIt]	**насыщать**	
		air saturated with moisture	воздух, насыщенный влажностью
to scatter (v)	['skxtq]	**разбрасывать**	
		scattered clouds	рассеянные облака
slope (n, v)	[slqup]	**уклон, клониться, иметь наклон**	
		glide slope; RW slope; down/up slope of the RW	наклон глиссады; уклон ВПП; уклон ВПП вниз/вверх
snowplow /plough (n)	['snqu"plau]	**снегоочиститель**	
steep (adj)	[stI:p]	**крутой (зд. о траектории полета ВС)**	
threat (n) **to threaten** (v)	[Trqt] [Trqt(q)n]	**угроза, угрожать**	
		inflight bomb threat	угроза применения взрывного устройства в полете
thunder (n)	['TAndq]	**гром**	
		thunder shower; thundercloud	дождь с громом; грозовая туча
updraft (n) **/upwash**	[ApdrRft]	**восходящий поток воздуха**	
vapor /vapour (n) **to vaporize** (v)	['veIpq]	**пар (испаряться)**	
		vapor resistance	паростойкость, паронепроницаемость
wedge (n, v)	[wedZ]	**клин (вклиниваться)**	

Ex. 100. Cross the odd one out.

1. Headwind, tailwind, crosswind, upwind, downwind, basewind.
2. Veer, creep, drift, reverse.
3. Obscure, overcast, clear, frozen.
4. Thunder, calm, lightning, rain.
5. Hill, mountain, slope, peak.
6. Drizzle, rain, hail, tornado.

Ex. 101. A: Study the following types of clouds and their abbreviation set.
B: Translate their names

Remember:	
cumulus	**кучевые**
nimbus	**дождевые**
stratus	**слоистые**
alto	**высотные**
cirrus	**перистые**

CI	*Cirrus*	*Перистые*
CC	*Cirrocumulus*	*Перисто-кучевые*
CS	*Cirrostratus*	*Перисто-слоистые*
AC	*Altocumulus*	*Высококучевые*
NS	*Nimbostratus*	*Слоисто-дождевые*
SC	*Stratocumulus*	*Слоисто-кучевые*
ST	*Stratus*	*Слоистые*
CU	*Cumulus*	*Кучевые*
CB[1]	*Cumulonimbus*	*Кучево-дождевые*
LYR	*Layer or layered (instead of cloud type)*	*Слой*

Reading

Ex. 102. A: Read and translate word combinations.

Certain types of weather, boundaries called frontal zones or "fronts", to move along the earth's surface, to slide up over the wedge of colder air, to increase moisture content, to become saturated, to be caused by upslope motion or cooling of the ground after sunset, thin wisps of cirrus clouds, in advance of the point on the ground which marks the position of the front, to act like a snow plow, to form cloud types that depend on the stability of the warm air, a steeper frontal surface, with gusty and turbulent surface winds, several thunderstorm "cells" within one cloud, to constitute a severe hazard to the pilot, obvious dangers from thunderstorm, damage from lightning strikes, loss of control and structural damage, sudden expansion of the air in its path, interference to radio communications, severe icing possibly with formation of the very dangerous clear ice.

B: Read Text "Air Masses and Fronts" and pay your attention to the

[1] ***CB*** means hail, moderate or severe icing and / or turbulence

way they are used in the context.

Text.

AIR MASSES AND FRONTS

Air masses can be associated with certain types of weather. When two air masses meet, they will not mix readily unless their temperatures, pressures, and relative humidities are very similar. Instead, they set up boundaries called frontal zones, or "fronts," the colder air mass projecting under the warmer air mass in the form of a wedge. This condition is termed a "stationary front" if the boundary is not moving.

Usually, however, the boundary moves along the earth's surface, and as one air mass withdraws from a given area it is replaced by another air mass. This action creates a moving front. If warmer air is replacing colder air, the front is called "warm;" if colder air is replacing warmer air, the front is called "cold."

Warm Front. When a warm front moves forward, the warm air slides up over the wedge of colder air lying ahead of it.

Warm air usually has high humidity. As this warm air is lifted, its temperature is lowered. As the lifting process continues, condensation occurs, low nimbostratus and stratus clouds form and drizzle or rain develops. The rain falls through the colder air below, increasing its moisture content so that it also becomes saturated. Any reduction of temperature in the colder air, which might be caused by upslope motion or cooling of the ground after sunset, may result in extensive fog.

As the warm air progresses up the slope, with constantly falling temperature, clouds appear at increasing heights in the form of altostratus and cirrostratus, if the warm air is stable. If the warm air is unstable, cumulonimbus clouds and altocumulus clouds will form and frequently produce thunderstorms. Finally, the air is forced up near the stratosphere, and in the freezing temperatures at that level, the condensation appears as thin wisps of cirrus clouds.

The upslope movement is very gradual, rising about 1,000 ft. very 20 miles. Thus, the cirrus clouds, forming at perhaps 25,000 ft. altitude, may appear as far as 500 miles in advance of the point on the ground which marks the position of the front.

Cold Front. When the cold front moves forward, it acts like a snow plow, sliding under the warmer air and forcing it aloft. This causes the warm air to cool suddenly and form cloud types that depend on the stability of the warm air.

Fast-Moving Cold Fronts. In fast-moving cold fronts, friction retards the front near the ground, which brings about a steeper frontal surface. This steep frontal surface results in a narrower band of weather concentrated along the forward edge of the front. If the warm air is stable, an overcast sky may occur for some distance ahead of the front, accompanied by general rain. If the warm air is conditionally unstable, scattered thunderstorms and showers may form in the warm air. At times an almost continuous line of thunderstorms may form along the front or ahead of it. These lines of thunderstorms (squall lines) contain some of the most turbulent weather experienced by pilots.

Behind the fast-moving cold front there is usually rapid clearing, with gusty and turbulent surface winds, and colder temperatures.

Occluded front

One other form of front with which the pilot has to be aware of is the “occluded front”. This is a condition in which an air mass is trapped between two colder air masses and forced aloft to higher levels until it finally spreads out and loses its identity. As far as the pilot is concerned, the weather in any occlusion is a combination of warm front and cold front conditions.

Thunderstorms are accompanied by thunder, lightning, heavy rain showers and sometimes hail, squalls and tornadoes.

Thunderstorms are associated with cumulonimbus clouds and there may be several thunderstorm "cells" within one cloud. They constitute a severe hazard to the pilot, especially in light aircraft.

Dangers to aviation do not exist just inside or under the cloud, but for quite some distance around it. Some obvious dangers from thunderstorms include:

- severe windshear, causing flight path deviations and handling problems, loss of airspeed and possibly structural damage;
- severe turbulence, causing loss of control and structural damage;
- severe icing possibly with formation of the very dangerous clear ice from large supercooled water drops;
- damage from hail to the airframe and windows;
- reduced visibility;
- damage from lightning strikes, including electrical damage;
- interference to radio communications and radio navigation instruments.

The atmosphere always contains a certain amount of foreign matter — smoke, dust, salt particles, and particularly moisture in the form of invisible water vapor. The amount of moisture that can be present in the atmosphere depends upon the temperature of the air.

Relative Humidity "Humidity" is commonly referred to as the apparent dampness in the air. Relative humidity is a ratio of the amount of moisture present in any given volume of air to the amount of moisture the air could hold in that volume of air at prevailing temperature and pressure.

For the pilot, the relationship discussed under relative humidity is expressed in a slightly different way — as "temperature and dewpoint." In other words, dewpoint is the temperature to which air must be cooled to become saturated. Dewpoint is of tremendous significance to the pilot because it represents a critical condition of the air. When temperature reaches the dewpoint, water vapor can no longer remain invisible, but is forced to condense, becoming visible on the ground as dew or frost, appearing in the air as fog or clouds, or falling to the earth as rain, snow, or hail.

Fog and Mist. When the air near the ground is four or five degrees above the dewpoint, the water vapor condenses and becomes visible as fog / mist. There are many types of fog, varying in degree of intensity and classified according to the particular phenomena which cause them. One type, "ground fog," which frequently forms at night in low places, is limited to a few meters in height, and is usually dissipated by the heat of the sun shortly after sunrise. Other types, which can form any time conditions are favorable, may extend to greater heights and persist for days or even weeks. Along seacoasts fog often forms over the ocean and is blown inland. All fogs produce low visibilities and therefore constitute a serious hazard to aircraft. The difference between mist and fog is: mist exists if the visibility exceeds 1 km, fog exists if it falls below 1 km. It is usual for mist to precede fog at a place and to follow fog as it disperses.

When flying near clouds, pilots should remember that the cloud is a storm factory. The lightning that accompanies such a storm is probably due to the breakup of raindrops. This produces static electricity that discharges as lightning, thus causing sudden expansion of the air in its path, resulting in thunder.

Within the cloud and directly beneath it are updrafts and downdrafts; in the rear portion is a strong downdraft which becomes a wind blowing away from the cloud.

Ceiling A ceiling is defined as the height above the surface of the base of the lowest layer of clouds or obscuring phenomena that hide more than half of the sky, and is reported as broken or overcast. A ceiling is also defined as the vertical visibility into a surface based obscuration that hides all of the sky. A layer of clouds or obscuring phenomena classified as thin does not constitute a ceiling. The ceiling is unlimited if the sky is cloudless.

Visibility Closely related to ceiling and cloud cover is "visibility" – the greatest horizontal distance at which prominent objects can be distinguished with the naked eye. Visibility, like ceiling, is included in hourly weather reports and in aviation forecasts.

Precipitation In addition to possible damage by hail and the danger of icing, precipitation may be accompanied by low ceilings, and in heavy precipitation visibilities may suddenly be reduced to zero.

Precipitation refers to falling water that finally reaches the ground and includes:

- rain consisting of liquid water drops;
- drizzle consisting of fine water droplets;
- snow consisting of branched and star-shaped ice crystals;
- hail consisting of small balls of ice;
- freezing rain or drizzle which freezes when contacts a cold surface.

Rain that falls from the base of clouds but evaporates before reaching the ground (hence is not really precipitation) is called virga.

It should be obvious that aircraft which may have accumulated snow while on the ground should never be flown until all traces of snow have been removed, including the hard crust that frequently adheres to the surfaces. An aircraft which has been exposed to rain followed by freezing temperatures should be carefully cleared of ice and checked before takeoff to make certain that the controls operate freely.

Ex. 103. Comprehension check.

1. What condition is termed a "stationary front"?
2. How are the boundaries of air masses called?
3. What humidity does warm air usually have?
4. What happens when the cold front moves forward?
5. What is an "occluded front"?
6. Which phenomena accompany thunderstorms?
7. What are obvious dangers from thunderstorms?
8. Why is dewpoint of tremendous significance to the pilot?
9. What is the difference between mist and fog?
10. When is the ceiling is unlimited?
11. What does precipitation refers to?

Bits of Grammar

Ex. 104. Translate into English the following word combinations paying attention to the prepositions:

На земле, **с** нижней кромки облаков, проверять **до** взлета, **в** дополнении **к,** опасность обледенения, **вдоль** поверхности земли, **в пределах** облака и **под** ним, **с** другой стороны, помехи **в** радиосвязи; условие, **при** котором; ограничено **до**, повреждение **от** удара молнии.

Ex. 105* Fill in the chart with the related words. Use your dictionary where necessary. Check the pronunciation.

NOUN	*VERB*	*ADJECTIVE*
1. creature	*create*	*creative*
2. ….	…	safe
3. ….	freeze	…
4. existence	…	…
5. ….	…	knowing

6. ….	vary	…
7. ….	…	active
8. consumption	…	…
9. …	anticipate	…
10. remnant	…	…
11. …	…	relative
12. clearance	…	…
13. …	predict	…
14. …	…	mixing
15. stability	…	…
16. …	continue	…
17. …	…	adherent
18. location	…	…
19. …	communicate	…
20. …	…	movable

Ex. 106* **Form nouns from the verbs.**

To predict, to consume, to locate, to exist, to explode, to disturb, to anticipate, to remain, to clear, to stabilize, to reverse, to saturate, to alert, to communicate, to move, to continue, to create, to act, to know.

Ex. 107. **Match each adjective in the left-hand column with its stronger equivalent from the right-hand column.**

Example: 7 – c.

1. exciting	**a.** powerful
2. large	**b.** distinguished
3. important	**c.** *severe*
4. dangerous	**d.** hazardous
5. well-known	**e.** violent
6. big	**f.** tremendous
7. *extreme*	**g.** turbulent
8. basic	**h.** freezing
9. disturbed	**i.** fundamental
10. harmful	**j.** dramatic
11. cold	**k.** significant
12. strong	**l.** vast

Ex. 108. **Form comparatives and superlatives from the adjectives in the text.**

Remember the rule:		
big	**bigger**	**the biggest**
important	**more important**	**the most important**

Ex. 109. Transform the sentences without changing their meaning.

Example: Wednesday was hotter than yesterday.
Answer: Yesterday was not as hot as Wednesday.

1. At higher levels wind is stronger than near the surface. - ……...…..……..
2. Any landings or take offs attempted under gusty conditions are not as safe as ones made in favourable weather. - ……..……..
3. Warm air usually is more humid than cold air. - ……..
4. "Stratus" are not as hazardous as "cumulus". - ……..……
5. Near the surface, the air is warmer than at higher levels. - ……
6. Steady winds are not so dangerous as variable ones. - ……...……
7. The wind on the windward side is less turbulent than the wind on the leeward side. - ……...…..
8. At 6.000 metres the pressure is half as great as at sea level. - ……
9. If the temperature is above standard, the density altitude is higher than pressure altitude. - ……...
10. If the temperature is below standard, the density altitude is not so high as pressure altitude. - …...……..……
11. When the aircraft moves through the air, the pressure on the pitot line becomes greater than the pressure in the static lines. - ……

Ex. 110. Make all the changes and additions necessary to produce 8 sentences according to this pattern from the following series of words and phrases.

Remember
"the" + comparative (+ subject and verb), "the" + comparative (+ subject and verb).

Example: The more pilots know about the weather, the safer the flight is.

1. More / know about weather / safe flight.
2. Better / understand weather / sound / judgment.
3. Far / the earth's surface / thin / the atmosphere.
4. Near / the surface / warm / the air.
5. Far / the surface / strong / the wind.
6. Large / obstructions / noticeable / mountain waves.
7. Strong / the wind / great / turbulence.
8. Warm / air / high / humidity.

Writing / Speaking

Ex. 111. Give definitions of aviation terms and words.

1	Visibility	……
2	Fog	……
3	Thunderstorm	……
4	Dew point	……
5	Occluded front	……
6	Ceiling	……

7 Humidity ……
8 Mist ……
9 Cold front ……
10 Warm front ……

Ex. 112. Find the English equivalents to the following.

1) сильное обледенение с вероятностью образования льда,
2) внезапное расширение воздуха,
3) определенные типы погодных явлений,
4) двигаться вдоль поверхности земли,
5) несколько грозовых очагов внутри одного облака,
6) с порывистым и турбулентным приземным ветром,
7) представлять серьезную опасность для пилотов,
8) потеря управления и повреждение конструкции,
9) очевидная опасность грозы,
10) помехи в радиосвязи,
11) увеличивать степень влажности,
12) границы, называемые фронтальными зонами или фронтами,
13) становиться насыщенным,
14) вызываться охлаждением земли после заката солнца,
15) повреждение от удара молнии.

Ex. 113. Make a presentation on any of Aviation Meteorology topics. Refer to section I.**

Summary		
Vocabulary	*Plan*	*Notes:*
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……

Ex. 114. Think of the best translation.**

ОПРЕДЕЛЕНИЕ ВИДИМОСТИ

Видимость объектов может быть определена инструментальными и визуальными методами. Инструментальные методы определения видимости основаны на том, что видимость любого реального объекта, в том числе и объектов на аэродроме (например, ВПП), является функцией нескольких составляющих, среди которых прозрачность атмосферы имеет решающее значение.

Визуальные методы основаны на оценке видимости по ориентирам. В качестве ориентиров используются объекты достаточных для наблюдения угловых размеров, имеющие хороший контраст с окружающим фоном. Ориентиры выбирают во всех направлениях от метеостанции на различных расстояниях от нее. В странах-членах ИКАО для обеспечения безопасности полетов используют три метода наблюдения за видимостью: трансмиссиометр, наблюдателя и телевизионный.

Section VI. **WEATHER INFORMATION**

Phonetics

Ex. 115. Study new words** **(Glossary 8)**

to amend (v) **amendment** (n)	[q'mend] [q'mendmqnt]	**дополнять, изменять,** **изменение, дополнение**	
alternate (v, n, adj)	[0:l'tq:nIt]	**чередовать(ся), сменять(ся),** ***запасной (зд. аэродром)***	
		alternate frequency; alternate aerodrome	запасная частота; запасный аэродром
to assess (v) **assessement** (n)	[q'ses]	**давать оценку, оценивать, оценка**	
		to assess as fit to; to assess the damage of	считать годным (напр. к полету); определять стоимость повреждения
available (adj)	[q'veIlqbl]	**имеющийся в наличии, располагаемый**	
		the latest available weather; available FL (flight level)	имеющаяся в наличии последняя сводка погоды; свободный эшелон
broken (adj)	['brquk(q)n]	**разорванный, (зд.) значительная облачность**	
		broken clouds; a broken vehicle	разорванные облака; поломанное транспортное средство
CAT - clear air turbulence (n)	[kxt]	**турбулентность ясного неба (ТЯН)**	
destination (n)	["destI'neISn]	**пункт назначения**	
to deteriorate (v) **deterioration** (n)	[dI'tIqriq"reIt] [dI'tIqriq"reISn]	**(зд.) ухудшать(ся), ухудшение погоды**	
		flight deterioration; weather deterioration	(резкое) ухудшение (напр. метеоусловий) в полете; ухудшение метеоусловий
embedded(adj)	[Im'bedId]	**замаскированный (зд. облака)**	
to expect (v)	[Ik'spekt]	**ожидать**	
		expected weather conditions; to expect delay to expect clearance	ожидаемые метеоусловия; ожидать задержку; ожидать разрешения
extent (n)	[Ik'stent]	**степень (выраженности явления)**	
		to determine the extent of damage; to a great extent	определять степень повреждения; в значительной степени
frequency (n)	['frI:kwqnsI]	**частота**	

		to change the frequency; to monitor the frequency; emergency frequency (121.5 MHz); international distress frequency; listening frequency; standby/secondary frequency; primary frequency	изменять частоту; прослушивать частоту (радиосвязи); аварийная частота (радио-) связи (121,5 МГц); международная частота (передачи) сигнала бедствия; частота прослушивания; резервная частота; основная частота
to issue (v)	['ISu:"]	**выпускать, выдавать (зд. диспетчерское разрешение)**	
		to issue departure/clearance/landing clearance	выдавать разрешение на вылет/на посадку
message (n)	['mesIdZ]	**сообщение**	
		alerting message; distress message.	аварийное сообщение; сообщение о бедствии
to observe (v) **observation** (n)	["Obzq(:)'veIS(q)n]	**наблюдать, наблюдение**	
		to facilitate observations; to make observations; to transmit observations; air observation; aircraft observation; routine observation; weather observation	обеспечивать наблюдения; проводить наблюдения; передавать наблюдения; наблюдение за воздушным пространством; наблюдение с борта ВС; регулярные наблюдения; синоптическое наблюдение.
to precede (v) **preceding** (adj)	[prI'(:)si:d]	**предшествовать, предшествующий**	
		wake turbulence of the preceding aircraft	спутный след предшествующего ВС
to prevail (v) **prevailing** (adj)	[prI'veIlIN]	**превалировать, превалирующий**	
		prevailing wind	господствующий ветер
to request (v) **request** (n)	[rI'kwest]	**запрашивать, запрос**	
		to request landing/departure/taxi; available **on** request; in start-up request.	запрашивать посадку/разрешение на взлет/ на руление; предоставляется по запросу; в запросе на запуск двигателя
route (v, n)	[ru:t]	**направлять по маршруту, маршрут**	
		on route/**en** route; air ferry route; **along** the route; arrival route; departure route; designated route; flight route; **out of/off** the route; uncontrolled route; advisory route (ADR)	**на** маршруте; маршрут перегонки ВС; **вдоль** маршрута; маршрут прибытия; маршрут вылета; заданный маршрут; маршрут полета; **вне** маршрута; неконтролируемый (диспетчерской службой) маршрут; консультативный маршрут
shallow (adj)	['SxIqu]	**поземный, стелющийся**	
		shallow fog	стелющийся туман

to specify (v) **specific** (adj)	["speslfal] [spq'slflk]	**определять, определенный**	
		within the specified limits	в пределах определенных ограничений
towering	['tauqrIN]	**башенкообразный**	
		towering clouds	башенкообразные облака
to update (v, n)	[Ap'delt]	**обновлять, обновление**	
valid (adj)	['vxlld]	**действительный (в силе)**	
		valid for … minutes valid **until** …; period of validity	действителен на … минут; действителен до…; срок действия
vicinity (n) **in the vicinity of**	[vq'slnqtl]	**район, окрестность, в районе/окрестности**	
		in the vicinity **of** the beacon in the vicinity of the field	в районе маяка; в районе аэродрома

Ex. 116. Read and translate word combinations.

The weather encountered in the course of a flight, to a limited extent, the possibility of fog, other weather phenomena, expected weather over an area or region, to affect the safety of flight operations, to make alternative plans, suitable for the planned flight, to provide information on expected weather for a certain area over a certain period, to be amended to account for significant weather changes, to request a forecast office; forecasts for the departure, destination and up to three alternates; routine weather observations, prevailing conditions at an aerodrome, to issue amendments, at a specific time, on a routine basis, to act as a guide to the possibility of mist / fog, the weather in the vicinity of the aerodrome.

Reading

Text.

WEATHER INFORMATION

Since weather conditions vary from place to place and from time to time, it is good airmanship (common sense) to know the weather that pilots may encounter in the course of a flight, especially if it is a cross-country flight to another aerodrome.

Checking the weather can be done to a limited extent by making one's observations; it can be done more adequately by consideration of the information available to pilots from the Meteorological Office. Information will include air temperatures, winds, pressure patterns, the extent and base of any cloud, and the possibility of fog, icing, thunderstorms or other weather phenomena.

Weather information available to pilots falls into two categories :

- **forecasts** of expected weather over an area or region, and at aerodromes; and
- **reports** of actual weather.

Significant weather that may affect the safety of flight operations may be advised in the form of a **SIGMET**.

The criteria for raising a SIGMET include active thunderstorms, tropical storms, a severe line squall, heavy hail, severe turbulence, severe airframe icing, marked mountain waves, a dust / sandstorm.

Weather information must be considered carefully pre-flight. It can also be obtained during a flight. This information helps the pilot make alternative plans in time if the weather conditions are no longer suitable for the planned flight.

METEOROLOGICAL FORECASTS:

- **Area forecasts;**
- **Aerodrome forecasts** (TAFs or TRENDs)**;**
- **Special Forecasts**.

Area Forecasts. An Area Forecast provides information on expected weather for a certain area over a certain period. It may cover a large area such as the British Isles, or a more localized region.

AIRMET Area Forecasts are text-based.

They cover conditions from the surface (ground or sea level) to 15.000 ft, with winds and air temperatures up to 18.000 ft. They are issued four times daily for each region and amended between those times to account for significant weather changes.

Special Forecasts

For departure from aerodromes where the weather information is inadequate or unavailable, the pilot can request a forecast office to prepare a Special Forecast specifically for his flight. This takes time and at least 2 hours' notice is required (4 hours' if the route distance exceeds 500 nm).

Special Forecasts can also include Aerodrome Forecasts for the departure, destination and up to three alternates.

Aerodrome Forecasts (TAFs)

Aerodrome Forecasts, known as TAFs, are text messages which follow the international (ICAO) format for aerodromes where observations are taken.

TAFs describe the forecast prevailing conditions at an aerodrome and usually cover periods of 9 to 24 hours. The 9-hour TAFs are updated and re-issued every 3 hours; TAFs valid for 12-24 hours are updated and re-issued every 6 hours. Amendments are issued when necessary.

Aviation weather reports

A report is an observation of what the weather actually is (or was) at a specific time. The common aviation weather reports are :

- Aerodrome Weather Reports (**METARs** on a routine basis and **SPECIs** when special conditions happen);
- Automatic Terminal Information Service (**ATIS**);
- In-flight Weather Reports (obtained in a recorded form on a **VOLMET** VHF frequency, e.g. London VOLMET on 128,6 or 126,6 MHz, or from an ATIS, or by radio communication with an Air Traffic Unit.

Meteorological Reports - METARs

METARs are routine aerodrome reports. Routine weather observations are taken at many aerodromes on the hour and half-hour. They give two temperatures : e.g. 09 /07, where 09 is the actual temperature and 07 is the dewpoint temperature - the difference between them acting as a guide to the possibility of mist / fog that will occur if the temperature and the dewpoint become the same.

Trends (or Landing Forecasts)

It is common to attach a forecast **TREND** to an Aerodrome Report (i.e. an observation of actual weather) in order to improve the meteorological information. The Trend Forecast indicates what the weather tendency for the next two hours is expected to be. It is valid only until two hours after the time of observation - a much shorter period than the duration of a normal Aerodrome Forecast (9 hours); so it must be more accurate. A TREND is commonly referred to as a *landing forecast*. If no significant change is expected, the observation will be followed by the trend statement : **NOSIG *(no significant change).***

Weather reports and trends for selected aerodromes are broadcast continuously on VHF frequencies. This service is called **VOLMET**.

The VOLMET broadcast for each aerodrome is updated each hour and half-hour and indicates:

- the actual weather report;
- landing forecast;
- SIGMET (significant weather, if any);
- the forecast trend for the two hours following the time of report.

Information is also obtained from the **Automatic Terminal Information Service (ATIS)** - a tape-recorded message of the current aerodrome information and is broadcast on appropriate VOR or VHF frequencies to off-load the ATC communication frequencies.

Some aerodromes have both an arrival and departure ATIS.

CLOUDS

The amount of **cloud coverage** in Area Forecasts (and in TAFs and METARs) is expressed in *eights* of the sky covered, or *oktas*.

4 oktas means that half of the sky is covered by the cloud mentioned, and 8 oktas means complete sky coverage.

In Aerodrome Forecasts and Reports, the amount of cloud coverage is indicated by the following abbreviations:

KC - Sky clear (0 okta)
FEW - Few (1- 2 oktas)
SCT - Scattered (3 -4 oktas)
BKN - Broken (5 - 7 oktas)
OVC - Overcast (8 oktas)

Thunderstorms (TS), which are best avoided by aircraft, are associated with cumulonimbus (CB) clouds meaning hail, moderate or severe icing and/or turbulence. The amount of CB cloud in an area is indicated by the following abbreviations:

ISOL *Isolated for individual CB clouds*
OCNL *Occasional - for well-separated CB clouds*
FRQ *Frequent - for CB clouds with little or no separation*
EMBD *Embedded - CB clouds contained in layers of other clouds*

CAVOK

The term CAVOK is often used . It means that the following conditions occur simultaneously :

- visibility 10 km or more;
- no cloud below 5,000 ft above aerodrome level (aal) or below the highest minimum sector altitude,
- no cumulonimbus; no significant weather phenomena at or in the vicinity of the aerodrome.

CHANGING WEATHER IN FORECASTS

Temporary change (TEMPO)

While the cumulonimbus cloud associated with a thunderstorm may exist for hours, its passage through the immediate vicinity of an aerodrome may take only a short period - less than 60 minutes, or an even shorter time. During those t*emporary* periods the weather in the vicinity of the aerodrome may be quite different when compared with the *prevailing conditions.*

In such a situation, the Aerodrome and Landing Forecasts will state the general conditions existing at the aerodrome (i.e. the **prevailing conditions**), and any **temporary changes** to the conditions will be indicated by the term TEMPO.

TEMPO. Temporary variation lasting less than 60 minutes, or lasting in total less than half the TREND (or TAF) period; that is, changes take place quite infrequently for the prevailing conditions.

Note: TEMPO can relate to improvements as well as deteriorations
in wind, visibility, weather or cloud.

Lasting changes

While TEMPO is used to indicate a temporary variation from the prevailing weather, when lasting changes in the prevailing weather are forecast, the term **BECMG** (becoming) is used preceding an expected permanent change in the weather conditions.

In an Aerodrome Forecast (TAF), *BECMG* will be followed by a four-figure time group; in a TREND Forecast that is attached to an aerodrome report (METAR), *BECMG* may be followed by a four-figure time group hours and minutes preceded by one of the abbreviations: **FM** (from), **TL** (until) or **AT** (at).

Other descriptive terms that appear on Trend statements are:

NOSIG: no significant change, **NSC** : no significant cloud, and
NSW: no significant weather.

Probability. Sometimes the forecaster is uncertain of whether conditions will occur and, if he or she assesses the probability of them occurring as 50 % or less, the message may be prefaced with a **PROB** (probability) percentage.

Ex. 117. Comprehension check.

1. What does the information from the Met. Office include ?
2. What categories of weather information can you specify?
3. What types of weather information do you know?
4. Give definitions to the following terms : TAF, METAR, SPECI, TREND, VOLMET, ATIS, SIGMET, TEMPO, PROB.
5. How is the amount of cloud coverage indicated ?
6. What is the difference between the prevailing conditions and temporary changes?
7. When is the term "BECMG" used?
8. Decode NOSIG.
9. Decode PROB.
10. Can the term "TEMPO" relate to deteriorations?
11. In what case may the message be prefaced with a PROB percenatage?

Vocabulary Practice

Ex. 118. Match cloud types with the standard set of abbreviations.

CU	***Cumulonimbus***
NS	
CS	
CI	
ST	
CB	
AS	
LYR	
SC	
CC	
AC	

Ex. 119. A: Study these met abbreviations.

COMMON MET ABBREVIATIONS

+	*heavy*	**ICE**	*icing*	**RA**	*rain*
-	*light*	**IMPR**	*improve(-ing)*	**RAG**	*ragged*
BECM	*becoming*	**IMT**	*immediately*	**RE**	*recent*
BL	*blowing*	**INC**	*in cloud*	**SEV**	*severe*
BLO	*below clouds*	**INCR**	*increase*	**SFC**	*surface*
BR	*mist*	**INTSF**	*intensify*	**SG**	*snow grains*
BTN	*between*	**IR**	*ice on runway*	**SH**	*showers*
CAT	*clear air turbulence*	**LAN**	*inland*	**SN**	*snow*
COT	*At the coast*	**LGT**	*light*	**SQ**	*squall*
CUF	*cumuliform*	**LOC**	*locally*	**STNR**	*stationary*
DECR	*decrease*	**LSQ**	*line squall*	**TCU**	*towering cumulus*
DP	*dewpoint temperature*	**LV**	*light and variable (wind)*	**TS**	*thunderstorm*
DR	*low drifting*	**LYR**	*layer(ed)*	**TURB**	*turbulence*
DTRT	*deteriorate*	**MI**	*shallow*	**UA**	*air report (PIREP)*
DZ	*drizzle*	**MNM**	*minimum*	**V**	*varying*
FCST	*forecast*	**MOD**	*moderate*	**VAL**	*in valleys*
FG	*fog*	**MS**	*minus*	**VC**	*vicinity of aerodrome*
FLUC	*fluctuating*	**MT**	*mountain*	**VCY**	*vicinity*
FT	*feet*	**MTW**	*mountain waves*	**VER**	*vertical*
FU	*smoke*	**NC**	*no change*	**VIS**	*visibility*
FZ	*freezing*	**NSC**	*nil significant cloud*	**WDSPR**	*widespread*
GEN	*generally*	**NSW**	*nil significant weather*	**WKN**	*weaken(ing)*
GR	*hail*	**OBSC**	*obscured*	**WRNG**	*warning*
GS	*small hail and/or snow pellets*	**PE**	*ice pellets*	**WS**	*windshear*
HVY	*heavy*	**PROV**	*provisional*	**WX**	*weather*
		PS	*plus*		

B: Decode metabbreviations:

SN, GR, SH, INCR, RA, TS, NC, V, WRN, WS, DP, LSQ, RE, FZ, TURB, SEV, MOD, GEN, DZ, FG, CAT, IR, +, -.

Vocabulary Practice

Ex. 120. A: Match the word combinations in column A with the Russian equivalents in column B.
Example: a – 1.
B: Make up sentences of your own using these expressions.

A	B
a. *suface wind*	1. *приземный ветер, ветер у земли*
b. tailwind	2. штиль
c. headwind	3. сдвиг ветра
d. crosswind	4. попутный ветер
e. wind calm	5. встречный ветер
f. wind shear	6. преобладающий ветер
g. variable wind	7. ветер по высотам
h. wind aloft	8. порывистый ветер
i. gusty wind	9. боковой ветер
j. prevailing wind	10. переменный ветер

Ex. 121. A: Match the word combinations in column A with the Russian equivalents in column B.
Example: a – 1.
B: Use these word combinations in the sentences of your own.

A	B
a *broken clouds*	1. *разорванные облака, значительная облачнос*
b. scattered clouds	2. дождевое облако
c. embedded clouds	3. башенкообразные облака
d. towering clouds	4. непрерывная облачность
e. rain clouds	5. замаскированные
f. continuous clouds	6. рассеянные облака

Ex. 122* . Fill in the chart to find the other parts of speech. Use your dictionary where necessary. Check the pronunciation.

NOUN	*VERB*	*ADJECTIVE*
1. specification	*specify*	*specific*
2. …	observe	…
3. …	…	assessing
4. amendment	…	…
5. …	categorize	…
6. expectancy	…	…
7. …	define	…
8. coverage	…	…
9. …	…	significant
10. completion	…	…
11. …	describe	…
12. …	…	updating

Ex. 123*. Form nouns from the verbs.

To specify, to describe, to define, to determine, to categorize, to update, to expect, to complete, to amend, to signify, to cover, to request, to deteriorate, to assess, to observe, to encounter.

Ex. 124. A: Match the word combinations in column A with the Russian equivalents in column B.

Example: a – 1.

B: Make up sentences of your own using these expressions.

A	**B**
a. *heavy rain*	1. *сильный дождь*
b. light rain	2. переохлажденный дождь
c. moderate rain	3. непрерывный дождь
d. intermittent rain	4. слабый дождь
e. continuous rain	5. кратковременный дождь
f. freezing rain	6. умеренный дождь

Ex. 125. A: Match the word combinations in column A with the Russian equivalents in column B.

Example: a – 1.

B: Make up sentences of your own using these expressions.

A	B
a. *shallow fog*	1. *стелющийся туман*
b. thick fog	2. адвективный туман
c. thin fog	3. густой туман
d. dense fog	4. моросящий туман
e. drizzling fog	5. плотный туман
f. advection fog	6. туман клочьями
g. fog in patches	7. редкий туман

Ex. 126. Find the English equivalents to the following.

1) погода в районе аэродрома,
2) преобладающие условия на аэродроме,
3) прогноз погоды аэродрома отправления, пункта назначения и запасных аэродромов,
4) вероятность тумана,
5) обеспечивать информацией об ожидаемой погоде в определенном районе в определенное время,
6) быть измененным, чтобы принять в расчет последние значительные изменения погоды,
7) подходящий для запланированного полета,
8) до определенной степени,
9) запросить метеобюро,
10) выдавать изменения,
11) на постоянной основе,
12) влиять на безопасность воздушных перевозок,
13) в определенное время,
14) выступать в качестве сигнала вероятности возникновения тумана или дымки,
15) другие погодные явления.

Speaking

Ex. 127. Read this short text below and discuss your answers to the question:

What if Poor Weather is Forecast ?

Like most things in flying, it is not the everyday situation that tests you, but rather the unusual situations that have a habit of occurring from time to time. Making sound operational decisions is what flying is all about.

Section VII. **AIR NAVIGATION**

Phonetics

Ex. 128. A: Practise saying the following international words.
B: Expalin their meanings.

Navigation, culture, computer, instrument, problem, electronic, base, signal, azimuth, magnetic, mile, distance, tactical, ultra, indication, radio, medium, station, standard, procedure, identify, code, acceleration, relay, calculation, position, synchronize, location, aeronautical, accurate, pilotage, commercial, combine, zone.

Vocabulary Pre-teaching

Ex. 129*. Study definitions:

Aeronautical Chart:	A representation of a portion of the earth, its culture, and relief. Different charts are published to meet different requirements of air navigation.
Computer:	An instrument which uses graduated dials with scales for solving time, distance, speed, altitude, airspeed, fuel consumption, and wind direction problems; similar to a slide rule and not to be confused with an electronic computer.
VOR (Very-high-frequency Omnidirectional Radio):	A ground - based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented to magnetic north.
DME (Distance Measuring Equipment):	Airborne and ground equipment used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigation aid.
TACAN (Tactical Air Navigation):	An ultrahigh frequency electronic air navigation aid which provides suitably equipped aircraft with a continuous indication of bearing and distance to the TACAN station.
VORTAC (VHF Omnidirectional Radio / Tactical / Air Navigation):	A navigation aid providing VOR azimuth, TACAN azimuth, and DME information at one site.
NDB (Non-directional Beacon):	A low or medium frequency navigation aid providing suitably equipped aircraft with a non - directional signal from which a pilot may determine a bearing to the station.
Home (or Homing):	Flight toward a NAVAID, without correcting for wind, by adjusting the aircraft heading so that it maintains the same relative bearing.
Radials:	Magnetic bearings extending from a VOR / VORTAC / TACAN navigation facility.
Slant Range:	The distance between two points not at the same height, as between a ground NAVAID station and an airborne aircraft.
Azimuth:	Direction measured from 000° clockwise through 360°.
Tune and Identify:	The standard procedure of tuning the frequency of a navigational aid station and then positively identifying it by listening to its identifier letters being transmitted via Morse code.

Inertial Navigation System (INS):	A navigational system which, through the use of gyros, measures acceleration or displacement. The measurement is electronically relayed to a computer which in turn calculates the aircraft's position in relation to some given reference.
LORAN (Long Range Navigation):	An electronic aid to navigation whereby position may be determined by measuring electronically the time difference between the receipt of two pulsating signals from two different synchronized transmitting stations.

Ex. 130. Work in pairs for comprehension check, refer to Ex. 129.

1. What is an *aeronautical chart*? Why are different charts published?
2. A pilot can carry a *computer* in a pocket. For what purpose may a *computer* be used?
3. The navigation aid, *very-high-frequency omnidirectional radio*, is usually referred to by its abbreviation. What is it?
4. *Distance measuring equipment (DME)* gives what kind of range distance?
5. What is a *TACAN*?
6. What information is given by a *VORTAC*?
7. What is a *nondirectional beacon (NDB)*?
8. Describe *homing*.
9. What are *radials*?
10. Describe *slant range*.
11. What is *azimuth*?
12. What is the procedure called *tune and identify*?
13. Does an *inertial navigation system* receive information via radio signals?
14. What is *LORAN*?
15. What other navigational terms can you name?
16. How can you define *air navigation*?

Ex. 131**. Study new words (Glossary 9)

to adjust (v) **adjustment** (n)	[q'dZAst] [q'dZAstmqnt]	**регулировать, регулировка**	
		engine adjustment	регулировка двигателя
accurate (adj)	['xkjHrqt]	**точный**	
aerial **antenna** (n)	['etqriql] [qntenq]	**антенна**	
		airborne antenna; all-around looking antenna; glide slope antenna; receiving antenna; wire antenna; whip antenna	бортовая антенна; антенна кругового обзора; глиссадная антенна; приемная антенна; проволочная антенна; штыревая антенна
to avoid (v) **avoidance** (n)	[q'v0Id] [q'v0Idqns]	**обходить, избегать, обход, расхождение**	
		to avoid a thunderstorm; for avoidance action	обходить грозу; для обхода/расхождения

beacon (n)	['bI:k(q)n]	**привод, радиомаяк**	
		airway/en route beacon; approach beacon; boundary beacon; danger beacon; ground beacon; identification beacon; landing beacon; light beacon; rotating beacon; RW boundary beacon.	трассовый маяк; посадочный (радио) маяк; пограничный (свето) маяк; предупредительный (свето) маяк; наземный маяк; опознавательный маяк; посадочный маяк; световой маяк; вращающийся маяк; пограничный (свето) маяк ВПП
bearing (n)	['bFqrIN]	**пеленг**	
		to read out a bearing: to take the bearing; aircraft bearing; back/reverse bearing; beacon bearing; course bearing; gyro bearing	отсчитывать пеленг; брать заданный пеленг; пеленг ВС; обратный пеленг; пеленг маяка; курсовой пеленг; гиропеленг
blip (n)	[blip]	**засветка, метка**	
		aircraft position blip; radar blip	отметка местонахождения ВС; радиолокационная отметка
callsign (n)	[k0:lsaIn]	**позывной**	
changeover point (waypoint)	['tSeIndZ"quvq p0Int]	**(зд.) ППМ (поворотный пункт маршрута)**	
chart (n)	[tSRt]	**карта, схема**	
		aeronautical chart; aeronautical route chart; approach chart; danger areas chart; flight chart; instrument approach chart; landing chart; loading chart; maximum wind chart; parking chart; preflight planning chart; route chart; significant weather chart; taxi chart; weather chart	аэронавигационная карта; аэронавигационная маршрутная карта; схема захода на посадку; карта опасных (для полетов) зон; карта полетов; схема захода на посадку по приборам; схема посадки; схема загрузки; карта максимальных ветров; схема стоянок; карта предполетного планирования; маршрутная карта; карта особых явлений погоды схема руления; карта погоды
to confirm (v)	[kqn'fq:m]	**подтверждать**	
		to confirm a message	подтверждать сообщение
continuous (adj)	[k0n'tInjuqs]	**непрерывный**	
		continuous steady signal	непрерывный устойчивый сигнал
to cover (v) **coverage** (n)	[kAvq] [kAvqrIdZ]	**покрывать(ся), зона действия, покрытия**	
		RW covered **with** snow **within/beyond** radar coverage	ВПП, покрытая снегом; **в пределах/за пределами** зоны действия радара

decision height (n)	[dI'sIZ(q)n haIt]	**высота принятия решения (ВПР)**	
essential (adj)	[I'senS(q)l]	**основной, существенный**	
		essential information	основная информация
fix (n)	[fIks]	**(зд.) радио-навигационная точка (РНТ)**	
		approach fix; en-route fix; entry/exit fix; ground position fix	контрольная точка захода на посадку; контрольная точка на маршруте; контрольная точка входа/выхода; местоположение ВС относительно поверхности земли
to fluctuate (v) **fluctuation** (n)	["flAktju'eIt] ["flAkCu'eIS(q)n]	**колыхаться, колебание**	
		temperature fluctuation	колебание температуры
glide path (n)	[glaId pRT]	**глиссада**	
to hold (v)	[hquld]	**ждать**	
		to hold en-route; **to hold position;** **to hold short of …;** **to hold over the beacon**	ожидать в процессе полета; **ждать на месте;** **остановиться перед …;** **ждать над приводом**
holding pattern (n)	['hquldIN "px tqn]	**схема полета в зоне ожидания, зона ожидания**	
		holding **area**; holding **stack**	зона ожидания; очередность полетов в зоне ожидания
to home (v)	[hqum]	**наводить, выводить**	
to identify (v) **identification** (n)	[aI'dentI"faI]	**опознавать, опознавание**	
		to identify signals; aircraft identification	распознавать сигналы; опознавание (ВС) в полете
inbound (adj)	['Inbaund]	**приближающийся, на подходе**	
inner marker (n)	['Inq 'mRkq]	**ближний привод**	
		field marker; route marker	ориентир летного поля; маршрутный маркер
to interrogate (v) **interrogation** (n)	[In'terq"geIt] [In'terq"geISqn]	**запрашивать, запрос**	
		to respond **to** interrogation	отвечать **на** запрос ВС
latitude (n)	['lxtI"tju:d]	**широта (географическая)**	
		aircraft fix latitude	широта местонахождения ВС
let-down procedure (n)	['let"daun prq'sJGq]	**процедура снижения**	
longitude (n)	['l0ndZI"tju:d]	**долгота (географическая)**	
		flight longitude	географическая долгота точки маршрута
middle marker	[mIdl 'mRkq]	**средний привод**	
mode (n)	[mqud]	**режим работы**	
		to fly heading mode; mode of flight; control mode; holding mode; manual mode; search mode; standby mode; steady/unsteady mode	летать в курсовом режиме; режим полета; режим управления; режим ожидания (в полете); ручной/штурвальный режим работы; режим поиска; режим готовности; (не)установившийся режим

non-directional (adj)	[n0ndIrekSqnl]	**ненаправленный**	
		non-directional beacon; non-directional signal	ненаправленный маяк; ненаправленный сигнал
omnidirectional (adj)	[0mnIdIrekSqnl]	**всенаправленный**	
		omnidirectional radio beacon; omnidirectional antenna; omnirange receiver	всенаправленный радиомаяк; всенаправленная антенна; приемник сигналов всенаправленного радиомаяка
outbound (adj)	['aut"baund]	**удаляющийся, на удалении**	
outer marker (n)	['autq 'mRkq]	**дальний привод**	
overshoot (n,v)	["quvq'Su:t]	**(зд.) перелетать (… метров до касания ВПП)**	
		to overshoot … of the RW	перелетать … м ВПП
pulse (v, n)	[pAls]	**пульсировать, импульс**	
		position pulse	сигнал о местонахождении ВС
radial (n)	['reIdiql]	**радиал, магнитный пеленг маяка VOR**	
to receive (v) **receiver** (n)	[rI'sI:v] [rI'sI:vq]	**принимать, приемник**	
		to receive a message; localizer receiver; glide-path receiver; homing receiver	принимать сообщение, курсовой приемник; глиссадный приемник; приемник системы (само) наведения
reply (v, n)	[rI'plaI]	**отвечать, ответ**	
		reply missing; **reply to** my call	ответ отсутствует; ответьте на мой вызов
slide rule (n)	[slaId "ru:l]	**штурманская линейка**	
steady (adj)	['stedI]	**устойчивый**	
to transmit (v) **transmitter** (n)	[trxnz'mIt] [trxnz'mItq]	**передавать, передатчик**	
		to transmit for identification feed back transmitter; fuel flow transmitter; rate-of-flow transmitter; airspeed transmitter; **to adjust transmitter**	передавать для опознавания; датчик обратной связи; датчик расхода топлива; датчик мгновенного расхода (топлива); датчик воздушной скорости; **настраивать передатчик**
transponder (n)	[trxn'sp0:ndq]	**ответчик**	
		airborne transponder	бортовой ответчик
to tune (v)	[tju:n]	**настраивать**	
		to tune receiver	**настраивать приемник**

Reading

Ex. 132. A: Read and translate word combinations.

To reach the destination, to find the exact location, to navigate accurately; to be equipped with electronic computers, to aid in navigation, several different kinds of aeronautical charts, to show the location of various landmarks, to broadcast air navigation signals, every enroute high altitude airway, the portrayal of the airway jet routes, identification and frequency of radio aids, selected airports, time zones, pilotage, dead reckoning, radio navigation, to keep on course by following landmarks on the ground, in all weather conditions, few or no visible landmarks, to follow the preplanned route of flight, to prevent the plane from keeping exactly on course, to tune the radio navigation equipment, to receive a signal from a ground - stationed NAVAID, to fly on a direct course to or from the station, to drift off course, the major aid in air navigation, the low-frequency radio receiver, to home on signals from the radio station, a line connecting one navigational aid to another, airway corridors , to be identified on the pilots' aeronautical chart, to designate the route of flight via the airway system on the international flight plan, to tune and identify the NAVAID, to proceed inbound to the NAVAID, the radial which defines the airway as shown on the aeronautical chart, to proceed outbound, on another airway radial, to reach a changeover point, to switch from tracking outbound on the original NAVAID to inbound on another new one, other methods for navigating across oceans.

B: Read Text "Air Navigation" and pay attention to the way they are used in the context.

Text

AIR NAVIGATION

During the climb, the emphasis in the cockpit quickly shifts from manipulating the controls to an air navigation. Air navigation is the means by which pilots reach their destinations and find their exact locations at any time. All airlines have compasses and other instruments to help pilots navigate accurately; some are also equipped with electronic computers to aid in navigation. However, the most essential aid to air navigation is the aeronautical chart.

There are several different kinds of aeronautical charts. Some look much alike maps: they show the location of various landmarks, airline routes, landing fields, and radio stations that broadcast air navigation signals. Another chart which is widely used shows aeronautical information for every enroute high altitude airway in a given region.

Information on this kind of chart (sometimes called a radio chart) includes the portrayal of the airway jet routes, identification and frequency of radio aids, selected airports, distance, time zones, and related information – all of which is needed for radio navigation.

The three chief methods of air navigation over land are pilotage, dead reckoning, and radio navigation. Most pilots use a combination of all three of these methods.

Pilotage is the simplest and most common method of air navigation. Using this method, a pilot keeps on course by following landmarks on the ground. For a commercial pilot this system is not very practical since it cannot be used at high altitudes and in all weather conditions. The second method of air navigation, dead reckoning, is a way of navigating when there are few or no visible landmarks. Dead reckoning takes more skill

and experience than pilotage. Here the pilot uses an aeronautical chart, a clock, compass, and small computer (a slide rule) to follow the preplanned route of flight. Dead reckoning is not always successful because changing winds prevent the plane from keeping exactly on course.

Radio navigation is used by all commercial pilots, as well as by most other pilots. For this type of navigation, the pilot tunes the radio navigation equipment so as to receive a signal from a ground – stationed NAVAID (navigational aid). A needle on the equipment tells the pilot when he is flying on a direct course to or from the station. It also shows when the aircraft drifts off course so that its direction can be corrected.

The most common system designed for civil aircraft is called VOR (very-high-frequency omnidirectional radio). Airlines also use another special device called DME (distance measuring equipment). This combined system is known as VOR / DME. A similar system used almost exclusively for military aircraft is called TACAN (tactical air navigation). A combined system, called VORTAC, can be used by both civil and military aircraft. Before evolution of these systems the radio compass low-frequency radio receiver together with the nondirectional beacon (NDB) was the major aid in air navigation. The low-frequency radio receiver allows the pilot to home on signals from the radio station.

Airways are formed by a line connecting one navigational aid to another. These airway corridors are identified on the pilots' aeronautical chart. When the pilot plans a mission, he designates the route of flight via the airway system on the international flight plan, which is then filed with ATC. In flying on an airway, the pilot tunes and identifies the NAVAID to be used, then proceeds inbound to that NAVAID on the radial which defines the airway as shown on the aeronautical chart. After passing over the station, he proceeds outbound on another airway radial. Soon the aircraft reaches a changeover point. At this point the pilot switches from tracking outbound on the original NAVAID to inbound on another new one.

This process is repeated from NAVAID to NAVAID until the pilot reaches the destination. Pilots, however, use other methods for navigating across oceans.

There are three transoceanic navigation systems commonly used by civilian air transports throughout the world :

1. Inertial navigation system.
2. LORAN.
3. Decca.

Ex. 133. **For detailed information read the text again and answer the questions**:

1. What are the three chief methods of air navigation?
2. What is pilotage? Why isn't it used by commercial airlines?
3. How does dead reckoning differ from pilotage?
4. What is radio navigation?
5. Most pilots consider DME distance as what kind of distance?
6. What NAVAIDS compose a VORTAC?
7. How are airways formed?
8. What is the difference between "inbound" and "outbound"?
9. Explain the process a pilot follows in order to fly on an airway.
10. Name the three principal transoceanic navigation systems.

Ex. 134. A: Complete the following sentences with the suitable word or phrase. Refer to Text "Air Navigation"

1. An……will depict the airway structure for a …… given region.
2. …….. is the simplest form of navigation.
3. All commercial pilots use …….. navigation.
4. With the instruments in the cockpit, a pilot can tell if he is …… ……going to or from ……..
5. The most common radio navigation aids today are the…….
6. A pilot can …….. on a signal received from a nondirectional beacon.
7. Distance measuring equipment measures . . . . .
8. In flying on an airway, a pilot must fly . . . . and . . . . each NAVAID used.
9. LORAN means …….. .
10. Radio navigation is the means by which pilots can reach their …….and find their exact …… at any time.

B: Now read the text again to check your answers.

Ex. 135. Give full names of the abbreviations :

1	**LORAN**	long	……	navigation
2	**INS**	……	navigation	system
3	**NDB**	non	……	beacon
4	**TACAN**	……	air	navigation
5	**DME**	distance	……	equipment
6	**VOR**	very-high-frequency	……	radio

Reading

Text

NAVIGATIONAL AIDS

Radio beacons are used to help a pilot navigate along airways and to help controllers keep accurate track of his progress in relation to other traffic when no radar is available. They also provide holding in a particular area, locating an aerodrome, or may be used as a fix for a let-down procedure in bad weather. Certain other aids are used for long range navigation and landing approaches.

1. Non – Directional Beacon (NDB)

This most basic of all aids is still used in less developed areas to mark air routes, its useful range being up to 100 miles. It remains the most common approach and landing aid, sometimes referred to as a Locator Beacon, with a range of about 15 miles in this application. The NDB consists of a radio transmitter in the medium frequency band which sends out a continuous steady signal in all directions. A callsign of two or three letters in Morse code is superimposed at regular intervals as a check that the desired beacon has been selected.

The Automatic Direction Finder (ADF), or radio compass, fitted in an aircraft, when tuned to the appropriate frequency, indicates the relative position of the transmission source by a needle on the Radio Magnetic Indicator (RMI). Unfortunately, NDBs suffer greatly from interference. Their signals can be deflected by high ground and coastal refraction and, if there is a thunderstorm in the area, the needle may point to its most active cell. Still, NDBs have one advantage. This advantage is that their signals follow the curvature of the earth, so if the aircraft is within the power range of the station, the signals can be received regardless of altitude.

2. VHF Omnidirectional Range (VOR)

For the last 40 years VOR has been the ICAO standard international short range navaid, used both to navigate along airways and to provide an accurate approach.

It consists of a ground beacon which sends out a signal from which an airborne receiver can determine the aircraft 's bearing (or radial) from the beacon. The receiver can add 180° to the 'From' indication and instruct the pilot which way to fly ' To' the station. A 'To / From' flag on the instrument face tells the pilot in which mode it is operating. Accuracy is increased by the addition of Doppler (DVOR), by which fluctuations in frequency wave motion emitted by an object moving at speed can be calculated.

VOR's great advantages are ease of use and freedom from static interference. With two VORs an accurate fix can be obtained from radial intersections. VORs can also be used for ATIS broadcasts. Disadvantages are that the VHF signals are line-of-sight and thus can be cut off by mountains and man-made obstructions. For the same reason, a large area of coverage requires numerous expensive beacons.

3. Distance Measuring Equipment (DME)

DME gives a pilot range information from a DME facility which, in case of en route aids, is normally co-located with a VOR. DME is also coupled with Instrument Landing Systems, which makes fixed ground outer and middle marker beacons unnecessary. A special transmitter in the aircraft transmits pulses in all directions which are received at the DME ground station. As each pulse is received, an answering pulse is transmitted automatically and this is picked up in the aircraft.

As the speed of radio waves is constant, a computer in the aircraft, which measures the time interval between the transmission of the pulse and the reception of the response, is able to convert this interval into a distance and display it in nautical miles or kilometers. With more advanced equipment the 'time-to-go' to the beacon can also be displayed. Because DME measures slant range rather than ground distance, an aircraft at 30,000 ft overhead the facility will get an indication of approximately 5 nm. Combined with VOR, DME provides an extremely accurate position fix.

4. Instrument Landing System (ILS)

ILS gives pilots a continuous indication of whether the aircraft is left or right of the final approach track and also its position in relation to an ideal glide path to the runway. This information is provided by marker beacons, the outer marker at about four miles from touchdown and the middle marker at about 3,500 ft. As the aircraft passes over them they give an audible signal. The outer marker transmits low-toned dashes and the middle marker alternate dots and dashes on a medium tone. These markers cannot only be heard, they also illuminate lamps on the instrument panel. These signals are transmitted on a standard 75 MHz.

A transmitter with a large aerial system known as the Localizer is situated at the far end of the runway, transmitting its signals on either side of the □enterline of the runway and approach. A second unit, the glide path transmitter, is located at the nearer end and slightly to one side of runway. Aboard the aircraft there is an instrument with two needles : one is actuated by the signals from the Localizer and moves left and right, while the other, which is operated by the signals from the glide path aerial, moves up and down. When the two needles are crossed at right angles, the aircraft is lined up for a landing. Any deviations can be quickly corrected by an experienced pilot.

ILSs are divided into three categories :

Cat 1 – Operation down to 60 m decision height with Runway

Visual Range (RVR) of 800 m.

Cat 2 – Operation down to 30 m decision height with RVR of 400 m.

Cat 3 – Operation with no height limitation to and along the surface of the runway with external visual reference during the final phase of landing with RVR of 200 m.

Localizer/ DME approaches are non – precision and therefore uncategorized.

5. OMEGA

Eight VLF (Very Low Frequency) radio transmitters are situated at strategic points on the globe (Argentina, Australia, Japan, Hawaii, Liberia, North Dakota, Reunion Island, and Trinidad) so that aircraft, equipped with a simple receiver and Omega charts can find their position wherever they are.

Omega is a very long range form of Loran.

6. Global Positioning System (GPS)

It is generally considered that GPS is revolutionizing aircraft navigation now and will in time replace most existing aids. Based on a series of satellites, it is capable of fixing an aircraft's position anywhere on the globe with an accuracy of few metres. It is already under trial on certain transoceanic flights and may become the major aid for instrument approaches during the next few years. GPS was originally designed for US military use, the first satellite being launched in 1978. The completed system consists of 24 satellites with three on-orbit spares. The master control station is located in Colorado and is supported by monitoring stations on Ascension Island, Diego Garcia, Kwajelein, and Hawaii, spaced at nearly equidistant points around the earth. The satellites require constant attention from the ground, including orbital positioning adjustments. Without this maintenance it is said that the system would ' degrade' in about two weeks!

GPS equipment in the aircraft measures the time that it takes the satellite signal to reach the receiver. To do this accurately, it needs the exact time the signal leaves the satellite. Each satellite carries four atomic clocks to keep unbelievably accurate time. GPS works on the classic navigational principle of triangulation. However, instead of the position being the point at which three lines from different radio beacons intersect, a GPS position is derived from the intersection of three' circles' transmitted from three satellites. The receiver also checks a fourth satellite.

Also operational is GLONASS, the Global Orbiting Navigation Satellite System developed by Russia. A joint system combining the GLONASS and GPS satellites is planned so that worldwide coverage will be increased significantly.

Ex. 136. **For detailed information read the text again and answer the questions:**

1. What is the function of radio beacons?
2. What is the purpose of NDB?
3. What can you tell about advantages and disadvantages of NDBs?
4. Name the two main components of VOR.
5. How is the VOR accuracy increased?
6. What kind of information does DME give?
7. When does DME provide an extremely accurate position fix?
8. What is the function of ILS?
9. Name the two main units of ILS.
10. How many categories of ILSs can you name? How do they differ?
11. How many Omega transmitters exist?
12. Where are they situated?
13. Why has Global Positioning System got this name?
14. How many satellites make up the system?
15. What is GLONASS?

Vocabulary Practice

Ex. 137. **Match the abbreviations with their definitions:**

Example: a – 1

1. ***ATIS***	**a.** ***automatic terminal information service***
2. ADF	**b.** instrument landing system
3. DME	**c.** very high frequency
4. GPS	**d.** non-directional beacon
5. ILS	**e.** very low frequency
6. NDB	**f.** VHF omni-directional range
7. RMI	**g.** global positioning system
8. VHF	**h.** radio magnetic indicator
9. VLF	**i.** distance measuring equipment
10. VOR	**j.** automatic direction finder

Reading

Ex. 138. **Scan Text "Aircraft Navigational Equipment" to answer the questions:**

1. Does Inertial Navigation System have any ground stations?
2. What does INS compute?
3. How does INS direct the aircraft?
4. Why Doppler is of limited use over calm seas?
5. Doppler is used as a primary system, isn't it? Why?
6. Why is transponder very helpful for ATC?
7. Name the three modes of the transponder.
8. Which mode allows two-way transfer of information without cluttering VHF channel?
9. What is the function of TCAS?
10. What is the difference between TA and RA?

Text. **AIRCRAFT NAVIGATIONAL EQUIPMENT**

1. Inertial Navigation System (INS)

A totally self-contained aid which uses gyros and accelerometers to measure continuously the acceleration of an aircraft and from this computes velocity and position information. Correct adjustment is absolutely necessary before starting or moving the aircraft. The latitude and longitude of the parking stand (published in navigation documents) is fed into the computer and the INS equipment automatically stabilizes itself to true north. This has to be checked at every new starting point. So, all the positions for the planned route are put into the computer in their correct order. These en route positions are known as way-points and INS will direct the aircraft via them.

The INS computes Great Circle tracks (the shortest distance over a curved surface, i.e. the globe) between two way-points. As the aircraft approaches each way-point the system will draw the attention of the pilot to the fact. If a turn is to be made onto a new track, the aircraft will automatically begin its turn before arriving overhead the way-point so as to avoid overshooting it. The system has the ability to return to the original flight path after temporary track deviation for weather avoidance.

2. Doppler

Another aid independent of ground transmitters, it uses a radar pulse transmitted by an aircraft at a certain frequency, which is reflected back to the aircraft at a different frequency according to its speed. This difference – the Doppler Shift – is proportional to the velocity of the aircraft. Doppler is of limited use over calm seas which do not reflect very well. So it is used as a back-up aid rather than a primary system such as INS.

3. Transponder

The transponder is not a navigational aid in the true sense, but it is very helpful for ATC. A small airborne transmitter waits until a radar pulse strikes its antenna and then immediately broadcasts, at a different frequency, a radar reply of its own.

The transponder helps the radar operator to track targets that may return an echo too weak to display.

The transponder is triggered into either of two modes of reply by the nature of the ground radar pulse. Without going too deeply into details, mode ‘ A’ is used for identification and mode ‘C’ for altitude. Mode ‘B’ is in military use only and mode ‘S’ is a datalink. At modern Area Control Centres, radar replies are □ enterlin into a computer which decodes the pulses, converts them into a letter and number display, and places a label near the target on the radar screen. The information includes the callsign and altitude of the aircraft. Secondary Surveillance Radar (SSR) has many advantages. One of the most important is that it is easy to get aircraft identification and there is no need to request a turn of 30° from the original heading in order to confirm which blip is which on the screen. Radio telephony (R/T) loading is greatly reduced because altitude information is presented continuously to the controller and the pilot no longer needs to make constant checks.

In North-West Europe the presence of too many secondary radars leads to another kind of problem: over-interrogation of aircraft. The answer is monopulse SSR, which is gradually replacing previous equipment. It requires only a limited number of interrogations to identify and locate an aircraft and is able to differentiate between two aircraft in close proximity. Its accuracy and Mode ‘S’ capability mean that the controller can isolate one aircraft target among many and concentrate a flow of information upon it. (The ‘S’ in Mode ‘S’ stands for ‘ Selective’).

4. Datalink

Mode ‘S’ datalink is an air / ground data communications facility using modern SSR technology. SSR itself is a basic one-way datalink, automatically transferring to the ground, on request from the ground station, aircraft identity

and height information from the aircraft avionics. This information is known as Mode 'A / C' data and Mode 'S' is a development of this function, allowing two-way transfer of much larger amounts information to and from suitably equipped aircraft. Its advantages include the transfer of information without cluttering busy VHF voice channels.

5. Traffic Alert and Collision Avoidance System (TCAS)

When Traffic Alert and Collision Avoidance System is fitted to aircraft, the equipment reacts to the transponders of other aircraft in the vicinity to determine whether or not it is potential for a collision.

Warnings are given in two steps: typically 40 seconds before the assumed collision, a Traffic Advisory (TA) warning indicates where the pilot must look for the traffic; then between 20 and 30 seconds before the assumed collision a Resolution Advisory (RA) gives the pilot advice to climb, descend or remain level. The two warnings, TA followed by RA, can only be received if the conflicting aircraft is transponding on Mode C or Mode S. When both aircraft are fitted with TCAS Mode S, the transponders will communicate with each other to agree which aircraft is to pass below, and which above. Warnings appear on a small cockpit display indicating relative positions of the conflicting aircraft in plan view and elevation, together with an aural warning spoken by a synthetic voice.

Vocabulary Practice

Ex. 139. Categorize the following equipment into two groups.

Transponder, HSI, inner marker, VOR/DME, homer, NDB, weather radar, ILS localizer, SSR, turn-and-slip indicator, slide rule, vertical speed indicator, ADI, GPS satellite, speed indicator, INS.

A: AIRBORNE	B: GROUND/SPACE-BASED
e.g. Radio compass (ADF)	Outer marker

Ex. 140. Here are two pairs of synonyms and antonyms. Think of your own examples. Make up several sentences with these words.

1. Waypoint – en route point
2. Let-down – descent
3. Primary - secondary
4. Overshoot - undershoot

synonyms / antonyms		*Sentences*

Ex. 141. A: Fill in the gaps with the correct prepositions where necessary.

1. Before the flight the pilot designates the route … flight … the airway system … the international flight plan, which is then filed … ATC.
2. The pilot keeps … course … following landmarks … the ground, using the method of pilotage.
3. Homing causes a vehicle automatically to fly … a particular source … radiation.
4. DME operates … frequencies … the UHF spectrum …962 MHz and 1213 MHz.
5. Each serving a special service, different types … air navigation aids are … use today.
6. Most VORs are equipped … voice transmission … the VOR frequency.
7. The effectiveness …the VOR depends … proper use and adjustment … both ground and airborne equipment.
8. The NDB consists … a radio transmitter … the medium frequency band … which a continuous steady signal … all directions are being sent out.
9. GPS that is based … a series … satellites, is capable .. fixing an aircraft's position anywhere on the globe … an accuracy … few metres.
10. An ILS transmitter … a large aerial system known as the Localizer is situated … the far end … the runway, transmitting its signals … either side of the centreline … the runway and approach.

B: Scan the text again to check your answers.

Ex. 142* . Fill in the chart to find the other parts of speech. Use your dictionary where necessary. Check the pronunciation.

NOUN	*VERB*	*ADJECTIVE*
1. navigation	*navigate*	*navigational*
2. …	combine	…
3. interference	…	…
4. …	…	pressing
5. …	require	…
6. transmitter	…	…
7. …	…	decisive
8. deflection	…	…
9. …	fail	…
10. calculation	…	…
11. …	…	identical
12. automation	…	…
13. …	avoid	…
14. …	…	fluctuating
15. …	receive	…

Ex.143* Form nouns from the verbs.

To equip, to move, to automate, to fail, to proceed, to combine, to identify, to simplify, to calculate, to deflect, to compute, to direct, to decide, to require, to navigate, to confuse, to synchronize, to transmit, to receive, to fix, to confirm, to interrogate, to interfere, to tune, to avoid.

Ex. 144. Complete each sentence with a suitable form of the verb given.

1. A low or medium frequency radio beacon … (to transmit) non-directional signal.
2. Voice, music or erroneous identification may … (to hear) when a steady false bearing … (to display).
3. Voice identification … (to add) to numerous VORs recently.
4. The latitude and longitude of the parking stand … (to feed) into the computer and the INS equipment automatically … (to stabilize) itself to true north.
5. A new navigational system, TACAN, … (to develop) by the military and naval forces.
6. The transponder … (to help) the radar operator to track targets that may return an echo too weak to display.
7. If a turn … … (to be to make) onto a new track, the aircraft automatically … (to begin) its turn before arriving overhead the way-point.
8. In the operation of DME, paired pulses at a specific spacing … (to send out) from the aircraft and … (to receive) at the ground station.
9. Pilots … (to caution) to disregard any distance displays from automatically selected DME equipment when VOR or ILS facilities, which … (not to have) the DME feature installed, … (to use) for position determination.
10. The en route positions … (to know) as way-points and INS … (to direct) the aircraft via them.

Ex. 145. Find the English equivalents to the following.

1) передавать радионавигационные сигналы,
2) обозначать маршрут полета через систему воздушных трасс в плане полета,
3) достичь пункта назначения,
4) настраивать радионавигационное оборудование,
5) принимать сигнал от наземного навигационного средства,
6) находиться на подходе к навигационному средству,
7) другие способы самолетовождения через океаны,
8) быть опознанным на аэронавигационной карте пилота,
9) линия, соединяющая одно навигационное средство с другим,
10) отклоняться от линии пути,
11) найти точное местоположении,
12) временные зоны,
13) держаться на курсе, следуя по наземным ориентирам,
14) при любых погодных условиях,
15) следовать по запланированному маршруту полета,
16) основная помощь в воздушной навигации,
17) быть оборудованным электронными компьютерами,
18) радиоприемник низких частот,
19) радиал, определяющий трассу в соответствии с аэронавигационной картой,
20) воздушные коридоры,
21) лететь (идти) на сигналы от станции,
22) лететь «на» или «от» станции,
23) показывать расположение различных ориентиров,
24) следовать на удалении от …

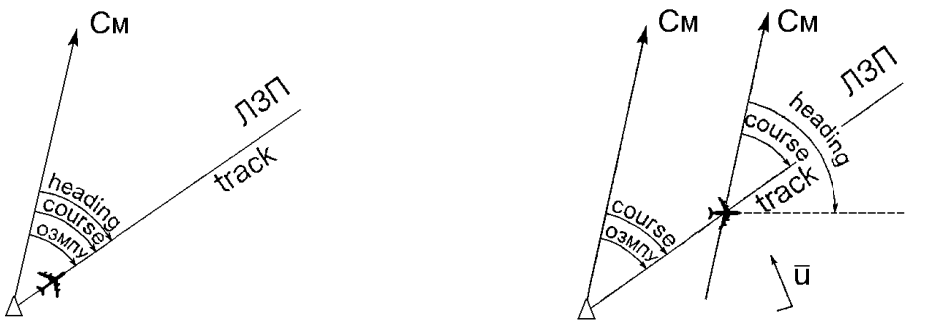
Ex. 146**. Read and translate definitions. Explain the difference between these notions.

К понятию слов «course», «heading», «track»

Course – намечаемое (заданное) направление полета в горизонтальной плоскости в градусах, отсчитываемое от северного меридиана.

Heading – направление, в котором находится продольная ось ВС, выражаемое обычно в градусах угла и отсчитываемое от северного направления меридиана (истинного, магнитного, компасного или условного).

Track – действительная линия пути полета самолета над поверхностью Земли.



В условиях штиля В условиях учета УС за счет ветра

Figure 7-1.

Speaking

Ex. 147. Make a 100-word presentation on one of the topics below:**

1. Pilotage.
2. Dead-reckoning.
3. Radio navigation.
4. Airborne equipment.
5. Ground-based equipment.

Presentation Topic		
Vocabulary	*Plan*	*Notes:*
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……
……	……	……

Ex. 148. Think of the best translation.**

ЭЛЕМЕНТЫ ДВИЖЕНИЯ САМОЛЕТА

При описании положения самолета в процессе его поступательного движения используется ряд точек и координат (навигационных понятий), к которым относятся пространственное место самолета, место самолета, траектория полета и линия пути. *Пространственное место самолета* – это точка пространства, в которой в данный момент находится центр масс самолета. *Место самолета* – это точка на земной поверхности, в которую в данный момент проектируется центр масс самолета. Пространственное место самолета и место самолета могут быть заданными и фактическими. *Траектория полета* – это пространственная линия, описываемая центром масс самолета при движении. *Линия пути* – это проекция траектории полета самолета на поверхность Земли. Проекция на земную поверхность фактической траектории полета самолета называется линией фактического пути. В реальном полете линия фактического пути может отличаться от линии заданного пути из-за погрешностей, допускаемых в процессе навигации.

Section VIII. **AIR LAW**

Phonetics

Ex. 149. Read these words and practise saying them:

[0:]	Border, accordance, source, cause, torque, stall, authority, caution, yaw, restore, course, corridor, force, vortex, draw, forward, north
[0]	Adopt, appropriate, operate, accomplish, volume, obstacle, cross
[ou]	Impose, decode, hold, explode, known, motion, roll, control, load, slope, rotation, nose, open, ocean, overfly, low, slow, tornado, mode
[oI]	Destroy, noise, airfoil, voice, choice, moisture, point, oil, join, appoint
[aI]	Flight, private, light, glider, quite, high, type, simplify, design, notify, comply, apply, license, file, classify, authorize, advisory, identify, fly
[A]	Above, country, plus, cover, subject, ultra, rough, dust, thrust, rudder
[a:]	Parking, retard, far, fast, large, chart, calm, nasty, master, bar, pass
[au]	Boundary, amount, around, plough, cowling, sound, outflow, hour
[u]	Pulley, foot, push, output, hook, book, goods
[u:]	Route, improve, rule, group, boom, cool, boost, loop, tool, true
[ju:]	Assume, use, introduce, peculiar, fuse, few, neutral, rescue, dew
[e]	Amend, step, level, center, subject, elevator, decelerate, extend
[eI]	Wait, space, regulate, information, state, cater, lane, able, relation, straight, recommendation, safe, grade, gain, stable, aileron, ratio
[q:]	Pertinent, observe, alert, service, determine, curve, circuit, surface
[I]	Predict, proximity, permit, applicable, visual, instrument, division
[I:]	Region, between, each, need, wheel, exceed, east, steep, keep, heat
[iq]	Interfere, severe, rear, steer, atmosphere, clear, clearance, veer
[x]	Classify, geographical, international, add, category, establish, handle
[Fq]	Air, area, vary, various, aircraft, aerial, airfoil, fairing, careful, bearing
[juq]	Fuel, pure, cure, Europe, during, secure

Ex. 150. A: Read and translate international words:
B: What word class do they belong?

A region, total, geographical, international, a line, a location, micro, a recommendation, a centre, information, a type, aeronautical, commercial, an ocean, operations, military, plus, to regulate, private, a classification, a system, a pilot, service, a category, controlled, uncontrolled, to design, a status, a structure, special, criteria, separate, Arctic, a balloon, an organization, a zone, a commander, a limit, a corridor, an identification code, vertical, protection, a mile, supersonic, phonetically, to form, a prefix, minimum, a term, adequate.

Ex. 151. Study new words** **(Glossary 10)**

ACC (area control center)		**районный диспетчерский центр (РЦ)**	
access (v, n)	['ækses]	**доступ, подход, проход**	
		to have full access; to provide access; emergency exit access	иметь полный доступ; обеспечивать доступ; доступ к аварийному выходу
to accomplish (v)	[ə'kʌmplɪʃ]	**выполнять, завершать**	
		to accomplish maneuvers; to accomplish procedure turn	выполнять маневры; завершать стандартный разворот
to adopt (v)	[ə'dɔpt]	**принимать**	
advisory service	[əd'vaɪz(ə)rɪ 'sə:vɪs]	**консультативное обслуживание**	
		limit advisory; traffic advisory	консультативное сообщение об ограничении (в зоне полетов); консультативное сообщение о воздушной обстановке
air space (n) **(controlled / uncontrolled)**	['eə" speɪs]	**воздушное пространство (контролируемое/ неконтролируемое)**	
airway (n)	['eəweɪ]	**воздушная трасса**	
		low-level airway	авиатрасса нижнего воздушного пространства
to allocate (v) **allocation** (n)	['ælə"keɪt]	**отводить, предназначать, распределять (предназначение)**	
		to allocate duties; cost allocation to routes; allocated code	распределять обязанности; распределение расходов по маршрутам; код, отведенный данному ВС
appropriate (adj)	[ə'prəuprɪɪt]	**соответствующий**	
		appropriate frequency; appropriate authority	соответствующая частота; соответствующие полномочные органы
area (n) **(control area, control zone)**	['eərɪə]	**зона, район, область (контрольная зона)**	
		to leave a parking area; area of coverage of the forecasts; active thunderstorm area; departure area; liftoff area.	выруливать с места стоянки; район обеспечения прогнозами; район активной грозовой деятельности; зона вылета; зона отрыва (ВС при взлете)
assume (v)	[ə'sju:m]	**принимать, предполагать, допускать**	
to authorize (v) **authority** (n)	[ɔ:'θɔrɪtɪ]	**власть, полномочный орган**	
		ATC authority; customs authority	область полномочий УВД; таможенный орган
to cater (v) **catering** (n)	['keɪtə] ['keɪtərɪŋ]	**поставлять бортпитание, бортпитание**	
		airport catering	аэропортовая служба бортпитания

to clear (v) **clearance** (n)	[klIq] ['klIqr(q)ns]	**разрешать (зд.)** **разрешение (диспетчерское), зазор, люфт**	
		climb clearance; route/ATC clearance; obstacle clearance attitude	разрешение на набор высоты; условия выхода; высота пролета препятствий
to comply with (v)	[kqm'plaI]	**выполнять, подчиняться**	
		to comply **with** ATC instuctions	выполнять инструкции диспетчера УВД
danger area (n) **/hazardous area**	['deIndZq 'Fqrlq] ['hxzqdqs]	**опасная зона**	
to designate (v) **designator** (n)	[dezIg'neIt] ['dezIgneItq]	**обозначать, указатель, обозначение**	
		airway designator; route designator	указатель воздушной трассы; обозначение [код] маршрута
to ensure (v)	[In'Suq]	**гарантировать, обеспечивать**	
		to ensure safety	обеспечивать безопасность
to facilitate (v)	[fq'sIlIteIt]	**способствовать, облегчать**	
		to facilitate the arrival	способствовать прибытию
file (v, n)	[faIl]	**заполнять, подавать документы**	
		to file flight plan; to file airprox report	подавать план полетов; подавать доклад об опасном сближении
FIR (flight information region) (n)	[qf aI Q:]	**РПИ (район полетной информации)**	
to handle (v)	['hxndl]	**обращаться, иметь дело**	
		to handle cargo	осуществлять разгрузку/погрузку
IFR (instrument flight rules) (n)	[aI qf R]	**ППП (правила полетов по приборам)**	
		to file IFR/VFR flight plan	подавать план полета по ППП / по ПВП
to impose (v)	[Im'pquz]	**навязывать, налагать, возлагать**	
		to impose responsibility on smb for smth	возлагать ответственность на кого-либо за что-либо
lane (n) **(entry, exit)**	[leIn]	**входной/выходной коридор**	
		taxiing lane	линия руления
to notify (v) **notice** (n)	['nqutI"faI]	**уведомлять, извещать, уведомление**	
		until further notice	до дальнейшего уведомления
peculiar (adj)	[pI'kju:ljq]	**особенный, свойственный чему-либо**	
		peculiar to … region	свойственный … региону
to penetrate (v) **penetration** (n)	['penq"treIt] [penq'treISqn]	**проникать, (проникновение)**	
		to penetrate (into) prohibited area	проникать в запретную зону
pertinent (adj)	['pq:tInqnt]	**относящийся к**	
to prohibit (v) **prohibited area**	[prq'hibit] [prqu'hIbItId Fqrlq]	**запрещать, запретная зона**	

proximity (n)	[pr0k'sImItI]	**близость, соседство, сближение**	
		ground proximity; hazardous proximity; routes proximity aircraft proximity warning	сближение с землей; опасное сближение; близость маршрутов; предупреждение о сближении с ВС
rescue (v, n)	['reskju:]	**спасать, спасение**	
		emergency rescue; SAR [search and rescue service]	спасание при аварии; поисково-спасательная служба
restricted area	[rI'strIktId FqrIq]	**зона с ограничением режима полетов**	
search (v, n)	[sq:tS]	**искать, поиск**	
		air search; radar search	поиск с воздуха; радиолокационный поиск
to step down(v)	["step 'daun]	**уменьшать число, объем, понижать**	
subject to (adj)	['sAbdZekt tu:]	**подверженный чему-либо**	
		to be subject to conditions	быть подверженным условиям
TMA (terminal control area)	['tWmInqI kontroul FqrIq]	**узловой диспетчерский район**	
VFR (visual flight rules)	['vJ qf R]	**ПВП (правила визуальных полетов)**	
		to change from VFR to IFR due to IMC conditions	переходить с полета по ПВП на ППП из-за инструментальных метеоусловий
volume (n)	['v0ljHm]	**объем, масштаб, громкость**	
		traffic volume	объем (воздушного) движения

Ex. 152. A: Read and translate the sentences with the new words.
B: Make up your own sentences using these words.

1. The planes have entered Israeli airspace without permission.
2. All flights in Russian Federation are performed in controlled space.
3. This airport lies on the border between the US and Mexico.
4. There are strict rules regulating the transport of dangerous goods.
5. All the necessary steps have been taken to ensure their safety.
6. How is this airspace classified?
7. Try to simplify your explanations.
8. You need to decide how much time to allocate to pre-flight briefing.
9. These areas are subject to strong winds.
10. I didn't see you in the aircraft, so I assumed you'd gone out.
11. The volume of air traffic has increased dramatically in recent years.
12. Report entering Scottish FIR.
13. The captain filed an IFR flight plan.
14. The flight received an air traffic advisory service.
15. Advisory routes are allocated Class F.

Reading

Ex. 153. A: Read and translate word combinations.

To follow geographical state borders, to assume straight lines in accordance with ICAO recommendations, within the FIR structure, to be subdivided according to the amount and type of aeronautical activity, light aircraft on training and private flights, to be regulated, to ensure safe use by the high volume of aircraft, to be classified internationally by ICAO, in line with a classification system for civil airspace, to simplify airspace structure, to establish commonality between countries, in order of importance, to be allocated to the busiest controlled airspace, in further development, to handle IFR traffic, to extend from ground level to a specified altitude or a specified flight level (FL), a portion of airspace in which Air Traffic Control is provided, at the confluence of controlled airspace routes, in the vicinity of, to an upper limit expressed as a flight level, to have an identification code, to be stepped down to provide controlled airspace protection for air traffic on climb and descent, as a prefix to the basic designator, to be expressed in terms of minimum flight visibility and distance from cloud, to be established instead of an airway in some less developed parts of the world, to depict Airspace Restrictions and Hazards, to be identified by a unique designator allocated by ICAO

B: Read the text paying attention to the way they are used in the context.

Text.

AIRSPACE

1. Divisions of airspace

Flight Information Region / Upper Information Region (**FIR / UIR**)

The world is divided into FIRs which, above a certain Flight Level varying between states, become UIRs. Their boundaries normally follow geographical state borders, but over international waters and parts of the world having good relations with their neighbours they are able to assume straight lines in accordance with ICAO recommendations. Each FIR / UIR takes its name from an important city, particularly if it is the location of an Area Control Centre (ACC). Sometimes the country itself gives its name to the FIR. Over the oceans the word Oceanic is added, e.g. New York Oceanic FIR. Alaska is a special case with three FIRs : Anchorage Arctic, Anchorage Continental, and Anchorage Oceanic.

Within the FIR structure airspace is subdivided according to the amount and type of aeronautical activity which takes place in it. For example, the airspace around London is very busy, with a lot of commercial airline operations, business traffic, light aircraft on training and private flights, some military flights, plus gliders, balloons and microlights, etc. All this occurs in a quite small geographic area and so the airspace needs to be regulated to ensure safe use by the high volume of aircraft.

2. Airspace classifications

Within the FIR / UIRs, different types of airspace are classified internationally by ICAO so that it is perfectly clear to pilots from anywhere in the world which rules apply and which air traffic services they can expect inside a particular area.

There are two categories of airspace : controlled airspace and uncontrolled airspace. Within these two categories, various 'Classes' have been allocated in different parts, in line with a *classification system for civil airspace* recently introduced by the International Civil Aviation Organization (ICAO). This new system is designed to both simplify airspace structure and establish more commonality between countries.

The ICAO system grades airspace from A to G in order of importance. It begins with Class A, the highest status, which is allocated to the busiest controlled airspace.

3. Controlled airspace

When, in further development, it is decided that an aerodrome should handle IFR traffic, it becomes necessary to protect such traffic by extending control to IFR flights and by placing additional restrictions on VFR flights. To accomplish this, controlled airspace should be established to protect the arrival, departure, and holding paths of the IFR flights.

In controlled airspace Air Traffic Control is provided to all flights. It is made up of various aerodrome Control Zones (CTR), Terminal Control Areas (TMA), Control Areas (CTA) and Airways.

A Control Zone (CTR) – is airspace around certain aerodromes in which Air Traffic Control (ATC) is provided to all flights.

A Control Zone extends from ground level to a specified altitude or a specified flight level (FL), depending on the height.

A Terminal Control Area (TMA) – is a Control Area established at the confluence of controlled airspace routes in the vicinity of one or more major aerodromes. *Terminal Control Area* is sometimes abbreviated as *TCA*, but more commonly as **TMA** (from the earlier designation *Terminal Manoeuvring Area*).

A Control Area (CTA) – *is a portion of airspace* in which Air Traffic Control is provided, and *which extends upwards from a specified base altitude or flight level to an upper limit expressed as a flight level.*

An Airway is a Control Area in the form of a corridor and is marked by radio navigation aids. Each airway has an identification code (e.g. A25 or Alpha Two Five, R8 or Romeo Eight), and extends 5 nm each side of a straight line joining certain places, with specified vertical limits. All airways are Class A except where they pass through a TMA , CTA or CTR of lower status. They are used by airliners (and other Instrument Flight Rules traffic) travelling between the principal aerodromes. As it approaches an aerodrome, the lower level of an Airway is usually stepped down to provide controlled airspace protection for air traffic on climb and descent.

Some major trunk routes extend for thousands of miles, others are short regional links. Until 1987 they were named after colours followed by a number between one and 999 - Amber, Red, Blue and Green, plus White for Advisory Routes - but the system became inadequate to cater for specialized applications such as Area Navigation and Supersonic Routes. The initial letters of the five colours already in use were adopted phonetically as the basis of the new system, Amber One becoming Alpha One, Blue One - Bravo One and so on. The allocations are as follows :

a) A, B, G, R - for routes which form part of regional networks of ATC routes:

b) L, M, N, P - for area navigation routes which form part of the regional networks of ATS routes:

c) H, J, V, W - for routes which do not form part of the regional networks of ATS routes and are not area navigation routes;

d) Q, T, Y, Z - for area navigation routes which do not form part of the regional networks of ATS routes.

Where applicable, one supplementary letter is added as a prefix to the basic designator in accordance with the following :

a) K (spoken as 'Kopter') to indicate a low level route established for use primarily by helicopters;

b) U (spoken as 'Upper') to indicate that the route or its portion is in the upper space;

c) S (spoken as 'Supersonic') to indicate a route established exclusively for use by supersonic aircraft during acceleration/deceleration, and while in supersonic flight.

Where Advisory Service only is provided a supplementary letter D is added to the end of the designator. A supplementary letter F indicates that flight information service only is provided on the route. It should be noted that some trunk routes have common segments with dual or even triple designators. An example is G472/G463 over western Thailand. The 'Victor' or VOR airway designator is peculiar to the USA and a few other countries including Japan, Turkey, and Saudi Arabia.

Each class of airspace available to VFR operations has specific Visual Meteorological Conditions (VMC) criteria, which are expressed in terms of minimum flight visibility and distance from cloud.

4. Uncontrolled airspace

Normally, uncontrolled airspace consists of Advisory Routes and Open-FIR. Open-FIR includes various areas and zones.

Advisory routes

Advisory Routes are allocated Class F. VFR operations on an Advisory Route require a flight plan to be compiled. En route, these flights then receive an Air Traffic Advisory Service from the Air Traffic Service Unit (ATSU), responsible for the route.

Advisory routes may be established instead of an airway in some less developed parts of the world where traffic is relatively light. It is still a narrow corridor but positive control is not imposed.

Controllers just pass information to help pilots maintain their own separation. Airways and Advisory Routes, as well as Arrival and Departure routes, are known as Air Traffic Services (ATS) Routes and each is identified by a unique designator allocated by ICAO.

Open - FIR

Open-FIR is a Class G airspace. Air Traffic services provided to flights in Open- FIR include:

- information and warnings on meteorological conditions;
- changes of serviceability in navigational and approach aids;
- condition of aerodrome facilities;
- aircraft proximity warnings;
- other information pertinent to the safety of air navigation.

Special use airspace

Aeronautical charts also depict Airspace Restrictions and Hazards. This include Danger Areas such as military weapons ranges, Prohibited Areas around critical installations, Restricted Areas for various defence purposes, Military Training Areas, and Air Defence Identification Zones.

- A ***Danger Area*** is defined airspace in which activities dangerous to flight may occur;
- A ***Restricted Area*** is defined airspace in which flight is restricted according to certain conditions;
- A ***Prohibited Area*** is defined airspace in which flight is prohibited.

Ex. 154. Comprehension check:

1. Why was controlled airspace established?
2. ATC isn't provided to all flights in controlled airspace, is it?
3. What is controlled airspace made up of?
4. What is an airway? Give its dimensions.
5. How are VMC criteria expressed?
6. What is the special VFR clearance? How does it facilitate flights?
7. What is the procedure for penetrating an airway?
8. What does uncontrolled airspace consist of?
9. Where may advisory routes be established?
10. How do ATC controllers help pilots flying via advisory routes?
11. How are airways designated now?
12. Which supplementary letter is added to the end of an advisory route designator?
13. What does Open-FIR include?
14. Name Air Traffic Services in Open-FIR.
15. Name standard dimensions of an Aerodrome Traffic Zone.
16. How is Special Use Airspace subdivided?

Ex. 155. Decode these abbreviations. Refer to Text "Airspace".

IFR	*Instrument Flight Rules*
CTA	
VMC	
VFR	
CTR	
TMA	
IMC	
ISA	
VOR	
GPS	
ILS	
ADF	
NDB	
RVR	
UTC	

Ex. 156. A: Fill in the gaps with the correct prepositions where necessary.

1. The world is divided … FIRs which, … a certain Flight Level varying … states, become UIRs.
2. Airspace is divided … FIRs according … the amount and type … aeronautical activity which takes place … it.
3. .The airspace needs to be regulated to ensure safe use … the high volume … aircraft.
4. … order … importance the ICAO system grades airspace … to G.
5. Being established … the confluence … controlled airspace routes, a TMA is located … the vicinity … one or more major aerodromes.
6. Until 1987.airways were named ….. colours followed … a number … one and 999 - Amber, Red, Blue and Green.
7. … some less developed parts … the world advisory routes may be established even instead … an airway
8. Including changes … serviceability … navigational and approach aids Air Traffic services are provided …flights … Open- FIR.
9. According to certain conditions, a Restricted Area is defined airspace … which flight is restricted … … certain conditions.
10. … controlled airspace Air Traffic Control is provided … all flights.

B: Read the text again to check your answers.

Reading

Text VISUAL FLIGHT RULES / INSTRUMENT FLIGHT RULES

1. VFR

Visual reference to the outside environment both for attitude reference and to navigate the aeroplane is necessary for the visual pilot (i.e. the pilot holding a basic PPL, without either an IMC Rating or an Instrument Rating).

If visual reference is lost - for example, by entering cloud or by flying in conditions of reduced visibility - the results may be awful.

To avoid this, minimum flight visibility requirements and minimum distances have been established. These are known as the Visual Flight Rules.

Conditions in which flight is possible under the VFR (Visual Flight Rules) are known as VMC (Visual Meteorological Conditions).

Each airspace class (except Class A, which is unavailable to VFR flights) has VMC minima specified for VFR flights.

Under the VFR the pilot is responsible for the safety of the flight, separation from other aircraft, terrain clearance, and for remaining at a satisfactory distance from cloud in adequate flight visibility.

VFR Flight Plan and ATC Clearance The pilot-in-command of a VFR flight must notify flight details to the appropriate Air Traffic Control unit in Class B, C, and D airspace, and obtain an ATC clearance for the flight. The flight plan should contain sufficient detail to help the ATC unit issue a clearance and for search and rescue purposes. While operating in the specified airspace, the pilot-in-command shall maintain a constant listening watch on the appropriate radio frequency and comply with instructions from ATC.

2. IFR

Flight under Visual Flight Rules is very restrictive. For this reason, flight and navigation instruments have been developed that allow a properly trained pilot to operate in cloud and other conditions not suitable for visual flight. The rules that apply to this category of flight are known as the Instrument Flight Rules (IFR). Only two types of flight category are available in aviation : VFR or IFR.

The Flight Plan

The *flight plan* is an ATC message, compiled by, or on behalf of, the aircraft commander (pilot-in-command) and then transmitted by the appropriate ATS authority to organizations concerned with the flight. It is the basis on which an ATC clearance is given for the flight to proceed.

Correct use of the Flight Plan Form is very important - particularly in these days of automatic data processing. Incorrect completion may result in a delay in processing and therefore a delay to the flight.

A pilot intending to make a flight must in any case contact ATC at the aerodrome of departure. This is known as booking out and is a separate and additional requirement to that of filling a flight plan. Where an aerodrome is notified as Prior Permission Required (PPR) the filing of a flight plan does *not* constitute prior permission.

Private pilots may file a flight plan for any flight. They are advised to file a flight plan if intending to fly more than 10 nm from the coast or over sparsely populated or mountainous area.

IFR Flight Plan and ATC Clearance

1. In order to comply with the Instrument Flight Rules, before any flight within controlled airspace the aircraft commander must file a flight plan (irrespective of whether IMC or VMC exist) and obtain an ATC clearance based upon it. The flight must be made in accordance with clearance and with the notified holding procedures at the destination unless otherwise instructed by ATC.
2. A pilot flying IFR in controlled airspace must follow :
   - the terms of the Air Traffic Control clearance and any further instructions given by ATC;
   - the published instrument holding and approach procedures for the destination aerodrome.

(However, he may cancel IFR and switch to

Position reports

VFR if: he can maintain VMC while in controlled airspace; and he informs ATC accordingly, asking them to cancel his flight plan).
3. ATC must be told as soon as possible if, to avoid immediate danger, any departure has to be made from the requirements of this rule.
4. Except when the flight plan has been cancelled, an aircraft commander must inform ATC when the aircraft lands within or leaves controlled airspace.

An aircraft under IFR which flies in or intends to enter controlled airspace must report its time, position and level at such reporting points or at such intervals of time as may be notified or directed by ATC.

Typical Position Report

Aircraft identification Golf Alpha Echo Sierra Echo
Position and time Wicken four seven
Level Flight level three three zero
Next position and Estimate Marlow five seven

Ex. 157: Write a short summary on one of the topics related to "Air Law".**

Summary		
Vocabulary	*Plan*	*Notes:*
……	……	……
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Ex. 158. Match words in column A with their synonyms in column B.

A	B
1. to occur	***a. to happen***
2. to assume	**b.** aid
3. to accomplish	**c.** to search
4. facility	**d.** to differ
5. to look for	**e.** to save
6. to vary	**f.** significant
7. to rescue	**g.** advice
8. important	**h.** to consider
9. recommendation	**i.** limitation
10. restriction	**j.** to complete
11. lately	**k.** to leave
12. instrument	**l.** to separate
13. to depart	**m.** indicator
14. to divide	**n.** recently

Ex. 159*. Fill in the chart to find the other parts of speech. Use your dictionary where necessary. Check the pronunciation.

NOUN	*VERB*	*ADJECTIVE*
1. advice	*advise*	*advisory*
2. authority	…	…
3. …	designate	…
4. …	…	closing
5. ….	notify	…
6. facilitation	…	…
7. …	…	correct
8. …	allocate	…
9. reduction	…	…
10. …	intend	…
11. …	…	defensive
12. arrival	…	…
13. …	depart	…
14. cancellation	…	…
15. …	adopt	…

Ex. 160*. Form nouns from the verbs.

To regulate, to operate, to organize, to form, to service, to allocate, to adopt, to designate, to notify, to reduce, to cancel, to arrive, to defend, to depart, to advise, to facilitate, to correct, to recommend, to classify.

Ex. 161. Translate the compound words and use them in your own contexts.

Search and rescue equipment, flight route, climb clearance, airway designator, identification code, flight route, classification system, airspace structure, ground level, destination aerodrome, radio navigation, airspace protection, area navigation, flight visibility, aerodrome facility, airspace restrictions, flight instruments, terrain clearance, trunk route, flight path, arrival path, state border, flight safety, aircraft commander, approach procedure, airspace class, departure aerodrome, flight level, air law, aircraft system, classification system, flight rules, air defence, approach aids, danger area, defence purpose, radio frequency, flight plan form, aircraft proximity warning, Air Defence Identification Zones.

Ex. 162. Match these notions with their definitions. *Example: 3 – c.*

1. Control Zone (CTR)	**a.** Control Area established at the confluence of controlled airspace routes in the vicinity of one or more major aerodromes.
2. Control Area (CTA)	**b.** A *portion of airspace* in which Air Traffic Control is provided, and which extends upwards from a specified base altitude or flight level to an upper limit expressed as a flight level.
3. *Airway*	***c.*** *Control Area in the form of a corridor and is marked by radio navigation aids.*
4.Terminal Control Area (TMA)	**d.** airspace around certain aerodromes extending from ground level to a specified altitude or flight level in which Air Traffic Control (ATC) is provided to all flights.
5. Danger area	**e.** Defined airspace in which flight is restricted according to certain conditions.
6. Restricted area	**f.** Defined airspace in which flight is prohibited.
7. Prohibited area	**g.** Defined airspace in which activities dangerous to flight may occur.
8. Controlled airspace	**h.** Published route served by Advisory service, but not necessarily by ATC or separation monitoring and usually without radar surveillance.
9. Advisory route	**i.** An ATC message compiled by, or on behalf of aircraft commander and then transmitted by the appropriate ATS authority to organizations concerned with the flight.
10. Flight plan	**j.** Airspace of defined dimensions within which ATC service is provided.

Bits of Grammar

Ex. 163. Complete the sentences with *who, that, which* or *where*. If no word is needed, leave a space (-).

1. The world is divided into FIRs …, above a certain Flight Level varying between states, become UIRs.
2. The pilot … intends to make a flight must in any case contact ATC at the aerodrome of departure.
3. Advisory routes may be established instead of an airway in some less developed parts of the world … traffic is relatively light.
4. For this reason, flight and navigation instruments have been developed … allow a properly trained pilot to operate in cloud and other conditions not suitable for visual flight.
5. …it is decided … an aerodrome should handle IFR traffic, it becomes necessary to protect such traffic by extending control to IFR flights and by placing additional restrictions on VFR flights.

6. Each class of airspace available to VFR operations has specific Visual Meteorological Conditions (VMC) criteria, … are expressed in terms of minimum flight visibility and distance from cloud.
7. An aircraft under IFR … flies in or intends to enter controlled airspace must report its time, position and level at such reporting points or at such intervals of time as may be notified or directed by ATC.
8. … it is applicable, one supplementary letter is added as a prefix to the basic designator in accordance with the purpose of indication.
9. … an aerodrome is notified as Prior Permission Required (PPR) the filing of a flight plan does *not* constitute prior permission.
10. Airspace classification begins with Class A, the highest status, … is allocated to the busiest controlled airspace.

Ex. 164. Find the English equivalents to the following.

1) отображать ограничения об опасности воздушного пространства,
2) система классификации воздушного пространства гражданской авиации,
3) для дальнейшего развития,
4) простираться от уровня земли до определенной высоты или эшелона полета,
5) иметь опознавательный код,
6) до верхнего предела, обозначаемого как эшелон полета,
7) чтобы обеспечить защиту контролируемого воздушного пространства для набирающих высоту или снижающихся воздушных судов,
8) выражаться в терминах минимальной видимости и расстояния от облачности,
9) иметь международную классификацию ИКАО,
10) следовать географической границе между странами,
11) управлять воздушными судами, выполняющими полет по ППП,
12) упрощать структуру воздушного пространства,
13) в порядке важности,
14) часть воздушного пространства, внутри которого обеспечивается УВД,
15) устанавливаться вместо воздушных трасс в некоторых менее развитых частях мира.

Speaking

Ex. 165. A: Make up a short presentation on one of the topics below:**
B: Use aviation terms and abbreviations from Exercises 155, 162.

1. FIR;
2. UIR;
3. Controlled airspace;
4. Uncontrolled airspace;
5. Airspace classification;
6. VFR;
7. IFR;
8. Flight plan;
9. Russian Federation airspace.

Presentation Topic		
Vocabulary …… …… …… …… …… …… …… …… …… …… ……	*Plan* …… …… …… …… …… …… …… …… …… …… ……	*Notes:* …… …… …… …… …… …… …… …… …… …… ……

Ex. 166. Think of the best translation.**

ОБЯЗАННОСТИ ГОСУДАРСТВ, ВОЗДУШНЫЕ СУДА КОТОРЫХ ВЫПОЛНЯЮТ МЕЖДУНАРОДНЫЕ ПОЛЕТЫ

Государства, воздушные суда (ВС) которых выполняют международные полеты, обязаны:

1) обеспечить каждое ВС национальными и регистрационными знаками;
2) исключить использование всех ВС в целях, не совместимых с Чикагской конвенцией;
3) соблюдать законы страны пребывания;
4) не перевозить военных материалов, исключение – только с разрешения соответствующего государства;
5) признавать удостоверение о годности при условии, что требования, на основании которых оно выдано, равны либо превышают минимальные требования стандартов ИКАО;
6) предоставлять другим Договаривающимся государствам или Совету ИКАО в случае их запроса сведения, касающиеся регистрации или принадлежности ВС;
7) обеспечивать ВС следующими документами:
   - свидетельством о регистрации;
   - удостоверением о годности к полетам;
   - свидетельством каждого члена экипажа;
   - бортовым журналом;
   - разрешением на бортовую радиостанцию;
   - списком пассажиров (если требуется);
   - генеральной декларацией;
   - декларацией на груз.

Vocabulary Extension

Ex. 167. Learn the ATS structure.

ATS Structure

ATS	Air Traffic Service	Обслуживание воздушного движения (**ОВД**)
FIS	Flight Information Service	Полетно - информационное обслуживание
FIC	Flight Information Centre	Центр полетной информации **'Information'**
ATAS	Air Traffic Advisory Service	Консультативное обслуживание
ATCS	Air Traffic Control Service	Диспетчерское обслуживание
Area Control Service		Районное диспетчерское обслуживание
ACC	Area Control Centre	Районный диспетчерский пункт '**Control**'
Approach Control Service		Диспетчерское обслуживание подхода
APP	Approach Control Office	Диспетчерский пункт подхода '**Approach**'
Aerodrome Control Service		Аэродромное диспетчерское обслуживание
TWR	Aerodrome Control Tower	Аэродромный диспетчерский пункт. Позывной '**Tower**'
GND	Surface Movement Control	Диспетчерский пункт управления наземным движением. Позывной '**Ground**'
UAS	Upper Area Control Centre	Диспетчерский центр управления верхним районом. Позывной **'Control'**
AS	Alerting Service	Аварийное обслуживание
SARC	Search and Rescue Centre	Центр поиска и спасения.

Airspace - Воздушное пространство

UAS	Upper Airspace	Верхнее воздушное пространство
UIR	Upper Flight Information Region	Верхний район полетной информации
LAS	Lower Airspace	Нижнее воздушное пространство
FIR	Flight Information Region	Район полетной информации (РПИ)
UTA	Upper Control Area	Верхний диспетчерский район
UAR	Upper Air Route	Маршрут верхнего воздушного пространства
CTA	Control Area	Диспетчерский район
AWY	Airway	Воздушная трасса
TMA	Terminal Control Area	Узловой диспетчерский пункт
CTR	Control Zone	Диспетчерская зона
ATZ	Aerodrome Traffic Zone	Зона аэродромного движения в районе контролируемого аэродрома

Section IX. **AIR TRAFFIC CONTROL**

Phonetics

Ex. 168. Read these words and practise saying them:

[p] - [b]	[k] - [g]	[s] - [z]
paved – beyond	collision - glidepath	squawk - zone
position – block	conflict - gear	safe - horizon
pattern - boundary	clearance - agree	service – minimize
passage – inbound	calculate - grade	surface – organize
provide - outbound	complicated – gradient	suitable – horizontal
practice – bearing	comply - grow	circuit - desired
procedure - beacon	complete – gap	cylinder - refusal
support - busy	correct – gradually	slot - size
priority - base	confirm – colleague	concerned – release
point - breakdown	occupancy - significant	supersonic - hazard

[t] - [d]	[f] - [v]	[C] – [G]
taxiway - delay	final – vehicle	check - jack
tower - director	factor - vicinity	achieve – advantage
transmit - define	frequency – vortex	approach - acknowledge
take off - departure	flow - vector	chance - change
detour - avoid	force – various	touchdown – join
turn - desirable	function – variable	temperature - adjust
complete – destroy	confusion - verbal	switch - gentle
time - depend	few - view	chart - range
slot - downwind	favorable - available	charge - procedure
aircraft - extend	front - coverage	chance - generally

Ex. 169. Read and translate these international words:

Limit, manoeuvring, natural, control, collision, assistant, occupy, vacate, ideally, final, minimize, tractor, start, alternative, manner, orbit, active, parallel, international, equivalent, combination, cylinder, effective, details, form, phraseology, aerodrome, minimum, normal, obstruction, category, status, service, terminal, national, position, local, telephone, conflict, priority, information, separate, radio, type, horizontal, vertical, plan, calculate, function, sector, operation, radar, electronic, actual, co-ordination, vector, location, system, procedure, method, complex.

Ex. 170. Study new words** **(Glossary 11)**

PART I.

acknowledge (v)	[qk'n0lIdZ]	**подтвердите (сообщите, что вы получили и поняли это сообщение)**	
to assist (v) **assistance** (n)	[q'sIst] [q'sIstqns]	**помогать, оказывать помощь**	
		medical assistance; navigation assistance; radar assistance; technical assistance; to assist search and recque	медицинская помощь; навигационная помощь радиолокационная помощь; техническая помощь; помогать поисково-спасательной службе
ATC (air traffic control) (n)	[eI tJ sJ]	**УВД (управление воздушным движением)**	
		ATC unit; adjacent ATC unit	орган УВД; смежный орган УВД
base leg (n)	[beIs leg]	**участок между 3 и 4 разворотами**	
		on the base leg; report turning base	«Выполнил третий разворот» (доклад экипажа диспетчеру); доложите выполнение 3 разворота
contact (v) (n)	[kqn'tx kt] ['kqntx kt]	**устанавливать связь с …, радиосвязь, контакт**	
		to contact Approach; to establish contact **with**	работать с Подходом (пункт УВД); устанавливать связь **с**
cross-wind leg (n)	['kr0s' wInd leg]	**участок между 1 и 2 разворотами**	
		on the cross-wind leg;	«Выполнил первый разворот» (доклад экипажа диспетчеру)
delay (n v) **(delaying)**	[dIl'eI]	**задерживать, задержка**	
		to determine the delay; to expect delay	устанавливать время задержки; ожидать задержку
down-wind leg	["daun' wIN leg]	**участок между 2 и 3 разворотами**	
		on the down-wind leg; extend down-wind	«Выполнил второй разворот» (доклад экипажа диспетчеру); затягивать третий разворот
even (adj)	[Iv(q)n]	**(зд.) четный (эшелон)**	
final (n) **(on final)**	['faInl]	**предпосадочная прямая (на прямой)**	
		final approach	конечная прямая захода на посадку
go around (n, v)	["gqu q'raund]	**уходить на второй круг, уход на второй круг**	
		to execute missed approach procedure; to make an overshoot procedure/another hand approach; to follow go-around procedure; to make another attempt to land;	**уходить на второй круг**
		published missed approach procedure	опубликованная схема ухода на второй круг
holding point/position	['hquldIN p0Int]	**предварительный старт**	
line-up (n, v) **(taxi-into-position)**	["lain 'Ap]	**исполнительный старт, занимать исполнительный старт, выруливать на исполнительный старт**	
missed approach	[mist q'prqutS]	**неудачный заход, уход на второй круг**	
odd (adj)	[0d]	**(зд.) нечетный**	
		odd flight levels	нечетные эшелоны полета

orbit (v, n) **(a three-sixty turn)**	['0:bIt]	**вираж, выполнять вираж (разворот на 360°)**	
		to make an orbit to the left/right; to make a 360 turn to the left; to orbit left	выполнить вираж влево/вправо; выполнять левый вираж на 360°; выполнять левый вираж
paved (adj)	[peIvd]	**бетонированная**	
		paved RW	забетонированная ВПП
pushback (v, n)	["puS 'bxk]	**буксироваться хвостом вперед, буксировка /выталкивание хвостом вперед**	
		pushback approved	буксировка хвостом вперед разрешена
rapidly (adv)	['rxpIdlI]	**быстро**	
		rapidly reducing	быстро уменьшающийся
RW-in-use (n)	['rAn weI In jHs]	**рабочая ВПП**	
		active/duty RW	рабочая ВПП
slot time (n)	[sl0t taIm]	**промежуток времени, временное окно, согласованное время вылета**	
squawk (v, n)	[skw0:k]	**передавать сигнал радиоответчика, код ответчика**	
surface (n)	['sq:fis]	**поверхность**	
		surface wind surface visibility natural surfaced RW	приземный ветер видимость у земли грунтовая ВПП
taxiway (n) **(inner, outer, loop)**	['txksI"weI]	**рулежная дорожка - РД (внутренняя, внешняя, кольцевая)**	
		to take the taxiway; RW access taxiway; high speed turn-off taxiway	занимать рулежную дорожку; рулежная дорожка у торца ВПП; рулежная дорожка скоростного выруливания с ВПП
traffic circuit (pattern) (n)	['trxflk 'sq:kIt]	**круг полетов, схема полета по кругу**	
		to enter traffic circuit	**входить в круг полетов**
to transfer (v, n)	['trxnsfq(:)]	**(зд.) передавать (управление движением), передача управления**	
urgency (n) **urgent** (adj)	['q:dZ(q)nsI] ['q:dZqnt]	**срочность, срочный**	
		urgent message	срочное сообщение
wake turbulence (n)	['weIk 'tq:bjulqns]	**турбулентный след, спутная струя**	
		to get into wake turbulence; to hold for wake turbulence	попасть в спутный след; ждать, пока не рассеется спутный след предыдущего борта
to waste (v, n)	[weIst]	**расходовать, тратить, отходы, расход,потеря**	
		to waste fuel	тратить топливо

PART II

Типовые позывные и функциональные характеристики диспетчерских пунктов:

ВЫЛЕТ

Ground Delivery Clearance	выдача диспетчерского разрешения на полет, запуск двигателей
Taxi, Taxiing, Ground,	запуск двигателей и руление до предварительного старта
Tower	взлет (старт)
Approach	набор высоты, выход из района аэродрома.

При наличии радиолокатора позывной – '**Radar**'. Возможен позывной '**Departure**', обозначающий, что данный диспетчерский пункт обслуживает только вылетающие ВС и имеет вторичный радиолокатор. **Control -** контролируемый маршрутный полет. При наличии радиолокатора позывной - '**Radar**'.

ПРИЛЕТ

Control	аналогично п. 'Вылет'
Approach	снижение, предпосадочный маневр,

Информация об условиях посадки. При наличии радиолокатора позывной - '**Radar**'. Позывной '**Arrival**' означает обслуживание прилетающих ВС и наличие вторичного обзорного радиолокатора

Director	радиолокационное векторение на предпосадочную прямую, как правило, ниже эшелона перехода
Tower	самостоятельный заход ВС на прямой, разрешение посадки, полет по кругу по ПВП, движение по ВПП
Precision	заход по посадочному радиолокатору, использует частоту, отдельную от TOWER
Taxi, Taxiing, Ground, Apron	движение по аэродрому

STANDARD EXPRESSIONS:

Extend downwind leg	затяните третий (третий по команде)
Join right base	следуйте правым доворотом к 4 развороту
Hold short of	остановитесь перед
Report vacated	доложите, когда освободите ВПП
In sight	в поле зрения
Wilco / Wildo	ваше сообщение понял и буду выполнять
At your discretion	по вашему усмотрению
SID (Standard Instrument Departure)	стандартная схема выхода ВС по приборам из зоны аэродрома
Work in progress	ведутся работы
To issue departure clearance	выдавать разрешение на взлет

Ex. 171. A: Read and translate these sentences.
B: Make up your own sentences with the new words.

1. Delay is not determined.
2. Take off or vacate the RW immediately.
3. What is your destination?
4. Pushback approved, TW 5.
5. Taxi via taxiways 8 and 1 to holding point RW 12.
6. Slot time 16.30. Start up at your discretion.
7. Are you ready to copy your route clearance?
8. Report the B-747 on final in sight.
9. Contact Approach on 118,3.
10. Make an orbit to your left to give way to TU-204.
11. There was danger of collision at FL 220.
12. You are number three to land. Extend downwind leg.
13. Join left base and report turning final.
14. The plane lost altitude due to wake turbulence after the preceding jet aircraft.
15. The aircraft had to burn out fuel in order to lose weight.

Reading

Ex. 172. A: Read and translate word combinations.

Route clearance, to obtain taxi instructions, to copy landing instructions, to enter the traffic circuit, to join base leg, to extend downwind leg, to report on final, in sight, in use, out of sight, out of use, due to wake turbulence, report at holding point, hold short taxiway 4, squawk 1254, SID N (standard departure November), line up and wait, delay is not expected, holding fix, at your discretion, urgent call, under radar control.

B: Read the text paying attention to the way they are used in the context.

Ex. 173. A: Read and translate word combinations (noun+noun structure)
B: Use them in your own sentences.

Flight plan, time check, departure ATIS, region code, traffic circuit, start-up area, radar display, position information, route clearance, TW closure, RW occupancy, airways flight, airfield data, taxi clearance, flight conditions, slot time, wind direction, safety service, identity lable, surface level, traffic situation, radar data, flight progress strip, taxiway system.

Reading

Text.

AERODROME CONTROL

The basic unit of ATC is known as Aerodrome Control, referred to colloquially as '**The Tower**'. In the words of an ICAO document, the tower issues '*information to aircraft under its control to achieve a safe, orderly and expeditious flow of air traffic on and in the vicinity of the aerodrome with the object of preventing collisions between :*

a) aircraft flying in the traffic circuit around an aerodrome;

b) aircraft operating on the manoeuvring area;

c) aircraft landing and taking off;

d) aircraft and vehicles operating on the manoeuvring area;

e) aircraft on the manoeuvring and obstructions on that area.

The manoeuvring area is defined as '*that part of an aerodrome to be used for take-off, landing and taxying of aircraft, excluding aprons'*. In other words, the runways and taxiways whether paved or natural surfaced.

Among its other important responsibilities is alerting the safety services in case of accident or emergency, and the reporting to pilots of any unserviceable navigational or lighting equipment. Airfield lighting is also operated from the tower. The runway-in-use is selected with regard for wind strength and direction, and normally a pilot will expect to land or take-off as nearly into wind as possible. The tower controller also takes into account other factors, such as runway lengths and the approach and landing aids available, as well as other traffic. If the runway-in-use is not considered suitable, the pilot-in-command may request permission to use another one.

To facilitate the running of the busiest airports it is often necessary to split the duties of Aerodrome Control into Air Control and Ground Movement Control (GMC). The latter's responsibility covers aircraft moving on the apron and aircraft and vehicles on the manoeuvring area except on runways and their access points. At some very busy airports GMC is subdivided with, for example, separate frequencies for inbound and outbound aircraft at Chicago O'Hare and for the two main runways at Atlanta, and separate north and south frequencies at Los Angeles International. Tower, (Air Control) may also be split into two for different runways or sectors of an airport. For operations in bad visibility, many airports are equipped with ground movement radar to assist the controllers in monitoring the positions of traffic on the runways and taxiways. Further developments include identity labels added to aircraft images on the radar display and Mode S datalink to confirm position information.

Associated with Ground Control is the Clearance Delivery frequency which is used to pass route clearances to aircraft prior to taxi. Callsign in Europe is usually **Delivery,** in North America **Clearance**. A useful method of reducing R/T communications is the Departure ATIS which broadcasts continuous information on QNH, runway-in-use, wind direction and speed, temperature, and any other pertinent information such as taxiway closures and unserviceabilities.

Runway occupancy is governed by the following rules:

a) An aircraft shall not be permitted to begin take-off until the preceding aircraft is seen to be airborne or has reported 'airborne' by R/T and all preceding landing aircraft are clear of the runway-in-use.

b) A landing aircraft will not be permitted to cross the beginning of the runway on its final approach until a preceding departing is airborne.

ICAO allows landing clearance to be issued when there is a reasonable assurance that the separation described above will exist when the aircraft crosses the RW threshold. It must not, however, be issued until a preceding landing aircraft has crossed the RW threshold.

Airports outside controlled airspace possess an aerodrome traffic zone through which flight is prohibited without ATC clearance. The **circuit (pattern -** *Amer.*) height is normally 1,000 ft above surface level but at some airfields it may be different.

The circuit is divided into four legs: **crosswind**, **downwind**, **base**, and **final** approach. The standard **circuit-joining** procedure is to arrive overhead the field at 2,000 ft and descend to 1,000 ft on the dead side, i.e. the one opposite the live downwind leg. While watching for departing traffic, the pilot then joins the crosswind leg over the upwind end of the active runway. This should ensure that a joining aircraft does not conflict with one just airborne, as there have been numerous cases of collisions because of careless rejoins in the past. At many controlled airports the standard join is not used, aircraft are authorized to join directly onto final, base, or downwind.

Scheduled and other large aircraft are usually fed straight into the final approach. One way to achieve this safely, if there is a circuit traffic, is to instruct the trainer **to extend downwind leg** until he has the arriving traffic **in sight** and then to follow it. The other way is **an orbit** - a 360° turn - always away from the final approach, to be continued until the traffic is sighted.

The first method has the disadvantage that a strong tailwind may carry the aircraft out of sight of the aerodrome. An orbit may be impracticable because of following traffic in the circuit. In busy traffic situations when large aircraft are expected, trainers may be told to land and taxi back to the holding point to await further take-off clearance. Another complication is **vortex wake (wake turbulence),** a phenomenon often referred to as slipstream or propwash. This is a rapidly moving cylinder of air from each wingtip which can be strong enough to overcome the control forces of a following aircraft and invert it. There are three categories (four in the UK), depending upon maximum total weight at take-off, these being Heavy, Medium, and Light. The Aerodrome Controller is, of course, pre-warned of arriving traffic by Approach and at some places he handles both functions on the same frequency. Similarly, for departing IFR flights he will have the flight progress strips, made up when the flight plan was filed with ATC. Aircraft on IFR flight plans should first require permission to start engines so that ATC can warn of any **delays** and thus minimize **fuel burn**. The aircraft should be given an Approved Departure Time (known as '**slot**'). A short time is allowed beyond this to cover taxying delays. Sometimes ATC will allocate a start-up time so that aircraft can taxi to the runway in a pre-planned manner.

If there is no delay, '*Start-up approved* ' is passed, together with the outside air temperature in degrees Celsius. (Fahrenheit in the USA, Canada and a few other places.) The QNH, QFE, runway-in-use, and wind information may be given in the same transmission, although this is optional. The alternative is to pass them when taxi clearance is given. In practice, pilots often call in advance for this airfield data, **acknowledge** it and say '*call you again for start* '. The presence of a Departure ATIS makes this unnecessary, of course.

If there are no problems, taxi instructions will be given to the appropriate runway. Meanwhile, ATC will obtain an **airways clearance** from the parent ACC by land line and this is passed to the aircraft. (Where a Clearance Delivery frequency is used this will already have been done).

Standard Instrument Departure routes (SIDs) are designed to minimize conflict with those taken by arriving aircraft. Ideally,the sequence of departing aircraft will be organized so that the first will turn on its **desired route** one way, the second - the other, and a third will climb straight ahead. Various combinations of these will reduce delay to a minimum and the demands of vortex wake separation are also taken into account. Immediately after take-off an aircraft is transferred to Approach, Departure, or Area Control. By local agreement, Area may delegate great amount of airspace to Approach Control for separation of inbound and outbound traffic.

The SSR code, or **squawk** as it is known, is allocated in accordance with a predetermined system. A lot of countries take part in the internationally agreed Originating Region Code Assignment Method (ORCAM) developed by Eurocontrol and approved by ICAO. ORCAM is designed to reduce R/T and cockpit workload by allocating an SSR code which will be retained by the aircraft from take-off to touchdown. This helps controllers in forward planning, particularly in areas of radar data processing.

Each ACC is allocated two blocks of codes, one for internal flights (Domestic), and the other (ORCAM) for international flights. The code will

depend on the destination and will be retained throughout the flight within Participating Area, being transferred from centre to centre along the route.

a) Aerodrome Control Phraseology:

Aircraft: *Tower Lufthansa 135 request start-up.*
ATC: *Lufthansa 135 start-up approved, temperature + 8.*

These start-up requests should always be made by aircraft which intend to fly airways, as there may be unexpected delays. It's much better to postpone starting-up for a few minutes than waste fuel at the holding point. The phrase 'Start-up at your discretion', together with an expected departure time, may be used so that the decision is on the crew to start engines at a convenient time.

b) Aerodrome Control Phraseology:

Aircraft: *Amsterdam Ground KLM 153 request pushback.*
ATC: *KLM 153 pushback approved.*

Many airports have nose-in parking at the terminal to save apron space and to facilitate passenger handling. Aircraft have to be pushed backwards by a tractor into a position from which they can taxi for departure.

c) Aerodrome Control Phraseology:

Aircraft: *Tower Skybird 123 request taxi.*
ATC: *Skybird 123 taxi Charlie hold Runway 27 via the parallel taxiway, wind 240 at 12 knots, QNH 1008.*

Taxi instructions must always specify a clearance limit, which is the point where an aircraft must stop and ask for further permission to proceed. The limit is normally the holding point of the runway-in-use, but it may be an intermediate position. Many airports have complex taxiway systems and each significant section is given a letter, number, or alphanumeric. Some have such names as North West Taxiway, Parallel, Outer, Inner, and Loop.

The ideal is to establish a circular flow of taxying aircraft so that the ones just landed do not get in the way of those moving to the holding point. A refusal to give crossing clearance of an active runway is passed in the form : '*Iberia 123* ***hold short*** *Runway 27'*. Permission to continue is: ' *Iberia 123 cross RW 27* ***report vacated'***.

Now an aircraft is ready for departure and awaits permission from the Tower. If the runway is occupied by traffic which has just landed, the aircraft will be told to ' ***line-up*** ', the American equivalent being ' ***Taxi into position*** '. If there is traffic on final, the aircraft at the holding point may be told : ' Behind the 737 on short final, line-up behind '. Care must be taken that there is no possibility of confusion with another aircraft which may have just landed. Where a preceding aircraft is beginning its take-off roll, the second aircraft may be told: 'After the departing DC-9, line-up'. The use of the words 'cleared immediate take-off' means that the aircraft go without delay to leave the runway free for landing traffic. It is only to be used where there is actual **urgency**.

Here is the example of R/T phraseology with the landing aircraft:

d) Aerodrome Control Phraseology:

Aircraft: *DNK five miles east for landing.*
ATC: *DNK* ***join right hand downwind*** *RW 05, QFE 1004.*
or: *DNK cleared straight-in approach RW 27 QFE 1004.*
Aircraft: *DNK downwind.*
ATC: *DNK Number 2, follow the Cessna 150 on base.*
Aircraft: *DNK Number 2, traffic in sight.*
or
ATC: *DNK extend downwind, number 2 to a Cessna 150 4 miles final on radar approach.*
Aircraft: *DNK* ***wilco***.

Instructions to carry out a **missed approach** may be given to avoid an unsafe situation, such as when one aircraft is too close behind another on final.' *DNK* ***go around****, I say again, go around. Acknowledge '.*

Depending on local procedures, a departing aircraft will be retained on the tower frequency until it is clear of the circuit or changed to Approach immediately. Airways flights will be transferred to

the ACC just after take-off or as soon as they have been separated from any conflicting traffic by Approach or Departure Control.

When landing roll is completed, the arriving aircraft will be told to clear the runway in the following manner :

e) Aerodrome Control Phraseology

ATC: *DNK vacate left.*
or
ATC: *DNK taxi to the end, report runway vacated.*
or
ATC: *DNK take next right. When vacated contact Ground 121,7.*

The appropriate taxying instructions are then passed. Pilots may also be given their airborne and landing times by the tower. A further detail is defined as ' Essential Aerodrome Information' and refers to any obstruction or unserviceability which may affect operations. It is always prefixed ' **caution** ' and some examples follow:

f) Aerodrome Control Phraseology:

ATC: *Caution work in progress ahead north side of the taxiway.*
Caution large flocks of birds south of RW 27.

Ex. 174. Comprehension check:

1. What is the function of the Tower?
2. What is a manoeuvring area used for?
3. How can the Aerodrome Control be sub-divided?
4. What information is passed on Clearance Delivery frequency?
5. What kind of information is broadcast on ATIS frequency?
6. How is the traffic circuit divided?
7. What is the standard circuit-joining procedure?
8. What is an orbit?
9. What do you know about the vortex wake? Why may it be dangerous?
10. How can fuel burn be minimized on ground?
11. What is Slot Time?
12. What are SIDs designed for?
13. What is squawk?
14. Why does an SSR code reduce R/T workload?

Vocabulary Practice

Ex. 175. A: Decode abbreviations :

1.	**SSR**	secondary	……	radar
2.	**ATIS**	…… terminal……		service
3.	**VFR**	visual	flight	……
4.	**SID**	standard	……	departure
5.	**ILS**	……..	landing	system
6.	**PAR**	……..	approach	……
7.	**FIR**	flight	……	……
8.	**ATC**	……..	traffic	……
9.	**SAR**	search	and	……
10.	**VMC**	visual	……	……

B: Make up your own word combinations using abbreviations from section A:

Example: 1 - VMC conditions

1.	*conditions*
2.	flight plan
3.	boundary
4.	approach
5.	Alpha 3
6.	code
7.	team
8.	localizer
9.	information
10.	unit

Ex. 176. Find the English equivalents to the following.

1) условия выхода,
2) под радиолокационным контролем,
3) задержки не ожидается,
4) останавливаться перед рулежной дорожкой ,
5) устанавливать код ответчика,
6) входить в круг полетов,
7) вне поля зрения,
8) радионавигационная точка ожидания,
9) доложить на предварительном старте,
10) доложить на предпосадочной прямой,
11) занять исполнительный и ждать,
12) из-за спутного следа,
13) затягивать третий разворот,
14) записывать условия посадки,
15) получать инструкции по рулению,
16) срочный вызов,
17) на ваше усмотрение,
18) стандартная схема выхода,
19) вписываться в круг полетов на участке между 3 и 4 разворотами.

Reading

Ex. 177. A: Read and translate word combinations.

A country's air route system, to depend upon the complexity and size of the air space, to be located on or adjacent to an airport, to be fed with data, both verbal and electronic, to provide the fullest coverage of the route system, to co-ordinate passage from one sector to another, to separate aircraft using horizontal and/or vertical separation, by procedural methods or with the aid of radar, to have priority over other aircraft, to issue route clearances, by calculating in advance the time an aircraft will pass each reporting point along its route, to ensure that the required time separation from a preceding aircraft is being maintained, to be subject to local agreements between the ATC units concerned, to pass a 'release message'; to include callsign and type, point of departure, release point, ETA, and level at the terminal beacon or holding stack; to be made flexible to react to differences in the flow of traffic, to be downgraded to Advisory Route status, to assume the same responsibilities as air traffic control service in the avoidance of collisions, available information regarding the location of traffic in the area concerned may be of doubtful accuracy and completeness, in addition to issuing instructions to aircraft under control; to supply emergency assistance in the form of D/F, steers, and fixes; the provision of available information to VFR flights, concerning traffic and weather conditions along the intended route, to make operating under VFR impracticable.

B: Read Text "Area Control" paying attention to the way they are used in the context.

Text.

AREA CONTROL

Aircraft flying on a country's air route system are controlled from one or more Area Control Centres (ACCs). The number of such facilities depends upon the complexity and size of the air.space but the trend is towards reducing the number of ACCs and thus the amount of co-ordination necessary. ACCs are not necessarily located on or adjacent to an airport, although many are. They are fed with data, both verbal and electronic, from remote transmitter / receiver sites and radar aerials heads which are located to provide the fullest coverage of the route system.

For ease of operation the work of an ACC is divided into sectors, each having one or more radio frequencies. Sector boundaries are normally delineated by radio beacons or **en route reporting points**. In some states upper airspace has its own sector(s). In all cases the controllers work closely together to co-ordinate passage from one sector to another. The three types of sector control organizations are :

a) procedural control sectors where radar is not available;

b) procedural control sectors assisted by radar;

c) radar control sectors supported by procedural control.

The ACC's basic function is to separate aircraft using horizontal and / or vertical separation, either by procedural methods or with the aid of radar. Flight levels are assigned, as far as practicable, according to those requested in the Flight Plan. An aircraft already at cruising level will normally have priority over other aircraft desiring that cruising level. When two or more aircraft are at the same cruising level, the preceding aircraft usually has priority. The ACC issues route clearances based on the information in filed Flight Plans. These clearances are passed landline to the departure point. Some are complicated initial routes to establish on an airway, others are a simple Standard Instrument Departure (SID) designator and an SSR squawk.

Procedural separation (i.e. where radar is not available) is achieved by calculating in advance the time an aircraft will pass each reporting point along its route, based on its flight planned true airspeed and forecast winds at cruising level. The actual time over each reporting point is monitored by the controller and compared with the pre-calculated figure to ensure that the required time separation from a preceding aircraft is being maintained. Up to flight level 290, even levels are allocated to westbound flights and odds to eastbound. Above flight level 290, greater vertical separation is applied. A typical position report to the standard format is as follows: '*Speedbird 123 GUVAS at 15 Flight Level 310 estimate KOVIS 35 Recife next*'.

En-route aircraft are handed over to the next ACC along the route, the estimated time for the boundary being passed well in advance by telephone or other means such as HF radio. This transfer of control is subject to local agreements between the ATC units concerned, which are often in neighbouring countries. The accepting controller may require the aircraft at a higher or lower level because of conflict with existing traffic or, in exceptional circumstances, to hold at the boundary until the airspace is clear.

For aircraft landing within its airspace, an ACC passes a 'release message' to the approach control unit at destination. This information includes callsign and type, point of departure, release point, ETA, and level at the terminal beacon or holding stack. The release point is made flexible to react to differencies in the flow of traffic. It may be a position, time, or level. For example, if the release is '*passing Flight Level 50*', approach may not change the heading of the aircraft until he has received a '*passing FL 50*' report. The reason for this is that Area Control may have been separating the inbound aircraft from other traffic above FL 50.

Advisory and Flight Information Services

In less developed parts of the world, comprehensive area control will not exist and airways will be downgraded to Advisory Route

status. The aim is to make information on collision hazards more effective than it would be in the provision of flight information service. However, advisory service does not afford the same degree of safety and cannot assume the same responsibilities as air traffic control service in the avoidance of collisions. The reason for this is that available information regarding the location of traffic in the area concerned may be of doubtful accuracy and completeness. (Aircraft are entitled to fly IFR along advisory routes or cross them without contacting the ground station, but this is not good airmanship). To make it clear, advisory service does not issue clearances but only *advisory information* and it uses the words 'advise' or 'suggest' when an action is proposed to an aircraft.

IFR flights choosing to use the advisory service when operating within advisory airspace are expected to comply with the same procedures as those applying to controlled flights. However, it is for the pilot to decide whether or not he will comply with any advice or suggestions and notify the unit providing the advisory service of his decision without delay. A further complication is that some advisory routes may revert to full airway status when crossing a national or FIR / UIR boundary. Advisory airspace is administered by a Flight Information Centre (FIC), the Lusaka FIC in Zambia, for example. Sometimes it may be co-located with an ACC, such as the Christchurch ACC / FIC in New Zealand.

All ATC units provide a flight information service (FIS) in addition to issuing instructions to aircraft under their control. **FIS** is defined by ICAO as '*a service provided for the purpose of giving advice and information useful for the safe and efficient conduct of flights*'. It can take many forms including Sigmets, information on changes in the serviceability of navigation aids, and details of airfield runways affected by snow, ice, or significant depth of water. Also available weather conditions at departure, destination and alternate airfields are reported or forecast, as well as traffic information for aircraft operating in Airspace Classes C, D, E, F and G. Another example is the provision of available information to VFR flights concerning traffic and weather conditions along the intended route that are likely to make operating under VFR impracticable. Aerodrome Terminal Information Service (ATIS) is another form of FIS.

An extension of FIS in the USA is Flight Watch or EFAS (En Route Flight Advisory Service). Its nationwide frequency is 122.0 and as well as the normal information service it is able to supply emergency assistance in the form of D/F, steers, and fixes. Japan has a similar organization known as Aeronautical En Route Information Service (AEIS) using transmitter sites scattered throughout its territory.

Ex. 178. Comprehension check:

1. What ATC units control aircraft flying en route?
2. Why is the work of an ACC divided into sectors?
3. How are sectors boundaries delineated?
4. Name three types of sector control organizations.
5. Describe the ACC's basic function.
6. What is route clearance based on?
7. Define procedural separation. How is it achieved?
8. Why does an ATC controller need actual time over each reporting point?
9. What does a release message include?
10. What kind of information does advisory service issue?
11. When may an ADR revert to full airway status?
12. What is FIS? Name its forms.

Vocabulary

Ex. 179. Study new words **(Glossary 12)**

to assign (v) **assignment** (n)	[q'saIn]	**назначать, определять, назначение**	
		to assign duties; assigned flight level	распределять обязанности; подписанный эшелон
circumstances pl. (n)	['sq:kqmstqnsqs]	**обстоятельства**	
		force major circumstances; **under**/in particular circumstances; non-routine circumstances	чрезвычайные обстоятельства, состояние «форс-мажор»; **при** особых обстоятельствах; нештатные обстоятельства
en route reporting point (n)	[a:n rHt rIpLtIN poInt]	**пункт обязательного донесения (ПОД)**	
		obligatory/compulsory /mandatory reporting point	пункт обязательного донесения
ETA (Estimated Time of Arrival)	[J tJ 'eI]	**расчетное время прибытия**	
		ETD – estimated time of departure; EET – estimated elapsed time	расчетное время вылета; расчетное время полета до …
to monitor (v) **monitoring** (n)	['m0nItq]	**контролировать, прослушивать, контроль**	
		flight monitoring; monitor ATIS on …	1. контроль за полетом; 2. дистанционное управление ВС; прослушивайте АТИС на … частоте
position report		**доклад о пролете ПОДа**	
		to resume position reports; to omit position report	возобновлять доклады о местоположении; опускать доклады о местоположении
prior to (prep)	['praIq tu:]	**до (предшествующий)**	
		prior to departure	перед вылетом
priority (n)	[praI'0rItI]	**приоритет, преимущество**	
		priority for landing	преимущество на посадку
to release (v,n)	[rI'lI:s]	**разрешать, давать разрешение, отпускать**	
		to release the brake; hold for release	отпустить тормоза; ждите разрешения на вылет
to revert (to) (n)	[rI'vq:t]	**(зд.) возвращаться на предыдущую частоту (по радиосвязи)**	
to steer (v)	[stIq]	**направлять(ся)**	
		nose wheel steering	система управления передней стойкой
towards (prep)	[tq'w0:dZ]	**к, по направлению к**	
		towards the beacon	по направлению к маяку

Ex. 180. Read and translate instructions and questions:

1. Monitor ATIS on 121,3.
2. This aircraft has priority for landing.
3. You are closing towards the RW centreline.
4. What is your estimate for the next reporting point?
5. If contact with Approach is broken, revert to Tower.
6. What is your assigned flight level?
7. Under these circumstances all emergency services should be alerted.
8. Can you steer us to the nearest aerodrome?
9. Say again your ETA Pulkovo.
10. You will be directed to holding stack.
11. Adrenalin is released in moments of danger.
12. Heading 145° will steer you to the holding fix.

Ex. 181. Translate word combinations and use them in your own contexts:

Word Combination	*Translation*	*Your own contexts*
collision hazard	…… …….. ……..	
flight information	…… …….. ……..	
air traffic control	…… …….. ……..	
IFR flights	…… …….. ……..	
UIR boundary	…… …….. ……..	
weather conditions	…… …….. ……..	
emergency assistance	…… …….. ……..	

Ex. 182. A: Fill in the gaps with the correct prepositions where necessary.

1. ILS is ... ... use now. Make an NDB approach.
2. Hold short ... RW 12.
3. Taxi ... position RW 21 L.
4. Enter ... traffic circuit at 600 m.
5. Land ... your discretion.
6. Report ground ... sight.
7. Make an orbit ... your right ... delaying action.
8. Comply ... my instructions.
9. Contact Control ... 121,5.
10. Cleared to line ....
11. Is DC-9 ... final ... sight?
12. Prior ... departure perform cockpit check ... landing.

B: Scan the text again to check your answers.

Ex. 183. A: Read and translate these word combinations.
B: Think of the similar word combinations.

1. a 360 turn
2. a 5- minute flight
3. a 100-mile control zone
4. a two-person crew
5. a 3-mile taxiway
6. a 10-minute delay

Ex. 184. Think of antonyms to these words and word combinations.

Word Combination	*Antonyms*	*Word Combination*	*Antonyms*
Arrival RW		IFR flight	
Inner TW		To increase	
Local agreement		Straight-in approach	
Transmit mes-sage		Destination aerodrome	
Following aircraft		Outbound aircraft	

Ex. 185. Find the English equivalents to the following.

1) выдавать условия выхода,
2) иметь преимущество перед другим самолетом,
3) обеспечение воздушных судов, выполняющих полет по ПВП, имеющейся информацией о воздушной обстановке и погодных условиях вдоль предполагаемого маршрута полета,
4) система воздушных маршрутов в стране,
5) координировать пролет от одного сектора к другому,
6) заранее рассчитывая время, когда воздушное судно будет проходить пункты обязательного донесения по маршруту,
7) удостовериться в том, что выдерживается необходимый временной интервал от предыдущего борта,
8) разделять воздушные суда, используя вертикальное и/или горизонтальное эшелонирование,
9) подчиняться местным соглашениям между заинтересованными органами УВД,
10) включать позывной и тип ВС,
11) обеспечивать аварийную помощь в виде пеленгования,
12) расчетное время прибытия,
13) быть пониженным в статусе до Консультативного маршрута,
14) в дополнение к выдаче указаний воздушным судам, находящимся под контролем,
15) имеющаяся информация о воздушном движении в определенной зоне

Vocabulary Pre-teaching

Ex. 186. Study new words** **(Glossary 13)**

approach (n)	[q'prqutS]	**подход, заход**
to approach the airfield (v)		**подходить к аэродрому, заходить**
ILS approach	[aI qI qs]	**заход по ИЛСу**
NDB approach	[qn dJ bJ]	**заход по приводам**
another hand approach	[qnADq h x nd]	**повторный заход**
PAR approach	[pJ ar 'eI]	**заход по посадочному локатору**
SAR approach	[qs a:reI]	**заход по обзорному локатору**
standard approach	[st x ndqd]	**стандартный заход**
straight-in-approach	[streIt in]	**заход с прямой**
VOR approach	[vJ ou a:r]	**заход по ВОРу**
visual contact approach	['vIZuqI 'k0ntqkt]	**визуальный заход**
to carry out (v)	["k x rI 'aut]	**выполнять, осуществлять**
	to carry out the missed approach	осуществлять уход на второй круг
establish (v)	[Is'tabliS]	**устанавливать, входить в зону действия**
	to establish contact with	устанавливать связь с
	to be established on ILS	захватывать ИЛС
instead of (prep)	[In'sted 0v]	**Вместо**

separation (n)	["sepq'reIS(q)n]	**эшелонирование**	
		to provide separation; lateral/longitudinal separation; altitude separation; flow separation; own separation; to maintain own separation VMC	обеспечивать эшелонирование; боковое [поперечное]/ продольное эшелонирование; эшелонирование по высоте; разделение потока; эшелонирование по усмотрению пилота; самостоятельно выдерживать интервал, визуально
sequencing (n)	['sJkwqnsIN]	**создание очерёдности**	
		sequence of operation; approach sequence	последовательность выполнения операций; очередность захода на посадку
spacing (n)	['speIsIN]	**создание интервала**	
		for aircraft spacing	для создания интервала между воздушными судами
to vector (v, n) **(vectoring)**	['vektq]	**векторить, давать векторы, вектор, векторение**	
		radar vectoring to expect vecroring/ vectors	радиолокационное наведение (ВС), «векторение»; ожидать векторения

STANDARD EXPRESSIONS

Report established on ILS	доложите, когда войдёте в зону ИЛС
No delay expected	задержка не ожидается
Resume own navigation	следуйте расчётным курсом
Continue own navigation	продолжайте следовать расчётным курсом
Approaching glidepath	подходите к глиссаде
Returning to glidepath	возвращаетесь к глиссаде
Coming back to glidepath	возвращаетесь к глиссаде
Closing with track	выходите на посадочный курс
Unknown traffic 10 o'clock	неизвестный борт под 60° слева,
crossing left to right	пересекает слева направо,
moving fast	движется быстро
STAR	схема прибытия
EAT	ожидаемое время подхода (время выхода из зоны ожидания)

Aviation abbreviations to remember:

ATC	Air Traffic Control	Управление Воздушным Движением
ATM	Airspace and Traffic Management	Управление воздушным пространством и воздушным движением
CAVOK	Ceiling and Visibility OK	Погода хорошая
EET	Estimated Elapsed Time	Расчетное время полета до …
ETA	Estimated Time of Arrival	Расчетное время прибытия
ETD	Estimated Time of Departure	Расчетное время отправления
EAT	Expected Approach Time	Ожидаемое время начала захода (выхода из зоны ожидания)
ETO	Estimated Time Over	Расчетное время пролета
ILS	Instrument Landing System	Система посадки по приборам (КГС)
NOSIG	No Significant Changes	Без изменений
QFE	Question Field Elevation	Аэродромное давление
QNH	Question Nautical Height	Давление, приведенное к уровню моря
RW	Runway	ВПП (взлетно-посадочная полоса)
RVR	Runway Visual Range	Дальность видимости на ВПП
SAR	Search and Rescue	Поиск и спасание
SRA	Surveillance Radar Approach	Заход по (вторичному) обзорному локатору
SID	Standard Instrument Departure	Стандартная схема выхода (вылета)
STAR	Standard Terminal Arrival Route	Стандартная схема прибытия
TW	Taxiway	РД (рулежная дорожка)

Reading

Ex. 187. A: Read and translate word combinations.

To be the link between, to ensure IFR aircraft arrival in an orderly sequence, to direct VFR traffic to a position from which it can join the visual circuit without conflictions with IFR traffic, arriving aircraft operating outside controlled airspace; at a specified release point - a position, or level agreed on the telephone by the two controllers, the lowest vacant level at the aerodrome's terminal beacon, to establish an approach sequence in a manner which will facilitate the arrival of the maximum number of aircraft with at least average delay, a reasonable possibility of a successful landing, to realign the aircraft in the correct direction for the descent (a sector join), to help the pilot lock on the ILS beam by the shortest practicable route,a suitable point on the approach path marked by a radio beacon, to serve as a check point in timing successive approaches; to arrange traffic in line together with the correct spacing, particularly at airports, served by multiple holding stacks, to be authorized to ensure maximum utilization of the arrival runway, to give information by use of the 12 hour clock, due to departing traffic or a previous landing aircraft being slow to clear the RW, too close to traffic in front, a reasonable chance of seeing the approach lights and making a successful landing, to request avoiding action, a rapid action required to avoid risk of collision.

B: Read Text "Approach Control" paying attention to the way they are used in the context.

Text.

APPROACH CONTROL

Approach Control is the link between Area and Aerodrome Control, although in some parts of the world it may serve a large area in the absence of a proper Area Control service (Port Vila Approach in Vanuatu, South Pacific, for example). It ensures that IFR aircraft arrive in an orderly sequence and that VFR traffic is directed to a position from which it can join the visual circuit without conflictions with IFR traffic. Approach will have the first contact with arriving aircraft operating outside controlled airspace, and at very rudimentary airfields the Approach and Aerodrome services will be combined on a single frequency.

An arriving aircraft is transferred from Area to Approach at a specified release point, a position, or level agreed on the telephone by the two controllers before the aircraft comes onto the Approach frequency. Area will already have requested the lowest vacant level at the aerodrome's terminal beacon and cleared the aircraft to descend accordingly. Ideally, the arriving aircraft should be released in plenty of time to enable it carry out a straight-in approach and simultaneously lose height. However, should a busy traffic situation exist, it might be necessary to put it into the holding pattern based upon a radio beacon. The patterns are a standard oval 'racetrack' in the direction of turn and headings being published in navigation charts or approach plates. ICAO's guideline is to establish an approach sequence in a manner which will facilitate the arrival of the maximum number of aircraft with at least average delay. Priority will be given to aircraft in emergency, hospital flights, and certain other specific operations.

At airfields without radar, traffic is separated by procedural methods, the first aircraft making an instrument approach from, say 3,000 ft, aircraft continuing to hold above 1,000 ft vertical intervals. As soon as the first aircraft reports visual with the ground or approach lights, and there is a reasonable possibility of a successful landing, the second aircraft is cleared for the approach and so on. If the aircraft carries out a missed approach prior to becoming visual, it must climb to the safe terrain clearance altitude, in this example - 3,000 ft.

The **decision height** is the level at which the pilot on a precision approach must carry out a missed approach if he fails to achieve the required visual reference to continue the approach to a landing. A precision approach is defined as being provided by an ILS, or PAR facilities. All other procedures, i.e. NDB, VOR/DME, Localizer/ DME approaches, and SRAs, are non-precision and the term Minimum Descent Height is used instead.

The term **Expected Approach Time (EAT)** is often heard at non-radar equipped airports. This indicates to a pilot that if he has a radio failure he must not commence an instrument approach until this specific time to allow preceding aircraft to descend and land. '*No delay expected*' means that a pilot can begin his approach as soon as he reaches the beacon. If his estimate for the beacon is 12, the next aircraft's EAT will be 19, the third's 26, and so on. When necessary, EATs are passed to Area along with the lowest vacant level in the holding stack – so-called 'lowest and earliest'.

A standard seven minutes is assumed to complete let-down procedure and three minutes will be added to this if an aircraft arrives from certain points of the compass and has to realign itself in the correct direction for the descent (a sector join). The controller will calculate the figures and update them as necessary.

ICAO approve a Timed Approach Procedure which seems to be little used except in Japan. A suitable point on the approach path marked by a radio beacon serves as a check point in timing successive approaches. Aircraft are given a time at which to pass the specified point inbound. The time is determined in order to achieve the desired interval between landings on the runway while maintaining minimum separation at all times, including the period of runway occupancy.

Where Approach Radar is in use, the ACC also transfers radar identity in what is called a handover (a 'handoff ' to the Americans).

The Approach Controller is sure that the aircraft he is directing on his radar display is the correct one. The controller may pass headings (vectors) to the pilot to help him lock on the ILS beam by the shortest practicable route. If there is no ILS, a Surveillance Radar Approach (**SRA**) will be given or, when the weather is suitable, radar positioning to a visual final.

If a radar directed circuit is flown, the terms ***downwind***, ***base leg***, and ***final*** are used where necessary, although the area of sky covered is far bigger than in the normal visual traffic pattern.

A closing heading of 30° is recommended so that when the aircraft intercepts the ILS only a gentle turn is necessary to lock on. The aim is to intercept the standard 3° glide path at seven to eight miles out on the extended centreline of the runway. At this point the aircraft should be between 2,000 ft and 2,500 ft.

Subsequent landing aircraft are vectored not less than five miles behind, or further depending on the vortex wake category of the preceding traffic. Bigger gaps may also be built in to give space for departing traffic at single-runway airports. At certain locations reduction of the separation to three miles is authorized to ensure maximum utilization of the arrival runway. The wake turbulence rules still apply, of course. Great skill is needed to arrange traffic in line together with the correct spacing, particularly at airports, served by multiple holding stacks. Speed control is also used to even out the flow of traffic.
The Approach Controller passes an eight mile check to his colleague in the tower who will already have details of the arriving aircraft. If there are no departures at the RW holding point, a landing clearance may be given at this juncture, but it is more useful to give it at the four-mile range. Alternatively, once the pilot **reports established on the ILS**, Approach may tell him to contact the Tower who will give landing clearance when available.

Pilots expect to receive a landing clearance at about four miles on final approach, but this is not always possible due to departing traffic or a previous landing aircraft being slow to clear the RW. Two miles is the absolute minimum for large transport aircraft because a go-around is a very important operation. The phrase *'expect late landing clearance'* is sometimes heard because light aircraft in a busy circuit may receive it only on very short final. They may even be told to go around if they get too close to traffic in front.

For a runway not equipped with ILS the radar controller is normally able to offer a Surveillance Radar Approach. If the weather is poor this can be down to half a mile touchdown. This ensures a reasonable chance of seeing the approach lights and making a successful landing.

Precision Approach Radar (PAR) is nowadays confined mainly to military ATC but it is still in common use at civil airports in Russia to monitor ILS and other instrument approaches. PAR requires two radar displays, one showing the approach centreline in plan view, i.e. from above, and a second showing the glidepath from the side. Height as well as heading corrections can be provided by the controller. Standard phrases include : *'This will be a precision monitored ILS approach RW 27'*; *'Rate of descent is good'*; *'On glidepath'*; *'Slightly (or well) above below) glidepath'*; *'Still ... metres (or feet) too high (too low)'*; *'Coming back slowly to the glidepath'*.

General Approach Control Phraseology

An aircraft must be identified before it can receive a radar control or advisory service: in other words, the controller must be sure that one particular blip on his screen is the aircraft he is directing. This is simple with a radar handover from another ATC unit or by means of SSR.

a) Approach Control Phraseology:

ATC: *FGM report heading and flight level (or altitude).*
Aircraft: *FGM heading 140 at flight level 55.*
ATC: *FGM for identification turn left heading 110.*

The identification turn must be at least 30° different from the original heading. When the pilot reports steady on the new heading, and the controller is sure that he has related a specific blip on his screen with the aircraft, he transmits: '*FGM* ***identified*** *12 miles south of the field*'. The service is then added.

ATC: *Vectoring for an ILS approach runway* (designation).

The weather and pressure settings are then passed as a separate transmission.

If in the initial call the aircraft makes the turn requested and is still not observed on radar, perhaps because it is out of range, in weather clutter, or below cover, the controller will say: '*FGM* ***not identified. Resume (or continue) own navigation***'. D / F will be used to home the aircraft towards the airfield for radar pick-up. When identified, the aircraft will be vectored, i.e. given headings to steer to fit it into the approach sequence or, if the traffic is light, direct to final approach. Position checks are given at intervals ('*Five miles north of the airport downwind*') so that the pilot can maintain a mental picture of his geographical position and carry out the appropriate cockpit checks in good time. Outside controlled airspace the aircraft may be vectored around unidentified traffic. Information will be given by use of the 12 hour clock, **12 o'clock** being straight ahead, **3 o'clock** over the pilot's right shoulder, and so on. The distance and relative direction of movement is also given, together with any other information on speed, type of aircraft if known, etc. Typical traffic information is passed in this form: '*ABC123 unknown traffic 10 o'clock, five miles crossing left to right, fast moving* '.

If the pilot does not have the traffic in sight he may request avoiding action. Sometimes rapid action is required to avoid risk of collision: '*ABC123 avoiding action turn left immediately heading 110* °'. At locations with no radar, procedural methods are used. The same applies when radar is normally available but unserviceable or seriously affected by weather clutter.

On transfer from the ACC the first call will be something like this:

b) Approach Control Phraseology:

Aircraft: *Ostend Approach OTM descending to 3,500 ft, estimating ONO at 42.*
ATC: *OTM cleared for beacon approach RW 26 descend to altitude 2,500 ft QNH 1021. Report beacon outbound.*

Subsequent reports will be made when ' ***base turn complete*** ' and if the beacon is several miles out on final approach, a '*beacon inbound call* ' will be made as well. These standard calls help the tower controller to plan his traffic.

Where the airport is equipped with ILS, permission to make a procedural approach is given in the following way : '*FGM cleared for ILS approach RW 27, report beacon outbound QNH 1008* '.

Subsequent exchanges would be :

c) Approach Control Phraseology

Aircraft : *FGM beacon outbound.*
ATC : *FGM report established inbound.*
Aircraft: *FGM established ILS inbound.*
ATC: *FGM report outer marker* (or *report 4 DME*).
Aircraft: *FGM outer marker* (or *4 DME*).
ATC: *FGM contact Tower 118,1.*

In good weather, by day or night, even though nominally flying IFR, a pilot may request permission to make a visual approach. In this case the pilot must have visual reference to the surface, i.e. the ground or water, and the pilot must be sure that he will be able to complete landing visually. Standard separation continues to be applied between this aircraft and other departing and arriving traffic unless the pilots reports that he can see an aircraft ahead in the approach sequence and follow it down to the runway. During daylight hours only, IFR flights may be cleared to approach maintaining VMC and their own separation, if reports indicate that it is possible.

Busy airports with complex airspace often have a Departure Controller who deals only with departing traffic, separating it from inbounds before handling it over to Area. An Approach unit may also have responsibility for one or more subsidiary airfields whose close proximity makes overall control desirable. An example is Paris/Charles de Gaulle Approach which is responsible also for arriving and departing traffic at Le Bourget and Creil.

Holding Patterns and STARs

The most efficient way of delaying terminal traffic until it can be sequenced on to final approach has always been the holding pattern based on a radio beacon. Modern navigational aids make it possible to hold over an imaginary point. The standard hold is an oval or racetrack pattern with Rate one turns, i.e. 3° per second, taking four minutes to complete. The turns are normally to the right but some change above a certain flight level. A **holding pattern** is contained within a **holding area**, which allows a certain amount of inaccuracy due to wind effect, turning errors, and other variables. It also ensures that aircraft in adjacent patterns do not conflict. Generally speaking, the higher the holding level, the less accurate the indications from a radio beacon, which is why some holding patterns change direction above a certain level to avoid possible confliction.

In recent times there has been increased use of offset VOR /DME procedures. An offset VOR / DME pattern can be established either along an inbound radial to a VOR / DME or along an outbound radial. In both cases, a holding fix is located at a specified range along the designated VOR radial from the co-located DME. In order to hold on an inbound radial, the pilot flies towards the beacon on the designated inbound radial and on reaching the holding fix position carries out a procedure turn on the reciprocal outbound track. At the end of the outbound track, the pilot turns the aircraft to intercept the VOR radial back to the holding fix position.

So-called multiple entry procedures are used when routeing to an offset holding pattern from more than one direction. Standard Terminal Arrival Routes (STARs) are designed either towards or away from suitable VORs. The arrival tracks join the pattern at a holding fix, an intersection of the outbound track with the limiting DME distance, or at another designated position known as the routeing fix. The holding and routeing fix positions are usually given five-letter identifying designators. A typical STAR designator is the BLUFI Four Arrival at Miami.

Levels in holding patterns are assigned so as to permit aircraft to approach in their correct order. Normally, the first aircraft to arrive over a holding facility should be at the lowest level with following aircraft at successively higher levels. The first aircraft will descend from the lowest level of the holding stack and commence its approach when instructed. The second aircraft in the approach sequence may be told to descend to the level previously occupied by the first, after the latter has reported vacating it.

Traffic may also need to hold en route, perhaps because an adjacent ACC is not able to accept the flight immediately because of congestion. Except where otherwise instructed by ATC, holding en route is carried out on tracks parallel to the centreline of the airway, turning right at the reporting point. Whenever possible, pilots will be given a specific time at which to leave the reporting point and are expected to adjust the pattern accordingly.

Ex. 188. Comprehension check.

1. Why is Approach Control considered to be the link between Area and Aerodrome Control?
2. What does Approach Control ensure?
3. Where is an arriving aircraft transferred from Area to Approach Control?

4. When is it necessary to put the arriving aircraft into the holding pattern?
5. Where are holding patterns published?
6. Which aircraft is the priority given to?
7. How do you understand the term 'approach sequence'?
8. How is traffic separated at airfields without radar?
9. What is the decision height?
10. What is Expected Approach Time?
11. How long does it normally take to complete let-down procedure?
12. Describe a Timed Approach Procedure.
13. Find a synonym to the term ' a handover ' in Text 2.
14. Why does the controller pass headings to the pilot during approach? How is this procedure called?
15. What closing heading is recommended to intercept the ILS?
16. Where is minimum separation used? Name the figure.
17. Why is speed control used?
18. When does Approach Control transfer the arriving aircraft to Tower?
19. Give examples of Approach Control Phraseology.
20. What is STAR?

Vocabulary Practice

Ex. 189*. Fill in the chart to find the other parts of speech. Use your dictionary where necessary. Check the pronunciation.

NOUN	VERB	ADJECTIVE
1. assistance	*assist*	*assistant*
2. …	alter	…
3. division	…	…
4. …	prohibit	…
5. …	…	training
6. instruction	…	…
7. …	…	optimum
8. achievement	…	…
9. …	vacate	…
10. coordination	…	…

Ex. 190*. Form nouns from the verbs.

To achieve, to coordinate, to assist, to vacate, to prohibit, to alter, to complicate, to divide, to train, to obstruct, to transfer, to consider, to prevent, to continue, to report, to inform, to clear, to restrict, to refer, to warn, to instruct, to depend, to occupy, to release, to propose, to assume, to serve.

Ex. 191. Decode these abbreviations:

EAT	*Expected Approach Time*
SID	
NDB	
PAR	
ETA	
TMA	
SAR	
ILS	
STAR	

Ex. 192. A: Fill in the gaps with the correct prepositions where necessary.

1. Alerting the safety services … case … accident or emergency, as well as the reporting … pilots … any unserviceable navigational or lighting equipment are responsibilities of Tower.
2. The Ground Movement Control responsibility covers aircraft moving … the apron and aircraft and vehicles … the manoeuvring area except … runways and their access points.
3. To assist the controllers … monitoring the positions … traffic … the runways and taxiways many airports are equipped … ground movement radar … operations … bad visibility.
4. The pilot joins … the crosswind leg … the upwind end … the active runway, while watching … departing traffic.
5. Approach Control ensures that IFR aircraft arrive … an orderly sequence and that VFR traffic is directed … a position from which it can join … the visual circuit … conflictions … IFR traffic.
6. Before the aircraft comes … the Approach frequency, an arriving aircraft is transferred … Area … Approach … a specified release point, a position, or level agreed … the telephone … the two controllers
7. One way to achieve safely, if there is a circuit traffic, is to instruct the trainer to extend downwind leg until he has the arriving traffic … sight and then to follow … it.
8. Precision Approach Radar (PAR) is nowadays confined mainly … military ATC but it is still … common use … civil airports … Russia to monitor ILS and other instrument approaches.

B: Scan the text again to check your answers.

Ex. 193. Match aviation terms with their definitions.

Example: 3 – C.

1. **Decision height**	**a.** a preplanned instrument flight rule air traffic control departure procedure printed for pilot use in graphic and / or textual form to provide transition from the terminal to the appropriate enroute structure.
2. **Manoeuvring area**	**b.** An instrument approach wherein final approach is begun without first having executed a procedure turn.
3. **STAR**	**c.** a preplanned instrument flight rule air traffic control arrival procedure published for pilot use in graphic and / or textual form to provide transition from the enroute structure to an outer fix or an instrument approach fix / arrival waypoint in the terminal area.
4. **SID**	**d.** A specified altitude or height in the precision approach at which a

	missed approach must be initiated if the required visual reference to continue the approach has not been established.
5. **ATIS**	e. Is used to activate specific modes /codes /functions on the aircraft transponder.
6. **Squawk**	f. That part of an aerodrome to be used for take-off, landing and taxying of aircraft, excluding aprons'. In other words, the runways and taxiways whether paved or natural surfaced.
7. **Tower**	g. The continuous broadcast of recorded noncontrol information in selected terminal areas for improving controller effectiveness and relieving frequency congestion by automating the repetitive transmission of essential but routine information.
8. **IFR straight–in approach**	h. The beginning of that portion of the runway usable for landing
9. **Threshold**	i. The specified path to be flown by aircraft operating in the vicinity of an aerodrome.
10. **Aerodrome traffic circuit/ traffic pattern**	j. The basic ATC unit issues information to aircraft under its control to achieve a safe, orderly and expeditious flow of air traffic on and in the vicinity of the aerodrome with the object of preventing collisions between : a) aircraft flying in the traffic circuit around an aerodrome; b) aircraft operating on the manoeuvring area; c) aircraft landing and taking off; d) aircraft and vehicles operating on the manoeuvring area; e) aircraft on the manoeuvring and obstructions on that area.

Ex. 194. Find the English equivalents to the following.

1) давать информацию о положении воздушных судов, используя «часовую схему»,
2) быстрое действие, необходимое для избежания угрозы столкновения,
3) обеспечивать прибытие воздушных судов по ППП в определенной последовательности,
4) помочь пилоту захватить ИЛС наикратчайшим маршрутом,
5) значительная вероятность успешной посадки,
6) в аэропортах, где имеется большая очередь воздушных судов, находящихся в зонах ожидания,
7) из-за того, что вылетающий предыдущий борт слишком медленно освобождает ВПП,
8) слишком близко к борту впереди,
9) запрашивать обход,
10) возможность увидеть огни подхода и выполнить успешную посадку,
11) быть связующим звеном между,
12) прибывающие воздушные суда, маневрирующие вне контролируемого воздушного пространства,
13) на определенном рубеже передачи – в точке, на эшелоне, согласованном двумя диспетчерами по телефону,
14) точка на траектории подхода, отмеченная радиомаяком,
15) устанавливать очередность прибывающих воздушных судов таким образом, чтобы способствовать прибытию максимального количества бортов со средней задержкой.

Speaking: What makes a good pilot?

Ex. 195. A: Think of a list of a good pilot's Dos and discuss it in pairs then in your group:**
B: Think of your own list of a good pilot's Donts.

1. A good pilot should detect mistakes immediately after they occur.
2. It is necessary that … .
3. It is recommended that … .
4. It is imperative that good pilots … .
5. It is desirable that … .
6. It is important that … .
7. The proposal is … .
8. The demand is ...

- to cope, correct and compensate for the errors and failures immediately;
- to communicate the assessment of errors without delay to their crewmembers;
- to prevent the threat of existing or future errors;
- to anticipate errors;
- to stay mentally ahead of the aircraft;
- to exercise the character, strength and professional skills;
- to adapt readily to permanent changes in the performance requirements and environmental conditions of the profession.

Ex. 196. Role play.**

Choose three students who will be responsible for Aerodrome, Approach, and Area Control, while others will act as pilots. Give instructions and read them back according to ICAO standard phraseology.

On ground	*ATC:*
	Pilot:
After take off, climb	*ATC:*
	Pilot:
En-route flight	*ATC:*
	Pilot:
Descent	*ATC:*
	Pilot:
Holding	*ATC:*
	Pilot:
Landing approach	*ATC:*
	Pilot:
Landing	*ATC:*
	Pilot:
Vacating the RW	*ATC:*
	Pilot:

Ex. 197. Think of the best translation.**

ПРОФЕССИЯ ДИСПЕТЧЕРА УВД

Основной задачей специалиста УВД является четкое руководство движением всей совокупности воздушных судов, находящихся в его районе, секторе, для обеспечения безопасности и регулярности полетов. Диспетчер УВД должен постоянно анализировать воздушную обстановку, хорошо знать местонахождение летательных аппаратов, их скорость и высоту полета, маршруты следования, состояние аэродромов назначения и запасных аэродромов. Это позволяет диспетчеру грамотно и своевременно давать указания экипажам об изменении режима полета, рекомендовать в случае необходимости запасной аэродром, разрешать взлет или посадку. В процессе управления воздушным движением специалист УВД постоянно поддерживает связь с экипажами воздушных судов, передавая им управляющие команды и запрашивая у них необходимую информацию, связанную как с непосредственным управлением полетами, так и с планированием воздушного движения, его организацией и обеспечением.

Профессия диспетчера УВД ответственна и сложна. Работа по УВД требует от человека предельной собранности, решительности, умения четко работать в сложных условиях, то есть профессия диспетчера предъявляет высокие требования к психофизиологическим качествам человека. Для специалиста УВД важны такие качества, как устойчивость, распределение и легкость переключения внимания, так как одновременно диспетчеру приходится управлять несколькими воздушными объектами; отдавать команды в эфир и прослушивать переговоры своих коллег, работающих в смежных секторах, следить за экраном радиолокатора и вести необходимые записи.

Специалист УВД должен обладать хорошей оперативной памятью. В процессе УВД необходимо запоминать и передавать большое количество информации: позывные самолетов, эшелоны следования, курс, метеоинформацию (давление и температуру воздуха, направление и скорость ветра и др.). Кроме того, необходимо хорошо помнить инструкции и правила полетов, схемы маневров, летные характеристики различных типов самолетов, параметры географической среды и особенности технической оснащенности аэропортов.

Специалист УВД должен уметь прогнозировать воздушную обстановку на основании имеющейся информации о планах полетов, обладать развитым пространственным воображением, уметь быстро анализировать воздушную ситуацию, то есть предвидеть потенциальные конфликты и вовремя их устранять.

Специалист УВД должен обладать хорошей дикцией, так как речевой обмен информацией с экипажами воздушных судов, смежными органами УВД и другими наземными службами играет огромную роль в его/ее специальности. Диспетчер также должен обладать хорошим зрением и слухом. Он должен уметь выделить полезную информацию на фоне шумов. Кроме указанных выше качеств диспетчер УВД должен обладать таким важным для работы интегральным свойством, как нервно-эмоциональная устойчивость, т.е. способность сохранять хладнокровие и хорошую работоспособность в сложных условиях деятельности.

И, конечно же, диспетчер УВД должен уметь вести радиообмен на английском языке, на котором работает все мировое авиационное сообщество. Помимо знания и свободного владения стандартной Фразеологией радиообмена на английском языке, являющейся одним из компонентов Профессионально-ориентированного английского языка, диспетчер обязан владеть Общим английским языком на уровне Upper-Intermediate или на Рабочем уровне 4 ИКАО. Постоянное повышение / поддержание уровня своей языковой подготовки является одной из основных задач современного авиадиспетчера.

Ex. 198. Outline the pilot's main duties (refer to Ex. 197).**

APPENDIX

Aviation English Test

1. Choose the correct word

1. People dreamed of … like the birds from earliest of times.

A fly **B** flying **C** the flying

2. An aeroplane is a … vehicle.

A ground **B** "follow me" **C** flying

3. An air balloon is a …. craft.

A heavier-than-air **B** lighter-than-air **C** lighter-than-ground

4. In 1783 man left …. the ground for the first time.

A from **B** off **C** -

5. The Wright brothers made the first …. flights.

A controlling **B** controlled **C** uncontrolled

6. The monoplane "Spirit of St. Louis" had only a 220 … engine.

A horsepower **B** manpower **C** horsepowers

7. Modern planes can … hundreds of passengers.

A put **B** get **C** carry

8. Aircraft designers … the size and the speed of aircraft some years ago.

A have increased **B** increase **C** increased

9. Lately the … of passenger planes has been improved.

A data **B** characteristics **C** performance

10. The first … passengers were two birds and a sheep.

A airborne **B** aloft **C** airbridge

11. There are different kinds of flying vehicles: an air balloon, a glider, an airship and … .

A a submarine **B** an aircraft **C** a ship

12. Sikorsky designed his biplane in 1913, … he?

A did **B** wasn't **C** didn't

13. Who … a solo flight across the Atlantics?

A did make **B** made **C** was made

14. Airports differ in the type of traffic, the flight distribution and the way they … their passengers.

A service **B** control **C** care

15 …….are usually located on the arrival and departure floors.
A shares **B** concourses **C** landsites

16. When flying abroad passengers should go through the … after the check-in.
A meeting point **B** jetty **C** passport control

17. Things lost in the airport or left on a plane can be found in the …
A customs control **B** lost property office **C** tourist bureau

18. Passengers can pick up their luggage in the … .
A security section **B** car rentals **C** baggage reclaim area

19. In case a person needs doctor's consultation he should go to a …
A medical center **B** nursery **C** health control

20. In some airports travel … can be bought from machines.
A catering **B** insurance **C** influx

21. The desired accommodation ... … … at the hotel reservation desk.
A can be book **B** can book **C** can be booked

22. Information … your flight is displayed on the flight information
A about, board **B** on, counter **C** about, hold up

23. Flight number 783 is … due to bad weather.
A intended **B** influenced **C** cancelled

24. Passengers usually … to the airport two hours before departure.
A are come **B** are coming **C** come

25 … are used for take off and landings.
A clearways **B** runways **C** stopways

26. Before lining up the aircraft must stop at the … .
A holding point **B** threshold **C** stopway

27. The area where aircraft stop in case of abandoned take off is a ….
A safety strip **B** stopway **C** stopbar

28. …. provides ATC services to aircraft operating in the vicinity of the airport or on the movement area.
A tower **B** information **C** ground

29. The area used for the aircraft loading and unloading is called
A blast fence **B** load area **C** ramp

30. There are many planes in the … of the aerodrome.
A vicinity **B** visibility **C** aids

31. What is the passenger … of the TU-204 aircraft?
A capacity **B** ability **C** capability

32. … allows aircraft to turn off at higher speeds than on other exit taxiways.

A taxisrip **B** high-speed turnoff **C** holding bay

33. Where is the compass …?

A stand **B** base **C** area

34. Passenger luggage … in the luggage compartment during flight.

A is kept **B** is keeped **C** kept

35. Catering is delivered into the plane through the … .

A hatch **B** service door **C** emergency door

36. The aircraft is controlled in three axes; roll, pitch and … .

A steering **B** heading **C** yaw

37. Flight crew … the aircraft from the cockpit.

A controlling **B** controls **C** is controlled

38. Flaps form the … edge of the aircraft.

A leading **B** extending **C** trailing

39. Rudder and elevator are located on the … .

A tail wheel **B** tail unit **C** wing tip

40. The conventional aircraft consists of five main parts: the wing, the fuselage, the tail assembly, the landing gear and the … .

A APU **B** power supply **C** power plant

41. … are used during descent in flight and landing run.

A spoilers **B** fin **C** ailerons

42. The landing gear is retracted in the air and extended before landing in order to reduce … .

A thrust **B** drag **C** weight

43. How long … … … to remain on the ramp?

A must we **B** do we have **C** should we

44. What is the fuel … of this aircraft?

A consumption **B** waste **C** use

45. The aircraft was … by the controller.

A tuned **B** identified **C** adjusted

46. The Airbus will … the first 100 m of the RW.

A overshoot **B** overfly **C** overtake

47. You are cleared to make … approach.

A RVR **B** RMI **C** SRA

48. I cannot read you due to … .

A	intercommunication	**B**	intermittent	**C**	interference

49. Radial is the magnetic .. .

A	track	**B**	bearing	**C**	course

50. Due to distortions change to the … frequency.

A	secondary	**B**	present	**C**	cancelled

51. Information for you: abrupt … was reported on final approximately at 300 m.

A	windscreen	**B**	wind shear	**C**	windshield

52. You are cleared to detour … the thunderstorm activity 20 miles right of the route.

A	around	**B**	across	**C**	along

53. The sky is obscured. It's .. .

A	broken	**B**	overcast	**C**	scattered

54. Be informed of … conditions en route.

A	hazardous	**B**	heavy	**C**	frequent

55. Heavy icing … … between 3.000 and 5.000 m.

A	was observing	**B**	observed	**C**	was observed

56. I am unsure of my position. We haven't … GPS yet.

A	tuned	**B**	updated	**C**	improved

57. Proceed via … route 16.

A	advisory	**B**	additional	**C**	advising

58. Search and .. service was alerted one hour ago.

A	recent	**B**	rescue	**C**	resolve

59. VFR flights are not … in Class A airspace.

A	catered	**B**	accessed	**C**	authorized

60. Report avoidance action …. .

A	completed	**B**	will be complete	**C**	will complete

61. Did you … all passengers' safety?

A	prohibit	**B**	notify	**C**	ensure

62. When you … the Scottish FIR boundary contact London Control on 125,3.

A	will pass	**B**	pass	**C**	passing

63. The aircraft … … … according to ETA if there … … an opening on clouds.

A	would have landed, had been	**B**	has landed, will be	**C**	had landed, would have been

64. Aircraft accidents result … losses of vital resources, namely people and equipment.

A in **B** to **C** at

65. ATC controllers … the flow of traffic.

A accomplish **B** apply **C** regulate

66. Is it possible to …. this step down procedure?

A simply **B** simplify **C** simplificate

67. The aircraft … … on westbound leg of approach.

A was identificated **B** was identification **C** was identified

68. What is this beacon … ?

A designate **B** designator **C** designating

69. Each pilot should be trained to manage risk ... order to keep all situations .. control.

A in, under **B** with, in **C** on, under

70. His pilot's license hasn't been … for two weeks.

A A evaluated **B** value **C** valid

71. The … mode of transponder provides altitude readout.

A B **B** A **C** C

72. A plane flying behind a jet … to avoid wake turbulence.

A has **B** must **C** have

73. .. clouds cover less than half the sky.

A scattered **B** overcast **C** obscure

74. … are followed when a plane is navigated using instruments only.

A VFR **B** IFR **C** IMC

75. A specified area within or over which there may exist activities constituting a potential danger to aircraft is a … .

A hazardous area **B** prohibited area **C** restricted area

76. … time 16.30. Start up at your discretion.

A take off **B** slot **C** airborne

77. If the fog … … thicker then the aircraft … … … a TV mast.

A hadn't got, wouldn't have struck **B** wouldn't got, had struck **C** hasn't' got, will not strike

78. The aircraft had to .. fuel in order to lose weight.

A lose **B** burn **C** spare

79. The plane lost altitude due to wake turbulence of the … aircraft.

A	following	**B**	adjacent	**C**	preceding

80. The aircraft in distress has … for landing.

A	queue	**B**	sequence	**C**	priority

81. The aircraft … on radar when it … for RW 04.

A	lost, approached	**B**	was lost, was approaching	**C**	is losing, approached

82. VDA 035 is approaching … the field from North.

A	to	**B**	-	**C**	for

83. If we cannot land at our destination we will proceed to the … .

A	alternating	**B**	alternative	**C**	alternate

84. A holding … is contained within a holding … , which allows a certain amount of inaccuracy due to wind effect, turning errors, and other variables.

A	pattern, area	**B**	area, pattern	**C**	stack, pattern

85. In recent times there … increased use of offset VOR/DME procedures.

A	is	**B**	was	**C**	has been

86. The aims of … for all aircraft operations are: increased profit, schedule reliability, user selected flight profiles, reduced separation.

A	CFIT	**B**	CNS/ATM	**C**	CRM

87. The implementation of this system … the opportunity to apply vast knowledge about human factors to provide safety.

A	is renew	**B**	renews	**C**	news

88. To ensure global … of regional AFTM systems as a part of an integrated ATM system, standardization of functionality is required on a worldwide basis.

A	compatibility	**B**	cost	**C**	capacity

89. Tower issues information to aircraft under its control to achieve a safe flow of air traffic on and in the vicinity of the aerodrome with the object of preventing ... between aircraft.

A	gaps	**B**	collisions	**C**	meetings

90. The much publicized "free flight" concept of the USA is one example of the drive toward more … of flight.

A	autonomy	**B**	automation	**C**	control

91. Pilots follow .... procedure if they fail to continue approach.

A	standard arrival	**B**	missed approach	**C**	approach

92. ... is intended to provide current, routine information to arriving and departing aircarft by means of continious and repetitive broadcasts throughout the day or specified portion of of the day.

A ATIS **B** CNS **C** CTA

93. The time at which the pilot estimates that the aircraft will come to its destination is .... .

A ETD **B** EAT **C** ETA

94. Any area of land or water designed, equipped and prepared for the landing and take-off of aircraft is an ... .

A airfoil **B** aerial **C** aerodrome

95. ... is a control area or part of a control area established in the form of a corridor equipped with radio navigation aids.

A airway **B** approach **C** airborne

96. The direction in which the longitudinal axis of an aircraft is pointed usually expressed in degrees from North is .... .

A heading **B** course **C** way

97. ... altitude/height is a specified altitude / height at which pilots must initiate a missed approach if they fail to establish visual contact with ground.

A deciding **B** decision **C** decisive

98. Two minutes ago the aircraft ... speed due to wind shear on final.

A has lost **B** is lost **C** lost

99. ... is the vertivcal distance of a level or an object considered as a point, measured from mean sea level.

A altitude **B** height **C** flight level

100. What was the reason for emergency landing?

A were **B** was **C** are

1 B	**2 C**	**3 B**	**4 C**	**5 B**
6 A	**7 C**	**8 C**	**9 C**	**10 A**
11 B	**12 C**	**13 B**	**14 A**	**15 B**
16 C	**17 B**	**18 C**	**19 A**	**20 B**
21 C	**22 A**	**23 C**	**24 C**	**25 B**
26 A	**27 B**	**28 A**	**29 C**	**30 A**
31 A	**32 B**	**33 B**	**34 A**	**35 B**
36 C	**37 B**	**38 C**	**39 B**	**40 C**
41 A	**42 B**	**43 B**	**44 A**	**45 B**
46 A	**47 C**	**48 C**	**49 B**	**50 A**
51 B	**52 A**	**53 B**	**54 A**	**55 C**
56 B	**57 A**	**58 B**	**59 C**	**60 A**
61 C	**62 B**	**63 A**	**64 A**	**65 C**
66 B	**67 C**	**68 B**	**69 A**	**70 C**
71 C	**72 A**	**73 A**	**74 B**	**75 A**
76 B	**77 A**	**78 B**	**79 C**	**80 C**
81 B	**82 B**	**83 C**	**84 A**	**85 C**
86 B	**87 B**	**88 A**	**89 B**	**90 A**
91 B	**92 A**	**93 C**	**94 C**	**95 A**
96 A	**97 B**	**98 C**	**99 A**	**100 B**

Test evaluation criteria:

100 – 91 (correct answers) = excellent (5)
90 – 76 (correct answers) = good (4)
75 – 60 (correct answers) = satisfactory (3)

English – Russian Dictionary

A

access	доступ, подход, проход	103
accessories	вспомогательное оборудование	21
to accomplish	выполнять, завершать	103
accurate	точный	87
to activate	задействовать	11
adjustment	регулировка	87
to adopt	принимать	103
advisory service	консультативное обслуживание	103
aerial antenna	антенна	87
aid	помощь, средство	48
aileron	элерон	11
air space (controlled / uncontrolled	воздушное пространство (контролируемое/ неконтролируемое)	103
aircraft	воздушное судно	5
airfoil	аэродинамическая поверхность	5
airframe	планер	21
airway	воздушная трасса	103
alert	бдительный, настороже	67
to alert	объявлять тревогу, поднимать по тревоге	67
to align	совмещать, согласовывать	48
to allocate	отводить, предназначать	103
alternate	запасной аэродром	76
altitude	высота (по давлению, приведенному к уровню моря)	5
to amend	дополнять, изменять	76
amount	количество	21
angle of attack	угол атаки	5
to anticipate	предвидеть, предвосхищать, ожидать	62
to apply	просить, применять, прилагать	5
appropriate	соответствующий	103
approximately	приблизительно, примерно	48
APU (auxiliary power unit)	ВСУ (вспомогательная силовая установка)	35
area (control area, control zone)	зона, район, область (контрольная зона)	103
to assess	давать оценку, оценивать	76
to assume	принимать, предполагать, допускать	103
attitude	положение в пространстве	5
authority	власть, полномочный орган	103
available	имеющийся в наличии, располагаемый	76
average	средний	62
to avoid	обходить, избегать	87
axis (pl. axes)	ось	11

B

beacon	привод, радиомаяк	88
bearing	пеленг	88
bleed air	отбираемый воздух	35
blip	засветка, метка	88
boom	балка, штанга	21
booster pump	насос подкачки	35
boundary	граница (зоны)	67
broken	разорванный	76
bump	болтанка	62
burn out, burn off	вырабатывать	35
bus bar	шина элетропитания	35

C

callsign	позывной	88
calm	тихий, спокойный	48

to cater	снабжать, поставлять, обслуживать	103
to cause	вызывать, являться причиной	5
caution	предупреждать, предостерегать	22
cell	очаг (грозы)	67
centrifugal	центробежный	48
changeover point (waypoint)	зд. ППМ (поворотный пункт маршрута)	88
to charge	заряжать	35
chart	карта, схема	88
circuit breaker	АЗС (автомат защиты сетей)	35
clear air turbulence (CAT)	турбулентность ясного неба	76
clearance	разрешение (диспетчерское)	104
climb	набор высоты	5
to collide	сталкиваться	48
to comply with	выполнять, подчиняться	104
condition	условие, состояние	11
conducive	способствующий, благоприятный	67
to confirm	подтверждать	88
connector	разъем	35
continuous	непрерывный	88
controls	органы, рычаги управления	5
contact	установить связь с …	118
conventional	условный	22
to counterbalance	уравновешивать	5
course, track	путевой угол	11
coverage	зона действия, покрытия	88
cowling	кожух	22
crosswind	боковой ветер	62
to counterbalance	уравновешивать	5
crust (ice-crusted)	корка (покрытый льдом, обледеневший)	67
current	поток, текущий	48

D

damage (n, v)	повреждение	35
to damper	гасить	11
danger area (hazardous area)	опасная зона	104
to decelerate	замедлять, тормозить	5
decision height	высота принятия решения (ВПР)	89
density	плотность	48
descent	снижение	5
designator	указатель, обозначение	104
destination	аэродром назначения	76
to deteriorate	ухудшаться	76
to determine	определять	48
dew point	точка росы	67
differential pressure	перепад давления	49
dip stick	мерная линейка	35
directional gyro	гироагрегат	49
disaster	катастрофа (природная)	62
to discharge	разряжать, выпускать, стравливать	35
to displace	смещать	11
to dissipate	рассеивать	67
to disturb	нарушать, беспокоить	62
downward	направленный вниз, нисходящий	6
drag	лобовое сопротивление	6
drain plug	сливная пробка	35
drift	снос	49
to drift	сносить	49
drizzle	морось	67
to "drop in "	проседать (о ВС)	62

E

eddy	завихрение	62
edge	край, кромка	22
elevator	руль высоты	11
to eliminate	устранять	49
embedded	замаскированный	76
to encounter	встретиться, натолкнуться	49
to enhance	увеличивать, усиливать, повышать	49
to ensure	гарантировать, обеспечивать	104
entire	целый, полный	11
error	ошибка, погрешность	49
to establish	устанавливать	132
excessive	избыточный	22
to expand	расширяться	35
to expect	ожидать	76
to explode	взрывать(ся)	62
to extend	простираться, удлинять, затягивать, выпускать (шасси, механизацию крыла)	11
extent	степень (выраженности явления)	76

F

to facilitate	способствовать, облегчать	104
to fail	отказывать	35
failure	отказ	36
fairing	обтекатель, зализ	22
favourable	благоприятный	49
fibrous	волокнистый	67
fight path	траектория полета	6
to file	заполнять, подавать документы	104
final (on final)	предпосадочная прямая	118
FIR (flight information region)	РПИ (район полетной информации)	104
fix	РНТ – радионавигационная точка	89
flat	пологий, плоский, ровный	12
fluctuation	колебание	89
forward	направленный вперед	6
frequency	частота	76
fuel transfer pump	топливный насос перекачки	36
to furnish	подавать, поставлять	36
fuse	предохранитель	36

G

to gain	набирать (высоту, скорость)	6
galley	бытовое оборудование, кухня	36
gauge	манометр	36
glide path	глиссада	89
go around	уходить на второй круг	118
gravity	сила тяжести	6
gust	порыв ветра	62

H

hail	град	67
to handle	обращаться, иметь дело	104
heading	курс (текущий, фактический)	12
headwind	встречный ветер	62
heat exchanger	теплообменник	36
hinge	шарнир	22
to hold	ждать	89
holding pattern	схема полета в зонаеожидания	89
holding point	предварительный старт	118
holding stack	очередность полетов в зоне ожидания	89
to home	наводить, выводить	89
humidity	влажность	67

I

to identify	опознавать	89
IFR (instrument flight rules)	ППП (правила полетов по приборам)	104
imaginary	воображаемый	12
to impose	налагать, накладывать навязывать, налагать, возлагать	104
inbound	приближающийся, на подходе	89
to incline	наклонять	49
inclinometer	угломер	49
to increase	увеличивать	6
inner marker	ближний привод	89
to install	устанавливать	36
instead of	вместо	132
instrument, indicator	прибор, указатель	49
to interfere	вмешиваться, создавть помехи, мешать	67
interference	помехи	67
to interrogate	запрашивать	89
to intersect	пересекаться	12
intersection	перекресток	12
to invert	перевертывать, переворачивать	12
to issue	выпускать	77

L

landing gear	шасси	22
landmark	наземный ориентир	67
lane (entry, exit)	входной/ выходной коридор	104
lateral	поперечный, боковой	12
latitude	широта	89
layer	слой	62
leak	утечка	49
leeward	подветренный (с подветренной стороны)	62
let-down procedure	процедура снижения	89
lift	подъемная сила	6
lightning (strike)	молния (удар молнии)	67
line-up (taxi-into-position)	исполнительный старт	118
linkage	проводка системы управления	36
load		22
longitude	долгота	89
longitudinal	продольный	12
to lubricate	смазывать	36

M

magnitude	величина	6
maintain	выдерживать, сохранять	6
manually, in manual mode	вручную, в штурвальном режиме	69
master switch	основной выключатель	36
to measure	измерять	36
message	сообщение	77
mid-air collision	столкновение ВС в воздухе	50
middle marker	средний привод	89
missed approach	неудачный заход, уход на второй круг	118
mist	дымка	67
mode	режим работы	89
moisture	влага	50
to monitor (v), monitoring (n)	контролировать, прослушивать (контроль)	129
motion	движение	6
mountain waves	горные волны	62

N

nacelle	мотогондола	22
natural surfaced	грунтовая	119
non-directional	ненаправленный	90
nosewheel steering	система управления передней стойкой	36
to notify	уведомлять, извещать	104

O

obscure	неясный, смутный, неотчетливый	67
observation	наблюдение	77
obstacle, obstruction	препятствие	50
obvious	очевидный	12
odd	нечетный	118
omnidirectional	всенаправленный	90
orbit (a three-sixty turn)	вираж	119
original	исходный	12
oscillation	колебание	12
outbound	удаляющийся, на удалении	90
outer	внешний	22
outer marker	дальний привод	90
output	выход	36
overcast	затянутый облаками	68
overload	перегрузка	36
to overshoot	перелетать	90

P

particle	частица	68
path (flight path)	тропа, дорога (траектория полета)	6
paved	бетонированная	119
peculiar	особенный, свойственный чему-либо	104
to penetrate	проникать	104
performance	летно-технические характеристики	7
pertinent	относящийся к	104
pitch	тангаж	12
Pitot tube	приемник полного давления (ППД)	36
plane	плоскость	12
pointer	стрелка прибора	50
power setting	режим работы двигателей	7
to precede	предшествовать	77
precession	прецессия	50
precipitation	осадки	68
precisely	точно	50
to predict	предсказывать	63
to pressurize	герметизировать	36
prevailing	превалирующий	77
prior to	до (предшествующий)	129
priority	приоритет, преимущество	129
prohibited area	запретная зона	104
property	свойство	12
to provide	обеспечивать	22
proximity	близость, соседство	105
pulley	шкив, ролик	37
pulse	импульс	90
pushback	буксировка хвостом вперед	119

R

radial	радиал, магнитный пеленг	90
range	расстояние, дальность, диапазон, маяк	50
rapidly	быстро	119
rate of charge	зд. скорость заряда	37
ratio	соотношение	63
rearward	направленный назад	7
receiver	приемник	90
receptacle	розетка	37
reciprocal heading	обратный курс	133
reference	контрольная точка, начало отсчета, ссылка	50
to release (v.n.)	разрешать, давать разрешение, отпускать	129
to reply	отвечать	90
to request	запрашивать	77
to require	требовать	12

rescue	спасение	105
to reset	возвращать в исходное состояние	37
to restore	восстанавливать	13
to restrict	ограничивать	37
restricted area	зона с ограничением режима	105
to retard	задерживать	7
to retract	убирать	22
to reverse	изменять в обратную сторону (реверсировать)	68
to revert	возвращаться (в прежнее состояние)	129
ridge	гребень	63
roll	крен	13
to rotate	вращать	7
route	маршрут	77
rudder	руль направления	13
RW-in use (active RW)	рабочая ВПП	119

S

to saturate	насыщать	68
to scatter	разбрасывать	68
scattered	рассеянный	68
search	поиск	105
sediment	осадок топлива	37
separation	эшелонирование	133
sequencing	создание очередности	133
severe	сильный	22
shallow	поземный, стелющийся	77
to shut down	выключать двигатель	37
simultaneous	одновременный	13
slant range	наклонная дальность	50
slide rule	штурманская линейка	90
slope	уклон	68
slot time	промежуток времени, временное окно, согласованное время вылета	119
snowplow (plough)	снегоочиститель	68
spacing	создание интервала	133
specific	определенный	78
squawk	передавать сигнал радиоответчика	119
stability	устойчивость	13
to stall	сваливаться (о самолете)	22
static port	приемник статического давления	37
steady	устойчивый	90
steep	крутая (о траектории)	22
to steer	направлять(ся)	129
to step down	уменьшать число, объем, понижать	105
strainer	фильтр	37
strength	прочность	22
stress	напряжение (в конструкции)	22
subject to	подверженный чему-либо	105
to substitute	заменять	63
sump	отстойник	37
to support	поддерживать	22
surface wind	ветер у земли	63

T

tailwind	попутный ветер	63
take off power	взлетный режим двигателей	50
taxiway (inner, outer, loop)	РД (внутренняя, внешняя, кольцевая)	119
threat	угроза	68
thrust	тяга	7
thunder	гром	68
TMA (terminal control area)	узловой диспетчерский район	105
torque	крутящий момент	7
towards	к, по направлению к	129
towering	башенкообразный	78
traffic circuit (pattern)	круг полетов	119

to transfer (v. n.)	(зд.) передавать (управление движением	119
transmitter	передатчик	90
transponder	ответчик	90
to trim	триммировать	37
trim tabs	триммер	37
to tune	настраивать	90
to twist	изгибать, сворачивать, скручивать	7

U

to update	обновлять	78
updraft (upwash)	восходящий поток воздуха	68
upward	направленный вверх, восходящий	7
urgency (urgent)	срочность (срочный)	119

V

valid	действительный (в силе)	78
valve	клапан	37
vapor (vapour)	пар	68
to vector (v), vectoring (n)	давать векторы (вектоpение)	133
to veer	отклоняться (от курса)	63
velocity	скорость	50
vent	дренажное или вентиляционное отверстие	37
vertical gyro	гировертикаль	50
VFR (visual flight rules)	ПВП (правила визуальных полетов)	105
vicinity (in the vicinity of)	район (в районе, в окрестностях)	78
volume	объем, масштаб, громкость	105

W

wake turbulence	турбулентный след, спутная струя	119
to waste	расходовать, тратить	119
wedge	клин	68
weight	вес, масса	7
wind shear	сдвиг ветра	63
wind sock	ветроуказатель, флюгер	63
windward	надветренный	63
wing area	площадь крыла	7
wing span	размах крыла	7
wingtip	законцовка крыла	13
wiring	электропроводка	37

Y

yaw	курс	13

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