# Aeronautical Information Circular

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REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU
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AUTORIDADE DE AVIAÇÃO CIVIL
CIVIL AVIATION AUTHORITY

**AERONAUTICAL INFORMATION SERVICE**

AIC
B
No: 03/23
Date: 01 May 23

SUBJECT: ***Flight Crew Licence Written Examinations Policy and Syllabus***

1. In accordance with paragraph 3(1)(c) and paragraph 4(b) of the Eighth Schedule of the Air Navigation Regulation of Macao, a person applying for the grant of an Air Transport Pilot License (ATPL) or applying for the conversion of a flight crew license on the basis of a valid similar licence granted by other competent civil aviation authorities is required to pass such examinations as deemed necessary by the AACM.

***Examination Subjects***

2. A person who holds a Macao Commercial Pilot License (CPL) and wishes to apply for **the grant of an ATPL** is required to pass written examinations on the following subjects:

   - *Air Law*
   - *Aircraft General Knowledge I (Airframe, systems and power plant)*
   - *Aircraft General Knowledge II (Instrumentation)*
   - *Flight Planning*
   - *Flight Performance*
   - *Mass and Balance*
   - *Human Performance*
   - *Meteorology*
   - *Principles of Flight*
   - *Navigation*
   - *Operational Procedures*

3. A person who wishes to apply for **conversion of an ATPL** is required to pass written examinations on the following subjects:

   - *Air Law*
   - *Flight Performance*
   - *Flight Planning*
   - *Human Performance*
   - *Meteorology*

4. A person who wishes to apply for **conversion of a CPL** is required to pass written examinations on the following subjects:

   - *Air Law*

5. Detailed examination syllabus can be found in the attachment to this AIC.

***Pass Marks***

6. Examination results are assessed as either 'Pass' or 'Fail' and are normally published within 2 working days after the examination date. Results are either dispatched by post or available for personal collection from the AACM upon request. Examination results will not be disclosed over the telephone.

7. The pass mark for each subject is 70% except for Air Law, which is 80%.

***Attempt Cycles – Written Examinations for the Grant of an ATPL***

8. ATPL written examinations are based on a system of three attempt cycles. Whenever a candidate fails **the third** attempt of any examination section, the next attempt of that particular section will only be allowed after 3 months following the third attempt, unless otherwise determined by the AACM.

9. ATPL written examination is divided into four papers each consists of a number of sections. For the initial attempt of any paper, all sections of that paper must be undertaken. If the applicant fails any examination section(s) of the paper, he/she needs to re-sit for the failed section(s) of that paper only.

***Attempt Cycles – Written Examinations for Conversion of ATPL and CPL***

10. Conversion written examinations consist of one exam paper and are based on a system of three attempt cycles. Each cycle must be completed within 6 months ("6-month cycle") from the day of the first attempt. If the candidate fails the paper but achieves a pass for certain sections, he/she will be credited for the section(s) passed within the current cycle. A candidate must sit for all outstanding sections of the exam paper in each attempt.

11. Within the 6-month cycle, the candidate will be subject to a barred period of 3 months during which he/she will be barred from re-sitting any examination, should:

    (i) He/she fail to pass any examination section within three attempts. In such case, the barred period counts from the day of the 3rd attempt; or

    (ii) He/she for any reasons fail to complete all required examination sections of the paper. In such case, the barred period counts from the end of the 6-month cycle.

    In either case, the candidate will be required to re-sit the whole paper in the next attempt cycle after the barred period.

*Example: ATPL(A) conversion written exam*

| *CYCLE 1 (6 months)* | | |
|---|---|---|
| Attempt 1 | Attempt 2 | Attempt 3 |
| Air Law - **PASS** | Air Law – ***CREDIT*** | Air Law – ***CREDIT*** |
| Meteorology- FAIL | Meteorology - **PASS** | Meteorology - ***CREDIT*** |
| Human Performance- FAIL | Human Performance- FAIL | Human Performance & Limitations - **PASS** |
| Flight Planning- FAIL | Flight Planning- FAIL | Flight Planning – **PASS** |
| Flight Performance- FAIL | Flight Performance- FAIL | Flight Performance - FAIL |

3 months

| *CYCLE 2 (6 months)* | |
|---|---|
| Attempt 1 | |
| Air Law | Candidate is required to re-sit for the whole paper. |
| Meteorology | |
| Human Performance | |
| Flight Planning | |
| Flight Performance | |

***Validity of Exam Result for Conversion of ATPL and CPL***

12. For completing a license conversion application, the examination results are valid for one year from the date the whole conversion examination paper is passed.

***Examination Booking and Cancellation Policy***

13. For ATPL written examinations, applicant must hold a valid Macao CPL.

14. For ATPL/CPL Conversion written examinations, applicant must hold a valid corresponding pilot license issued by other civil aviation authority.

15. Applicant must submit a completed examination application form together with the appropriate fee no later than 5 working days prior to the examination date.

16. An examination booking confirmation will be returned to the candidate when the booking is confirmed. All candidates **are required to present the examination booking confirmation <u>with</u> his/her valid personal identification document** on the examination day.

17. Cancellation of a confirmed booking must be made in writing to the AACM at least 3 working days prior to the examination day.

18. Absence from a confirmed examination without prior cancellation notified to the AACM will be counted as one attempt.

19. Candidates who are unable to sit for an exam due to illness or other extenuating circumstances must notify the AACM as soon as possible, and provide appropriate documentation to support the justification within 5 working days of the examination day. If the justification for absence is acceptable to the AACM, the absence from exam will not be counted as one attempt, and the candidate may be allowed to reschedule the exam to a later date. Acceptance to the justification is at the discretion of the AACM.

***Exam Arrangement During Typhoon***

20. If typhoon signal no.8 is hoisted on the examination day after 7:30AM, all examinations of the day will be cancelled and rescheduled. AACM will contact the candidates for rescheduling the examinations.

- END -

# 01 – AIR LAW

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **01 01 00 00** | **REGISTRATION & AIRWORTHINESS OF AIRCRAFT** | | |
| **01 01 01 00** | **Aircraft Registration** | *x* | x |
| **01 01 02 00** | **Aircraft airworthiness and safety precautions** | *x* | x |
| **01 02 00 00** | **PERSONNEL LICENSING** | | |
| **01 02 01 00** | **Privileges of the license holder** | *x* | x |
| **01 02 02 00** | **Requirements for license grant and revalidation** | *x* | x |
| **01 02 03 00** | **Medical provisions for licensing** | *x* | x |
| **01 03 00 00** | **OPERATION OF AIRCRAFT** | | |
| **01 03 01 00** | **Operation facilities** | x | x |
| **01 03 02 00** | **Flight Preparation** | x | x |
| **01 03 03 00** | **In-flight procedures** | x | x |
| **01 03 04 00** | **Additional requirements for extended range operations** | x | x |
| **01 03 05 00** | **Flight Crew** | | |
| *01 03 05 01* | *Composition of flight crew* | x | x |
| *01 03 05 02* | *Duties and responsibilities of Pilot-in-command* | x | x |
| *01 03 05 03* | *Flight crew member emergency duties* | x | x |
| *01 03 05 04* | *Flight crew qualification* | x | x |
| *01 03 05 05* | *Flight crew equipment* | x | x |
| *01 03 05 06* | *Fitness of flight crew members* | x | x |
| *01 03 05 07* | *Security of the flight crew compartment* | x | x |
| **01 03 06 00** | **Cabin Crew** | | |
| *01 03 06 01* | *Cabin crew composition* | x | x |
| **01 03 07 00** | **Flight time, flight duty period and rest periods** | x | x |
| **01 03 08 00** | **Aircraft instruments and equipment** | x | x |
| **01 03 09 00** | **Flight documents, manuals, logs and records** | x | x |
| **01 03 10 00** | **Passengers briefing** | x | x |
| **01 03 11 00** | **Refuelling with passengers on board** | | |
| *01 03 11 01* | *Aeroplane refuelling with passengers* | x | |
| *01 03 11 02* | *Helicopter refuelling with passengers* | | x |
| **01 03 12 00** | **Aerodrome operating minima** | x | x |
| **01 03 13 00** | **Destination alternate aerodromes** | x | x |
| **01 03 14 00** | **Limitations imposed by weather conditions** | x | x |
| **01 03 15 00** | **Fuel and oil supply** | x | x |
| **01 03 16 00** | **Use of oxygen supply** | x | x |
| **01 03 17 00** | **In-flight emergency instruction** | x | x |
| **01 03 18 00** | **Hazardous flight conditions** | x | x |
| **01 03 19 00** | **Carry-on baggage** | x | x |
| **01 03 20 00** | **Transport of dangerous goods** | | |
| *01 03 20 01* | *Dangerous goods* | x | x |
| *01 03 20 02* | *Munitions of war* | x | x |



Note: A - Aeroplane H - Helicopter x - Applicable

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **01 03 21 00** | **Aircraft Performance Operating limitations** | | |
| *01 03 21 01* | *General performance limitations* | x | x |
| *01 03 21 02* | *Aeroplane performance limitations* | x | |
| *01 03 21 03* | *Helicopter performance limitations* | | x |
| **01 04 00 00** | **RULES OF THE AIR AND AIR TRAFFIC SERVICES** | | |
| **01 04 01 00** | **General rules and definitions** | x | x |
| **01 04 02 00** | **ATS airspace classification** | x | x |
| **01 04 03 00** | **Visual flight rules** | x | x |
| **01 04 04 00** | **Instrument flight rules** | x | x |
| **01 04 05 00** | **Change from IFR to VFR flight** | x | x |
| **01 04 06 00** | **Low flying** | x | x |
| **01 04 07 00** | **Right of way** | x | x |
| **01 04 08 00** | **Clearances and information** | x | x |
| **01 04 09 00** | **Reporting of operational and meteorological information** | x | x |
| **01 04 10 00** | **Air Traffic incident report** | x | x |
| **01 04 11 00** | **Change of radiotelephony call sign of aircraft** | x | x |
| **01 04 12 00** | **Minimum separation** | | |
| *01 04 12 01* | *Minimum vertical separation* | x | x |
| *01 04 12 02* | *Vertical separation during ascent and descent* | x | x |
| *01 04 12 03* | *Horizontal separation* | x | x |
| **01 04 13 00** | **Cruising level** | | |
| *01 04 13 01* | *Minimum cruising level* | x | x |
| *01 04 13 02* | *Assignment of cruising level* | x | x |
| **01 04 14 00** | **Aircraft interception** | x | x |
| **01 04 15 00** | **Emergencies and communication failure** | x | x |
| **01 05 00 00** | **PROCEDURE FOR AIR NAVIGATION** | | |
| **01 05 01 00** | **Definitions and abbreviations** | x | x |
| **01 05 02 00** | **Departure Procedures** | | |
| *01 05 02 01* | *General criteria* | x | x |
| *01 05 02 02* | *Instrument departure routes* | x | x |
| *01 05 02 03* | *Omnidirectional departures* | x | x |
| *01 05 02 04* | *Published Information* | x | x |
| **01 05 03 00** | **Approach Procedures** | | |
| *01 05 03 01* | *General criteria* | x | x |
| *01 05 03 02* | *Approach procedure* | x | x |
| *01 05 03 03* | *Approach procedure design* | x | x |
| *01 05 03 04* | *Approach segments* | x | x |
| *01 05 03 05* | *Visual Manoeuring* | x | x |
| **01 05 04 00** | **Holding Procedures** | | |
| *01 05 04 01* | *In flight procedures* | x | x |
| *01 05 04 02* | *Obstacle clearance* | x | x |
| **01 05 05 00** | **Altimeter setting procedures** | x | x |
| **01 05 06 00** | **Secondary surveillance radar** | | |
| *01 05 06 01* | *Radar services* | x | x |
| *01 05 06 02* | *Use of SSR transponders* | x | x |



Note: A - Aeroplane H - Helicopter x - Applicable

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **01 06 00 00** | **AERODROMES AND FACILITATION** | | |
| **01 06 01 00** | **Alerting service provided by aerodrome control towers** | x | x |
| **01 06 02 00** | **Critical positions of aircraft in the aerodrome traffic and taxi circuits** | x | x |
| **01 06 03 00** | **Marshalling signals** | x | x |
| **01 06 04 00** | **Selection of runway-in-use** | x | x |
| **01 06 05 00** | **Aeronautical ground lights** | x | x |
| **01 06 06 00** | **Aerodrome signals and markings** | x | x |
| **01 07 00 00** | **SEARCH AND RESURE** | x | x |

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**MATERIAL FOR REFERENCE**

- *Air NavigationRegulation of Macau*
- *Macau AC, AIC and AIP*
- *ICAO Annex 1, Annex 2, Annex 4, Annex 6, Annex 11*
- *ICAO Document 4444, Document 8168*



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# 02 – AIRCRAFT GENERAL KNOWLEDGE – Paper I
# AIRFRAME, SYSTEMS AND POWER PLANT

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **02 01 00 00** | **SYSTEM DESIGN, LOADS, STRESSES, MAINTENANCE** | | |
| **02 01 01 00** | **System design** | | |
| *02 01 01 01* | *Design concepts* | x | x |
| *02 01 01 02* | *Level of certification* | x | x |
| **02 01 02 00** | **Loads and stresses** | | |
| *02 01 02 01* | *Stress, strain and loads* | x | x |
| **02 01 03 00** | **Fatigue and corrosion** | | |
| *02 01 03 01* | *Describe and explain fatigue and corrosion* | x | x |
| **02 01 04 00** | **Reserved** | | |
| **02 01 05 00** | **Maintenance** | x | x |
| *02 01 05 01* | *Maintenance methods: hard-time and on-condition monitoring* | x | x |
| **02 02 00 00** | **AIRFRAME** | | |
| **02 02 01 00** | **Attachment methods** | | |
| *02 02 01 01* | *Attachment methods and detecting the development of faulty* | x | x |
| **02 02 02 00** | **Materials** | | |
| *02 02 02 01* | *Composite and other materials* | x | x |
| **02 02 03 00** | **Aeroplane: wings, tail surfaces and control surfaces** | | |
| *02 02 03 01* | *Design* | x | |
| *02 02 03 02* | *Structural components* | x | |
| *02 02 03 03* | *Loads, stresses and aeroelastic vibrations (flutter)* | x | |
| **02 02 04 00** | **Fuselage, landing gear, doors, floor, windscreen and windows** | | |
| *02 02 04 01* | *Construction, functions, loads* | x | x |
| **02 02 05 00** | **Helicopter: structural aspects of flight controls** | | |
| *02 02 05 01* | *Design and construction* | | x |
| *02 02 05 02* | *Structural components and materials* | | x |
| *02 02 05 03* | *Loads, stresses and aeroelastic vibrations* | | x |
| **02 02 06 00** | **Structural limitations** | | |
| *02 02 06 01* | *Maximum structural masses* | x | x |
| **02 03 00 00** | **HYDRAULICS** | | |
| **02 03 01 00** | **Hydromechanics: basic principles** | | |
| *02 03 01 01* | *Concepts and basic principles* | x | x |
| **02 03 02 00** | **Hydraulic systems** | | |
| *02 03 02 01* | *Hydraulic fluids: types, characteristics, limitations* | x | x |
| *02 03 02 02* | *System components: design, operation, degraded modes of operation, indications and warnings* | x | x |
| **02 04 00 00** | **LANDING GEAR, WHEELS, TYRES, BRAKES** | | |
| **02 04 01 00** | **Landing gear** | | |
| *02 04 01 01* | *Types* | x | x |
| *02 04 01 02* | *System components, design, operation, indications and warnings, on-ground/in-flight protections, emergency extension systems* | x | x |



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| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **02 04 02 00** | **Nose-wheel steering** | | |
| *02 04 02 01* | *Design, operation* | x | x |
| **02 04 03 00** | **Brakes** | | |
| *02 04 03 01* | *Types and materials* | x | x |
| *02 04 03 02* | *System components, design, operation, indications and warnings* | x | x |
| *02 04 03 03* | *Anti-skid* | x | |
| *02 04 03 04* | *Autobrake* | x | |
| **02 04 04 00** | **Wheels, rims and tyres** | | |
| *02 04 04 01* | *Types, structural components and materials, operational limitations, thermal plugs* | x | |
| **02 04 05 00** | **Helicopter equipment** | | |
| *02 04 05 01* | *Flotation devices* | | x |
| **02 05 00 00** | **FLIGHT CONTROLS** | | |
| **02 05 01 00** | **Aeroplane: primary flight controls** | | |
| *02 05 01 01* | *Definition and control surfaces* | x | |
| *02 05 01 02* | *Manual controls* | x | |
| *02 05 01 03* | *Fully powered controls (irreversible)* | x | |
| *02 05 01 04* | *Partially powered controls (reversible)* | x | |
| *02 05 01 05* | *System components, design, operation, indications and* | x | |
| **02 05 02 00** | **Aeroplane: secondary flight controls** | | |
| *02 05 02 01* | *System components, design, operation, degraded modes of operation, indications and warnings* | x | |
| **02 05 03 00** | **Helicopter: flight controls** | | |
| *02 05 03 01* | *Droop stops, control systems, trim systems, control stops* | | x |
| **02 05 04 00** | **Aeroplane: fly-by-wire (FBW) control systems** | | |
| *02 05 04 01* | *Composition, explanation of operation, modes of operation* | x | |
| **02 05 05 00** | **Reserved** | | |
| **02 06 00 00** | **PNEUMATICS — PRESSURISATION AND AIR-CONDITIONING SYSTEMS** | | |
| **02 06 01 00** | **Pneumatic/bleed-air supply** | | |
| *02 06 01 01* | *Piston-engine air supply* | x | x |
| *02 06 01 02* | *Gas turbine engine: bleed-air supply* | x | x |
| **02 06 02 00** | **Helicopter: air-conditioning systems** | | |
| *02 06 02 01* | *Types, system components, design, operation, degraded modes of operation, indications and warnings* | | x |
| **02 06 03 00** | **Aeroplane: pressurisation and air-conditioning system** | | |
| *02 06 03 01* | *System components, design, operation, degraded modes of operation, indications and warnings* | x | |
| **02 07 00 00** | **ANTI-ICING AND DE-ICING SYSTEMS** | | |
| **02 07 01 00** | **Types, operation, indications** | | |
| *02 07 01 01* | *Types, design, operation, indications and warnings, operational limitations* | x | x |
| **02 07 02 00** | **Ice warning systems** | | |
| *02 07 02 01* | *Types, operation, and indications* | x | |
| **02 07 03 00** | **Helicopter blade heating systems** | | |
| *02 07 03 01* | *Limitations* | | x |



Note: A - Aeroplane H - Helicopter x - Applicable

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **02 08 00 00** | **FUEL SYSTEM** | | |
| **02 08 01 00** | **Piston engine** | | |
| *02 08 01 01* | *Fuel: types, characteristics, limitations* | x | x |
| *02 08 01 02* | *Design, operation, system components, indications* | x | x |
| **02 08 02 00** | **Turbine engine** | | |
| *02 08 02 01* | *Fuel: types, characteristics, limitations* | x | x |
| *02 08 02 02* | *Design, operation, system components, indications* | x | x |
| **02 09 00 00** | **ELECTRICS** | | |
| | Remark: For any reference to the direction of current flow, the conventional current flow shall be used, i.e. from positive to negative. | | |
| **02 09 01 00** | **General, definitions, basic applications: circuit breakers, logic circuits** | | |
| *02 09 01 01* | *Static electricity* | x | x |
| *02 09 01 02* | *Direct current (DC)* | x | x |
| *02 09 01 03* | *Alternating current (AC)* | x | x |
| *02 09 01 04* | *Reserved* | | |
| *02 09 01 05* | *Reserved* | | |
| *02 09 01 06* | *Electromagnetism* | x | x |
| *02 09 01 07* | *Circuit protection* | x | x |
| *02 09 01 08* | *Semiconductors and logic circuits* | x | x |
| **02 09 02 00** | **Batteries** | | |
| *02 09 02 01* | *Types, characteristics and limitations* | x | x |
| **02 09 03 00** | **Generation** | | |
| | Remark: For standardisation purposes, the following standard expressions are used:<br>— DC generator: produces DC output;<br>— DC alternator: produces AC, rectified by integrated rectifying unit, the output is DC;<br>— DC alternator: producing a DC output by using a rectifier;<br>— AC generator: produces AC output;<br>— starter generator: integrated combination of a generator and a starter motor;<br>— permanent magnet alternator/ generator: self-exciting AC generator. | | |
| *02 09 03 01* | *DC generation* | x | x |
| *02 09 03 02* | *AC generation* | x | x |
| *02 09 03 03* | *Constant speed drive (CSD) and integrated drive generator (IDG) systems* | x | |
| *02 09 03 04* | *Transformers, transformer rectifier units (TRUs), static inverters* | x | x |
| **02 09 04 00** | **Distribution** | | |
| *02 09 04 01* | *General* | x | x |
| *02 09 04 02* | *DC distribution* | x | x |
| *02 09 04 03* | *AC distribution* | x | x |
| *02 09 04 04* | *Electrical load management and monitoring systems: automatic generators and bus switching during normal and failure operation, indications and warnings* | x | x |



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| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **02 09 05 00** | **Electrical motors** | | |
| *02 09 05 01* | *General* | **x** | **x** |
| *02 09 05 02* | *Operating principle* | **x** | **x** |
| *02 09 05 03* | *Components* | **x** | **x** |
| **02 10 00 00** | **PISTON ENGINES** | | |
| | Remark: This topic includes diesel and petrol engines. | | |
| **02 10 01 00** | **General** | | |
| *02 10 01 01* | *Types of internal-combustion engines: basic principles, definitions* | **x** | **x** |
| *02 10 01 02* | *Engine: design, operation, components* | **x** | **x** |
| **02 10 02 00** | **Fuel** | | |
| *02 10 02 01* | *Types, grades, characteristics, limitations* | **x** | **x** |
| **02 10 03 00** | **Engine fuel pumps** | | |
| *02 10 03 01* | *Engine-driven fuel pump* | **x** | **x** |
| **02 10 04 00** | **Carburettor/injection system** | | |
| *02 10 04 01* | *Carburettor: design, operation, degraded modes of operation, indications and warnings* | **x** | **x** |
| *02 10 04 02* | *Injection: design, operation, degraded modes of operation, indications and warnings* | **x** | **x** |
| *02 10 04 03* | *Icing* | **x** | **x** |
| **02 10 05 00** | **Cooling systems** | | |
| *02 10 05 01* | *Design, operation, indications and warnings* | **x** | **x** |
| **02 10 06 00** | **Lubrication systems** | | |
| *02 10 06 01* | *Lubricants: characteristics, limitations* | **x** | **x** |
| *02 10 06 02* | *Design, operation, indications and warnings* | **x** | **x** |
| **02 10 07 00** | **Ignition circuits** | | |
| *02 10 07 01* | *Design, operation* | **x** | **x** |
| **02 10 08 00** | **Mixture** | | |
| *02 10 08 01* | *Definition, characteristic mixtures, control instruments,associated control levers, indications* | **x** | **x** |
| **02 10 09 00** | **Aeroplane: propellers** | | |
| *02 10 09 01* | *Definitions, general* | **x** | |
| *02 10 09 02* | *Constant-speed propeller: design, operation, system components* | **x** | |
| *(01)* | *Describe the operating principle of a constant-speed propeller system under normal flight operations with the aid of a schematic.* | **x** | |
| *(02)* | *Explain the need for a MAP indicator to control the power setting with a constant-speed propeller.* | **x** | |
| *(03)* | *State the purpose of a torque-meter.* | **x** | |
| *(04)* | *State the purpose and describe the operation of a low-pitch stop (centrifugal latch).* | **x** | |
| *(05)* | *Describe the operating principle of a single-acting and a double- acting variable pitch propeller for single- and multi-engine aeroplanes.* | **x** | |
| *(06)* | *Describe the function and the basic operating principle of synchronising and synchro-phasing systems.* | **x** | |
| *(07)* | *Explain the purpose and the basic operating principle of an auto-feathering system and unfeathering.* | **x** | |



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| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| *02 10 09 03* | *Reduction gearing: design* | x | |
| *02 10 09 04* | *Propeller handling: associated control levers, degraded modes of operation, indications and warnings* | x | |
| **02 10 10 00** | **Performance and engine handling** | | |
| *02 10 10 01* | *Performance* | x | x |
| *02 10 10 02* | *Engine handling* | x | x |
| **02 11 00 00** | **TURBINE ENGINES** | | |
| **02 11 01 00** | **Basic principles** | | |
| *02 11 01 01* | *Basic generation of thrust and the thrust formula* | x | |
| *02 11 01 02* | *Design, types and components of turbine engines* | x | x |
| *02 11 01 03* | *Coupled turbine engine: design, operation, components and* | | x |
| *02 11 01 04* | *Free-turbine engine: design, components and materials* | | x |
| **02 11 02 00** | **Main-engine components** | | |
| *02 11 02 01* | *Aeroplane: air intake* | x | |
| *02 11 02 02* | *Compressor and diffuser* | x | x |
| *02 11 02 03* | *Combustion chamber* | x | x |
| *02 11 02 04* | *Turbine* | x | x |
| *02 11 02 05* | *Aeroplane: exhaust* | x | |
| *02 11 02 06* | *Helicopter: air intake* | | x |
| *02 11 02 07* | *Helicopter: exhaust* | | x |
| **02 11 03 00** | **Additional components and systems** | | |
| *02 11 03 01* | *Engine fuel system* | x | x |
| *02 11 03 02* | *Engine control system* | x | x |
| *02 11 03 03* | *Engine lubrication* | x | |
| *02 11 03 04* | *Engine auxiliary gearbox* | x | |
| *02 11 03 05* | *Engine ignition* | x | |
| *02 11 03 06* | *Engine starter* | x | |
| *02 11 03 07* | *Reverse thrust* | x | |
| *02 11 03 08* | *Helicopter specifics on design, operation and components for additional components and systems such as lubrication system, ignition circuit, starter, accessory gearbox* | | x |
| **02 11 04 00** | **Engine operation and monitoring** | | |
| *02 11 04 01* | *General* | x | x |
| *02 11 04 02* | *Starting malfunctions* | x | x |
| *02 11 04 03* | *Relight envelope* | x | |
| **02 11 05 00** | **Performance aspects** | | |
| *02 11 05 01* | *Thrust, performance aspects, and limitations* | x | |
| *02 11 05 02* | *Helicopter engine ratings, engine performance and limitations, engine handling: torque, performance aspects and limitations* | | x |
| **02 11 06 00** | **Auxiliary power unit (APU)** | | |
| *02 11 06 01* | *Design, operation, functions, operational limitations* | x | x |
| **02 12 00 00** | **PROTECTION AND DETECTION SYSTEMS** | | |
| **02 12 01 00** | **Smoke detection** | | |
| *02 12 01 01* | *Types, design, operation, indications and warnings* | x | x |



Note: A - Aeroplane H - Helicopter x - Applicable

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **02 12 02 00** | **Fire-protection systems** | | |
| *02 12 02 01* | *Fire extinguishing (engine and cargo compartments)* | x | x |
| *02 12 02 02* | *Fire detection* | x | x |
| **02 12 03 00** | **Rain-protection system** | | |
| *02 12 03 01* | *Principle and method of operation* | x | x |
| **02 13 00 00** | **OXYGEN SYSTEMS** | | |
| **02 13 01 00** | **Cockpit, portable and chemical oxygen systems** | | |
| *02 13 01 01* | *Operating principles, actuation methods, comparison* | x | |
| **02 14 00 00** | **HELICOPTER: MISCELLANEOUS SYSTEMS** | | |
| **02 14 01 00** | **Variable rotor speed, active vibration suppression, night-vision goggles (NVG)** | | |
| *02 14 01 01* | *Variable rotor speed* | | x |
| *02 14 01 02* | *Active vibration suppression* | | x |
| *02 14 01 03* | *Reserved* | | |
| **02 15 00 00** | **HELICOPTER: ROTOR HEADS** | | |
| **02 15 01 00** | **Main rotor** | | |
| *02 15 01 01* | *Types* | | x |
| *02 15 01 02* | *Structural components and materials, stresses, structural limitations* | | x |
| *02 15 01 03* | *Design and construction* | | x |
| *02 15 01 04* | *Adjustment* | | x |
| **02 15 02 00** | **Tail rotor** | | |
| *02 15 02 01* | *Types* | | x |
| *02 15 02 02* | *Design and construction* | | x |
| **02 16 00 00** | **HELICOPTER: TRANSMISSION** | | |
| **02 16 01 00** | **Main gearbox** | | |
| *02 16 01 01* | *Different types, design, operation, limitations* | | x |
| **02 16 02 00** | **Rotor brake** | | |
| *02 16 02 01* | *Types, operational considerations* | | x |
| **02 16 03 00** | **Auxiliary systems** | | |
| *02 16 03 01* | *Powering the air-conditioning system* | | x |
| **02 16 04 00** | **Driveshaft and associated installation** | | |
| *02 16 04 01* | *Power, construction, materials, speed and torque* | | x |
| **02 16 05 00** | **Intermediate and tail gearbox** | | |
| 02 16 05 01 | Lubrication, gearing | | x |
| **02 16 06 00** | **Clutches** | | |
| *02 16 06 01* | *Purpose, operation, components, serviceability* | | x |
| **02 16 07 00** | **Freewheels** | | |
| *02 16 07 01* | *Purpose, operation, components, location* | | x |
| **02 17 00 00** | **HELICOPTER: BLADES** | | |
| **02 17 01 00** | **Main-rotor design and blade design** | | |
| *02 17 01 01* | *Design, construction* | | x |
| *02 17 01 02* | *Structural components and materials* | | x |
| *02 17 01 03* | *Forces and stresses* | | x |
| *02 17 01 04* | *Structural limitations* | | x |
| *02 17 01 05* | *Adjustment* | | x |
| *02 17 01 06* | *Tip shape* | | x |



Note: A - Aeroplane H - Helicopter x - Applicable

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| *02 17 01 07* | *Origins of the vertical vibrations* | | **x** |
| *02 17 01 08* | *Lateral vibrations* | | **x** |
| **02 17 02 00** | **Tail-rotor design and blade design** | | |
| *02 17 02 01* | *Design, construction* | | **x** |
| *02 17 02 02* | *Reserved* | | |
| *02 17 02 03* | *Stresses, vibrations and balancing* | | **x** |
| *02 17 02 04* | *Structural limitations* | | **x** |
| *02 17 02 05* | *Adjustment* | | **x** |
| *02 17 02 06* | *The Fenestron* | | **x** |
| *02 17 02 07* | *No tail rotor (NOTAR)* | | **x** |

~ End ~



Note: A - Aeroplane H - Helicopter x - Applicable

# 03 – AIRCRAFT GENERAL KNOWLEDGE – Paper II
# INSTRUMENTATION

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **03 01 00 00** | **SENSORS AND INSTRUMENTS** | | |
| **03 01 01 00** | **Pressure gauge** | | |
| *03 01 01 01* | *Units for pressure, sensor types, measurements* | x | x |
| **03 01 02 00** | **Temperature sensing** | | |
| *03 01 02 01* | *Units for temperature, measurements* | x | x |
| **03 01 03 00** | **Fuel gauge** | | |
| *03 01 03 01* | *Units for fuel, measurements, fuel gauges* | x | x |
| **03 01 04 00** | **Fuel flowmeters** | | |
| *03 01 04 01* | *Fuel flow, units for fuel flow, total fuel consumption* | x | x |
| **03 01 05 00** | **Tachometer** | | |
| *03 01 05 01* | *Types, operating principles, units for engine speed* | x | x |
| **03 01 06 00** | **Thrust measurement** | | |
| *03 01 06 01* | *Parameters, operating principle* | x | |
| **03 01 07 00** | **Engine torquemeter** | | |
| *03 01 07 01* | *Torque, torquemeters* | x | x |
| **03 01 08 00** | **Synchroscope** | | |
| *03 01 08 01* | *Purpose, operating principle, display* | x | |
| **03 01 09 00** | **Engine-vibration monitoring** | | |
| *03 01 09 01* | *Purpose, operating principle of a vibration-monitoring system, display* | x | |
| **03 01 10 00** | **Time measurement** | | |
| *03 01 10 01* | *On-board clock* | x | x |
| **03 02 00 00** | **MEASUREMENT OF AIR-DATA PARAMETERS** | | |
| **03 02 01 00** | **Pressure measurement** | | |
| *03 02 01 01* | *Definitions* | x | x |
| *03 02 01 02* | *Pitot/static system: design and errors* | x | x |
| **03 02 02 00** | **Temperature measurement** | | |
| *03 02 02 01* | *Definitions* | x | x |
| *03 02 02 02* | *Design and operation* | x | x |
| **03 02 03 00** | **Angle-of-attack (AoA) measurement** | | |
| *03 02 03 01* | *Sensor types, operating principles, ice protection, displays, incorrect indications* | x | |
| **03 02 04 00** | **Altimeter** | | |
| *03 02 04 01* | *Units, terms, types, operating principles, displays, errors, corrections* | x | x |
| **03 02 05 00** | **Vertical speed indicator (VSI)** | | |
| *03 02 05 01* | *VSI and instantaneous vertical speed indicator (IVSI)* | x | x |
| **03 02 06 00** | **Airspeed indicator (ASI)** | | |
| *03 02 06 01* | *Units, errors, operating principles, displays, position errors, unreliable airspeed indications* | x | x |
| **03 02 07 00** | **Machmeter** | | |
| *03 02 07 01* | *Operating principle, display, CAS, TAS and Mach number* | x | |
| **03 02 08 00** | **Air-data computer (ADC)** | | |
| *03 02 08 01* | *Operating principle, data, errors, air-data inertial reference unit* | x | x |



Note: A - Aeroplane H - Helicopter x - Applicable

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **03 03 00 00** | **MAGNETISM — DIRECT-READING COMPASS AND FLUX VALVE** | | |
| **03 03 01 00** | **Earth's magnetic field** | | |
| *03 03 01 01* | *Magnetic field, variation, dip* | x | x |
| **03 03 02 00** | **Aircraft magnetic field** | | |
| *03 03 02 01* | *Permanent magnetism, electromagnetism, deviation* | x | x |
| **03 03 03 00** | **Direct-reading magnetic compass** | | |
| *03 03 03 01* | *Purpose, errors, timed turns, serviceability* | x | x |
| **03 03 04 00** | **Flux valve** | | |
| *03 03 04 01* | *Purpose, operating principle, location, errors* | x | x |
| **03 04 00 00** | **GYROSCOPIC INSTRUMENTS** | | |
| **03 04 01 00** | **Gyroscope: basic principles** | | |
| *03 04 01 01* | *Gyroscopic forces, degrees of freedom, gyro wander, driving gyroscopes* | x | x |
| **03 04 02 00** | **Rate-of-turn indicator — Turn coordinator — Balance (slip) indicator** | | |
| *03 04 02 01* | *Indications, relation between bank angle, rate of turn and TAS* | x | x |
| **03 04 03 00** | **Attitude indicator (artificial horizon)** | | |
| *03 04 03 01* | *Purpose, types, effect of aircraft acceleration, display* | x | x |
| **03 04 04 00** | **Directional gyroscope** | | |
| *03 04 04 01* | *Purpose, types, drift, alignment to compass heading* | x | x |
| **03 04 05 00** | **Remote-reading compass systems** | | |
| *03 04 05 01* | *Operating principles, components, comparison with a direct-reading magnetic compass* | x | x |
| **03 04 06 00** | **Solid-state systems — attitude and heading reference system (AHRS)** | | |
| *03 04 06 01* | *Components, indications* | x | x |
| **03 05 00 00** | **INERTIAL NAVIGATION** | | |
| **03 05 01 00** | **Basic principles** | | |
| *03 05 01 01* | *Systems* | x | x |
| **03 05 02 00** | **Alignment and operation** | | |
| *03 05 02 01* | *Alignment process, incorrect data entry, and control panels* | x | x |
| **03 06 00 00** | **AEROPLANE: AUTOMATIC FLIGHT CONTROL SYSTEMS** | | |
| **03 06 01 00** | **General** | | |
| *03 06 01 01* | *Definitions and control loops* | x | |
| **03 06 02 00** | **Autopilot system** | | |
| *03 06 02 01* | *Design and operation* | x | |
| **03 06 03 00** | **Flight director: design and operation** | | |
| *03 06 03 01* | *Purpose, use, indications, modes, data* | x | |
| **03 06 04 00** | **Aeroplane: flight mode annunciator (FMA)** | | |
| *03 06 04 01* | *Purpose, modes, display scenarios* | x | |
| **03 06 05 00** | **Autoland** | | |
| *03 06 05 01* | *Design and operation* | x | |
| **03 07 00 00** | **HELICOPTER: AUTOMATIC FLIGHT CONTROL SYSTEMS** | | |
| **03 07 01 00** | **General principles** | | |
| *03 07 01 01* | *Stabilisation* | | x |
| *03 07 01 02* | *Reduction of pilot workload* | | x |
| *03 07 01 03* | *Enhancement of helicopter capability* | | x |
| *03 07 01 04* | *Failures* | | x |



Note: A - Aeroplane H - Helicopter x - Applicable

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **03 07 02 00** | **Components: operation** | | |
| *03 07 02 01* | *Basic sensors* | | x |
| *03 07 02 02* | *Specific sensors* | | x |
| *03 07 02 03* | *Actuators* | | x |
| *03 07 02 04* | *Pilot–system interface: control panels, system indications, warnings* | | x |
| *03 07 02 05* | *Operation* | | x |
| **03 07 03 00** | **Stability augmentation system (SAS)** | | |
| *03 07 03 01* | *General principles and operation* | | x |
| **03 07 04 00** | **Autopilot — automatic stability equipment** | | |
| *03 07 04 01* | *General principles* | | x |
| *03 07 04 02* | *Basic modes (3/4 axes)* | | x |
| *03 07 04 03* | *Automatic guidance (upper modes of AFCS)* | | x |
| *03 07 04 04* | *Flight director: design and operation* | | x |
| *03 07 04 05* | *Automatic flight control panel (AFCP)* | | x |
| **03 08 00 00** | **TRIMS — YAW DAMPER — FLIGHT-ENVELOPE PROTECTION** | | |
| **03 08 01 00** | **Trim systems** | | |
| *03 08 01 01* | *Design and operation* | x | |
| **03 08 02 00** | **Yaw damper** | | |
| *03 08 02 01* | *Design and operation* | x | |
| **03 08 03 00** | **Flight-envelope protection (FEP)** | | |
| *03 08 03 01* | *Purpose, input parameters, functions* | x | |
| **03 09 00 00** | **AUTOTHRUST — AUTOMATIC THRUST CONTROL SYSTEM** | | |
| **03 09 01 00** | **Autothrust system** | | |
| *03 09 01 01* | *Purpose, operation, overcompensation, speed control* | x | |
| **03 10 00 00** | **COMMUNICATION SYSTEMS** | | |
| **03 10 01 00** | **Voice communication, data-link transmission** | | |
| *03 10 01 01* | *Definitions and transmission modes* | x | x |
| *03 10 01 02* | *Systems: architecture, design and operation* | x | |
| **03 10 02 00** | **Future air navigation systems (FANSs)** | | |
| *03 10 02 01* | *Versions, applications, CPDLC messages, ADS contracts* | x | |
| **03 11 00 00** | **FLIGHT MANAGEMENT SYSTEM (FMS)/FLIGHT MANAGEMENT AND GUIDANCE SYSTEM (FMGS)** | | |
| **03 11 01 00** | **Design** | | |
| *03 11 01 01* | *Purpose, architecture, failures, functions* | x | x |
| **03 11 02 00** | **FMC databases** | | |
| *03 11 02 01* | *Navigation database* | x | x |
| *03 11 02 02* | *Aircraft performance database* | x | x |
| **03 11 03 00** | **Operations, limitations** | | |
| *02 11 03 01* | *Data, calculations, position inputs, raw data* | x | x |
| **03 11 04 00** | **Human–machine interface (control and display unit (CDU)/multifunction control and display unit (MCDU))** | | |
| *03 11 04 01* | *Purpose, scratchpad, data input, set-up process* | x | x |
| **03 12 00 00** | **ALERTING SYSTEMS, PROXIMITY SYSTEMS** | | |
| **03 12 01 00** | **Reserved** | | |



Note: A - Aeroplane H - Helicopter x - Applicable

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **03 12 02 00** | **Flight warning systems (FWSs)** | | |
| *03 12 02 01* | *Annunciations, master warning, master caution, advisory* | x | x |
| **03 12 03 00** | **Stall warning systems (SWSs)** | | |
| *03 12 03 01* | *Function, types, components* | x | |
| **03 12 04 00** | **Stall protection** | | |
| *03 12 04 01* | *Function, types* | x | |
| **03 12 05 00** | **Overspeed warning** | | |
| *03 12 05 01* | *Purpose, aural warning, VMO/MMO pointer* | x | |
| **03 12 06 00** | **Take-off warning** | | |
| *03 12 06 01* | *Purpose* | x | |
| **03 12 07 00** | **Altitude alert system** | | |
| *03 12 07 01* | *Function, displays, alerts* | x | x |
| **03 12 08 00** | **Radio altimeter** | | |
| *03 12 08 01* | *Purpose, range, displays, incorrect indications* | x | x |
| **03 12 09 00** | **Ground-proximity warning systems (GPWSs)** | | |
| *03 12 09 01* | *GPWSs: design, operation, indications* | x | x |
| *03 12 09 02* | *Terrain-avoidance warning system (TAWS); other name: enhanced GPWS (EGPWS)* | x | x |
| *03 12 09 03* | *Reserved* | | |
| **03 12 10 00** | **ACAS/TCAS** | | |
| *03 12 10 01* | *Principles and operations* | x | x |
| **03 12 11 00** | **Rotor/engine overspeed alert system** | | |
| *03 12 11 01* | *Design, operation, displays, alarms* | | x |
| **03 13 00 00** | **INTEGRATED INSTRUMENTS — ELECTRONIC DISPLAYS** | | |
| **03 13 01 00** | **Electronic display units** | | |
| *02 13 01 01* | *Design, limitations* | x | x |
| **03 13 02 00** | **Mechanical integrated instruments** | | |
| *03 13 02 01* | *Attitude and director indicator (ADI)/ horizontal situation indicator (HSI)* | x | x |
| **03 03 00** | **Electronic flight instrument systems (EFISs)** | | |
| *03 13 03 01* | *Design, operation* | x | x |
| *03 13 03 02* | *Primary flight display (PFD), electronic attitude director indicator (EADI)* | x | x |
| (01) | Describe that a PFD (or an EADI) presents a dynamic colour display of all the | x | x |
| (02) | Describe the typical design of the attitude information: artificial horizon with | x | x |
| (03) | Describe the typical design of the speed tape: | x | x |
| (04) | Explain the Mach number indications and how a selected Mach number is | x | |
| (05) | Describe the typical design of the altitude information: | x | x |
| (06) | Describe the typical design of the heading/track information: | x | x |
| (07) | Describe the typical design and location of the following information: | x | x |
| *03 13 03 03* | *Navigation display (ND), electronic horizontal situation indicator (EHSI)* | x | x |
| **03 13 04 00** | **Engine parameters, crew warnings, aircraft systems, procedure and mission display systems** | | |
| *03 13 04 01* | *Purposes of systems, display systems, checklists* | x | x |
| **03 13 05 00** | **Engine first limit indicator** | | |
| *03 13 05 01* | *Design, operation, information on display* | | x |
| **03 13 06 00** | **Electronic flight bag (EFB)** | | |
| ***022 13 06 01*** | ***Purpose, certification, malfunctions*** | x | x |



Note: A - Aeroplane H - Helicopter x - Applicable

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **03 13 07 00** | **Head-up display (HUD), synthetic vision system (SVS) and enhanced visual system (EVS)** | | |
| ***022 13 07 01*** | ***Components, benefits, modes of operation*** | **x** | **x** |
| **03 14 00 00** | **MAINTENANCE, MONITORING AND RECORDING SYSTEMS** | | |
| **03 14 01 00** | **Cockpit voice recorder (CVR)** | | |
| *03 14 01 01* | *Purpose, components, parameters* | **x** | **x** |
| **03 14 02 00** | **Flight data recorder (FDR)** | | |
| *03 14 02 01* | *Purpose, components, parameters* | **x** | |
| **03 14 03 00** | **Maintenance and monitoring systems** | | |
| *03 14 03 01* | *Helicopter operations monitoring program (HOMP): design, operation, performance* | | **x** |
| *03 14 03 02* | *Integrated health and usage monitoring system (IHUMS): design, operation, performance* | | **x** |
| *03 14 03 03* | *Aeroplane condition monitoring system (ACMS): general, design, operation* | **x** | |
| **03 15 00 00** | **DIGITAL CIRCUITS AND COMPUTERS** | | |
| **03 15 01 00** | **Digital circuits and computers** | | |
| *03 15 01 01* | *General, definitions and design* | **x** | **x** |

~ End ~



Note: A - Aeroplane H - Helicopter x - Applicable

# 04 – MASS AND BALANCE

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **04 01 00 00** | **PURPOSE OF MASS-AND-BALANCE CONSIDERATIONS** | | |
| **04 01 01 00** | **Mass limitations** | | |
| *04 01 01 01* | *Importance with regard to structural limitations* | x | x |
| *04 01 01 02* | *Importance with regard to performance*<br>*Remark: See also Subjects 032/034 and 081/082.* | x | x |
| **04 01 02 00** | **Centre-of-gravity (CG) limitations** | | |
| *04 01 02 01* | *Importance with regard to stability and controllability*<br>*Remark: See also Subjects 081/082.* | x | x |
| *04 01 02 02* | *Importance with regard to performance*<br>*Remark: See also Subjects 032/034 and 081/082.* | x | x |
| **04 02 00 00** | **LOADING** | | |
| **04 02 01 00** | **Terminology** | | |
| *04 02 01 01* | *Mass terms* | x | x |
| *04 02 01 02* | *Load terms (including fuel terms)*<br>*Remark: See also Subject 033.* | x | x |
| **04 02 02 00** | **Mass limits** | | |
| *04 02 02 01* | *Structural limitations* | x | x |
| *04 02 02 02* | *Performance and regulated limitations* | x | x |
| *04 02 02 03* | *Cargo compartment limitations* | x | x |
| **04 02 03 00** | **Mass calculations** | | |
| *04 02 03 01* | *Maximum masses for take-off and landing* | x | x |
| *04 02 03 02* | *Allowed traffic load and fuel load* | x | x |
| *04 02 03 03* | *Use of standard masses for passengers, baggage and crew* | x | x |
| **04 03 00 00** | **RESERVED** | | |
| **04 04 00 00** | **MASS-AND-BALANCE DETAILS OF AIRCRAFT** | | |
| **04 04 01 00** | **Contents of mass-and-balance documentation** | | |
| *04 04 01 01* | *Datum, moment arm* | x | x |
| *04 04 01 02* | *CG position as distance from datum* | x | x |
| *04 04 01 03* | *CG position as percentage of mean aerodynamic chord (% MAC)*<br>*Remark: Knowledge of the definition of MAC is covered under Subject 11A 01 01 05.* | x | |
| *04 04 01 04* | *Longitudinal CG limits* | x | x |
| *04 04 01 05* | *Lateral CG limits* | | x |
| *04 04 01 06* | *Details of passenger and cargo compartments* | x | x |
| *04 04 01 07* | *Details of fuel system relevant to mass-and-balance considerations* | x | X |
| **04 04 02 00** | **Determination of aircraft empty mass and CG position by weighing** | | |
| *04 04 02 01* | *Weighing of aircraft (general aspects)* | x | x |
| *04 04 02 02* | *Calculation of mass and CG position of an aircraft using weighing data* | x | x |
| **04 04 03 00** | **Extraction of basic empty mass (BEM) and CG data from aircraft** | | |
| *04 04 03 01* | *BEM or dry operating mass (DOM)* | x | x |
| *04 04 03 02* | *CG position or moment at BEM/DOM* | x | x |
| *04 04 03 03* | *Deviations from standard configuration* | x | x |



Note: A - Aeroplane H - Helicopter x - Applicable

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **04 05 00 00** | **DETERMINATION OF CG POSITION** | | |
| **04 05 01 00** | **Methods** | | |
| *04 05 01 01* | *Arithmetic method* | **x** | **x** |
| *04 05 01 02* | *Graphic method* | **x** | **x** |
| *04 05 01 03* | *Index method* | **x** | **x** |
| **04 05 02 00** | **Load and trim sheet** | | |
| *04 05 02 01* | *General considerations* | **x** | |
| *04 05 02 02* | *Load sheet/balance schedule and CG envelope for light aeroplanes and for helicopters* | **x** | **x** |
| *04 05 02 03* | *Load sheet for large aeroplanes* | **x** | |
| *04 05 02 04* | *Trim sheet for large aeroplanes* | **x** | |
| *04 05 02 05* | *Reserved* | | |
| *04 05 02 06* | *Other methods to present load and trim information* | **x** | |
| **04 05 03 00** | **Repositioning of CG** | | |
| *04 05 03 01* | *Repositioning of CG by shifting the load* | **x** | **x** |
| *04 05 03 02* | *Repositioning of CG by additional load or ballast or by load orballast removal* | **x** | **x** |
| **04 06 00 00** | **CARGO HANDLING** | | |
| **04 06 01 00** | **Types of cargo** | | |
| *04 06 01 01* | *Types of cargo (general aspects)* | **x** | **x** |
| **04 06 02 00** | **Floor-area load and running-load limitations** | | |
| *04 06 02 01* | *Floor-area load and running-load limitations in cargo compartments* | **x** | **x** |
| **04 06 03 00** | **Securement of load** | | |
| *04 06 03 01* | *Securement of load (reasons and methods)* | **x** | **x** |

~ End ~



Note: A - Aeroplane H - Helicopter x - Applicable

# 05(A) – FLIGHT PERFORMANCE – AEROPLANES

| Syllabus reference | Syllabus details and associated Learning Objectives |
|---|---|
| **05A 00 00 00** | **FLIGHT PERFORMANCE AND PLANNING** |
| **05A 00 00 00** | **PERFORMANCE — AEROPLANES** |
| **05A 01 00 00** | **GENERAL** |
| **05A 01 01 00** | **RESERVED** |
| **05A 01 02 00** | **General performance theory** |
| *05A 01 02 01* | *RESERVED* |
| *05A 01 02 02* | *Definitions and terms* |
| *05A 01 02 03* | *Variables influencing performance* |
| **05A 01 03 00** | **Level flight, range and endurance** |
| *05A 01 03 01* | *Steady level flight* |
| *05A 01 03 02* | *Range* |
| *05A 01 03 03* | *Maximum endurance* |
| **05A 01 04 00** | **Climbing** |
| *05A 01 04 01* | *Climbing (climb performance)* |
| **05A 01 05 00** | **Descending** |
| *05A 01 05 01* | *Descending (descent performance)* |
| **05A 02 00 00** | **RESERVED** |
| **05A 03 00 00** | **RESERVED** |
| **05A 04 00 00** | **APPLICABLE OPERATIONAL REQUIREMENTS iN PERFORMANCE OF LARGE AEROPLANE — THEORY** |
| **05A 04 01 00** | **Take-off** |
| *05A 04 01 01* | *Take-off performance, definitions of and relationships between terms* |
| *05A 04 01 02* | *Take-off distances* |
| *05A 04 01 03* | *Accelerate-stop distance* |
| *05A 04 01 04* | *Balanced field length concept* |
| *05A 04 01 05* | *Unbalanced field length concept* |
| *05A 04 01 06* | *Field-length-limited take-off mass (FLLTOM)* |
| *05A 04 01 07* | *Contaminated runways* |
| *05A 04 01 08* | *Take-off climb* |
| *05A 04 01 09* | *Obstacle-limited take-off* |
| *05A 04 01 10* | *Performance-limited take-off mass (PLTOM) and regulated take-off mass (RTOM) tables* |
| *05A 04 01 11* | *Take-off performance on wet and contaminated runways* |
| *05A 04 01 12* | *Use of reduced (flexible or flex) and derated thrust* |
| *05A 04 01 13* | *Take-off performance using different take-off flap settings* |
| *05A 04 01 14* | *Take-off performance using increased $V_2$ speeds ('improved climb performance')* |
| *05A 04 01 15* | *Brake-energy and tyre-speed limit* |
| **05A 04 02 00** | **Climb** |
| *05A 04 02 01* | *Climb techniques* |
| *05A 04 02 02* | *Influence of variables on climb performance* |
| **05A 04 03 00** | **Cruise** |
| *05A 04 03 01* | *Reserved* |
| *05A 04 03 02* | *Reserved* |

| Syllabus reference | Syllabus details and associated Learning Objectives |
|---|---|
| *05A 04 03 03* | *Reserved* |
| *05A 04 03 04* | *Long-range cruise* |
| *05A 04 03 05* | *Reserved* |
| *05A 04 03 06* | *Cruise altitudes* |
| *05A 04 03 07* | *Cost index (CI)* |
| **05A 04 04 00** | **En-route one-engine-inoperative** |
| *05A 04 04 01* | *Drift-down* |
| *05A 04 04 02* | *Influence of variables on the en-route one-engine-inoperative performance* |
| **05A 04 05 00** | **Descent** |
| *05A 04 05 01* | *Descent techniques* |
| *05A 04 05 02* | *Energy management in the descent* |
| **05A 04 06 00** | **Approach and landing** |
| *05A 04 06 01* | *Approach requirements* |
| *05A 04 06 02* | *Landing-field-length and landing-speed requirements* |
| *05A 04 06 03* | *Influence of variables on landing performance* |
| *05A 04 06 04* | *Quick turnaround limit* |
| **05A 05 00 00** | **APPLICABLE OPERATIONAL REQUIREMENTS IN PERFORMANCE OF LARGE AEROPLANE — USE OF AEROPLANE PERFORMANCE DATA** |
| **05A 05 01 00** | **Take-off** |
| *05A 05 01 01* | *Take-off (performance data)* |
| **05A 05 02 00** | **Drift-down and stabilising altitude** |
| *05A 05 02 01* | *Drift-down and stabilising altitude (performance data)* |
| **05A 05 03 00** | **Landing** |
| *05A 05 03 01* | *Landing (performance data)* |

~ End ~

# 05(H) – FLIGHT PERFORMANCE – HELICOPTERS

| Syllabus reference | Syllabus details and associated Learning Objectives |
|---|---|
| **05H 01 00 00** | **GENERAL** |
| **05H 01 01 00** | **Performance legislation** |
| *05H 01 01 01* | *Airworthiness requirements* |
| *05H 01 01 02* | *Operational regulations* |
| **05H 01 02 00** | **General performance theory** |
| *05H 01 02 01* | *Phases of flight* |
| *05H 01 02 02* | *Definitions and terms* |
| *05H 01 02 03* | *Power required/power available curves* |
| *05H 01 02 04* | *Height–velocity graphs* |
| *05H 01 02 05* | *Influencing variables on performance* |
| **05H 02 00 00** | **PERFORMANCE CLASS 3 — SINGLE-ENGINE HELICOPTERS** |
| **05H 02 01 00** | **Effect of variables on single-engine (SE) helicopter performance** |
| *05H 02 01 01* | *Effect of variables on SE helicopter performance* |
| **05H 02 02 00** | **Take-off and landing** |
| *05H 02 02 01* | *Take-off and landing (including hover)* |
| **05H 02 03 00** | **Climb, cruise and descent** |
| *05H 02 03 01* | *Climb, cruise and descent (capabilities)* |
| **05H 02 04 00** | **Use of helicopter performance data** |
| *05H 02 04 01* | *Take-off (including hover)* |
| *05H 02 04 02* | *Climb* |
| *05H 02 04 03* | *Cruise* |
| *05H 02 04 04* | *Landing (including hover)* |
| **05H 03 00 00** | **PERFORMANCE CLASS 2** |
| | *General remark: The Learning Objectives for Performance Class 2 are principally identical with those for Performance Class 1. (See 05H 04 00 00) Additional Learning Objectives are shown below.* |
| **05H 03 01 00** | **Operations without an assured safe forced landing capability** |
| *05H 03 01 01* | *Responsibility for operations without an assured safe forced landing capability* |
| **05H 03 02 00** | **Take-off** |
| *05H 03 02 01* | *Take-off requirements* |
| **05H 03 03 00** | **Take-off flight path** |
| *05H 03 03 01* | *Take-off flight path requirements* |
| **05H 03 04 00** | **Landing** |
| *05H 03 04 01* | *Landing requirements* |
| **05H 04 00 00** | **PERFORMANCE CLASS 1** |
| **05H 04 01 00** | **Take-off** |
| *05H 04 01 01* | *Take-off distances* |
| *05H 04 01 02* | *Rejected take-off distance required (helicopter) (RTODR(H))* |
| *05H 04 01 03* | *Reserved* |
| *05H 04 01 04* | *Take-off climb* |
| *05H 04 01 05* | *Obstacle-limited take-off* |
| *05H 04 01 06* | *Use of helicopter performance data* |

| Syllabus reference | Syllabus details and associated Learning Objectives |
|---|---|
| **05H 04 02 00** | **Climb** |
| *05H 04 02 01* | *Climb techniques* |
| *05H 04 02 02* | *Use of helicopter flight data* |
| **05H 04 03 00** | **Cruise** |
| *05H 04 03 01* | *Cruise techniques* |
| *05H 04 03 02* | *Maximum endurance* |
| *05H 04 03 03* | *Maximum range* |
| *05H 04 03 04* | *Maximum cruise* |
| *05H 04 03 05* | *Cruise altitudes* |
| *05H 04 03 06* | *Use of helicopter performance data* |
| **05H 04 04 00** | **En-route one-engine-inoperative (OEI)** |
| *05H 04 04 01* | *Requirements for en-route flights with OEI* |
| *05H 04 04 02* | *Use of helicopter flight data* |
| **05H 04 05 00** | **Descent** |
| *05H 04 05 01* | *Use of helicopter flight data* |
| **05H 04 06 00** | **Landing** |
| *05H 04 06 01* | *Landing requirements* |
| *05H 04 06 02* | *Landing procedures* |
| *05H 04 06 03* | *Use of helicopter performance data* |

~ End ~

# 06 – FLIGHT PLANNING AND MONITORING

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **030 00 00 00** | **FLIGHT PERFORMANCE AND PLANNING** | | |
| **06 00 00 00** | **FLIGHT PLANNING AND MONITORING** | | |
| **06 01 00 00** | **FLIGHT PLANNING FOR VFR FLIGHTS**<br>*Remark: Using the GSPRM VFR charts.* | | |
| **06 01 01 00** | **VFR navigation plan** | | |
| *06 01 01 01* | *Airspace, communication, visual and radio-navigation data from VFR charts* | x | x |
| *06 01 01 02* | *Planning courses, distances and cruising levels with VFR charts* | x | x |
| *06 01 01 03* | *Aerodrome charts and aerodrome directory* | x | x |
| *06 01 01 04* | *Reserved* | | |
| *06 01 01 05* | *Completion of navigation plan* | x | x |
| **06 02 00 00** | **FLIGHT PLANNING FOR IFR FLIGHTS**<br>*Remark: Using the GSPRM IFR charts.* | | |
| **06 02 01 00** | **IFR navigation plan** | | |
| *06 02 01 01* | *Air traffic service (ATS) routes* | x | x |
| *06 02 01 02* | *Courses and distances from en-route charts* | x | x |
| *06 02 01 03* | *Altitudes* | x | x |
| *06 02 01 04* | *Standard instrument departure (SID) and standard instrument arrival (STAR) routes* | x | x |
| *06 02 01 05* | *Instrument-approach charts* | x | x |
| *06 02 01 06* | *Communications and radio-navigation planning data* | x | x |
| *06 02 01 07* | *Completion of a manual navigation plan* | x | x |
| **06 03 00 00** | **FUEL PLANNING — CAT.OP.MPA.106 and CAT.OP.MPA.150 plus AMC1, 2 and 3** | | |
| **06 03 01 00** | **General** | | |
| *06 03 01 01* | *Fuel planning (general)* | x | x |
| **06 03 02 00** | **Pre-flight fuel planning for commercial flights** | | |
| *06 03 02 01* | *Taxi fuel* | x | x |
| *06 03 02 02* | *Trip fuel* | x | x |
| *06 03 02 03* | *Reserve fuel and its components* | x | x |
| | Contingency fuel | | |
| *06 03 02 04* | *Extra fuel* | x | x |
| *06 03 02 05* | *Calculation of total fuel and completion of the fuel section of the navigation plan (fuel plan)* | x | x |
| **06 03 03 00** | **Specific fuel-calculation procedures** | | |
| *06 03 03 01* | *Reduced contingency fuel procedure* | x | |
| *06 03 03 02* | *Isolated aerodrome or heliport procedure* | x | x |
| *06 03 03 03* | *Predetermined-point procedure* | x | |
| *06 03 03 04* | *Fuel-tankering* | x | |
| *06 03 03 05* | *Reserved* | | |
| **06 04 00 00** | **PRE-FLIGHT PREPARATION** | | |
| **06 04 01 00** | **Notice to airmen (NOTAM) briefing** | | |
| *06 04 01 01* | *Ground- and satellite-based facilities and services* | x | x |
| *06 04 01 02* | *Departure, destination and alternate aerodromes* | x | x |
| *06 04 01 03* | *Airway routings and airspace structure* | x | x |
| *06 04 01 04* | *Pre-flight preparation of GNSS achievability* | x | |
| **06 04 02 00** | **Meteorological briefing** | | |
| *06 04 02 01* | *Reserved* | | |
| *06 04 02 02* | *Update of navigation plan using the latest meteorological information* | x | x |
| *06 04 02 03* | *Reserved* | | |
| *06 04 02 04* | *Reserved* | | |
| *06 04 02 05* | *Update of fuel plan* | x | x |



Note: A - Aeroplane H - Helicopter x - Applicable

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **06 04 03 00** | **Point of equal time (PET) and point of safe return (PSR)** | | |
| *06 04 03 01* | *Point of equal time (PET)* | **x** | **x** |
| *06 04 03 02* | *Point of safe return (PSR)* | **x** | **x** |
| **06 05 00 00** | **ICAO FLIGHT PLAN (ATS flight plan (FPL))** | | |
| **06 05 01 00** | **Individual FPL** | | |
| *06 05 01 01* | *Format of FPL* | **x** | **x** |
| *06 05 01 02* | *Reserved* | | |
| **06 05 02 00** | **Repetitive flight plan (RPL)** | | |
| *06 05 02 01* | *Repetitive flight plan (RPL)* | **x** | **x** |
| **06 06 00 00** | **FLIGHT MONITORING AND IN-FLIGHT REPLANNING** | | |
| **06 06 01 00** | **Flight monitoring** | | |
| *06 06 01 01* | *Monitoring of track and time* | **x** | **x** |
| *06 06 01 02* | *In-flight fuel management* | **x** | **x** |
| **06 06 02 00** | **In-flight replanning** | | |
| *06 06 02 01* | *Deviation from planned data* | **x** | **x** |

~ End ~



Note: A - Aeroplane H - Helicopter x - Applicable

# 07 – HUMAN PERFORMANCE AND LIMITATIONS

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **07 01 00 00** | **HUMAN FACTORS: BASIC CONCEPTS** | | |
| **07 01 01 00** | **Human factors in aviation** | | |
| *07 01 01 01* | *Becoming a competent pilot* | x | x |
| **07 01 02 00** | **Reserved** | | |
| **07 01 03 00** | **Flight safety concepts** | | |
| *07 01 03 01* | *Threat and error management (TEM) model and SHELL model* | x | x |
| **07 01 04 00** | **Safety culture** | | |
| *07 01 04 01* | *Safety culture and safety management* | x | x |
| **07 02 00 00** | **Basics of aviation physiology and health maintenance** | | |
| **07 02 01 00** | **Basics of flight physiology** | | |
| *07 02 01 01* | *The atmosphere* | x | x |
| *07 02 01 02* | *Respiratory and circulatory system* | x | x |
| *07 02 01 03* | *High-altitude environment* | x | |
| **07 02 02 00** | **People and the environment: the sensory system** | | |
| *07 02 02 01* | *The different senses* | x | x |
| *07 02 02 02* | *Central, peripheral and autonomic nervous system* | x | x |
| *07 02 02 03* | *Vision* | x | x |
| *07 02 02 04* | *Hearing* | x | x |
| *07 02 02 05* | *Equilibrium* | x | x |
| *07 02 02 06* | *Integration of sensory inputs* | x | x |
| **07 02 03 00** | **Health and hygiene** | | |
| *07 02 03 01* | *Intentionally left blank* | x | x |
| *07 02 03 02* | *Body rhythm and sleep* | x | x |
| *07 02 03 03* | *Problem areas for pilots* | x | x |
| *07 02 03 04* | *Intoxication* | x | x |
| *07 02 03 05* | *Incapacitation in flight* | x | x |
| **07 03 00 00** | **BASIC AVIATION PSYCHOLOGY** | | |
| **07 03 01 00** | **Human information processing** | | |
| *07 03 01 01* | *Attention and vigilance* | x | x |
| *07 03 01 02* | *Perception* | x | x |
| *07 03 01 03* | *Memory* | x | x |
| *07 03 01 04* | *Response selection* | x | x |
| **07 03 02 00** | **Human error and reliability** | | |
| *07 03 02 01* | *Reliability of human behaviour* | x | x |
| *07 03 02 02* | *Mental models and situation awareness* | x | x |
| *07 03 02 03* | *Theory and model of human error* | x | x |
| *07 03 02 04* | *Error generation* | x | x |
| **07 03 03 00** | **Decision-making** | | |
| *07 03 03 01* | *Decision-making concepts* | x | x |



Note: A - Aeroplane H - Helicopter x - Applicable

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **07 03 04 00** | **Avoiding and managing errors: cockpit management** | | |
| *07 03 04 01* | *Safety awareness* | x | x |
| *07 03 04 02* | *Coordination (multi-crew concepts)* | x | x |
| *07 03 04 03* | *Cooperation* | x | x |
| *07 03 04 04* | *Communication* | x | x |
| **07 03 05 00** | **Human behaviour** | | |
| *07 03 05 01* | *Personality, attitude and behaviour* | x | x |
| *07 03 05 02* | *Individual differences in personality and motivation* | x | x |
| *07 03 05 03* | *Identification of hazardous attitudes (error proneness)* | x | x |
| **07 03 06 00** | **Human overload and underload** | | |
| *07 03 06 01* | *Arousal* | x | x |
| *07 03 06 02* | *Stress* | x | x |
| *07 03 06 03* | *Reserved* | | |
| *07 03 06 04* | *Reserved* | | |
| *07 03 06 05* | *Fatigue and stress management* | x | x |
| **07 03 07 00** | **Advanced cockpit automation** | | |
| *07 03 07 01* | *Advantages and disadvantages* | x | x |
| *07 03 07 02* | *Automation complacency* | x | x |
| *07 03 07 03* | *Working concepts* | x | x |

~ End ~



Note: A - Aeroplane H - Helicopter x - Applicable

# 08 – METEOROLOGY

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **08 01 00 00** | **THE ATMOSPHERE** | | |
| **08 01 01 00** | **Composition, extent, vertical division** | | |
| *08 01 01 01* | *Structure of the atmosphere* | x | x |
| *08 01 01 02* | *Troposphere* | x | x |
| *08 01 01 03* | *Stratosphere* | x | x |
| **08 01 02 00** | **Air temperature** | | |
| *08 01 02 01* | *Definition and units* | x | x |
| *08 01 02 02* | *Vertical distribution of temperature* | x | x |
| *08 01 02 03* | *Transfer of heat* | x | x |
| *08 01 02 04* | *Lapse rates* | x | x |
| *08 01 02 05* | *Development of inversions, types of inversions* | x | x |
| *08 01 02 06* | *Temperature near the Earth's surface, insolation, surface effects, effect of clouds, effect of wind* | x | x |
| **08 01 03 00** | **Atmospheric pressure** | | |
| *08 01 03 01* | *Barometric pressure, isobars* | x | x |
| *08 01 03 02* | *Pressure variation with height, contours (isohypses)* | x | x |
| *08 01 03 03* | *Reduction of pressure to QFF (MSL)* | x | x |
| *08 01 03 04* | *Relationship between surface pressure centres and pressure centres aloft* | x | x |
| **08 01 04 00** | **Air density** | | |
| *08 01 04 01* | *Relationship between pressure, temperature and density* | x | x |
| **08 01 05 00** | **International Standard Atmosphere (ISA)** | | |
| *08 01 05 01* | *International Standard Atmosphere (ISA)* | x | x |
| **08 01 06 00** | **Altimetry** | | |
| *08 01 06 01* | *Terminology and definitions* | x | x |
| *08 01 06 02* | *Altimeter settings* | x | x |
| *08 01 06 03* | *Calculations* | x | x |
| *08 01 06 04* | *Effect of accelerated airflow due to topography* | x | x |
| **08 02 00 00** | **WIND** | | |
| **08 02 01 00** | **Definition and measurement of wind** | | |
| *08 02 01 01* | *Definition and measurement* | x | x |
| **08 02 02 00** | **Primary cause of wind** | | |
| *08 02 02 01* | *Primary cause of wind, pressure gradient, Coriolis force, gradient wind* | x | x |
| *08 02 02 02* | *Variation of wind in the friction layer* | x | x |
| *08 02 02 03* | *Effects of convergence and divergence* | x | x |
| **08 02 03 00** | **General global circulation** | | |
| *08 02 03 01* | *General circulation around the globe* | x | x |
| **08 02 04 00** | **Local winds** | | |
| *08 02 04 01* | *Anabatic and katabatic winds, mountain and valley winds, Venturi effects, land and sea breezes* | x | x |
| **08 02 05 00** | **Mountain waves (standing waves, lee waves)** | | |
| *08 02 05 01* | *Origin and characteristics* | x | x |



Note: A - Aeroplane H - Helicopter x - Applicable

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **08 02 06 00** | **Turbulence** | | |
| *08 02 06 01* | *Description and types of turbulence* | x | x |
| *08 02 06 02* | *Formation and location of turbulence* | x | x |
| *08 02 06 03* | *Clear-air turbulence (CAT) — description, cause and location* | x | x |
| **08 02 07 00** | **Jet streams** | | |
| *08 02 07 01* | *Description* | x | |
| *08 02 07 02* | *Formation and properties of jet streams* | x | |
| ***08 02 07 03*** | ***Location of jet streams and associated CAT areas*** | x | |
| ***08 02 07 04*** | ***Reserved*** | x | |
| **08 03 00 00** | **THERMODYNAMICS** | | |
| **08 03 01 00** | **Humidity** | | |
| *08 03 01 01* | *Water vapour in the atmosphere* | x | x |
| *08 03 01 02* | *Reserved* | | |
| *08 03 01 03* | *Temperature/dew point, relative humidity* | x | x |
| **08 03 02 00** | **Change of state of water** | | |
| *08 03 02 01* | *Condensation, evaporation, sublimation, freezing and melting, latent heat* | x | x |
| **08 03 03 00** | **Adiabatic processes** | | |
| *08 03 03 01* | *Adiabatic processes, stability of the atmosphere* | x | x |
| **08 04 00 00** | **CLOUDS AND FOG** | | |
| **08 04 01 00** | **Cloud formation and description** | | |
| *08 04 01 01* | *Cloud formation* | x | x |
| *08 04 01 02* | *Cloud types and cloud classification* | x | x |
| *08 04 01 03* | *Influence of inversions on cloud development* | x | x |
| *08 04 01 04* | *Flying conditions in each cloud type* | x | x |
| **08 04 02 00** | **Fog, mist, haze** | | |
| *08 04 02 01* | *General aspects* | x | x |
| *08 04 02 02* | *Radiation fog* | x | x |
| *08 04 02 03* | *Advection fog* | x | x |
| *08 04 02 04* | *Sea smoke* | x | x |
| *08 04 02 05* | *Frontal fog* | x | x |
| *08 04 02 06* | *Orographic fog (hill fog)* | x | x |
| **08 05 00 00** | **PRECIPITATION** | | |
| **08 05 01 00** | **Development of precipitation** | | |
| *08 05 01 01* | *Process of development of precipitation* | x | x |
| **08 05 02 00** | **Types of precipitation** | | |
| *08 05 02 01* | *Types of precipitation, relationship with cloud types* | x | x |
| **08 06 00 00** | **AIR MASSES AND FRONTS** | | |
| **08 06 01 00** | **Air masses** | | |
| *08 06 01 01* | *Description, classification and source regions of air masses* | x | x |
| *08 06 01 02* | *Modifications of air masses* | x | x |
| **08 06 02 00** | **Fronts** | | |
| *08 06 02 01* | *General aspects* | x | x |
| *08 06 02 02* | *Warm front, associated clouds and weather* | x | x |
| *08 06 02 03* | *Cold front, associated clouds and weather* | x | x |
| *08 06 02 04* | *Warm sector, associated clouds and weather* | x | x |
| *08 06 02 05* | *Weather behind the cold front* | x | x |



Note: A - Aeroplane H - Helicopter x - Applicable

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| *08 06 02 06* | *Occlusions, associated clouds and weather* | x | x |
| *08 06 02 07* | *Stationary front, associated clouds and weather* | x | x |
| *08 06 02 08* | *Movement of fronts and pressure systems, life cycle* | x | x |
| *08 06 02 09* | *Changes of meteorological elements at a frontal wave* | x | x |
| **08 07 00 00** | **PRESSURE SYSTEMS** | | |
| **08 07 01 00** | **The principal pressure areas** | | |
| *08 07 01 01* | *Location of the principal pressure areas* | x | x |
| **08 07 02 00** | **Anticyclone** | x | x |
| *08 07 02 01* | *Anticyclones, types, general properties, cold and warm anticyclones, ridges and subsidence* | x | x |
| **08 07 03 00** | **Non-frontal depressions** | | |
| *08 07 03 01* | *Thermal, orographic, polar and secondary depressions; troughs* | x | x |
| **08 07 04 00** | **Tropical revolving storms** | | |
| *08 07 04 01* | *Characteristics of tropical revolving storms* | x | x |
| *08 07 04 02* | *Origin and local names, location and period of occurrence* | x | x |
| **08 08 00 00** | **CLIMATOLOGY** | | |
| **08 08 01 00** | **Climatic zones** | | |
| *08 08 01 01* | *General circulation in the troposphere and lower stratosphere* | x | x |
| *08 08 01 02* | *Climatic classification* | x | x |
| **08 08 02 00** | **Tropical climatology** | | |
| *08 08 02 01* | *Cause and development of tropical showers and thunderstorms: humidity, temperature, tropopause* | x | x |
| *08 08 02 02* | *Seasonal variations of weather and wind, typical synoptic situations* | x | x |
| *08 08 02 03* | *Intertropical Convergence Zone (ITCZ), weather in the ITCZ, general seasonal movement* | x | |
| *08 08 02 04* | *Monsoon, sandstorms, cold-air outbreaks* | x | x |
| *08 08 02 05* | *Easterly waves* | x | |
| **08 08 03 00** | **Typical weather situations in the mid-latitudes** | | |
| *08 08 03 01* | *Westerly situation (westerlies)* | x | x |
| *08 08 03 02* | *High-pressure area* | x | x |
| *08 08 03 03* | *Intentionally left blank* | x | x |
| *08 08 03 04* | *Cold-air drop* | x | x |
| **08 08 04 00** | **Local winds and associated weather** | | |
| *08 08 04 01* | *Foehn, Mistral, Bora* | x | x |
| *08 08 04 02* | *Harmattan* | x | x |
| **08 09 00 00** | **FLIGHT HAZARDS** | | |
| **08 09 01 00** | **Icing** | | |
| *08 09 01 01* | *Conditions for ice accretion* | x | x |
| *08 09 01 02* | *Types of ice accretion* | X | X |
| *08 09 01 03* | *Hazards of ice accretion, avoidance* | x | x |
| *08 09 01 04* | *Ice crystal icing* | x | x |
| 08 09 02 00 | Turbulence | | |
| *08 09 02 01* | *Effects on flight, avoidance* | x | x |
| *08 09 02 02* | *Clear-air turbulence (CAT): effects on flight, avoidance* | x | x |
| 08 09 03 00 | Wind shear | | |
| *08 09 03 01* | *Definition of wind shear* | x | x |
| *08 09 03 02* | *Weather conditions for wind shear* | x | x |
| *08 09 03 03* | *Effects on flight, avoidance* | x | x |



Note: A - Aeroplane H - Helicopter x - Applicable

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **08 09 04 00** | **Thunderstorms** | | |
| *08 09 04 01* | Conditions for and process of development, forecast, location, type specification | x | x |
| *08 09 04 02* | *Structure of thunderstorms, life cycle* | x | x |
| *08 09 04 03* | *Electrical discharges* | x | x |
| *08 09 04 04* | *Development and effects of downbursts* | x | x |
| *08 09 04 05* | *Thunderstorm avoidance* | x | x |
| **08 09 05 00** | **Tornadoes** | | |
| *08 09 05 01* | *Properties and occurrence* | x | x |
| **08 09 06 00** | **Inversions** | | |
| *08 09 06 01* | *Influence on aircraft performance* | x | x |
| **08 09 07 00** | **Stratospheric conditions** | | |
| *08 09 07 01* | *Influence on aircraft performance* | x | x |
| **08 09 08 00** | **Hazards in mountainous areas** | | |
| *08 09 08 01* | *Influence of terrain on clouds and precipitation, frontal passage* | x | x |
| *08 09 08 02* | *Vertical movements, mountain waves, wind shear, turbulence, ice accretion* | x | x |
| *08 09 08 03* | *Development and effect of valley inversions* | x | x |
| **08 09 09 00** | **Visibility-reducing phenomena** | | |
| *08 09 09 01* | *Reduction of visibility caused by precipitation and obscurations* | x | x |
| *08 09 09 02* | *Reduction of visibility caused by other phenomena* | x | x |
| **08 10 00 00** | **METEOROLOGICAL INFORMATION** | | |
| **08 10 01 00** | **Observation** | | |
| *08 10 01 01* | *Surface observations* | x | x |
| *08 10 01 02* | *Radiosonde observations* | x | x |
| *08 10 01 03* | *Satellite observations* | x | x |
| *08 10 01 04* | *Weather radar observations (Refer to Subject 08 09 04 05)* | x | x |
| *08 10 01 05* | *Aircraft observations and reporting* | x | x |
| **08 10 02 00** | **Weather charts** | | |
| *08 10 02 01* | *Significant weather charts* | x | x |
| *08 10 02 02* | *Surface charts* | x | x |
| *08 10 02 03* | *Upper-air charts* | x | x |
| *08 10 02 04* | *Gridded forecast products* | x | x |
| **08 10 03 00** | **Information for flight planning** | | |
| *08 10 03 01* | *Aviation weather messages* | x | x |
| *08 10 03 02* | *Meteorological broadcasts for aviation* | x | x |
| *08 10 03 03* | *Use of meteorological documents* | x | x |
| *08 10 03 04* | *Meteorological warnings* | x | x |
| **08 10 04 00** | **Meteorological services** | | |
| *08 10 04 01* | *World area forecast system and meteorological offices* | x | x |
| *08 10 04 02* | *International organisations* | x | x |

~ End ~



Note: A - Aeroplane H - Helicopter x - Applicable

# 09 – NAVIGATION

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **09 00 00 00** | **GENERAL NAVIGATION** | | |
| **09 01 00 00** | **BASICS OF NAVIGATION** | | |
| **09 01 01 00** | **The Earth** | | |
| *09 01 01 01* | *Form* | x | x |
| *09 01 01 02* | *Earth rotation* | x | x |
| **09 01 02 00** | **Position** | | |
| *09 01 02 01* | *Position reference system* | x | x |
| **09 01 03 00** | **Direction** | | |
| *09 01 03 01* | *Datums* | x | x |
| *09 01 03 02* | *Track and heading* | x | x |
| **09 01 04 00** | **Distance** | | |
| *09 01 04 01* | *WGS-84 ellipsoid* | x | x |
| *09 01 04 02* | *Units* | x | x |
| *09 01 04 03* | *Graticule distances* | x | x |
| *09 01 04 04* | *Air mile* | x | x |
| **09 01 05 00** | **Speed** | | |
| *09 01 05 01* | *True airspeed (TAS)* | x | x |
| *09 01 05 02* | *Mach number (M)* | x | |
| *09 01 05 03* | *CAS/TAS/M relationship* | x | x |
| *09 01 05 04* | *Ground speed (GS)* | x | x |
| *09 01 05 05* | *Flight log* | x | x |
| *09 01 05 06* | *Gradient versus rate of climb/descent* | x | x |
| **09 01 06 00** | **Triangle of velocities (TOV)** | | |
| *09 01 06 01* | *Construction* | x | x |
| *09 01 06 02* | *Solutions* | x | x |
| **09 01 07 00** | **Dead reckoning (DR)** | | |
| *09 01 07 01* | *Dead reckoning (DR) technique* | x | x |
| **09 01 08 00** | **Navigation in climb and descent** | | |
| *09 01 08 01* | *Average airspeed* | x | x |
| *09 01 08 02* | *Average wind velocity (WV)* | x | x |
| *09 01 08 03* | *Ground speed (GS)/distance covered during climb or descent* | x | x |
| **09 02 00 00** | **VISUAL FLIGHT RULE (VFR) NAVIGATION** | | |
| **09 02 01 00** | **Ground features** | | |
| *09 02 01 01* | *Ground features* | x | x |
| *09 02 01 02* | *Visual identification* | x | x |
| **09 02 02 00** | **VFR navigation techniques** | | |
| *09 02 02 01* | *Use of visual observations and application to in-flight navigation* | x | x |
| *09 02 02 02* | *Unplanned events* | x | x |
| **09 03 00 00** | **GREAT CIRCLES AND RHUMB LINES** | | |
| **09 03 01 00** | **Great circles** | | |
| *09 03 01 01* | *Properties* | x | x |
| *09 03 01 02* | *Convergence* | x | x |

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **09 03 02 00** | **Rhumb lines** | | |
| *09 03 02 01* | *Properties* | x | x |
| **09 03 03 00** | **Relationship** | | |
| *09 03 03 01* | *Distances* | x | x |
| *09 03 03 02* | *Conversion angle* | x | |
| **09 04 00 00** | **CHARTS** | | |
| **09 04 01 00** | **Chart requirements** | | |
| *09 04 01 01* | *ICAO Annex 4 'Aeronautical Charts'* | x | x |
| *09 04 01 02* | *Convergence* | x | x |
| *09 04 01 03* | *Scale* | x | x |
| **09 04 02 00** | **Projections** | | |
| *09 04 02 01* | *Methods of projection* | x | x |
| *09 04 02 02* | *Polar stereographic* | x | x |
| *09 04 02 03* | *Direct Mercator* | x | x |
| *09 04 02 04* | *Lambert* | x | x |
| **09 04 03 00** | **Practical use** | | |
| *09 04 03 01* | *Symbology* | x | x |
| *09 04 03 02* | *Plotting* | x | x |
| **09 05 00 00** | **TIME** | | |
| **09 05 01 00** | **Local Mean Time (LMT)** | | |
| *09 05 01 01* | *Mean solar day* | x | x |
| *09 05 01 02* | *Local Mean Time (LMT) and Universal Time Coordinated (UTC)* | x | x |
| **09 05 02 00** | **Standard time** | | |
| *09 05 02 01* | *Standard time and daylight saving time* | x | x |
| *09 05 02 02* | *International Date Line* | x | x |
| **09 05 03 00** | **Sunrise and sunset** | | |
| *09 05 03 01* | *Sunrise and sunset times* | x | x |
| **09R 00 00 00** | **RADIO NAVIGATION** | | |
| **09R 01 00 00** | **BASIC RADIO PROPAGATION THEORY** | | |
| **09R 01 01 00** | **Basic principles** | | |
| *09R 01 01 01* | *Electromagnetic waves* | x | x |
| *09R 01 01 02* | *Frequency, wavelength, amplitude, phase angle* | x | x |
| *09R 01 01 03* | *Frequency bands, sidebands, single sideband* | x | x |
| *09R 01 01 04* | *Pulse characteristics* | x | x |
| *09R 01 01 05* | *Carrier, modulation* | x | x |
| *09R 01 01 06* | *Kinds of modulation (amplitude, frequency, pulse, phase)* | x | x |
| **09R 01 02 00** | **Antennas** | | |
| *09R 01 02 01* | *Characteristics* | x | x |
| *09R 01 02 02* | *Polarisation* | x | x |
| *09R 01 02 03* | *Types of antennas* | x | x |
| **09R 01 03 00** | **Wave propagation** | | |
| *09R 01 03 01* | *Structure of the ionosphere and its effect on radio waves* | x | x |
| *09R 01 03 02* | *Ground waves* | x | x |
| *09R 01 03 03* | *Space waves* | x | x |
| *09R 01 03 04* | *Propagation with the frequency bands* | x | x |
| *09R 01 03 05* | *Doppler principle* | x | x |
| *09R 01 03 06* | *Factors affecting propagation* | x | x |

Note: A - Aeroplane H - Helicopter x - Applicable

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **09R 02 00 00** | **RADIO AIDS** | | |
| **09R 02 01 00** | **Ground direction finding (DF)** | | |
| *09R 02 01 01* | *Principles* | x | x |
| *09R 02 01 02* | *Presentation and interpretation* | x | x |
| *09R 02 01 03* | *Coverage and range* | x | x |
| *09R 02 01 04* | *Errors and accuracy* | x | x |
| **09R 02 02 00** | **Non-directional radio beacon (NDB)/automatic direction finding (ADF)** | | |
| *09R 02 02 01* | *Principles* | x | x |
| *09R 02 02 02* | *Presentation and interpretation* | x | x |
| *09R 02 02 03* | *Coverage and range* | x | x |
| *09R 02 02 04* | *Errors and accuracy* | x | x |
| *09R 02 02 05* | *Factors affecting range and accuracy* | x | x |
| **09R 02 03 00** | **VHF omnidirectional radio range (VOR): conventional VOR (CVOR) and Doppler VOR (DVOR)** | | |
| *09R 02 03 01* | *Principles* | x | x |
| *09R 02 03 02* | *Presentation and interpretation* | x | x |
| *09R 02 03 03* | *Reserved* | | |
| *09R 02 03 04* | *Errors and accuracy* | x | x |
| **09R 02 04 00** | **Distance-measuring equipment (DME)** | | |
| *09R 02 04 01* | *Principles* | x | x |
| *09R 02 04 02* | *Presentation and interpretation* | x | x |
| *09R 02 04 03* | *Coverage and range* | x | x |
| *09R 02 04 04* | *Reserved* | | |
| *09R 02 04 05* | *Factors affecting range and accuracy* | x | x |
| **09R 02 05 00** | **Instrument landing system (ILS)** | | |
| *09R 02 05 01* | *Principles* | x | x |
| *09R 02 05 02* | *Presentation and interpretation* | x | x |
| *09R 02 05 03* | *Coverage and range* | x | x |
| *09R 02 05 04* | *Errors and accuracy* | x | x |
| *09R 02 05 05* | *Factors affecting range and accuracy* | x | x |
| **09R 02 06 00** | **Microwave landing system (MLS)** | | |
| *09R 02 06 01* | *Principles* | x | x |
| *09R 02 06 02* | *Presentation and interpretation* | x | x |
| *09R 02 06 03* | *Coverage and range* | x | x |
| **09R 03 00 00** | **RADAR** | | |
| **09R 03 01 00** | **Pulse techniques** | | |
| *09R 03 01 01* | *Pulse techniques and associated terms* | x | x |
| **09R 03 02 00** | **Ground radar** | | |
| *09R 03 02 01* | *Principles* | x | x |
| *09R 03 02 02* | *Presentation and interpretation* | x | x |
| **09R 03 03 00** | **Airborne weather radar** | | |
| *09R 03 03 01* | *Principles* | x | x |
| *09R 03 03 02* | *Presentation and interpretation* | x | x |
| *09R 03 03 03* | *Coverage and range* | x | x |
| *09R 03 03 04* | *Errors, accuracy, limitations* | x | x |
| *09R 03 03 05* | *Factors affecting range and accuracy* | x | x |
| *09R 03 03 06* | *Application for navigation* | x | x |

Note: A - Aeroplane H - Helicopter x - Applicable

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **09R 03 04 00** | **Secondary surveillance radar and transponder** | | |
| *09R 03 04 01* | *Principles* | x | x |
| *09R 03 04 02* | *Modes and codes* | x | x |
| *09R 03 04 03* | *Presentation and interpretation* | x | x |
| **09R 04 00 00** | **RESERVED** | | |
| **09R 05 00 00** | **RESERVED** | | |
| **09R 06 00 00** | **GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSSs)** | | |
| **09R 06 01 00** | **Global navigation satellite systems (GNSSs)** | | |
| *09R 06 01 01* | *General* | x | x |
| *09R 06 01 02* | *Operation* | x | x |
| *09R 06 01 03* | *Errors and factors affecting accuracy* | x | x |
| **09R 06 02 00** | **Ground-, satellite- and aircraft-based augmentation systems** | | |
| *09R 06 02 01* | *Ground-based augmentation systems (GBASs)* | x | x |
| *09R 06 02 02* | *Satellite-based augmentation systems (SBASs)* | x | x |
| *09R 06 02 03* | *Reserved* | | |
| *09R 06 02 04* | *Aircraft-based augmentation systems (ABASs)* | x | x |
| **09R 07 00 00** | **PERFORMANCE-BASED NAVIGATION (PBN)** | | |
| **09R 07 01 00** | **Performance-based navigation (PBN) concept (as described in ICAO Doc 9613)** | | |
| *09R 07 01 01* | *PBN principles* | x | x |
| *09R 07 01 02* | *PBN components* | x | x |
| *09R 07 01 03* | *PBN scope* | x | x |
| **09R 07 02 00** | **Navigation specifications** | | |
| *09R 07 02 01* | *Area navigation (RNAV) and required navigation performance (RNP)* | x | x |
| *09R 07 02 02* | *Navigation functional requirements* | x | x |
| *09R 07 02 03* | *Designation of RNP and RNAV specifications* | x | x |
| **09R 07 03 00** | **Use of performance-based navigation (PBN)** | | |
| *09R 07 03 01* | *Reserved* | | |
| *09R 07 03 02* | *Reserved* | | |
| *09R 07 03 03* | *Specific RNAV and RNP system functions* | x | x |
| *09R 07 03 04* | *Reserved* | | |
| **09R 07 04 00** | **Performance-based navigation (PBN) operations** | | |
| *09R 07 04 01* | *Performance-based navigation (PBN) principles* | x | x |
| *09R 07 04 02* | *On-board performance monitoring and alerting* | x | x |
| *09R 07 04 03* | *Abnormal situations* | x | x |
| *09R 07 04 04* | *Database management* | x | x |
| **09R 07 05 00** | **Requirements of specific RNAV and RNP specifications** | | |
| *09R 07 05 01* | *RNAV 10* | x | x |
| *09R 07 05 02* | *RNAV 5* | x | x |
| *09R 07 05 03* | *RNAV 1/RNAV 2/RNP 1/RNP 2* | x | x |
| *09R 07 05 04* | *Reserved* | | |
| *09R 07 05 05* | *Required navigation performance approach (RNP APCH)* | x | x |
| *09R 07 05 06* | *Required navigation performance authorisation required approach (RNP AR* | x | x |
| *09R 07 05 07* | *Advanced required navigation performance (A-RNP)* | x | x |
| *09R 07 05 08* | *PBN point-in-space (PinS) departure* | | x |
| *09R 07 05 09* | *PBN point-in-space (PinS) approach* | | x |

*~ End of Syllabus ~*

Note: A - Aeroplane H - Helicopter x - Applicable

# 10 – OPERATIONAL PROCEDURES

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **10 00 00 00** | **OPERATIONAL PROCEDURES** | | |
| **10 01 00 00** | **GENERAL REQUIREMENTS** | | |
| **10 01 01 00** | **ICAO Annex 6** | | |
| *10 01 01 01* | *Definitions* | **x** | **x** |
| *10 01 01 02* | *Applicability* | **x** | **x** |
| *10 01 01 03* | *General* | **x** | **x** |
| **10 01 02 00** | **Operational requirements** | | |
| *10 01 02 01~ 10 01 02 04* | *Reserved* | | |
| *10 01 02 05* | *All-weather operations* | **x** | **x** |
| *10 01 02 06~ 10 01 02 12* | *Reserved* | | |
| **10 01 03 00** | **Long-range flights** | | |
| *10 01 03 01* | *Reserved* | | |
| *10 01 03 02* | *Transoceanic and polar flights (ICAO Doc 7030 'Regional Supplementary Procedures — North Atlantic Operations and Airspace Manual')* | **x** | |
| *10 01 03 03* | *North Atlantic High Level Airspace (NAT HLA)* | **x** | |
| *10 01 03 04* | *Extended-range operations with two-engined aeroplanes (ETOPS)* | | **x** |
| **10 02 00 00** | **SPECIAL OPERATIONAL PROCEDURES AND HAZARDS — GENERAL ASPECTS** | | |
| **10 02 01 00** | **Reserved** | | |
| **10 02 02 00** | **Icing conditions** | | |
| *10 02 02 01* | *On-ground de-icing/anti-icing procedures, types of de-icing/anti-icing fluids* | **x** | **x** |
| *10 02 02 02* | *Procedure to apply in case of performance deterioration, on ground/in flight* | **x** | **x** |
| *10 02 03 01* | *Bird-strike risk and avoidance* | **x** | **x** |
| **10 02 04 00** | **Noise abatement** | | |
| *10 02 04 01* | *Noise-abatement procedures* | **x** | **x** |
| *10 02 04 02* | *Influence of the flight procedure (departure, cruise, approach)* | **x** | **x** |
| *10 02 04 03* | *Influence by the pilot (power setting, low drag)* | **x** | |
| *10 02 04 04* | *Influence by the pilot (power setting, track of helicopter)* | | **x** |
| **10 02 05 00** | **Fire and smoke** | | |
| *10 02 05 01* | *Carburettor fire* | **x** | **x** |
| *10 02 05 02* | *Engine fire* | **x** | **x** |
| *10 02 05 03* | *Fire in the cabin, in the flight crew compartment and in the cargo compartment* | **x** | **x** |
| *10 02 05 04* | *Smoke in the flight crew compartment and in the cabin* | **x** | **x** |
| *10 02 05 05* | *Actions in case of overheated brakes* | **x** | |
| **10 02 06 00** | **Decompression of pressurised cabin** | | |
| *10 02 06 01* | *Slow decompression* | **x** | |
| *10 02 06 02* | *Rapid and explosive decompression* | **x** | |
| *10 02 06 03* | *Dangers and action to be taken* | **x** | |

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| **10 02 07 00** | **Wind shear and microburst** | | |
| *10 02 07 01* | *Effects and recognition during departure and approach* | x | x |
| *10 02 07 02* | *Actions to avoid and actions to take when encountering wind shear* | x | x |
| **10 02 08 00** | **Wake turbulence** | | |
| *10 02 08 01* | *Cause* | x | x |
| *10 02 08 02* | *List of relevant parameters* | x | x |
| *10 02 08 03* | *Actions to be taken when crossing traffic, during take-off and landing* | x | x |
| **10 02 09 00** | **Security (unlawful events)** | | |
| *10 02 09 01* | *ICAO Annex 17 and Regulation (EC) No 300/2008* | x | x |
| *10 02 09 02* | *Use of secondary surveillance radar (SSR)* | x | x |
| *10 02 09 03* | *Security (Regulation (EC) No 300/2008 and ICAO Annex 17)* | x | x |
| **10 02 10 00** | **Emergency and precautionary landing, and ditcing** | | |
| *10 02 10 01* | *Descriptions* | x | x |
| *10 02 10 02* | *Cause* | x | x |
| *10 02 10 03* | *Reserved* | | |
| *10 02 10 04* | *Action after a precautionary/emergency landing or ditching* | x | x |
| *10 02 10 05* | *Evacuation* | x | x |
| **10 02 11 00** | **Fuel jettisoning** | | |
| *10 02 11 01* | *Safety aspects* | x | |
| *10 02 11 02* | *Reserved* | | |
| **10 02 12 00** | **Transport of dangerous goods by air** | | |
| *10 02 12 01* | *ICAO Annex 18 (4th Edition, July 2011)* | x | x |
| *10 02 12 02* | *Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO Doc 9284)* | x | x |
| *10 02 12 03* | *Regulation (EU) No 965/2012 — Annex IV (Part-CAT) and Annex V (Part-SPA)* | x | x |
| **10 02 13 00** | **Contaminated runways** | | |
| *10 02 13 01* | *Reserved* | | |
| *10 02 13 02* | *Estimated surface friction, friction coefficient* | x | |
| *10 02 13 03* | *Hydroplaning principles and effects* | x | |
| *10 02 13 04* | *Intentionally left blank* | x | |
| *10 02 13 05* | *Snowtam and contamination on the aerodrome* | x | |
| **10 02 14 00** | **Rotor downwash** | | |
| *10 02 14 01* | *Describe downwash* | | x |
| *10 02 14 02* | *Effects* | | x |
| **10 02 15 00** | **Operation influence by meteorological conditions (helicopter)** | | |
| *10 02 15 01* | *White-out/sand/dust* | | x |
| *10 02 15 02* | *Strong winds* | | x |
| *10 02 15 03* | *Mountain environment* | | x |
| **10 03 00 00** | **EMERGENCY PROCEDURES (HELICOPTER)** | | |
| **10 03 01 00** | **Influence of technical problems** | | |
| *10 03 01 01* | *Engine failure* | | x |
| *10 03 01 02* | *Fire in the cabin, in the flight crew compartment and in the engine(s)* | | x |

Note: A - Aeroplane H - Helicopter x - Applicable

| Syllabus reference | Syllabus details and associated Learning Objectives | A | H |
|---|---|---|---|
| *10 03 01 03* | *Tail-rotor directional control failure* | | **x** |
| *10 03 01 04* | *Ground resonance* | | **x** |
| *10 03 01 05* | *Blade stall* | | **x** |
| *10 03 01 06* | *Settling with power (vortex ring)* | | **x** |
| *10 03 01 07* | *Overpitch* | | **x** |
| *10 03 01 08* | *Overspeed: rotor/engine* | | **x** |
| *10 03 01 09* | *Dynamic rollover* | | **x** |
| *10 03 01 10* | *Mast bumping* | | **x** |
| **10 04 01 00** | **Reserved** | | |

*~ End ~*

# 11(A) – PRINCIPLES OF FLIGHT – AEROPLANES

| Syllabus reference | Syllabus details and associated Learning Objectives |
|---|---|
| **11A 01 00 00** | **SUBSONIC AERODYNAMICS** |
| **11A 01 01 00** | **Basic concepts, laws and definitions** |
| *11A 01 01 01* | *International system of units of measurement (SI) and conversion of SI units* |
| *11A 01 01 02* | *Basics of airflow* |
| *11A 01 01 03* | *Aerodynamic forces on aerofoils* |
| *11A 01 01 04* | *Shape of an aerofoil section* |
| *11A 01 01 05* | *Wing shape* |
| **11A 01 02 00** | **Two-dimensional airflow around an aerofoil** |
| *11A 01 02 01* | *Streamline pattern* |
| *11A 01 02 02* | *Stagnation point* |
| *11A 01 02 03* | *Pressure distribution* |
| *11A 01 02 04* | *Centre of pressure (CP) and aerodynamic centre (AC)* |
| *11A 01 02 05* | *Reserved* |
| *11A 01 02 06* | *Drag and wake* |
| *11A 01 02 07* | *Influence of angle of attack (α)* |
| *11A 01 02 08* | *Reserved* |
| *11A 01 02 09* | *The lift coefficient (CL) – angle of attack (α) graph* |
| **11A 01 03 00** | **Coefficients** |
| *11A 01 03 01* | *General use of coefficients* |
| *11A 01 03 02* | *The lift coefficient (CL)* |
| *11A 01 03 03* | *Drag* |
| **11A 01 04 00** | **Three-dimensional airflow around an aeroplane** |
| *11A 01 04 01* | *Angle of attack (α)* |
| *11A 01 04 02* | *Streamline pattern* |
| *11A 01 04 03* | *Induced drag* |
| **11A 01 05 00** | **Total drag** |
| *11A 01 05 01* | *Total drag in relation to parasite drag and induced drag* |
| *11A 01 05 02* | *Parasite drag* |
| *11A 01 05 03* | *Parasite drag and speed (Refer to 11A 01 04 03)* |
| *11A 01 05 04* | *Induced drag and speed* |
| *11A 01 05 05* | *Total drag* |
| *11A 01 05 06* | *Reserved* |
| *11A 01 05 07* | *Variables affecting the total drag–speed graph* |
| **11A 01 06 00** | **Ground effect** |
| *11A 01 06 01* | *Influence of ground effect* |
| *11A 01 06 02* | *Effect on stalling angle of attack (αCRIT)* |
| *11A 01 06 03* | *Effect on lift coefficient (CL)* |
| *11A 01 06 04* | *Effect on take-off and landing characteristics of an aeroplane* |
| **11A 01 07 00** | **The relationship between lift coefficient and speed in steady, straight, and level flight** |
| *11A 01 07 01* | *Represented by an equation* |
| *11A 01 07 02* | *Represented by a graph* |
| **11A 01 08 00** | **Reserved** |

| Syllabus reference | Syllabus details and associated Learning Objectives |
|---|---|
| **11A 01 09 00** | **$C_{LMAX}$ augmentation** |
| *11A 01 09 01* | *Trailing-edge flaps and the reasons for their use in take-off and landing* |
| *11A 01 09 02* | *Leading-edge devices and the reasons for their use in take-off and landing* |
| *11A 01 09 03* | *Vortex generators* |
| **11A 01 10 00** | **Means to reduce the CL–CD ratio** |
| *11A 01 10 01* | *Spoilers and the reasons for their use in the different phases of flight* |
| *11A 01 10 02* | *Speed brakes and the reasons for their use in the different phases of flight* |
| **11A 01 11 00** | **Reserved** |
| **11A 01 12 00** | **Aerodynamic degradation** |
| *11A 01 12 01* | *Ice and other contaminants* |
| *11A 01 12 02* | *Deformation and modification of airframe, ageing aeroplanes* |
| **11A 02 00 00** | **HIGH-SPEED AERODYNAMICS** |
| **11A 02 01 00** | **Speeds** |
| *11A 02 01 01* | *Speed of sound* |
| *11A 02 01 02* | *Mach number* |
| *11A 02 01 03* | *Influence of temperature and altitude on Mach number* |
| *11A 02 01 04* | *Compressibility* |
| *11A 02 01 05* | *Subdivision of aerodynamic flow* |
| **11A 02 02 00** | **Shock waves** |
| *11A 02 02 01* | *Definition of shock wave* |
| *11A 02 02 02* | *Normal shock waves* |
| **11A 02 03 00** | **Effects of exceeding the critical Mach number (MCRIT)** |
| *11A 02 03 01* | *Critical Mach number (MCRIT)* |
| *11A 02 03 02* | *Effect on lift* |
| *11A 02 03 03* | *Effect on drag* |
| *11A 02 03 04* | *Effect on pitching moment* |
| *11A 02 03 05* | *Effect on control effectiveness* |
| **11A 02 04 00** | ***Reserved*** |
| **11A 02 05 00** | **Means to influence critical Mach number (MCRIT)** |
| *11A 02 05 01* | *Wing sweep* |
| *11A 02 05 02* | *Aerofoil shape* |
| *11A 02 05 03* | *Vortex generators* |
| **11A 03 00 00** | **Stall, Mach tuck, and upset prevention and recovery** |
| **11A 03 01 00** | **The stall** |
| *11A 03 01 01* | *Flow separation at increasing α* |
| *11A 03 01 02* | *The stall speed* |
| *11A 03 01 03* | *The initial stall in spanwise direction* |
| *11A 03 01 04* | *Stall warning* |
| *11A 03 01 05* | *Special phenomena of stall* |
| *11A 03 01 06* | *The spin* |
| **11A 03 02 00** | **Buffet onset boundary** |
| *11A 03 02 01* | *Mach buffet* |
| *11A 03 02 02* | *Buffet onset* |
| **11A 03 03 00** | **Situations in which buffet or stall could occur** |
| *11A 03 03 01* | *Explain why buffet or stall occurs* |

| Syllabus reference | Syllabus details and associated Learning Objectives |
|---|---|
| **11A 03 04 00** | **Recognition of stalled condition** |
| *11A 03 04 01* | *Recognition and explanation of stalled condition* |
| **11A 04 00 00** | **STABILITY** |
| **11A 04 01 00** | **Static and dynamic stability** |
| *11A 04 01 01* | *Basics and definitions* |
| *11A 04 01 02* | *Precondition for static stability* |
| *11A 04 01 03* | *Sum of forces* |
| *11A 04 01 04* | *Sum of moments* |
| **11A 04 02 00** | **Reserved** |
| **11A 04 03 00** | **Static and dynamic longitudinal stability** |
| *11A 04 03 01* | *Methods for achieving balance* |
| *11A 04 03 02* | *Static longitudinal stability* |
| *11A 04 03 03* | *Neutral point* |
| *11A 04 03 04* | *Factors affecting neutral point* |
| *11A 04 03 05* | *Location of centre of gravity (CG)* |
| *11A 04 03 06* | *The Cm–α graph* |
| *11A 04 03 07* | *Factors affecting the Cm–α graph* |
| *11A 04 03 08* | *Reserved* |
| *11A 04 03 09* | *Reserved* |
| *11A 04 03 10* | *The stick force versus speed graph (IAS)* |
| *11A 04 03 11* | *Reserved* |
| *11A 04 03 12* | *The manoeuvring stability/stick force per g* |
| *11A 04 03 13* | *Reserved* |
| *11A 04 03 14* | *Factors affecting the manoeuvring stability/stick force per g* |
| *11A 04 03 15* | *Reserved* |
| *11A 04 03 16* | *Dynamic longitudinal stability* |
| **11A 04 04 00** | **Static directional stability** |
| *11A 04 04 01* | *Definition and effects of static directional stability* |
| *11A 04 04 02* | *Sideslip angle* |
| *11A 04 04 03* | *Yaw-moment coefficient Cn* |
| *11A 04 04 04* | Cn–β graph |
| *11A 04 04 05* | *Factors affecting static directional stability* |
| **11A 04 05 00** | **Static lateral stability** |
| *11A 04 05 01* | *Definition and effects of static lateral stability* |
| *11A 04 05 02* | *Bank angle Ø* |
| *11A 04 05 03* | *The roll-moment coefficient Cl* |
| *11A 04 05 04* | *Contribution of sideslip angle (β)* |
| *11A 04 05 05* | ***The Cl–β graph*** |
| *11A 04 05 06* | *Factors affecting static lateral stability* |
| **11A 04 06 00** | **Dynamic lateral/directional stability** |
| *11A 04 06 01* | *Reserved* |
| *11A 04 06 02* | *Tendency to spiral dive* |
| *11A 04 06 03* | *Dutch roll* |
| *11A 04 06 04* | *Effects of altitude on dynamic stability* |

| Syllabus reference | Syllabus details and associated Learning Objectives |
|---|---|
| **11A 05 00 00** | **CONTROL** |
| **11A 05 01 00** | **General** |
| *11A 05 01 01* | *Basics — The three planes and three axes* |
| *11A 05 01 02* | *Camber change* |
| *11A 05 01 03* | *Angle-of-attack (α) change* |
| **11A 05 02 00** | **Pitch (longitudinal) control** |
| *11A 05 02 01* | *Elevator/all-flying tails* |
| *11A 05 02 02* | *Downwash effects* |
| *11A 05 02 03* | *Reserved* |
| *11A 05 02 04* | *Location of centre of gravity (CG)* |
| *11A 05 02 05* | *Moments due to engine thrust* |
| **11A 05 03 00** | **Yaw (directional) control** |
| *11A 05 03 01* | *The rudder* |
| *11A 05 03 02* | *Rudder limiting* |
| **11A 05 04 00** | **Roll (lateral) control** |
| *11A 05 04 01* | *Ailerons* |
| *11A 05 04 02* | *Reserved* |
| *11A 05 04 03* | *Spoilers* |
| *11A 05 04 04* | *Adverse yaw* |
| *11A 05 04 05* | *Means to avoid adverse yaw* |
| **11A 05 05 00** | **Roll/yaw interaction** |
| *11A 05 05 01* | *Explain roll/yaw interaction* |
| **11A 05 06 00** | **Means to reduce control forces** |
| *11A 05 06 01* | *Aerodynamic balance* |
| *11A 05 06 02* | *Artificial means* |
| **11A 05 07 00** | **Fly-by-wire (FBW)** |
| *11A 05 07 01* | *Control laws* |
| **11A 05 08 00** | **Trimming** |
| *11A 05 08 01* | *Reasons to trim* |
| *11A 05 08 02* | *Trim tabs* |
| *11A 05 08 03* | *Stabiliser trim* |
| **11A 06 00 00** | **LIMITATIONS** |
| **11A 06 01 00** | **Operating limitations** |
| *11A 06 01 01* | *Flutter* |
| *11A 06 01 02* | *Reserved* |
| *11A 06 01 03* | *Landing gear/flap operating* |
| *11A 06 01 04* | ***VMO, VNO, and VNE*** |
| *11A 06 01 05* | ***MMO*** |
| **11A 06 02 00** | **Manoeuvring envelope** |
| *11A 06 02 01* | *Manoeuvring–load diagram* |
| *11A 06 02 02* | *Factors affecting the manoeuvring–load diagram* |
| **11A 06 03 00** | **Gust envelope** |
| *11A 06 03 01* | *Gust–load diagram* |
| *11A 06 03 02* | *Factors affecting the gust–load diagram* |

| Syllabus reference | Syllabus details and associated Learning Objectives |
|---|---|
| **11A 07 00 00** | **PROPELLERS** |
| **11A 07 01 00** | **Conversion of engine torque to thrust** |
| *11A 07 01 01* | *Explain conversion of aerodynamic force on a propeller blade* |
| *11A 07 01 02* | *Relevant propeller parameters* |
| *11A 07 01 03* | *Blade twist* |
| *11A 07 01 04* | *Fixed pitch and variable pitch/constant speed* |
| *11A 07 01 05* | *Propeller efficiency versus speed* |
| *11A 07 01 06* | *Effects of ice on propeller* |
| **11A 07 02 00** | **Engine failure** |
| *11A 07 02 01* | *Windmilling drag* |
| **11A 07 03 00** | **Design features for power absorption** |
| *11A 07 03 01* | *Propeller design characteristics that increase power absorption* |
| *11A 07 03 02* | *Diameter of propeller* |
| *11A 07 03 03* | *Number of blades* |
| *11A 07 03 04* | *Propeller noise* |
| **11A 07 04 00** | **Secondary effects of propellers** |
| *11A 07 04 01* | *Torque reaction* |
| *11A 07 04 02* | *Gyroscopic precession* |
| *11A 07 04 03* | *Slipstream effect* |
| *11A 07 04 04* | *Asymmetric blade effect* |
| *11A 07 04 05* | *Consideration of propeller effects* |
| **11A 08 00 00** | **FLIGHT MECHANICS** |
| **11A 08 01 00** | **Forces acting on an aeroplane** |
| *11A 08 01 01* | *Straight, horizontal, steady flight* |
| *11A 08 01 02* | *Straight, steady climb* |
| *11A 08 01 03* | *Straight, steady descent* |
| *11A 08 01 04* | *Straight, steady glide* |
| *11A 08 01 05* | *Steady, coordinated turn* |
| **11A 08 02 00** | **Asymmetric thrust** |
| *11A 08 02 01* | *Jet-engined and propeller-driven aeroplanes* |
| *11A 08 02 02* | *Balanced moments about the normal axis* |
| *11A 08 02 03* | *Forces parallel to the lateral axis* |
| *11A 08 02 04* | *Influence of aeroplane mass* |
| *11A 08 02 05* | *Reserved* |
| *11A 08 02 06* | *Reserved* |
| *11A 08 02 07* | *Reserved* |
| *11A 08 02 08* | *Minimum control speed (VMC)* |
| *11A 08 02 09* | *Minimum control speed during approach and landing (VMCL)* |
| *11A 08 02 10* | *Minimum control speed on the ground (VMCG)* |
| *11A 08 02 11* | *Influence of density* |
| **11A 08 03 00** | **Significant points on a polar curve** |
| *11A 08 03 01* | *Identify and explain* |

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# 11(H)– PRINCIPLES OF FLIGHT – HELICOPTERS

| Syllabus reference | Syllabus details and associated Learning Objectives |
|---|---|
| **082 01 00 00** | **SUBSONIC AERODYNAMICS** |
| **082 01 01 00** | **Basic concepts, laws and definitions** |
| *082 01 01 01* | *International system of units of measurement (SI) and conversion of SI units* |
| *082 01 01 02* | *Definitions and basic concepts of air* |
| *082 01 01 03* | *Newton's laws* |
| *082 01 01 04* | *Basic concepts of airflow* |
| **082 01 02 00** | **Two-dimensional airflow** |
| *082 01 02 01* | *Aerofoil section geometry* |
| 082 01 02 02 | Aerodynamic forces on aerofoil elements |
| *082 01 02 03* | *Stall* |
| *082 01 02 04* | *Disturbances due to profile contamination* |
| **082 01 03 00** | **Three-dimensional airflow around a blade** |
| *082 01 03 01* | *The blade* |
| *082 01 03 02* | *Airflow pattern and influence on lift (L)* |
| *082 01 03 03* | *Induced drag* |
| *082 01 03 04* | *The airflow around the fuselage* |
| **082 02 00 00** | **TRANSONIC AERODYNAMICS and COMPRESSIBILITY EFFECTS** |
| **082 02 01 00** | **Airflow speeds and velocities** |
| *082 02 01 01* | *Speeds and Mach number* |
| *082 02 01 02* | *Shock waves* |
| *082 02 01 03* | *Influence of aerofoil section and blade planform* |
| **082 03 00 00** | **ROTORCRAFT TYPES** |
| **082 03 01 00** | **Rotorcraft** |
| *082 03 01 01* | *Rotorcraft types* |
| **082 03 02 00** | **Helicopters** |
| *082 03 02 01* | *Helicopter configurations* |
| *082 03 02 02* | *The helicopter, characteristics and associated terminology* |
| **082 04 00 00** | **MAIN-ROTOR AERODYNAMICS** |
| **082 04 01 00** | **Hover flight outside ground effect** |
| *082 04 01 01* | *Airflow through the rotor disc and around the blades* |
| *082 04 01 02* | *Anti-torque force and tail rotor* |
| *082 04 01 03* | *Total power required and hover outside ground effect (HOGE)* |
| **082 04 02 00** | **Vertical climb** |
| *082 04 02 01* | *Relative airflow and angles of attack (α)* |
| *082 04 02 02* | *Power and vertical speed* |
| **082 04 03 00** | **Forward flight** |
| *082 04 03 01* | *Airflow and forces in uniform inflow distribution* |
| *082 04 03 02* | *The flare (powered flight)* |
| *082 04 03 03* | *Non-uniform inflow distribution in relation to inflow roll* |
| *082 04 03 04* | *Power and maximum speed* |

| Syllabus reference | Syllabus details and associated Learning Objectives |
|---|---|
| **082 04 04 00** | **Hover and forward flight in ground effect** |
| *082 04 04 01* | *Airflow in ground effect, downwash* |
| **082 04 05 00** | **Vertical descent** |
| *082 04 05 01* | *Vertical descent, power on* |
| *082 04 05 02* | *Autorotation* |
| **082 04 06 00** | **Forward flight — autorotation** |
| *082 04 06 01* | *Airflow at the rotor disc* |
| *082 04 06 02* | *Flight and landing* |
| **082 05 00 00** | **MAIN-ROTOR MECHANICS** |
| **082 05 01 00** | **Flapping of the blade in hover** |
| *082 05 01 01* | *Reserved* |
| *082 05 01 02* | *Centrifugal turning moment (CTM)* |
| *082 05 01 03* | *Coning angle in the hover* |
| **082 05 02 00** | **Flapping angles of the blade in forward flight** |
| *082 05 02 01* | *Forces on the blade in forward flight without cyclic feathering* |
| *082 05 02 02* | *Cyclic pitch (feathering) in forward flight* |
| **082 05 03 00** | **Blade-lag motion in forward flight** |
| *082 05 03 01* | *Forces on the blade in the disc plane (tip path plane) in forward flight* |
| *082 05 03 02* | *Reserved* |
| *082 05 03 03* | *Ground resonance* |
| **082 05 04 00** | **Rotor systems** |
| *082 05 04 01* | *See-saw or teetering rotor* |
| *082 05 04 02* | *Reserved* |
| *082 05 04 03* | *Hingeless rotor, bearingless rotor* |
| **082 05 05 00** | **Blade sailing** |
| *082 05 05 01* | *Blade sailing and causes* |
| *082 05 05 02* | *Minimising the danger* |
| *082 05 05 03* | *Droop stops* |
| **082 05 06 00** | **Vibrations due to main rotor** |
| *082 05 06 01* | *Reserved* |
| *082 05 06 02* | *Reserved* |
| **082 06 00 00** | **TAIL ROTORS** |
| ***082 06 01 00*** | **Conventional tail rotor** |
| *082 06 01 01* | *Reserved* |
| *082 06 01 02* | *Tail-rotor aerodynamics* |
| *082 06 01 03* | *Strakes on the tail boom* |
| **082 07 00 00** | **EQUILIBRIUM, STABILITY AND CONTROL** |
| **082 07 01 00** | **Equilibrium and helicopter attitudes** |
| *082 07 01 01* | *Hover* |
| *082 07 01 02* | *Forward flight* |

| Syllabus reference | Syllabus details and associated Learning Objectives |
|---|---|
| **082 07 02 00** | **Stability** |
| *082 07 02 01* | *Static longitudinal, roll and directional stability* |
| *082 07 02 02* | *Static stability in the hover* |
| *082 07 02 03* | *Dynamic stability* |
| *082 07 02 04* | *Longitudinal stability* |
| *082 07 02 05* | *Roll stability and directional stability* |
| **082 07 03 00** | **Control** |
| *082 07 03 01* | *Manoeuvre stability* |
| *082 07 03 02* | *Control power* |
| *082 07 03 03* | *Static and dynamic rollover* |
| **082 08 00 00** | **HELICOPTER FLIGHT MECHANICS** |
| **082 08 01 00** | **Flight limits** |
| *082 08 01 01* | *Hover and vertical flight* |
| *082 08 01 02* | *Forward flight* |
| *082 08 01 03* | *Manoeuvring* |
| **082 08 02 00** | **Special conditions** |
| *082 08 02 01* | *Operating with limited power* |
| *082 08 02 02* | *Overpitch, overtorque* |

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