CIVIL AVIATION AUTHORITY OF NEW ZEALAND

Advisory Circular AC61-7

Revision 19.1

4 November 2016

Pilot Licences and Ratings—Airline Transport Pilot Licence

General

Civil Aviation Authority advisory circulars contain guidance and information about standards, practices, and procedures that the Director has found to be an **acceptable means of compliance** with the associated rules and legislation.

However the information in the advisory circular does not replace the requirement for participants to comply with their own obligations under the Civil Aviation Rules, the Civil Aviation Act 1990 and other legislation.

An advisory circular reflects the Director's view on the rules and legislation. It expresses CAA policy on the relevant matter. It is not intended to be definitive. Consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices, or procedures are found to be acceptable they will be added to the appropriate advisory circular. Should there be any inconsistency between this information and the rules or legislation, the rules and legislation take precedence.

An advisory circular may also include **guidance material** generally, including guidance on best practice as well as guidance to facilitate compliance with the rule requirements. However, guidance material must not be regarded as an acceptable means of compliance.

An advisory circular may also include **technical information** that is relevant to the standards or requirements.

Purpose

This advisory circular provides information on the flight time experience and on the examination syllabus content that is acceptable to the Director for meeting the Civil Aviation Rule requirements for the issue of an airline transport pilot licence.

Related Rules

This advisory circular relates specifically to Civil Aviation Rule Part 61 Subpart F—Airline Transport Pilot Licences.

Change Notice

Revision 19.1 makes editorial changes to this advisory circular.

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Rule 61.253 Eligibility Requirements

Current commercial pilot licence (CPL) required

Rule 61.253(a)(2) requires an applicant for an airline transport pilot licence (ATPL) to hold an appropriate current CPL. This includes the requirement to hold a current Class 1 medical certificate.

Flight time experience

Rule 61.253(a)(4). The flight time experience that is acceptable to the Director is set out in Appendix I of this advisory circular.

Written examination credit

Rule 61.253(a)(5) requires an applicant for an ATPL to have a written examination credit, or approved equivalents, in air law, flight navigation general, flight planning, meteorology, instruments and navigation aids, human factors, and advanced aerodynamics, performance, and systems knowledge, (A) or (H) as appropriate. Credits in the applicable examinations listed in Table 1, or 2 in Appendix II of this advisory circular will meet these requirements. Appendix III of this advisory circular details the syllabuses that are applicable to these examinations.

An examination knowledge deficiency report (KDR) is a report issued on completion of a written examination that details areas where questions were answered incorrectly. The applicant for an airline transport pilot licence flight test must provide the flight examiner with written examination KDRs in accordance with rule 61.21(a)(5). These KDRs, with content acknowledged against the relevant rule reference(s), must be certified prior to the flight test by a Category A or B flight instructor that the applicant has been examined in these areas and their knowledge has improved. The flight examiner conducting the flight test will test the applicant's knowledge of the written examination subject areas including but not limited to items included in the KDRs.

The written examination credit comes into effect when all the written examinations have been passed in the qualifying period of 3 years, and the written examination credit is valid for 10 years from the date of issue, except for aviation law where the examination pass must not be more than 5 years old as detailed in rule 61.17(c) and (d).

Approved equivalent

Examination pass results gained by an RNZAF pilot, together with the command flight time experience gained on the C130, P3, B757 or flight time experience plus Category A or B QFI qualification for the Beech Kingair will be accepted as approved equivalents to the written examinations required by rule 61.253(a)(5), for the issue of an ATPL except for the required air law written examination. All RNZAF pilots applying for the issue of an ATPL(A) are required to pass a New Zealand ATPL(A) air law written examination.

Examination pass results gained by an NZDF helicopter pilot together with the command flight time experience gained on the Kaman Seasprite, Bell UH-1, Agusta A-109 or NH-90 will be accepted as approved equivalents to the written examinations required by rule 61.253(a)(5), for the issue of an ATPL except for the required air law written examination. All NZDF pilots applying for the issue of an ATPL(H) are required to pass a New Zealand ATPL(H) air law written examination.

A person holding an ATPL (H) issued under Part 61 who wishes to gain an ATPL (A), is required to gain passes in the written examination subjects ATPL Law (Aeroplane), ATPL Flight Planning (Aeroplane), ATPL Instruments and Navigational Aids (Aeroplane), ATPL Advanced Aerodynamics, performance and systems knowledge.

The holders ATPL (H) together with passes in the above ATPL (A) examination subjects are an approved equivalent to the written examinations required for an ATPL (A).

NOTE: *Persons seeking an ATPL (H) are required to hold an Instrument Rating (Helicopter). Persons seeking an ATPL (A) are required to hold an Instrument Rating (Aeroplane).*

Flight tests

Rule 61.253(a)(6) requires an applicant for a ATPL to demonstrate competence and knowledge to the Director in a flight test in the appropriate category of aircraft. The competencies and knowledge to be tested are set out in the *ATPL Flight Test Standards Guide*, published by the Director. These are detailed in Appendices IV and V of this advisory circular. The flight tests are conducted by appropriately authorised flight examiners on behalf of the Director.

The privileges and limitations mentioned in rule 61.253(a)(6)(ii) are those detailed in rule 61.255.

Foreign ATPL

A current ATPL issued by an ICAO Contracting State may be accepted as the basis for meeting the eligibility requirements under rule 61.253 for the issue of a New Zealand ATPL.

For this to occur the following applies.

- The foreign pilot licence holder must meet flight experience equivalent to that required under rule 61.253(a)(4) as detailed in Appendix I of this advisory circular. Normally a current foreign ATPL meets this requirement.
- A current foreign ATPL will normally be accepted as meeting all written examination passes for rule 61.253(a)(5) (except for air law), if the applicant also produces evidence of having completed at least 500 hours as pilot-in-command or 1000 hours as co-pilot. This flight time must have been attained in countries under the jurisdiction of the foreign authority that issued the ATPL.
    - in multi-engine, multi-crew aircraft; and
    - on commercial IFR multi-crew operations; and
    - after the issue of the respective foreign ATPL that has been presented for this purpose.

NOTE: *A foreign ATPL holder who does not meet the post licence issue requirements as detailed is required to gain credits for all written examinations in accordance with rule 61.253(a)(5).*

- All foreign ATPL holders are required to pass New Zealand ATPL Law and a New Zealand ATPL issue flight test in accordance with rule 61.253(a)(6).

Further detailed information relating to this process is available on the CAA web site **www.caa.govt.nz**.

Appendix I—ATPL Flight Time Experience Requirements

Aeroplane

Total flight time experience

At least 1500 hours in aeroplanes with appropriate cross-crediting of experience as detailed below. This flight time experience is to include at least the minimum flight time as follows.

Pilot-in-command:

(i) 250 hours in aeroplanes as pilot-in-command including 100 hours of cross-country navigation of which 25 hours is to have been at night; or

(ii) 250 hours in aeroplanes consisting of 150 hours or more as pilot-in-command and additional command practice flight time as required; and

(iii) 100 hours of cross-country navigation of which 25 hours is to have been at night. 50 hours of night cross-country navigation time command practice meets this 25 hours night cross-country requirement.

NOTE: *Command practice is time gained in accordance with rule 61.31(b). No more than 50 percent of the total command practice flight time may be used for paragraph (ii) mentioned above.*

Cross-country navigation:

- 200 hours in aeroplanes as co-pilot in an aeroplane required to be operated with a co-pilot, or in lieu thereof 100 additional hours of cross-country navigation flight time as pilot-in-command which may have been part of the 250 hours required for pilot-in-command.

Night flight:

- 100 hours in aeroplanes as pilot-in-command or as co-pilot.

Instrument time:

- 75 hours that is to include 50 hours instrument flight time in aeroplanes and an instrument rating (aeroplane).

Cross-crediting:

Where an applicant produces logbook evidence of piloting experience in aircraft other than in aeroplanes, half the pilot-in-command time experienced within the immediately preceding 12 months, up to the maximums that follow, may be credited towards the total flight experience required, but not to the specific flight experiences.

- For helicopters: 60 hours.
- For gliders and powered gliders: 25 hours.
- For the above combined: 60 hours.

Helicopter

Total flight time experience

At least 1000 hours in helicopters with appropriate cross-crediting of experience as detailed below. This flight time experience is to include at least the minimum flight time requirements that follow.

Pilot-in-command:

(i) 250 hours in helicopters as pilot-in-command, or

(ii) 250 hours in helicopters consisting of 100 hours or more as pilot-in-command and additional command practice flight time as required.

NOTE: *Command practice is time gained in accordance with rule 61.31(b). No more than 50 percent of the total command practice flight time may be used for paragraph (ii) mentioned above*

Cross-country navigation:

200 hours in helicopters, or

200 hours in helicopters consisting of 100 hours or more as pilot-in-command and additional command practice flight time as required.

Instrument time:

An instrument rating (helicopter).

Night flying:

50 hours in helicopters.

Cross-crediting:

Where an applicant produces acceptable evidence of piloting experience in aircraft other than in helicopters, half the pilot-in-command time experienced within the immediately preceding 12 months up to the maximums that follow, may be credited towards the total flight experience required, but not to the specific experiences:

- For aeroplanes: 60 hours.
- For gliders and powered gliders: 25 hours.
- For the above combined: 60 hours.

Appendix II—ATPL Written Examinations

ATPL(A) examinations

The examinations that are approved for meeting the requirements of rule 61.253(a)(5) for the issue of an ATPL(A) are listed in Table 1.

Table 1

Examination Authority	ATPL subject titles
Aspeq	Air Law(Aeroplane)
Aspeq	Flight Navigation – General
Aspeq	Flight Planning
Aspeq	Meteorology
Aspeq	Instruments and Navigational Aids
Aspeq	Human Factors
Aspeq	Advanced Aerodynamics, Performance and Systems Knowledge

ATPL(H) examinations

The examinations that are approved for meeting the requirements of rule 61.253(a)(5) for the issue of an ATPL(H) are listed in Table 2.

Table 2

Examination Authority	ATPL subject titles
Aspeq	Aerodynamics and Aircraft Systems (Helicopter)
Aspeq	Flight Planning (Helicopter)
Aspeq	Performance and Loading (Helicopter)
Aspeq	Navigation
Aspeq	Meteorology
Aspeq	Human Factors
Aspeq	Air Law (Helicopter)

Appendix III—ATPL Written Examination Syllabuses

*(**NOTE:** where syllabuses refer to a 'representative' aircraft, study guides can be obtained from the 'candidate information' section at http://caanz.aspeqexams.com/.)*

Air Law Syllabus Matrix:

Sub-Heading	**PPL**	**CPL**	**IR**	**ATPL(A)**	**ATPL(H)**
	Subject # 4	**Subject # 16**	**Subject # 52**	**Subject # 36**	**Subject # 37**
General					
Aviation Legislation	4.2	16.2	52.2	36.2	37.2
Definitions	4.4	16.4	52.4	36.4	37.4
Abbreviations	4.6	16.6	52.6	36.6	37.6
Personnel Licensing					
Requirements for Licences and Ratings	4.10	16.10	52.10	36.10	37.10
Eligibility, Privileges and Limitations	4.12	16.12	52.12	36.12	37.12
Competency, Currency and Recency	4.14	16.14	52.14	36.14	37.14
Medical Requirements	4.16	16.16	52.16	36.16	37.16
Airworthiness of Aircraft and Aircraft Equipment					
Documentation	4.20	16.20	52.20	36.20	37.20
Aircraft Maintenance	4.22	16.22	52.22	36.22	37.22
Instruments and Avionics	4.24	16.24	52.24	36.24	37.24
Equipment	4.26	16.26	52.26	36.26	37.26
General Operating and Flight Rules					
General Operating Requirements	4.30	16.30	52.30	36.30	37.30
General Operating Restrictions	4.32	16.32	52.32	36.32	37.32

General Meteorological Requirements and Restrictions	4.34	16.34			37.34
Carriage of Dangerous Goods	4.36	16.36		36.36	37.36
Helicopter External Load Operations		16.38			37.38
Air Operations					
Air Operations Crew Requirements		16.40		36.40	37.40
Air Operations Requirements and Restrictions		16.42		36.42	37.42
Air Operations Meteorological Requirements and Restrictions		16.44		36.44	37.44
Air Operations Performance Requirements		16.46		36.46	37.46
Air Operations Weight and Balance Requirements					37.48
Flight Planning and Preparation					
Flight Preparation	4.50	16.50	52.50	36.50	37.50
Alternate Requirements			52.52	36.52	37.52
Fuel Requirements	4.54	16.54	52.54	36.54	37.54
Flight Plans	4.56	16.56	52.56	36.56	37.56
En-route Limitations		16.58		36.58	
Air Traffic Services					
Communications	4.60	16.60	52.60	36.60	37.60
Clearances	4.62	16.62	52.62	36.62	37.62
Separation	4.63	16.63	52.63	36.63	37.63
Terrain Clearance			52.64	36.64	37.64
Weather Avoidance			52.65	36.65	37.65
Radar Services	4.66	16.66	52.66	36.66	37.66
Oceanic Procedures				36.67	

Global Navigation Satellite System		16.68	52.68	36.68	37.68
Airspace; Aerodromes; and Heliports					
Altimetry	4.70	16.70	52.70	36.70	37.70
Cruising Levels	4.72	16.72	52.72	36.72	37.72
Transponders	4.74	16.74	52.74	36.74	37.74
Airspace	4.75	16.75	52.75	36.75	37.75
Aerodromes and Heliports	4.76	16.76	52.76	36.76	37.76
Aerodrome Lighting	4.78	16.78	52.78	36.78	37.78
Emergencies; Incidents; and Accidents					
Responsibilities of Operators and Pilots	4.80	16.80		36.80	37.80
Communications and Equipment	4.82	16.82	52.82	36.82	37.82
Instrument Departures and Approaches					
Departure Procedures			52.90	36.90	37.90
Holding Procedures			52.92	36.92	37.92
Approach Procedures			52.94	36.94	37.94
Communications and Navigation Aid Failure			52.96	36.96	37.96

Subject No. 36 ATPL Air Law (Aeroplane)

Each subject has been given a subject number and each topic within that subject a topic number. These reference numbers will be used on knowledge deficiency reports and will provide valuable feedback to the examination candidate. These topic reference numbers may be common across the subject levels and therefore may not be consecutive within a specific syllabus.

Sub Topic	Syllabus Item
	General
36.2	**Aviation Legislation**
36.2.2	Describe the requirements to hold an aviation document, as laid down in CA Act 1990 S7.
36.2.4	Describe the criteria for the fit and proper person test, as laid down in CA Act 1990 S10.
36.2.6	Describe the duties of the pilot-in-command, as laid down in CA Act 1990 S13 and 13A.
36.2.8	Describe the responsibilities of a licence holder with respect to changes in their medical condition, as laid down in CA Act 1990 S27.
36.2.10	Describe the responsibilities of a licence holder with respect to the surrender of a medical certificate as laid down in CA Act 1990 S27.
36.2.12	Describe the responsibilities of a licence holder with respect to safety offences, as laid down in CA Act 1990 S43 and S44.
36.4	**Definitions**
	CAR Part 1 (unless otherwise noted)
	State the definition of:
	(a) accelerate-stop distance available
	(b) accident
	(c) Act
	(d) adequate aerodrome
	(e) aerodrome control service
	(f) aerodrome operational area
	(g) aeronautical information circular
	(h) aircraft category
	(i) air transport operation
	(j) air operation
	(k) airworthiness certificate
	(l) airworthiness directive

Sub Topic	Syllabus Item
	(m) airworthy condition
	(n) alerting service
	(o) alternate aerodrome
	(p) altitude
	(q) approach control
	(r) area control
	(s) area navigation
	(t) ATC clearance
	(u) ATC instruction
	(v) augmented crew
	(w) Category II precision approach procedure
	(x) Category III precision approach procedure
	(y) ceiling
	(z) certificated organisation
	(aa) Class 3.1A Flammable liquid
	(bb) Class 3.1C Flammable liquid
	(cc) Class 3.1D Flammable liquid
	(dd) Class B cargo or baggage compartment
	(ee) clearance limit
	(ff) clearway
	(gg) command practice
	(hh) commercial transport operation
	(ii) contaminated
	(jj) controlled airspace
	(kk) controlled flight
	(ll) co-pilot
	(mm) crew member
	(nn) barometric vertical navigation (baro-VNAV) (AIP GEN)
	(oo) dangerous goods

Sub Topic	Syllabus Item
	(pp) day
	(qq) decision altitude (DA)
	(rr) decision height (DH)
	(ss) design aeroplane (AIP GEN)
	(tt) disabled passenger
	(uu) dual flight time
	(vv) escorted passenger
	(ww) extended diversion time operations
	(xx) final reserve fuel
	(yy) fit and proper person
	(zz) flight attendant
	(aaa) flight crew member
	(bbb) flight examiner
	(ccc) flight level
	(ddd) flight manual
	(eee) flight plan
	(fff) flight time
	(ggg) height
	(hhh) IFR flight
	(iii) incident
	(jjj) instrument approach procedure
	(kkk) instrument flight
	(lll) instrument flight time
	(mmm) instrument meteorological conditions
	(nnn) instrument time
	(ooo) landing distance available
	(ppp) Mach number
	(qqq) minimum descent altitude (MDA)
	(rrr) minimum descent height (MDH)

Sub Topic	Syllabus Item
	(sss) minimum safe altitude (AIP GEN)
	(ttt) minimum sector altitude (MSA 25M) (AIP GEN)
	(uuu) night
	(vvv) NOTAM
	(www) passenger
	(xxx) pilot-in-command
	(yyy) precision approach procedure
	(zzz) pressure altitude
	(aaaa) procedure altitude (AIP GEN)
	(bbbb) rated coverage (AIP GEN)
	(cccc) rating
	(dddd) regular air transport passenger service
	(eeee) reporting point
	(ffff) RNP performance
	(gggg) runway end safety area (AIP GEN)
	(hhhh) runway visual range
	(iiii) SARTIME
	(jjjj) serious incident
	(kkkk) segment OCA (AIP GEN)
	(llll) SEIFR passenger operation
	(mmmm) take-off distance available
	(nnnn) take-off run available
	(oooo) take-off weight
	(pppp) Technical Instructions
	(qqqq) threshold (CAR 121.3)
	(rrrr) transition altitude (AIP GEN)
	(ssss) transition layer (AIP GEN)
	(tttt) transition level (AIP GEN)
	(uuuu) turbofan

Sub Topic	Syllabus Item
	(vvvv) turbojet
	(wwww) turboprop
	(xxxx) type
	(yyyy) unlawful interference
	(zzzz) VFR flight
	(aaaaa) visibility
	(bbbbb) visual meteorological conditions
	(ccccc) ZFT simulator.
36.6	**Abbreviations**
	CAR Part 1 (unless otherwise noted)
	State the meaning of the following abbreviations:
	(a) ACARS (AIP GEN)
	(b) ACAS
	(c) AD
	(d) ADF
	(e) AEDRS
	(f) AGL
	(g) AMSL
	(h) ATIS
	(i) CAR
	(j) CPDLC (AIP GEN)
	(k) CRM
	(l) DME
	(m) EDTO
	(n) ELT
	(o) GPWS
	(p) ICAO
	(q) IFSD
	(r) ILS

Sub Topic	Syllabus Item
	(s) MNPS
	(t) QFE
	(u) QNH
	(v) RESA
	(w) RNP
	(x) RVR
	(y) RVSM
	(z) SARPS (AIP GEN)
	(aa) SATCOM (AIP GEN)
	(bb) SEIFR
	(cc) SELCAL
	(dd) TAWS
	(ee) TCAS
	(ff) VOR
	(gg) ZFT.
	Personnel Licensing
36.10	**Requirements for Licences and Ratings**
36.10.2	State the requirements for holding a pilot licence. CAR 61
36.10.4	State the requirements for a pilot-in-command to hold a type rating on the type of aircraft being flown. CAR 61
36.10.6	State the requirements for entering flight details into a pilot logbook. CAR 61
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36.12.2	Describe the allowance for a person who does not hold a current pilot licence to fly dual with a flying instructor. CAR 61
36.12.4	State the solo flight requirements on a person who does not hold a current pilot licence. CAR 61
36.12.6	State the limitations on a person who does not hold a current pilot licence. CAR 61
36.12.8	State the eligibility requirements for the issue of an airline transport pilot licence. CAR 61
36.12.10	State the privileges of holding an airline transport pilot licence. CAR 61

Sub Topic	Syllabus Item
36.14	**Competency, Currency and Recency**
36.14.2	State the recent experience requirements of a pilot-in-command on an air operation, who is the holder of an airline transport pilot licence. CAR 61
36.14.4	State the requirements for the completion of a biennial flight review. CAR 61
36.14.6	Explain the use of a lower licence or rating. CAR 61
36.14.8	State the period within which a pilot, acting as a flight crew member of an aircraft engaged on a CAR Part 121/125 air operation under IFR, must have passed a check of normal, abnormal and emergency procedures in the same aeroplane type.
36.14.10	State the period within which a pilot of an aircraft engaged on an air operation under CAR Part 121/125 must have completed a written or oral test of their knowledge in aeroplane systems, performance and operating procedures.
36.14.12	State the period within which a pilot-in-command of an aircraft engaged on an air operation under CAR Part 121/125 must have passed a check of route and aerodrome proficiency.
36.14.14	State the CAR Part 121/125 crew member grace provisions.
36.14.16	State the currency requirements of a pilot who is the holder of an instrument rating. CAR 61
36.14.18	State the currency requirements for carrying out an instrument approach. CAR 61
36.16	**Medical Requirements**
36.16.2	State the requirements for holding a medical certificate. CAR 61
36.16.4	State the requirements on a person applying for a medical certificate. CAR 67
36.16.6	State the requirements for maintaining medical fitness following the issue of a medical certificate. CA Act 1990 S27C
36.16.8	State the normal currency period of the Class 1 medical certificate for an ATPL holder who is under the age of 40. CAR 67
36.16.10	State the normal currency period of the Class 1 medical certificate for an ATPL holder who is 40 years of age or more on the date that the certificate is issued. CAR 67
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36.20	**Documentation**
36.20.2	State the documents which must be carried in aircraft operated in New Zealand. CAR 91
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36.22.6	State the requirements for the retention of maintenance records. CAR 91

Sub Topic	Syllabus Item
36.22.8	State the requirements for and contents of a technical log. CAR 91
36.22.10	State the requirements for entering defects into a technical log. CAR 91
36.22.12	State the requirements for clearing defects from a technical log. CAR 91
36.22.14	State the limitations and requirements on a person undertaking 'pilot maintenance'. CAR 43
36.22.16	State the requirements for conducting an operational flight check on an aircraft. CAR 91
36.22.18	State the requirements for acting as a test pilot. CAR 19
36.22.20	State the inspection period for radios. CAR 91
36.22.22	State the inspection period for altimeters. CAR 91
36.22.24	State the inspection period for transponders. CAR 91
36.22.26	State the inspection period for the ELT. CAR 91
36.24	**Instruments and Avionics**
36.24.2	State the CAR Part 121 requirements for a ground proximity warning system (GPWS).
36.24.4	State the CAR Part 121 requirements for a terrain awareness and warning system (TAWS).
36.24.6	State the CAR Part 121 requirements for an airborne collision avoidance system (ACAS II).
36.24.8	State the minimum instrument requirements for an IFR flight. CAR 91
36.24.10	State the communications and navigation equipment requirements for an IFR flight. CAR 91
36.24.12	State the equipment requirements of aircraft operating in airspace where RVSM is applied by ATC. CAR 91 and CAR 121
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36.26.4	State the CAR Part 91 requirements for emergency equipment.
36.26.6	State the CAR Part 121 requirements for night flight.
36.26.8	State the CAR Part 121 requirements for emergency equipment.
36.26.10	State the CAR Part 121 requirements for locating protective breathing equipment.
36.26.12	State the requirements for indicating the time in flight. CAR 91
36.26.14	Explain the requirement for altitude alerting/assigned altitude indicating. CAR 91
36.26.16	State the requirements for an ELT. CAR 91 and CAR 121

Sub Topic	Syllabus Item
	General Operating and Flight Rules
36.30	**General Operating Requirements**
36.30.2	Describe the requirements for passengers to comply with instructions and commands. CAR 91
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36.30.30	State and describe the application of the right of way rules. CAR 91
36.30.32	Explain the requirement for aircraft lighting. CAR 91
36.30.34	State the requirements for the pilot of an aircraft, being flown for the purpose of demonstrating eligibility for the issue of an airworthiness certificate. CAR 91
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36.32.6	State the restrictions when refuelling. CAR 121/125
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Sub Topic	Syllabus Item
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36.32.24	State the restrictions when operating VFR in icing conditions. CAR 91
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36.36	**Carriage of Dangerous Goods**
36.36.2	Describe the limitation of CAR Part 92 with respect to members of the Police.
36.36.4	Describe the allowance for the carriage of dangerous good for the recreational use of passengers. CAR 92
36.36.6	State the restriction for the carriage of dangerous goods in an aircraft cabin occupied by passengers, or on the flight deck of an aircraft. CAR 92
36.36.8	State the requirements for the carriage of non-dangerous goods in an aircraft. CAR 92
36.36.10	State the requirement for the notification of the pilot-in-command when dangerous goods are carried. CAR 92
36.36.12	State the requirement for a dangerous goods training programme. CAR 92
36.36.14	State the dangerous goods recurrent training programme requirements. CAR 92
	Air Operations
36.40	**Air Operations Crew Requirements**
36.40.2	State the CAR Part 121 crew qualification and experience requirements.
36.40.4	State the CAR Part 121 flight and duty time limitations on flight crew members.
36.40.6	State the AC119-2 normal minimum rest period required following any duty period.
36.40.8	State the maximum number of flight hours that a pilot may fly as crew in an aircraft which carries two pilots on an internal air operation. AC119-2
36.40.10	State the CAR Part 121 minimum number of flight attendants that must be carried on air operations.
36.40.12	State the CAR Part 125 crew qualification and experience requirements.

Sub Topic	Syllabus Item
36.40.14	State the CAR Part 125 flight and duty time limitations on flight crew members.
36.42	**Air Operations Requirements and Restrictions**
36.42.2	State the airworthiness requirements for aircraft used on air operations. CAR 121/125
36.42.4	State the conditions under which an air operator may perform an air transport operation carrying passengers with a single-engine aeroplane under IFR. CAR 125
36.42.6	State the operating restrictions on single-engine air transport operations under IFR (SEIFR). CAR 125
36.42.8	State the restrictions on commercial transport operations carrying passengers with a single-engine aeroplane under IFR. CAR 125
36.42.10	State the CAR Part 121 restrictions on VFR night operations.
36.42.12	State the CAR Part 121 restriction on VFR extended over-water operations.
36.42.14	State the CAR Part 121/125 requirements for passenger safety and the carriage of certain passengers.
36.42.16	State the CAR Part 121/125 requirement for the keeping of an operation record.
36.42.18	State the CAR Part 121/125 requirement for a maintenance review.
36.42.20	State the CAR Part 121/125 restrictions when refuelling.
36.42.22	State the CAR Part 121/125 restrictions on the manipulation of an aircraft's controls.
36.44	**Air Operations Meteorological Requirements and Restrictions**
36.44.2	State the CAR Part 121/125 meteorological requirements for commencing an air operation under IFR.
36.44.4	State the CAR Part 121 meteorological requirements for commencing an air operation under IFR to a destination outside New Zealand.
36.44.6	State the CAR Part 121 requirements and limitations for reduced take-off minima.
36.44.8	State the meteorological operating restrictions on an aeroplane performing a VFR air operation under CAR Part 121/125.
36.44.10	State the meteorological operating restrictions on a multi-engine aeroplane performing a VFR air operation under CAR Part 121.
36.46	**Air Operations Performance Requirements**
36.46.2	State the CAR Part 121/125 performance requirements for take-off distances.
36.46.4	State the CAR Part 121/125 performance requirements for clearing obstacles within the net take-off flight path.
36.46.6	State the CAR Part 121 turbo jet powered aeroplane performance requirements for landing distance.
36.46.8	State the CAR Part 121/125 turboprop powered aeroplane performance requirements

Sub Topic	Syllabus Item
	for landing distance.
36.46.10	State the CAR Part 121/125 performance requirements for landing on wet and contaminated runways.
	Flight Planning and Preparation
36.50	**Flight Preparation**
36.50.2	Explain the requirements for obtaining and considering relevant information prior to flight. CAR 91
36.50.4	Describe the publications and their content that provide operational route and aerodrome information.
36.50.6	Derive operational information from charts and publications that provide route, approach and aerodrome information.
36.52	**Alternate Requirements**
36.52.2	State the meteorological minima at destination which would require an alternate to be nominated. CAR 91
36.52.4	State the alternate requirements for a CAR Part 121 IFR flight, if meteorological conditions at the estimated time of arrival at the destination aerodrome, are below the minimum prescribed for the instrument approach procedure likely to be used.
36.52.6	State the meteorological minima at departure which would require a CAR Part 121/125 IFR operation to nominate a departure alternate. CAR 121/125
36.52.8	Determine the meteorological minima required at an aerodrome for it to be nominated as an IFR alternate. CAR 91
36.52.10	State the power supply requirements for the selection of an aerodrome as an alternate on an IFR air operation. CAR 91
36.52.12	State the reference datum for take-off meteorological minima for IFR operations. CAR 91
36.52.14	State the reference datum for landing meteorological minima for IFR operations. CAR 91
36.52.16	State the reference datum for alternate meteorological minima for IFR operations. AIP ENR
36.54	**Fuel Requirements**
36.54.2	State the fuel reserve required for an IFR flight in a non-turbine-powered aeroplane. CAR 91
36.54.4	State the fuel reserve required for an IFR flight in a turbine-powered aeroplane. CAR 91
36.56	**Flight Plans**
36.56.2	State the CAR Part 121/125 requirements for the filing of a flight plan.

Sub Topic	Syllabus Item
36.56.4	State the notification lead time for filing an IFR flight plan. CAR 91
36.56.6	State the requirements for adhering to an IFR flight plan. CAR 91
36.56.8	State the requirements for the notification of changes to a filed IFR flight plan. CAR 91
36.56.10	State the requirements for an inadvertent departure from an IFR flight plan. CAR 91
36.56.12	State the requirements for the terminating an IFR flight plan at an aerodrome without ATS. CAR 91
36.58	**En-route Limitations**
36.58.2	State the minimum heights for VFR flights under CAR Part 121.
36.58.4	State the en-route limitations for two engine aeroplanes with respect to flying time from an adequate aerodrome. CAR 121
	Air Traffic Services
36.60	**Communications**
36.60.2	Derive from operational publications, the required radio frequency for communicating with specified ATC units.
36.60.4	Explain the use of aircraft radiotelephony callsigns. CAR 91
36.60.6	State the requirements for making position reports to an ATS unit. CAR 91 & AIP ENR
36.60.8	State the contents of various IFR position reports. AIP ENR
36.60.10	State the meaning of the various light signals from a control tower. CAR 91 & AIP AD
36.60.12	State the communications requirements when TIBA procedures are in force. AIP ENR
36.62	**Clearances**
36.62.2	State the requirements for complying with ATC clearances and instructions. CAR 91 & AIP ENR
36.62.4	State the requirements for coordinating with an aerodrome flight information service. CAR 91
36.62.6	State the requirements for receiving an ATC clearance prior to entering various types of airspace, and ground manoeuvring area. CAR 91 & AIP ENR
36.63	**Separation**
36.63.2	Describe the situations where Air Traffic Control is responsible for the provision of separation between VFR, SVFR and IFR traffic. AIP ENR
36.63.4	Describe the situations where the pilot-in-command of an IFR flight is responsible for maintaining separation from other traffic. AIP ENR
36.63.6	Describe the normal separation standards applied by ATC. AIP ENR

Sub Topic	Syllabus Item
36.63.8	Describe the situations where the normal separation may be reduced. AIP ENR
36.63.10	State the meaning of the term “Essential traffic”. AIP ENR
36.63.12	State the conditions under which longitudinal separation between reciprocal track aircraft may be reduced. AIP ENR
36.63.14	State the minimum lateral and longitudinal separation between RNP10 aircraft, as permitted by ICAO Regional Supplementary procedures (Doc 7030). AIP ENR
36.63.16	State the deviation from an assigned indicated airspeed or Mach number and ETA outside of which pilots are required to notify ATC. CAR 91
36.63.18	State the wake turbulence separation requirements for medium and heavy aircraft. AIP AD
36.63.20	State the maximum airspeed below 10,000 feet. CAR 91
36.63.22	State the minimum descent height in IMC at an unattended aerodrome where traffic conflict may exist. AIP ENR.
36.64	**Terrain Clearance**
36.64.2	Describe the determination of the minimum safe altitude for IFR flight. AIP GEN
36.64.4	Explain the coverage and use of VORSEC charts. AIP GEN
36.64.6	Explain the coverage and use of 25nm Minimum Sector Altitude diagrams. AIP GEN
36.64.8	State when the radar control service is responsible for the provision of terrain clearance. AIP ENR
36.64.10	Explain how radar control provides terrain clearance. AIP ENR
36.64.12	Describe the use of DME descent steps for maintaining terrain clearance during departure climb or descent for an approach. AIP GEN & ENR
36.65	**Weather Avoidance**
36.65.2	State the requirements for deviation off track for weather avoidance. AIP ENR
36.66	**Radar Services**
36.66.2	Describe the radar services available to VFR and IFR flights. AIP ENR
36.66.4	Describe the responsibility of the radar controller to keep an aircraft within controlled airspace. AIP ENR
36.66.6	State the accuracy limits required when under radar speed control. AIP ENR
36.66.8	State the distance from touchdown that radar speed control can be maintained on an instrument and a visual approach. AIP ENR
36.66.10	State the meteorological and other conditions which allow a radar controller to vector an aircraft for a visual approach. AIP ENR
36.66.12	State the criteria for a radar controller to consider an unknown aircraft to be on a

Sub Topic	Syllabus Item
	conflicting path with another aircraft. AIP ENR
36.67	**Oceanic Procedures**
36.67.2	State the pilot's actions, under oceanic procedures, when deviation from track to avoid weather is required, and contact with ATC cannot be established to receive a clearance. AIP ENR
36.67.4	State the pilot's actions, under oceanic procedures, when aircraft are unable to meet RNP10 criteria, and wish to enter RNP10 airspace. AIP ENR
36.67.6	State the requirements, under oceanic procedures, which must be met before longitudinal separation between reciprocal track aircraft may be reduced. AIP ENR
36.67.8	State the requirements for position reports by aircraft using uncharted (random) oceanic routes. AIP ENR
36.68	**Global Navigation Satellite System**
36.68.2	State the equipment required by aircraft within the New Zealand flight information region, using GPS as a primary means navigation system. CAR 19
36.68.4	State the meaning of a GPS "sole means navigation system". CAR 19
36.68.6	State the restriction on using GPS as a sole means navigation system under IFR in the New Zealand flight information region. CAR 19
36.68.8	State the actions required of pilots, under IFR using GPS equipment as a primary means navigation system, if system degradation occurs. CAR 19
36.68.10	State the requirements which must be met before a pilot of an aircraft operating within the New Zealand flight information region, under IFR, using GPS equipment as a primary means navigation system, is permitted random flight routing. CAR 19
36.68.12	State the requirements for carrying out an instrument approach using GPS equipment as a primary means navigation system. CAR 19
36.68.14	State the requirements for the nomination of an alternate if GPS is used as a primary means navigation system. CAR 19
	Airspace and Aerodromes
36.70	**Altimetry**
36.70.2	State the altimeter setting procedures required when operating in the Auckland Oceanic FIR. AIP ENR
36.70.4	State the altimeter setting procedures required when operating in the New Zealand FIR. CAR 91 & AIP ENR
36.70.6	State the procedure to use to obtain an altimeter setting when QNH is not available prior to take-off and the requirement to obtain a QNH once in flight. AIP ENR
36.70.8	Describe QNH zones and state when zone QNH should be used. AIP ENR
36.70.10	Describe the transition altitude, layer and level. AIP ENR

Sub Topic	Syllabus Item
36.72	**Cruising Levels**
36.72.2	State the altitude/flight level requirements when cruising IFR within the Auckland Oceanic FIR. AIP ENR
36.72.4	State the altitude/flight level requirements when cruising IFR within the New Zealand FIR. CAR 91 AIP ENR
36.72.6	Determine from charts and publications the minimum flight altitude (MFA) for a route sector.
36.72.8	Describe situations where ATC may assign cruising altitudes not in accordance with the IFR table of cruising altitudes. AIP ENR
36.72.10	State the position by which an aircraft must be at a higher MFA if one is specified. AIP GEN
36.74	**Transponders**
36.74.2	State the requirements for the operation of transponders within the New Zealand FIR. CAR 91 & AIP ENR
36.74.4	Describe the procedures required of pilots operating transponders. AIP ENR
36.74.6	Describe the altitude accuracy limits of transponders. AIP ENR
36.74.8	State the requirements and limitations on an aircraft operating in transponder mandatory airspace without an operating transponder. CAR 91 & AIP ENR
36.75	**Airspace**
36.75.2	State the rules pertaining to operating IFR in the various classes of airspace. CAR 91 & AIP ENR
36.75.4	Describe the vertical limits and purpose of control zones (CTR). CAR 71
36.75.6	Describe the vertical limits and purpose of control areas (CTA). CAR 71
36.75.8	State the status and conditions relating to flight in VFR transit lanes. AIP ENR
36.75.10	Describe the status and purpose of a general aviation area (GAA). CAR 91 & AIP ENR
36.75.12	Describe visual reporting points.
36.75.14	Describe the status of controlled airspace when ATC go off duty. AIP GEN
36.75.16	State the restrictions on operating an aircraft in a restricted area. CAR 91 & AIP ENR
36.75.18	State the restrictions on operating an aircraft in a military operating area (MOA). CAR 91 & AIP
36.75.20	State the restrictions and operating considerations relating to operating an aircraft in a mandatory broadcast zone (MBZ). CAR 91 & AIP ENR
36.75.22	State the restrictions and operating considerations relating to operating an aircraft in a volcanic hazard zone (VHZ). CAR 91 & AIP ENR

Sub Topic	Syllabus Item
36.75.24	State the restrictions and operating considerations relating to operating an aircraft in a danger area. CAR 91 & AIP ENR
36.75.26	State the operating considerations relating to operating an aircraft in a common frequency zone (CFZ). AIP ENR
36.75.28	State the operating considerations relating to operating an aircraft over or close to temporary hazards/airspace. AIP ENR
36.75.30	Explain the requirements for the operation of an aircraft in RNP airspace. AIP ENR
36.75.32	Interpret airspace information on aeronautical charts.
36.76	**Aerodromes**
36.76.2	Describe the limitations on the use of a place as an aerodrome. CAR 91
36.76.4	Describe the method of runway designation. AIP AD
36.76.6	Describe the movement area of an aerodrome. CAR 1
36.76.8	Describe the meaning of the various aerodrome ground signals.
36.76.10	Interpret runway, taxiway, apron and stand signs and markings.
36.76.12	Interpret information on aerodrome charts. AIP GEN & Volume 4
36.78	**Aerodrome Lighting**
36.78.2	Describe the lighting intensity classifications.
36.78.4	Describe the following lighting systems: (a) Runway edge lighting (REDL) (b) Runway landing threshold lighting (RTHL) (c) Runway end lighting (RENL) (d) Runway centreline lighting system (RCLL) (e) Runway touchdown zone lighting (RTZL) (f) Runway end identifier lighting (REIL) (g) Approach lighting systems (ALS) (h) Circling guidance lighting (CGL) (i) Runway lead in lighting (RLLS) (j) Pilot activated lighting (PAL) (k) T-Visual approach slope indicators (T-VASIS) (l) Visual approach slope indicators (VASIS) (m) Precision approach path indicators (PAPI).

Sub Topic	Syllabus Item
36.78.6	Describe aerodrome beacons.
36.78.8	Describe the indication of above, on and below slope for: (a) PAPIs (b) VASIS (c) T-VASIS.
	Emergencies Incidents and Accidents
36.80	**Responsibilities of Operators and Pilots**
36.80.2	State the requirement for the notification of accidents. CAR 12
36.80.4	State the requirement for the notification of incidents. CAR 12
36.80.6	State the extent to which a pilot may deviate from the CA Act or rules in an emergency situation. CA Act 1990 S13A (2)
36.80.8	State the pilot action required following deviation from the CA Act or rules in an emergency situation. CA Act 1990 S13A (6)
36.82	**Communications and Equipment**
36.82.2	State the transponder code a pilot should set to indicate an emergency condition. AIP ENR
36.82.4	State the transponder code a pilot should set to indicate a loss of communications. AIP ENR
36.82.6	State the transponder code a pilot should set to indicate that the aircraft is being subjected to unlawful interference. AIP ENR
36.82.8	Describe the means by which ATC will verify the transmission of an emergency SSR transponder code. AIP ENR
36.82.10	Describe the use of the speechless technique using unmodulated transmissions. AIP ENR
36.82.12	Describe and interpret ground-air visual signal codes. AIP GEN
36.82.14	Describe the procedures for directing a surface craft to a distress incident. AIP GEN
36.82.16	State the procedures for the emergency activation of an ELT. AIP GEN
36.82.18	State the pilot action required following the inadvertent transmission of an ELT. AIP GEN
36.82.20	State the requirements for the operational testing of an ELT. AIP GEN
36.82.22	State the procedures to be followed on receiving an ELT signal. AIP GEN

Sub Topic	Syllabus Item
	Instrument Departures and Approaches
36.90	**Departure Procedures**
36.90.2	Interpret information on SID and Departure Procedure charts.
36.90.4	Determine the IFR take-off minima for a departure off a given runway. AIP ENR
36.90.6	State the IFR take-off minima if it is not prescribed in Volume 3 and 4. AIP ENR
36.90.8	State the CAR Part 91 requirements and limitations of IFR reduced take-off minima. CAR 91 & AIP ENR
36.90.10	State the minimum height for a turn after take-off on departure. AIP ENR
36.90.12	State the minimum climb gradient on a SID unless otherwise specified. AIP ENR
36.90.14	Calculate the rate of climb required to meet the net climb gradient specified on instrument departures. AIP ENR
36.90.16	State when a departure procedure terminates. AIP ENR
36.90.18	State the limitation on the termination of radar vectoring for a departing IFR aircraft. AIP ENR
36.90.20	State the requirements for broadcasting intentions when departing from an unattended aerodrome. AIP ENR
36.90.22	State the requirements for and limitations on a visual departure. AIP ENR
36.90.24	Describe the operating restrictions where an IFR departure procedure is not promulgated. AIP ENR
36.92	**Holding Procedures**
36.92.2	State the maximum speed in en-route holding patterns. AIP ENR
36.92.4	State the maximum entry and holding pattern speeds. AIP ENR
36.92.6	Identify and describe appropriate holding pattern entry procedures. AIP ENR
36.92.8	State when an onwards clearance time will be passed to the pilots of an aircraft instructed to hold en-route. AIP ENR
36.92.10	State when an expected approach time will be passed to the pilots of an aircraft instructed to hold at an initial approach fix. AIP ENR
36.92.12	State the angle of bank required during turns in a holding pattern. AIP ENR
36.94	**Approach Procedures**
36.94.2	Describe the descent limitations from cruise to approach commencement. AIP GEN
36.94.4	Interpret information on STAR charts. AIP GEN
36.94.6	State the limitation on a clearance to fly a STAR. AIP ENR
36.94.8	Define the minimum initial approach altitude. AIP ENR

Sub Topic	Syllabus Item
36.94.10	Interpret information on instrument approach charts.
36.94.12	Determine the IFR meteorological minima for an instrument approach to a given runway.
36.94.14	State the meteorological minima which must exist prior to a landing off an instrument approach. CAR 91 & AIP ENR
36.94.16	Describe the procedures for joining overhead a navigation aid for an instrument approach. AIP ENR
36.94.18	State the minimum meteorological conditions which must exist before ATC may clear an aircraft for an instrument approach with a descent restriction. AIP ENR
36.94.20	State the meteorological and other conditions which will allow a pilot to request a visual approach in controlled airspace. AIP ENR
36.94.22	State the meteorological and other conditions which allow ATC to advise that conditions are suitable for a visual approach. AIP ENR
36.94.24	State the meteorological and other conditions which will allow a pilot to carry out a visual approach in uncontrolled airspace. AIP ENR
36.94.26	Describe the provision of traffic separation and terrain clearance during a visual approach. AIP ENR
36.94.28	Given an aircraft's Vs, determine its category for approach speeds and minima. AIP ENR
36.94.30	State the category B and C speed limitations during an instrument approach under ICAO PANS OPS II procedures. AIP ENR
36.94.32	State the requirements for making position reports during an instrument approach in controlled and uncontrolled airspace. AIP ENR
36.94.34	Describe the procedures for carrying out an instrument approach at an unattended aerodrome. AIP ENR
36.94.36	Determine the minimum descent altitude using a QNH from a remote location. AIP ENR
36.94.38	State when descent below decision altitude or minimum descent altitude may be made on an instrument approach. AIP ENR
36.94.40	Describe the missed approach procedures and limitations. AIP ENR
36.96	**Communications and Navigation Aid Failure**
36.96.2	Describe the procedures required following a communications failure en-route. AIP ENR
36.96.4	Describe the procedures required following a communications failure during an instrument approach. AIP ENR
36.96.6	Describe the procedure to be carried out in the event of a radio navigation aid failure during an approach. AIP ENR

Sub Topic	Syllabus Item
36.96.8	State the requirements for changing approach types in the event of a radio navigation aid failure during an approach. AIP ENR

Subject No. 37 ATPL Air Law (Helicopter)

Each subject has been given a subject number and each topic within that subject a topic number. These reference numbers will be used on knowledge deficiency reports and will provide valuable feedback to the examination candidate. These topic reference numbers may be common across the subject levels and therefore may not be consecutive within a specific syllabus.

Sub Topic	Syllabus Item
	General
37.2	**Aviation Legislation**
37.2.2	Describe the requirements to hold an aviation document, as laid down in CA Act 1990 S7.
37.2.4	Describe the criteria for the fit and proper person test, as laid down in CA Act 1990 S10.
37.2.6	Describe the duties of the pilot-in-command, as laid down in CA Act 1990 S13 and 13A.
37.2.8	Describe the responsibilities of a licence holder with respect to changes in their medical condition, as laid down in CA Act 1990 S27.
37.2.10	Describe the responsibilities of a licence holder with respect to the surrender of a medical certificate as laid down in CA Act 1990 S27.
37.2.12	Describe the responsibilities of a licence holder with respect to safety offences, as laid down in CA Act 1990 S43 and 44.
37.4	**Definitions**
37.4.2	CAR Part 1 (unless otherwise noted) State the definition of: (a) accident (b) Act (c) aerodrome control service (d) aerodrome operational area (e) aeronautical information circular (f) aircraft category (g) air transport operation (h) air operation (i) airworthiness certificate (j) airworthiness directive (k) airworthy condition (l) alerting service (m) alternate aerodrome (n) altitude

Sub Topic	Syllabus Item
	(o) approach control
	(p) area control
	(q) area navigation
	(r) ATC clearance
	(s) ATC instruction
	(t) barometric vertical navigation (baro-VNAV) AIP GEN
	(u) augmented crew
	(v) Category I precision approach procedure
	(w) Category II precision approach procedure
	(x) ceiling
	(y) certified organisation
	(z) Class 3.1A Flammable liquid
	(aa) Class 3.1C Flammable liquid
	(bb) Class 3.1D Flammable liquid
	(cc) clearance limit
	(dd) command practise
	(ee) commercial transport operation
	(ff) controlled airspace
	(gg) controlled flight
	(hh) co-pilot
	(ii) crew member
	(jj) dangerous goods
	(kk) day
	(ll) decision altitude (DA)
	(mm) decision height (DH)
	(nn) design helicopter (AIP GEN)
	(oo) disabled passenger
	(pp) dual flight time
	(qq) escorted passenger
	(rr) final reserve fuel
	(ss) fit and proper person
	(tt) flight crew member
	(uu) flight examiner
	(vv) flight level
	(ww) flight manual
	(xx) flight plan

Sub Topic	Syllabus Item
	(yy) flight time
	(zz) height
	(aaa) heliport (AIP GEN)
	(bbb) IFR flight
	(ccc) incident
	(ddd) instrument approach procedure
	(eee) instrument flight
	(fff) instrument flight time
	(ggg) instrument meteorological conditions
	(hhh) instrument time
	(iii) minimum descent altitude (MDA)
	(jjj) minimum descent height (MDH)
	(kkk) minimum safe altitude (AIP GEN)
	(lll) minimum sector altitude (MSA 25M) (AIP GEN)
	(mmm) night
	(nnn) NOTAM
	(ooo) passenger
	(ppp) pilot-in-command
	(qqq) precision approach procedure
	(rrr) pressure altitude
	(sss) procedure altitude (AIP GEN)
	(ttt) rated coverage (AIP GEN)
	(uuu) rating
	(vvv) regular air transport passenger service
	(www) reporting point
	(xxx) RNP performance
	(yyy) runway visual range
	(zzz) SARTIME
	(aaaa) serious incident
	(bbbb) segment OCA (AIP GEN)
	(cccc) take-off distance available
	(dddd) take-off run available
	(eeee) take-off weight
	(ffff) Technical Instructions
	(gggg) threshold (CAR 121.3)
	(hhhh) type

Sub Topic	Syllabus Item
	(iiii) unlawful interference
	(jjjj) VFR flight
	(kkkk) visibility
	(llll) visual meteorological conditions and
	(mmmm) ZFT simulator.
37.6	**Abbreviations**
37.6.2	CAR Part 1 (unless otherwise noted)
	State the meaning of the following abbreviations:
	(a) ACAS
	(b) AD
	(c) ADF
	(d) AGL
	(e) AMSL
	(f) ATIS
	(g) CAR
	(h) CRM
	(i) DME
	(j) ELT
	(k) FATO (AIP GEN)
	(l) GPWS
	(m) ICAO
	(n) ILS
	(o) OGE
	(p) QFE
	(q) QNH
	(r) RNP
	(s) RTODAH (AIP GEN)
	(t) RVR
	(u) TODAH (AIP GEN)
	(v) TALO (AIP GEN)
	(w) TLOF (AIP GEN)
	(x) TAWS
	(y) TCAS
	(z) VOR
	(aa) VTOL (AIP GEN)
	(bb) ZFT.

Sub Topic	Syllabus Item
	Personnel Licensing
37.10	**Requirements for Licences and Ratings**
37.10.2	State the requirements for holding a pilot's licence. CAR 61
37.10.4	State the requirements for a pilot-in-command to hold a type rating on the type of aircraft being flown. CAR 61
37.10.6	State the requirements for entering flight details into a pilot's logbook. CAR 61
37.12	**Eligibility, Privileges and Limitations**
37.12.2	Describe the allowance for a person who does not hold a current pilot's licence to fly dual with an instructor. CAR 61
37.12.4	State the solo flight requirements on person who does not hold a current pilot's licence. CAR 61
37.12.6	State the limitations on a person who does not hold a current pilot's licence. CAR 61
37.12.8	State the eligibility requirements for the issue of a helicopter air transport pilot's licence. CAR 61
37.12.10	State the privileges of holding a helicopter air transport pilot's licence. CAR 61
37.14	**Competency, Currency and Recency**
37.14.2	State the recent experience requirements of a pilot-in-command on an air operation, who is the holder of an airline transport pilot licence. CAR 61
37.14.4	State the requirements for the completion of a biennial flight review. CAR 61
37.14.6	Explain the use of a lower licence or rating. CAR 61
37.14.8	State the period within which a pilot-in-command of a helicopter engaged on an air operation under CAR Part 135 must have passed a check of route and aerodrome proficiency.
37.14.10	State the period within which a pilot, acting as a flight crew member of a helicopter engaged on a CAR Part 135 air operation under VFR, must have passed a check of normal, abnormal and emergency procedures in the same aircraft type.
37.14.12	State the period within which a pilot, acting as a flight crew member of a helicopter engaged on a CAR Part 135 air operation under IFR, must have passed a check of normal, abnormal and emergency procedures in the same aircraft type.
37.14.14	State the period within which a pilot of a helicopter engaged on an air operation under CAR Part 135 must have completed a written or oral test of their knowledge in aeroplane systems, performance and operating procedures.
37.14.16	State the CAR Part 135 crew member grace provisions.
37.14.18	State the currency requirements of a pilot who is the holder of an instrument rating. CAR 61
37.14.20	State the currency requirements for carrying out an instrument approach. CAR 61
37.14.22	State the requirements for acting as a safety pilot during simulated instrument flight. CAR 61
37.16	**Medical Requirements**
37.16.2	State the requirements for holding a medical certificate. CAR 61
37.16.4	State the requirements on a person applying for a medical certificate. CAR 67

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37.16.6	State the requirements for maintaining medical fitness following the issue of a medical certificate. CA Act 1990 S27C
37.16.8	State the normal currency period of the Class 1 medical certificate for an ATPL holder who is under the age of 40. CAR 67
37.16.10	State the normal currency period of the Class 1 medical certificate for an ATPL holder who is 40 years of age or more on the date that the certificate is issued. CAR 67
	Airworthiness of Aircraft and Aircraft Equipment
37.20	**Documentation**
37.20.2	State the documents which must be carried in aircraft operated in New Zealand. CAR 91
37.22	**Aircraft Maintenance**
37.22.2	Describe the maintenance requirements of an aircraft operator. CAR 91
37.22.4	State the requirements for maintenance records. CAR 91
37.22.6	State the requirements for the retention of maintenance records. CAR 91
37.22.8	State the requirements for and contents of a technical log. CAR 91
37.22.10	State the requirements for entering defects into a technical log. CAR 91
37.22.12	State the requirements for clearing defects from a technical log. CAR 91
37.22.14	State the limitations and requirements on a person undertaking ‘pilot maintenance’. CAR 43
37.22.16	State the requirements for conducting an operational flight check on an aircraft. CAR 91
37.22.18	State the requirements for acting as a test pilot. CAR 19
37.22.20	State the inspection period for radios. CAR 91
37.22.22	State the inspection period for altimeters. CAR 91
37.22.24	State the inspection period for transponders. CAR 91
37.22.26	State the inspection period for the ELT. CAR 91
37.24	**Instruments and Avionics**
37.24.2	State the minimum instrument requirements for a day VFR flight. CAR 91
37.24.4	State the minimum instrument requirements for a night VFR flight. CAR 91
37.24.6	State the radio equipment requirements for a VFR flight. CAR 91
37.24.8	State the communications and navigation equipment requirements for a VFR over water flight. CAR 91
37.24.10	State the minimum instrument requirements for an IFR flight. CAR 91
37.24.12	State the communications and navigation equipment requirements for an IFR flight. CAR 91
37.26	**Equipment**
37.26.2	State the requirements for night flight. CAR 91
37.26.4	State the equipment requirements for a night VFR flight. CAR 91

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37.26.6	State the CAR Part 135 requirements for night flight.
37.26.8	State the equipment requirements for an IFR flight. CAR 91
37.26.10	State the equipment requirements for flight over water. CAR 91 & CAR 135
37.26.12	State the requirements for emergency equipment in helicopters with seating capacity for more than 10 passengers. CAR 91
37.26.14	State the CAR Part 135 requirements for emergency equipment.
37.26.16	State the requirements for an ELT. CAR 91
37.26.18	State the requirements for indicating the time in flight. CAR 91
37.26.20	State the CAR Part 135 requirements for a cockpit voice recorder.
37.26.22	State the CAR Part 135 requirements for a flight data recorder.
37.26.24	State the CAR Part 135 requirements for an additional altitude indicator.
37.26.26	Explain the requirement for altitude alerting/assigned altitude indicating. CAR 91
	General Operating and Flight Rules
37.30	**General Operating Requirements**
37.30.2	Describe the requirements of passengers to comply with instructions and commands. CAR 91
37.30.4	Explain the requirements for maintaining daily flight records. CAR 91
37.30.6	State the aircraft requirements for giving flight instruction. CAR 91
37.30.8	State the requirements for operating an aircraft in simulated instrument flight. CAR 91
37.30.10	State the requirements of a pilot-in-command with respect to the safe operation of an aircraft. CAR 91
37.30.12	Describe the authority of the pilot-in-command. CAR 91
37.30.14	State the requirements for crew occupation of seats and wearing safety belts. CAR 91
37.30.16	State the requirements for the occupation of seats and wearing of restraints. CAR 91
37.30.18	State the requirements for the use of oxygen equipment. CAR 91
37.30.20	State the requirements for briefing passengers prior to flight. CAR 91
37.30.22	State the requirements for familiarity with operating limitations and emergency equipment. CAR 91
37.30.24	State the requirements for carrying appropriate aeronautical publications and charts in flight. CAR 91
37.30.26	State the requirements for operating on and in the vicinity of an aerodrome. CAR 91
37.30.28	Describe the standard overhead joining procedure, and state when it should be used. AIP AD
37.30.30	State and describe the application of the right of way rules. CAR 91
37.30.32	Explain the requirement for aircraft lighting. CAR 91
37.30.34	State the requirements for the pilot of a helicopter, being flown for the purpose of demonstrating eligibility for the issue of an airworthiness certificate. CAR 91
37.30.36	State the requirements for wearing/holding identity documentation in certain areas.

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	CAR 19
37.32	**General Operating Restrictions**
37.32.2	State the restrictions on smoking in a helicopter. CA Act 1990 S65N
37.32.4	State the restrictions associated with the abuse of drugs and alcohol. CAR 91 and CAR 19
37.32.6	State the restrictions on the use of portable electronic devices in flight. CAR 91
37.32.8	State the restrictions on the carriage and discharge of firearms on helicopters. CAR 91
37.32.10	Explain the restrictions on stowage of carry-on baggage. CAR 91
37.32.12	Explain the restrictions on the carriage of cargo. CAR 91
37.32.14	State the restrictions applicable to aircraft flying near other aircraft. CAR 91
37.32.16	State the restrictions on the dropping of objects from a helicopter in flight. CAR 91
37.32.18	State the minimum heights for VFR flights under CAR Part 91.
37.32.20	State the restrictions when operating VFR in icing conditions. CAR 91
37.32.22	State the restrictions when operating IFR in icing conditions. CAR 91
37.32.24	State the restrictions applicable to operating a helicopter in aerobatic flight. CAR 91
37.32.26	State the restrictions applicable to parachute-drop operations. CAR 91
37.32.28	State the restrictions on aircraft noise and engine emission standards. CAR 91
37.34	**General Meteorological Requirements and Restrictions**
37.34.2	State the met minima for VFR flight in various airspace. CAR 91
37.34.4	State the restrictions and met minima for Special VFR flight. CAR 91
37.36	**Carriage of Dangerous Goods**
37.36.2	Describe the limitation of CAR Part 92 with respect to members of the Police.
37.36.4	State the restriction for the carriage of dangerous goods in a helicopter's cabin occupied by passengers, or in the cockpit of a helicopter. CAR 92
37.36.6	Describe the allowance for the carriage of dangerous goods for the recreational use of passengers. CAR 92
37.36.8	State the requirements for the carriage of non-dangerous goods in an aircraft. CAR 92
37.36.10	State the requirement for the notification of the pilot-in-command when dangerous goods are carried. CAR 92
37.36.12	State the requirement for a dangerous goods training programme. CAR 92
37.36.14	State the dangerous goods recurrent training programme requirements. CAR 92
37.36.16	State the allowance for the carriage of dangerous goods as an under-slung load. CAR 133
37.38	**Helicopter External Load Operations**
37.38.2	State the definition of: (a) helicopter external load operation (b) helicopter external load towing operation (c) helicopter sling load operation

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	(d) OGE. CAR 133
37.38.4	State the pilot licence requirements for performing a helicopter external load operation. CAR 133
37.38.6	Describe the minimum height requirements when performing a helicopter external load operation. CAR 133
37.38.8	State the restrictions on the carriage of persons inside a helicopter on a helicopter external load towing operation. CAR 133
37.38.10	State the restrictions on the carriage of persons inside a helicopter on a helicopter sling load operation. CAR 133
37.38.12	State the restrictions on the carriage of persons inside a helicopter on a winching, rappelling, or human sling load operation. CAR 133
37.38.14	State the third party risk restrictions when carrying a load suspended beneath a helicopter. CAR 133
37.38.16	State the weight limitation for a helicopter performing a helicopter external load operation. CAR 133
37.38.18	State the flight rules restriction for a helicopter performing a helicopter external load operation. CAR 133
37.38.20	Describe the restrictions on helicopter external load operations at night. CAR 133
37.38.22	Describe the flight characteristics requirements for a helicopter performing a helicopter external load operation. CAR 133
37.38.24	Explain the requirements for performing a helicopter external load operation over congested areas. CAR 133
37.38.26	Describe the general requirements for performing an operation involving the suspension of a person beneath a helicopter. CAR 133
37.38.28	State the requirements for performing a helicopter winch operation. CAR 133
37.38.30	State the requirements for the carriage of an injured person beneath a helicopter in a harness or stretcher. CAR 133
37.38.32	State the requirements for performing a helicopter rappelling operation. CAR 133
37.38.34	Explain the requirements for the carriage of a supplementary crew member on a helicopter performing a helicopter external load operation. CAR 133
37.38.36	Explain the requirements for ensuring crew member competency to carryout winching, rappelling, or human sling load operations. CAR 133
37.38.38	Describe the external load equipment requirements on a helicopter performing a helicopter external load operation. CAR 133
37.38.40	Describe the requirements for quick release devices on a helicopter performing a helicopter external load operation. CAR 133
37.38.42	Explain the requirements for the maintenance of external load equipment. CAR 133
	Air Operations
37.40	**Air Operations Crew Requirements**
37.40.2	State the CAR Part 135 crew qualification and experience requirements.
37.40.4	State the CAR Part 135 flight and duty time limitations on flight crew members.

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37.40.6	State the AC119-2 normal minimum rest period required following any duty period.
37.40.8	State the maximum number of flight hours that a pilot may fly as crew in a helicopter which carries two pilots on an internal air operation. AC119
37.42	**Air Operations Requirements and Restrictions**
37.42.2	State the airworthiness requirements for a helicopter used on air operations. CAR 135
37.42.4	State the CAR Part 135 minimum heights for VFR flights.
37.42.6	State the CAR Part 135 operating restriction on single-engine air operations under IFR (SEIFR).
37.42.8	State the CAR Part 135 requirements for reduced take-off minima.
37.42.10	State the requirement to keep a daily flight record. CAR 135
37.42.12	State the CAR Part 135 requirement for a maintenance review.
37.42.14	State the CAR Part 135 requirement for passenger safety and the carriage of certain passengers.
37.42.16	State the CAR Part 135 restrictions when refuelling.
37.42.18	State the CAR Part 135 restrictions on the manipulation of a helicopter's controls.
37.42.20	State the CAR Part 135 requirement for helicopter operations over congested areas.
37.42.22	State the restrictions on helicopter sling loads on an air operation. CAR 135
37.44	**Air Operations Meteorological Requirements and Restrictions**
37.44.2	State the CAR Part 135 requirements for persons performing an air operation to use meteorological information.
37.44.4	State the CAR Part 135 meteorological conditions and requirements for an air operation under VFR.
37.44.6	State the CAR Part 135 meteorological conditions and requirements for an air operation under IFR.
37.44.8	State the CAR Part 135 aerodrome operating minima - IFR flight.
37.44.10	State the CAR Part 135 requirements for reduced take-off minima.
37.44.12	State the CAR Part 135 restrictions for IFR procedures.
37.46	**Air Operations Performance Requirements**
37.46.2	State the meaning of a Performance-Class 1 (Category A) helicopter. CAR Pt 1
37.48	**Air Operations Weight and Balance Requirements**
37.48.2	State the CAR Part 135 requirements for managing weight and balance of aircraft used on an air operation.
	Flight Planning and Preparation
37.50	**Flight Preparation**
37.50.2	Explain the requirements for the obtaining and considering relevant information prior to flight. CAR 91
37.50.4	Describe the publications and their content that provide operational route and aerodrome information.
37.50.6	Derive operational information from charts and publications that provide route,

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	approach and aerodrome information.
37.52	**Alternate Requirements**
37.52.2	State the meteorological minima at destination which would require an alternate to be nominated. CAR 91
37.52.4	State the meteorological minima at departure which would require a CAR Part 135 IFR operation to nominate a departure alternate. CAR 135
37.52.6	Determine the meteorological minima required at an aerodrome for it to be nominated as an IFR alternate. CAR 91
37.52.8	State the power supply requirements for the selection of an aerodrome as an alternate on an IFR air operation. CAR 91
37.52.10	State the reference datum for take-off meteorological minima for IFR operations. CAR 91
37.52.12	State the reference datum for landing meteorological minima for IFR operations. CAR 91
37.52.14	State the reference datum for alternate meteorological minima for IFR operations. AIP ENR
37.54	**Fuel Requirements**
37.54.2	State the fuel reserve required for a VFR flight in a helicopter. CAR 91
37.54.4	State the fuel reserve required for an IFR flight in a helicopter. CAR 91
37.56	**Flight Plans**
37.56.2	State the CAR Part 135 requirements for the filing of a flight plan.
37.56.4	State the requirements for the notification of changes to a filed VFR flight plan. CAR 91
37.56.6	State the requirements for the terminating a VFR flight plan. CAR 91
37.56.8	State the requirements for the filing of a flight plan for flight under IFR. CAR 91
37.56.10	State the notification lead time for filing an IFR flight plan. CAR 91 & AIP ENR
37.56.12	State the requirements for adhering to an IFR flight plan. CAR 91
37.56.14	State the requirements for the notification of changes to the filed IFR flight plan. CAR 91
37.56.16	State the requirements for an inadvertent departure from an IFR flight plan. CAR 91
37.56.18	State the requirements for the cancellation of an IFR flight plan in various airspaces. AIP ENR
37.56.20	State the requirements for the terminating an IFR flight plan at an aerodrome without ATS. CAR 91
37.56.22	State the time search and rescue action would be initiated if a flight plan is not terminated. AIP ENR
	Air Traffic Services
37.60	**Communications**
37.60.2	Derive from operational publications, the required radio frequency for communicating with specified ATC units.

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37.60.4	Explain the use of aircraft radiotelephony callsigns. CAR 91
37.60.6	State the requirements for making position reports to an ATS unit. CAR 91 & AIP ENR
37.60.8	State the content of a position report. AIP ENR
37.60.10	State the purpose of Universal Communications Services (UNICOM). AIP GEN
37.60.12	State the purpose of an Aerodrome Frequency Response Unit (AFRU). AIP GEN
37.60.14	State the purpose of Aerodrome and Weather Information Broadcasts (AWIB). AIP GEN
37.60.16	State the meaning of the various light signals from a control tower. CAR 91 & AIP AD
37.60.18	State the communications requirements when TIBA procedures are in force. AIP ENR
37.62	**Clearances**
37.62.2	State the requirements for complying with ATC clearances and instructions. CAR 91 & AIP ENR
37.62.4	State the requirements for coordinating with an aerodrome flight information service. CAR 91
37.62.6	State the requirements for receiving an ATC clearance prior to entering various types of airspace, and ground manoeuvring area. CAR 91 & AIP ENR
37.62.8	State the requirements for receiving an ATC clearance prior to re-entering controlled airspace. CAR 91
37.63	**Separation**
37.63.2	Describe the method of passing traffic information using the clock code.
37.63.4	Describe the situations where Air Traffic Control is responsible for the provision of separation between VFR, SVFR and IFR traffic. AIP ENR
37.63.6	Describe the situations where the pilot-in-command of an IFR flight is responsible for maintaining separation from other traffic. AIP ENR
37.63.8	Describe the normal separation standards applied by ATC. AIP ENR
37.63.10	Describe the situations where the normal separation may be reduced. AIP ENR
37.63.12	State the meaning of the term “Essential traffic”. AIP ENR
37.63.14	State the conditions under which longitudinal separation between reciprocal track aircraft may be reduced. AIP ENR
37.63.16	State the wake turbulence separation requirements for light aircraft in non-radar environment. AIP AD
37.63.18	State the minimum descent height in IMC at an unattended aerodrome where traffic conflict may exist. AIP ENR
37.64	**Terrain Clearance**
37.64.2	Describe the determination of the minimum safe altitude for IFR flight. AIP GEN
37.64.4	Explain the coverage and use of VORSEC charts. AIP GEN
37.64.6	Explain the coverage and use of 25nm Minimum Sector Altitude diagrams. AIP GEN
37.64.8	State when the radar control service is responsible for the provision of terrain clearance. AIP ENR

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37.64.10	Explain how radar control provides terrain clearance. AIP ENR
37.64.12	Describe the use of DME descent steps for maintaining terrain clearance during departure climb or descent for an approach. AIP GEN and ENR
37.65	**Weather Avoidance**
37.65.2	State the requirements for deviation off track for weather avoidance. AIP ENR
37.66	**Radar Services**
37.66.2	Describe the radar services available to VFR and IFR flights. AIP ENR
37.66.4	Describe the responsibility of the radar controller to keep an aircraft within controlled airspace. AIP ENR
37.66.6	State the accuracy limits required when under radar speed control. AIP ENR
37.66.8	State the distance from touchdown that radar speed control can be maintained on an instrument and a visual approach. AIP ENR
37.66.10	State the meteorological and other conditions which allow a radar controller to vector an aircraft for a visual approach. AIP ENR
37.66.12	State the criteria for a radar controller to consider an unknown aircraft to be on a conflicting path with another aircraft. AIP ENR
37.68	**Global Navigation Satellite System.**
37.68.2	State the equipment required by aircraft on air operations within the New Zealand flight information region, using GPS as a primary means navigation system. CAR 19
37.68.4	State the meaning of a GPS “sole means navigation system”. CAR 19
37.68.6	State the restriction on using GPS as a sole means navigation system under IFR in the New Zealand flight information region. CAR 19
37.68.8	State the actions required of pilots, under IFR using GPS equipment as a primary means navigation system, if system degradation occurs. CAR 19
37.68.10	State the requirements which must be met before a pilot of an aircraft operating within the New Zealand flight information region, under IFR, using GPS equipment as a primary means navigation system, is permitted random flight routing. CAR 19
37.68.12	State the requirements for carrying out an instrument approach using GPS equipment as a primary means navigation system. CAR 19
37.68.14	State the requirements for the nomination of an alternate if GPS is used as a primary means navigation system. CAR 19
	Airspace, Aerodromes and Heliports
37.70	**Altimetry**
37.70.2	State the altimeter setting requirements for flight under VFR and IFR in the New Zealand FIR. CAR 91 & AIP ENR
37.70.4	State the procedure to use to obtain an altimeter setting when QNH is not available prior to take-off and the requirement to obtain a QNH once in flight. AIP ENR
37.70.6	Describe QNH zones and state when zone QNH should be used. AIP ENR
37.70.8	Describe the transition altitude, layer and level. AIP ENR

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37.72	**Cruising Levels**
37.72.2	State the altitude/flight level requirements when cruising VFR and IFR within the New Zealand FIR. CAR 91 & AIP ENR
37.72.4	Determine from charts and publications the minimum flight altitude (MFA) for a route sector.
37.72.6	Describe situations where ATC may assign cruising altitudes not in accordance with the table of cruising altitudes. AIP ENR
37.72.8	Determine the minimum flight altitude (MFA) for a route sector.
37.72.10	State the position by which an aircraft must be at a higher MFA if one is specified. AIP GEN
37.74	**Transponders**
37.74.2	State the requirements for the operation of transponders within the New Zealand FIR. CAR 91 & AIP ENR
37.74.4	Describe the procedures required of pilots operating transponders. AIP ENR
37.74.6	Describe the altitude accuracy limits of transponders. AIP ENR
37.74.8	State the requirements and limitations on an aircraft operating under VFR in transponder mandatory airspace without an operating transponder. CAR 91 & AIP ENR
37.75	**Airspace**
37.75.2	State the rules pertaining to operating VFR in the various classes of airspace. CAR 91 and AIP ENR
37.75.4	Describe the vertical limits and purpose of control zones (CTR). CAR 71
37.75.6	Describe the vertical limits and purpose of control areas (CTA). CAR 71
37.75.8	State the status and conditions relating to flight in VFR transit lanes. AIP ENR
37.75.10	Describe the status and purpose of a general aviation area (GAA). CAR 91 & AIP ENR
37.75.12	Describe visual reporting points.
37.75.14	Describe the status of controlled airspace when ATC go off duty. AIP GEN
37.75.16	State the restrictions on operating an aircraft in a restricted area. CAR 91 & AIP ENR
37.75.18	State the restrictions on operating an aircraft in a military operating area (MOA). CAR 91 & AIP ENR
37.75.20	State the purpose of the various special use airspace. AIP ENR
37.75.22	State the restrictions and operating considerations relating to operating an aircraft in a mandatory broadcast zone (MBZ). CAR 91 & AIP ENR
37.75.24	State the restrictions and operating considerations relating to operating an aircraft in a volcanic hazard zone (VHZ). CAR 91 & AIP ENR
37.75.26	State the restrictions and operating considerations relating to operating an aircraft in a danger area. CAR 91 & AIP ENR
37.75.28	State the restrictions and operating considerations relating to operating an aircraft in a parachute landing area (PLA). AIP ENR
37.75.30	State the restrictions and operating considerations relating to operating an aircraft in a

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	designated low flying zone (LFZ). CAR 91 & AIP ENR
37.75.32	State the operating considerations relating to operating an aircraft in a common frequency zone (CFZ). AIP ENR
37.75.34	State the operating considerations relating to operating an aircraft over or close to temporary hazards/airspace. AIP ENR
37.75.36	Interpret airspace information on aeronautical charts.
37.76	**Aerodromes and Heliports**
37.76.2	Describe the limitations on the use of a place as an aerodrome or heliport. CAR 91.
37.76.4	Describe the method of runway designation. AIP AD
37.76.6	Describe the movement area of an aerodrome. CAR 1
37.76.8	Describe the meaning of the various aerodrome ground signals.
37.76.10	Describe and interpret heliport markings and lighting.
37.76.12	Interpret runway, taxiway, apron and stand signs and markings.
37.76.14	Interpret information on aerodrome/heliport charts. AIP GEN
37.78	**Aerodrome Lighting**
37.78.2	Describe the lighting intensity classifications.
37.78.4	Describe the following lighting systems: (a) Runway edge lighting (REDL) (b) Runway landing threshold lighting (RTHL) (c) Runway end lighting (RENL) (d) Runway centreline lighting system (RCLL) (e) Runway touchdown zone lighting (RTZL) (f) Runway end identifier lighting (REIL) (g) Approach lighting systems (ALS) (h) Circling guidance lighting (CGL) (i) Runway lead in lighting (RLLS) (j) Pilot activated lighting (PAL) (k) T-Visual approach slope indicators (T-VASIS) (l) Visual approach slope indicators (VASIS) (m) Precision approach path indicators (PAPI).
37.78.6	Describe aerodrome beacons.
37.78.8	Describe the indication of above, on and below slope for: (a) PAPIs (b) VASIS (c) T-VASIS.

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	Emergencies Incidents and Accidents
37.80	**Responsibilities of Operators and Pilots**
37.80.2	State the requirement for the notification of incidents. CAR 12
37.80.4	State the requirement for the notification of accidents. CAR 12
37.80.6	State the extent to which a pilot may deviate from the CA Act or rules in an emergency situation. CA Act 1990 S13A (2)
37.80.8	State the pilot action required following deviation from the CA Act or rules in an emergency situation. CA Act 1990 S13A (6)
37.82	**Communications and Equipment**
37.82.2	State the radio transmission applicable to a distress and urgency situation. AIP ENR
37.82.4	State the radio message required to impose silence during and emergency situation.
37.82.6	State the transponder code a pilot should set to indicate an emergency condition. AIP ENR
37.82.8	State the transponder code a pilot should set to indicate a loss of communications. AIP ENR
37.82.10	State the transponder code a pilot should set to indicate that the aircraft is being subjected to unlawful interference. AIP ENR
37.82.12	Describe the means by which ATC will verify the transmission of an emergency SSR transponder code. AIP ENR
37.82.14	Describe the use of the speechless technique using unmodulated transmissions. AIP ENR
37.82.16	Describe and interpret ground-air visual signal codes. AIP GEN
37.82.18	Describe the procedures for directing a surface craft to a distress incident. AIP GEN
37.82.20	State the procedures for the emergency activation of an ELT. AIP GEN
37.82.22	State the pilot action required following the inadvertent transmission of an ELT. AIP GEN
37.82.24	State the requirements for the operational testing of an ELT. AIP GEN
37.82.26	State the procedures to be followed on receiving an ELT signal. AIP GEN
	Instrument Departures and Approaches
37.90	**Departure Procedures**
37.90.2	Interpret information on SID and Departure Procedure charts.
37.90.4	Determine the IFR take-off minima for a departure off a given runway. AIP ENR
37.90.6	State the IFR take-off minima if it is not prescribed in the IFG. AIP ENR
37.90.8	State the CAR Part 91 requirements and limitations of IFR reduced take-off minima. CAR 91 & AIP ENR
37.90.10	State the minimum height for a turn after take-off on departure. AIP ENR
37.90.12	State the minimum climb gradient on a SID unless otherwise specified. AIP ENR
37.90.14	Calculate the rate of climb required to meet the net climb gradient specified on instrument departures. AIP ENR

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37.90.16	State when a departure procedure terminates. AIP ENR
37.90.18	State the limitation on the termination of radar vectoring for a departing IFR aircraft. AIP ENR
37.90.20	State the requirements for broadcasting intentions when departing from an unattended aerodrome. AIP ENR
37.90.22	State the requirements for and limitations on a visual departure. AIP ENR
37.90.24	Describe the operating restrictions where an IFR departure procedure is not promulgated. AIP ENR
37.92	**Holding Procedures**
37.92.2	State the maximum entry and holding pattern speeds. AIP ENR
37.92.4	Identify and describe appropriate holding pattern entry procedures. AIP ENR
37.92.6	State when an onwards clearance time will be passed to the pilots of an aircraft instructed to hold en-route. AIP ENR
37.92.8	State when an expected approach time will be passed to the pilots of an aircraft instructed to hold at an initial approach fix. AIP ENR
37.92.10	State the angle of bank required during turns in a holding pattern. AIP ENR
37.94	**Approach Procedures**
37.94.2	Describe the descent limitations from cruise to approach commencement. AIP GEN
37.94.4	Interpret information on STAR charts. AIP GEN
37.94.6	State the limitations on a clearance to fly a STAR. AIP ENR
37.94.8	Define the minimum initial approach altitude. AIP ENR
37.94.10	Interpret information on instrument approach charts.
37.94.12	Determine the IFR meteorological minima for an instrument approach to a given runway.
37.94.14	State the meteorological minima which must exist prior to an instrument approach being commenced. CAR 91 and AIP ENR
37.94.16	Describe the procedures for joining overhead a navigation aid for an instrument approach. AIP ENR
37.94.18	State the minimum meteorological conditions which must exist before ATC may clear an aircraft for an instrument approach with a descent restriction. AIP ENR
37.94.20	State the meteorological and other conditions which will allow a pilot to request a visual approach in controlled airspace. AIP ENR
37.94.22	State the meteorological and other conditions which allow ATC to advise that conditions are suitable for a visual approach. AIP ENR
37.94.24	State the meteorological and other conditions which will allow a pilot to carry out a visual approach in uncontrolled airspace. AIP ENR
37.94.26	Describe the provision of traffic separation and terrain clearance during a visual approach. AIP ENR
37.94.28	State the aircraft category for approach speeds and minima for helicopters. AIP ENR
37.94.30	State the category A speed limitations during an instrument approach under ICAO

Sub Topic	Syllabus Item
	PANS OPS II procedures. AIP ENR
37.94.32	State the requirements for making position reports during an instrument approach in controlled and uncontrolled airspace. AIP ENR
37.94.34	Describe the procedures for carrying out an instrument approach at an unattended aerodrome. AIP ENR
37.94.36	Determine the minimum descent altitude using a QNH from a remote location. AIP ENR
37.94.38	State when descent below decision altitude or minimum descent altitude may be made on an instrument approach. AIP ENR
37.94.40	Describe the missed approach procedures and limitations. AIP ENR
37.96	**Communications and Navigation Aid Failure**
37.96.2	Describe the procedures required following a communications failure en-route. AIP ENR
37.96.4	Describe the procedures required following a communications failure during an instrument approach. AIP ENR
37.96.6	Describe the procedure to be carried out in the event of a radio navigation aid failure during an approach. AIP ENR
37.96.8	State the requirements for changing approach types in the event of a radio navigation aid failure during an approach. AIP ENR

Flight Navigation Syllabus Matrix

-	-	Topic No.	PPL	CPL	IR	ATPL
-	-		6	18	54	38
Fundamentals of Air Navigation	Form of the Earth	2	√	√		√
	Direction on the Earth	4	√	√		√
	Distance on the Earth	6	√	√		√
	Speed/Velocity	8	√	√		√
	Position Referencing	10	√	√		√
	Altimetry	12	√	√	√	√
	Principles and Terminology	14	√			
	Time	16	√	√		√
	Twilight	18	√			
	Visibility	20				√
Aeronautical charts	Properties and Principles	22	√	√	√	√
	Scale	24				√
	Chart Reading	26	√	√	√	√
Circular Slide Rule	Computations	28	√	√		√
	Relative velocity	30				√
	Wind Components	32	√			
	Triangle of Velocities	34	√	√		√
	1:60 Rule	36	√	√		
Deduced Reckoning	In Flight Revisions	38	√			
Flight Planning	Route Selection	40	√	√	√	
	Chart Preparation	42	√	√		
	Plan Preparation	44	√	√	√	
	Fuel Planning	46	√	√	√	
Navigation Procedures - VFR	VFR Flight Navigation	48	√	√		
	Special Procedures	50	√	√		
Navigation Procedures - IFR	Properties and Principles	52			√	
	Chart Plotting	54			√	√
	Chart reading	56			√	
	En-route Diversion Calculation	58		√	√	√
Flight Management	Flight Management	60	√			√
	Fuel Management	62	√			
Radio Aids	ADF	64			√	
	VOR	66			√	
	DME	68			√	
GNSS	Global Navigation Satellite System	70	√	√	√	√
Radar	Procedures	72	√			

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Subject No. 38 Flight Navigation General (Aeroplane & Helicopter)

NOTE: *This syllabus is primarily based on regional/oceanic/global IFR navigation as applicable to navigating a multi engine turbine air transport type aeroplane or IFR capable turbine Helicopter.*

Each subject has been given a subject number and each topic within that subject a topic number. These reference numbers will be used on knowledge deficiency reports and will provide valuable feedback to the examination candidate. These reference numbers are common across the subject levels and therefore may not be consecutive.

This syllabus presupposes a knowledge and understanding already attained at PPL/CPL/IR level.

Sub Topic	Syllabus Item
	Fundamentals of Air Navigation
38.2	**Form of the Earth**
38.2.2	Define and identify, on a diagram of the earth: (a) great circles (b) small circles (c) rhumb lines (d) the equator (e) parallels of latitude (f) meridians of longitude (g) Greenwich (Prime) Meridian (h) the International Date Line.
38.4	**Direction on the Earth**
38.4.2	Define, with reference to navigation at higher latitudes and polar areas: (a) magnetic pole (b) true north (c) magnetic north (d) compass north.
38.4.4	Explain the processes, cautions and limitations when deriving track distances and bearings from a chart, with particular reference to navigation at higher latitudes and polar areas.
38.6	**Distance on the Earth**
38.6.2	Define units of distance used on aviation charts and the basis for these units.
38.6.4	Explain the distance calculation basis used by GNSS and FMC systems.
38.6.6	Determine distances (± 3nm) on an appropriate oceanic navigational chart.

Sub Topic	Syllabus Item
38.8	**Speed and velocity**
38.8.2	Define Mach number and associated computational formulae.
38.8.4	State the frame of reference for speed measurement provided by a GNSS and inertial system.
38.8.6	Explain how TAS and mach number are affected by changes in pressure altitude, air temperature and air density.
38.10	**Position Referencing**
38.10.2	Describe the grid system position reference method.
38.10.4	Describe the reference system used by a GNSS navigation system.
38.10.6	Plot and reference a position (± 3nm) on appropriate oceanic chart.
38.12	**Altimetry**
38.12.2	State the altimeter setting rules in oceanic airspace.
38.12.4	Explain the table of cruising levels and the application in oceanic airspace.
38.12.6	Explain the transition procedures between oceanic and domestic cruising levels.
38.12.8	State the change in temperature with altitude in the International Standard Atmosphere (ISA).
38.12.10	State the change in temperature with altitude in the Jet Standard Atmosphere (JSA).
38.16	**Time**
38.16.2	Explain the relationship between time and longitude.
38.16.4	Convert between arc and time.
38.20	**Visibility**
38.20.2	Define: (a) visibility (b) visual range (c) slant range (d) runway visual range (RVR).
38.20.4	Explain the factors which affect visibility and visual range.
38.20.6	Describe how visual range is determined from an aircraft in flight and by ground stations.

Sub Topic	Syllabus Item
	Aeronautical Charts
38.22	**Properties and Principles**
38.22.2	List the uses of: (a) a Mercator projection (b) a Lambert's conformal projection (c) current oceanic aeronautical charts.
38.22.4	Describe orthomorphism.
38.22.6	State the properties that a chart must possess to be considered orthomorphic.
38.22.8	Describe the relationship between a change in longitude and distance at a given latitude (departure).
38.22.10	State the departure formula.
38.22.12	Calculate the distance between two longitudes, at a given latitude.
38.22.14	Explain earth and chart convergence.
38.22.16	Describe the position of a great circle track relative to the rhumb line track between two points.
38.24	**Scale**
38.24.2	Define chart scale.
38.24.4	Calculate earth distance, given scale and chart distance.
38.24.6	Calculate chart distance, given scale and earth distance.
38.24.8	Calculate chart scale, given earth distance and chart distance.
38.26	**Chart Reading**
38.26.2	Interpret the features and symbols of appropriate aeronautical charts.
38.26.4	Derive navigation information from appropriate aeronautical charts.
	Navigation Calculations
38.28	**Computations**
38.28.2	Derive TAS, given Mach number and air temperature in degrees Celsius.
38.28.4	Calculate groundspeed given Mach number, wind component and air temperature in degrees Celsius.
38.28.6	Determine the outside air temperature, given an altitude or a flight level and a temperature deviation from ISA.
38.28.8	Derive TAS, given a Compressibility Correction Table, CAS, pressure altitude/flight level and air temperature in degrees Celsius.

Sub Topic	Syllabus Item
38.28.10	Calculate the equivalent still air distance, given total distance, mean TAS and mean wind component.
38.30	**Relative Velocity**
38.30.2	Calculate the closing/opening speeds of two aircraft on the same track.
38.30.4	Calculate the distance between two aircraft when they are 10 minutes apart on the same track.
38.30.6	Calculate the time that two aircraft will be 10 minutes apart on the same track.
38.30.8	Calculate the position of an aircraft along track when a following aircraft is 10 minutes behind it on the same track.
38.30.10	Calculate the time of passing of two aircraft on the same track, given relative positions and speeds.
38.30.12	Define line of constant bearing.
38.30.14	Calculate the distance two aircraft on diverging/converging tracks are apart at a given time.
38.30.16	Calculate the true, magnetic or relative bearing between two aircraft on diverging/converging tracks at a given time.
38.30.18	Determine whether the relative bearing between two aircraft on diverging/converging tracks will remain constant.
38.34	**Triangle of Velocities**
38.34.2	Solve triangle of velocity problems (given four of the six variables): (a) heading and track (± 2°) (b) TAS and GS (± 2kts) (c) wind velocity (± 3°/± 2kts) (d) drift (± 1°).
	Navigation Procedures - IFR
38.54	**Plotting**
38.54.2	Plot and measure the initial great circle track between two points, in true and magnetic, on an oceanic chart.
38.58	**En-route Diversion Calculations**
38.58.2	Calculate, considering normal operations, depressurised and engine out scenarios: (a) time and distance to the PNR (b) time and distance to the ETP between two aerodromes on a track (c) time and distance to the ETP between two aerodromes, one or both of which

Sub Topic	Syllabus Item
	are not on track
	(d) time and distance to the ETP between two aerodromes, given multiple legs with separate wind components.
38.58.4	State the flight profile (speed) required to achieve a PNR as far as possible from the departure aerodrome.
38.58.6	Describe the effect of headwind/tailwind on the position of the PNR from the departure aerodrome.
38.58.8	Describe the effect of headwind/tailwind on the position of the ETP between the departure and destination aerodrome.
	Flight Management
38.60	**Flight Management**
38.60.2	Discuss the factors to be considered when selecting altitudes at which to fly in the cruise.
38.60.4	Discuss the factors to be considered when selecting en-route and destination alternates.
38.60.6	Calculate the rate of climb required to make good a specified climb gradient.
38.60.8	Calculate the top of descent point to make good a specified height and distance, given a descent profile in nautical miles per 1000 feet.
38.60.10	Calculate groundspeed to make good a specified position at a specified time.
38.60.12	Describe the flight profile which provides greatest fuel efficiency.
38.60.14	Describe the flight profile which allows the longest time airborne before reaching minimum reserves.
38.60.16	Describe the flight profile which best utilises fuel before it is lost out of a leaking tank.
	GNSS
38.70	**Global Positioning System (GNSS)**
38.70.2	Explain the precautions to be taken when inserting data with the keypad.
38.70.4	State the factors influencing GNSS reliability including RAIM prediction.
38.70.6	Explain the precautions to be taken managing the GNSS, autopilot and crew interfaces.
38.70.8	Explain Automatic dependent surveillance-broadcast (ADS-B).
38.70.10	Explain Differential Global Positioning System (DGPS).

Subject No. 40 Flight Planning (Aeroplane)

NOTE: *This syllabus is based on Flight Planning for an oceanic IFR flight for a multi engine turbine air transport type aeroplane.*

Assessment of this syllabus will be predominantly based on the specific published 'representative' aircraft performance data and appropriate computer generated flight plans. However when required, instruction and assessment should be based on generic or other type specific data.

Appropriate preliminary information is defined as that information contained in the published data pack or that information embedded into individual assessment questions e.g. flight plan components, weather data, additional performance or related 'fuel policy' data.

Each subject has been given a subject number and each topic within that subject a topic number. These reference numbers will be used on knowledge deficiency reports and will provide valuable feedback to the examination candidate. These reference numbers can be common across the subject levels and therefore may not be consecutive.

This syllabus assumes a knowledge and understanding already attained at:

- PPL and CPL syllabus level
- Instrument rating (IR) Flight Navigation syllabus level
- Basic Turbine Knowledge syllabus level.

Any item containing components existing in another syllabus indicates a higher level of understanding is required and/or the advanced practical application of the item is to be considered.

Sub Topic	Syllabus Item
	Flight Planning Concepts
40.2	**Definitions**
40.2.2	Define and explain the use of the following terms in the correct context (include appropriate fuel reserves where applicable): (a) point of safe return (PSR) (b) inflight revised point of safe return (revised PSR) (c) equi-time point (ETP) (d) diversion decision point (DDP) (e) extended diversion time operations (EDTO) (f) cost index (CI) (g) performance deterioration allowance (PDA) (h) contingency fuel (i) ISA and temperature deviation (e.g. ISA +10).
40.4	**Extended Diversion Time Operations (EDTO)**
40.4.2	Explain the concept of EDTO.
40.4.4	Identify and describe the aircraft requirements for EDTO.

Sub Topic	Syllabus Item
40.4.6	Identify and explain the route and aerodrome requirements applicable to EDTO.
40.4.8	Identify and explain the critical fuel requirements for EDTO.
40.4.10	Describe the engine failure descent options (Terrain/Fuel critical drift down and Standard drift down) and explain when/why they would be used.
	Flight Planning
	NOTE: *This syllabus requires an understanding of both the ground flight planning phase and the inflight use of a CFP (computer generated flight plan) including the management of inflight planning contingencies.*
40.6	**Climb**
40.6.2	Given appropriate preliminary information, use representative aircraft data to determine: (a) time/distance to achieve a requested altitude (b) time/distance to permit climb to a requested higher cruise flight level.
40.8	**Cruise**
40.8.2	Given appropriate preliminary information, use representative aircraft data to determine: (a) maximum and optimum cruise levels (b) sector times and distances (c) TAS and fuel consumption at specific altitudes (d) maximum weight or temperature at which specific altitude can be attained (e) holding speeds and fuel consumption at standard hold altitudes.
40.10	**Cruise Management**
40.10.2	Given appropriate preliminary information, determine the optimum aircraft weight for a step climb.
40.10.4	Demonstrate the use of appropriate aircraft performance data to evaluate: (a) manoeuvre /buffet margins and how they relate to the selection of initial and step climb altitudes (b) how a constant CI changes cruising Mach as wind changes.
40.10.6	Explain (a) LRC (b) MRC (c) CI=0 (d) Identify and explain the difference between, and the application of: LRC,

Sub Topic	Syllabus Item
	MRC and CI=0.
40.10.8	Define MOCA, MORA and grid MORA.
40.10.10	Explain the term safety height (SH) as shown on a flight plan.
40.12	**Descent**
40.12.2	Given appropriate preliminary information, use representative aircraft data to determine: (a) appropriate CI descent point (b) time and distance to descend.
40.14	**Fuel Consumption**
40.14.2	Given appropriate preliminary information, use representative aircraft data to determine: (a) sector fuel consumption (b) hold and approach consumption (c) total flight fuel consumption (d) alternate and reserve fuel requirements (e) contingency fuel (f) total ramp fuel required for departure.
40.16	**Equi -Time Points**
40.16.2	Given appropriate preliminary information, use representative aircraft data to determine the following ETPs: (a) normal cruise (ETP) (b) depressurised cruise (ETPD) (c) engine-out descent and cruise (ETP1) (d) engine-out depressurised cruise (ETP1D).
40.18	**Return Points**
40.18.2	Given appropriate preliminary information, use representative aircraft data (include appropriate final reserves where applicable) to determine the: (a) point of safe return (PSR) (b) inflight revised point of safe return (revised PSR).
40.20	**Diversion decision point**
40.20.2	Explain the identification, function and application of a DDP flight plan.

Sub Topic **Syllabus Item**

Flight Data Extraction

NOTE: *Identification of any CFP data used to calculate syllabus items is required.*

40.22 Flight data extraction

40.22.2 Given a computer-generated flight plan and representative aircraft data, obtain the following:

(a) navigation data base validity

(b) type of plan (e.g. standard, EDTO, DDP etc)

(c) planned type of cruise profile (e.g. CI/high speed/low level etc)

(d) planned initial cruise level

(e) planned time/distance/fuel to the initial cruise level

(f) planned step-climb points

(g) planned EET between any en-route waypoint pairs

(h) planned ground speeds

(i) planned waypoint wind/temp

(j) planned EET to destination

(k) planned AUW at any en-route waypoint and at destination

(l) time/distance to planned ETPs

(m) minimum fuel required at planned ETPs

(n) estimated fuel available at planned ETPs

(o) plan fuel components not included in the fuel required figure

(p) identify any limiting weight factor (TOW, ZFW, or LDW)

(q) any specified EDTO en-route alternates as applicable

(r) airspace/FIR boundary points and what national airspace the aircraft is flying through

(s) sector safety height (SH).

40.22.4 Given a computer-generated flight plan and representative aircraft data, extract and interpret the information contained in the following flight plan blocks:

(a) route description

(b) fuel summary

(c) contingency summary

(d) critical fuel summary

Sub Topic **Syllabus Item**

(e) alternate summary

(f) time/fuel summaries for ZFW change.

40.22.6 Given a computer-generated flight plan and representative aircraft data, obtain any of the following based on specified appropriate in-flight time, weight, and fuel performance information:

(a) estimated time/distance/fuel to the initial cruise level (TOC)

(b) ETA for planned step-climb points

(c) ETA at any en-route waypoint

(d) ETA at destination

(e) estimated AUW at any waypoint, and at destination

(f) estimated time/distance to ETPs

(g) estimated minimum fuel required at ETPs.

40.22.8 Given appropriate in-flight times, weight, and fuel performance information extract the planned and actual:

(a) average fuel flow for each phase of the flight

(b) fuel used to an en-route point

(c) fuel required from a waypoint to destination

(d) contingency fuel status

(e) DDP fuel status

(f) the availability of extra holding fuel

(g) diversion fuel status

(h) minimum reserve fuel status

(i) critical ETP item fuel status

(j) total fuel required

(k) landing weight status.

Revision Calculations

40.24 Revised ETP calculations

40.24.2 Given a computer-generated flight plan, representative aircraft data and appropriate in-flight time, weight, and fuel performance information, calculate the following:

(a) ETP for a revised en-route alternate pair

(b) ETP fuel/time to a revised ETP en-route alternate pair.

Sub Topic	Syllabus Item
40.26	**Revised alternate, flight level and speed calculations**
40.26.2	Given a computer-generated flight plan, representative aircraft data and appropriate in-flight time, weight, and fuel performance information, derive the following: (a) fuel required for a revised destination alternate (b) time/fuel required for a lower level flight (c) time/fuel required for a high or low speed flight (d) time/fuel required for an increased hold requirement at the destination.

Meteorology Syllabus Matrix					
-	-	Topic No.	PPL	CPL	ATPL
-	-		8	20	42
Fundamentals of the atmosphere	The Atmosphere	2	√	√	√
	Atmospheric Pressure	4	√	√	√
	Temperature and Heat Exchange Processes	6	√	√	√
	Atmospheric Moisture	8	√	√	√
	Wind	10	√	√	√
	Stability of Air	12	√	√	√
	Local Winds	14	√	√	
	Inversions	16	√		
	Cloud	18	√	√	√
	Precipitation	20	√	√	
	Visibility	22	√	√	√
	Fog	24	√	√	
	Fronts and Depressions	26	√	√	√
	Thunderstorms	28	√	√	√
	Icing	30	√	√	√
	Turbulence	32	√	√	√
	Upper Air meteorology	34			√
	-				
New Zealand Meteorology	New Zealand Meteorology	36	√		
Tropical Meteorology	Tropical Meteorology	38		√	√
Global Meteorology	The General Circulation	40		√	√
Hazardous meteorological conditions	Hazardous meteorological conditions	42		√	√
Meteorological services to aviation	Domestic	44	√		
	Regional	46		√	
	International	48			√

Subject No. 42 ATPL Meteorology

NOTE: *This syllabus is principally based on regional/oceanic/global IFR applicable meteorology appropriate to navigating a multi engine turbine air transport type aeroplane or IFR capable turbine helicopter operating at all altitudes.*

Detailed acronyms and service provider titles (e.g. ETOPS, OPMET) are constantly changing and thus are indicative of the area of knowledge required and do not limit this syllabus to those specifically listed.

Each subject has been given a subject number and each topic within that subject a topic number. These reference numbers will be used on knowledge deficiency reports and will provide valuable feedback to the examination candidate. These reference numbers are common across the subject levels and therefore may not be consecutive.

This syllabus presupposes a thorough knowledge and understanding of the PPL and CPL Meteorology syllabus. Any item repeated here indicates a higher level of understanding or a wider scope is required.

Sub Topic	Syllabus Item
	Fundamentals of the Atmosphere
42.2	**The atmosphere**
42.2.2	Define: (a) tropopause (b) troposphere (c) stratopause (d) stratosphere (e) insolation.
42.2.4	Interpret a graph of temperature versus altitude from the earth's surface to the stratopause, and explain why the shape of the curve is different in the troposphere compared to the stratosphere.
42.2.6	Describe the following features of the troposphere (a) approximate vertical extent at low, middle and high latitudes (b) general weather and turbulence expected within the troposphere.
42.2.8	Explain the importance of the various elements in the atmosphere.
42.2.10	With respect to the tropopause: (a) describe the idealised global tropopause detailing approximate altitudes and the position of jet streams (b) explain why the altitude of the tropopause varies with latitude (c) explain how the tropopause pattern responds to the seasons in the northern and southern hemisphere.
42.2.12	Describe the relationship between the temperature of the tropopause and the temperature of the lower stratosphere.

Sub Topic	Syllabus Item
42.2.14	Explain the relationship between angle of insolation, atmospheric temperature and tropopause height.
42.2.16	Explain why the stratosphere is generally devoid of cloud and turbulence.
42.4	**Atmospheric pressure**
42.4.2	State the meteorological units of pressure used in (a) Australia (b) USA.
42.4.4	Calculate pressure lapse rates given temperatures and pressure levels.
42.4.6	State the average pressure lapse rate in the lower troposphere.
42.4.8	Define the following pressure systems, and state the direction of circulation around the systems in both hemispheres: (a) anticyclone (or 'high') (b) depression (or "low") (c) ridge of high pressure (d) trough of low pressure (e) col.
42.4.10	Describe the meteorological conditions commonly associated with and explain the causes of, in both hemispheres: (a) anticyclone (or "high") (b) depression (or "low") (c) ridge of high pressure (d) trough of low pressure (e) col.
42.4.12	With respect to the semi-diurnal variation of pressure: (a) describe the process (b) explain the cause(s) of the semi-diurnal variation of pressure (c) state the latitudes where the semi-diurnal variation of pressure is most evident.
42.4.14	Explain the cause of pressure gradient and the factors that determine its strength.
42.4.16	Describe the relationship between pressure gradient, isobars and wind speed.
42.4.18	State the conditions on which the International Standard Atmosphere (ISA) is based.
42.4.20	Explain the importance and application of the ISA to aviation.

Sub Topic	Syllabus Item
42.4.22	State the temperature and pressure lapse rates in the: (a) ISA (b) Jet Standard Atmosphere.
42.4.24	Convert ISA temperature at altitude to °C ambient and vice versa.
42.6	**Temperature and heat exchange processes**
42.6.2	Describe the following units of measurement of temperature: (a) Celsius (b) Fahrenheit (c) Absolute (Kelvin).
42.6.4	Demonstrate proficiency in converting Celsius to Fahrenheit and Absolute, and any combination of these.
42.6.6	Explain the relationship between the temperature of a heat source and radiation frequency.
42.6.8	State the frequency band and wave length of: (a) solar radiation (b) terrestrial radiation.
42.6.10	Explain what is meant by ‘solar radiation’, and state the components, and their percentage values, that make up solar radiation.
42.6.12	Explain how the components of solar radiation are affected by: (a) absorption (b) reflection (c) scattering.
42.6.14	Explain what is meant by: (a) sky radiation (b) global solar radiation.
42.6.16	Describe the effect of the following on the amount of solar radiation received by earth: (a) distance between sun and earth (b) sun angle (c) length of day.

Sub Topic	Syllabus Item
42.6.18	Explain what is meant by and the significance of: (a) solstice (b) equinox.
42.6.20	Explain what is meant by 'terrestrial radiation', and state the type of radiation involved.
42.6.22	List the atmospheric constituents that have the potential to hinder the escape of terrestrial radiation.
42.6.24	Explain the 'greenhouse' effect.
42.6.26	Explain what is meant by the: (a) 'atmospheric window' (b) 'energy budget'.
42.6.28	Explain what is meant by: (a) sensible heat (b) specific heat.
42.6.30	With the aid of graphs, describe the diurnal variation of surface air temperature.
42.6.32	Explain how, and why, the following factors influence the diurnal variation of surface air temperature: (a) type of surface (b) oceans and other large water areas (c) water vapour (d) cloud (e) wind.
42.6.34	Describe the characteristics of global maritime and continental climates.
42.8	**Atmospheric moisture**
42.8.2	Interpret a typical graph of water vapour at saturation against temperature, and calculate relative humidity from information provided by the graph.
42.10	**Wind**
42.10.2	Explain the relationship between insolation and movement of air, both horizontally and vertically.
42.10.4	Explain the effect of Coriolis force on the movement of air in the northern and southern hemisphere, and state the direction of the force and its strength relative to the flow of air.
42.10.6	Describe the basic concepts expressed in the Coriolis formula.

Sub Topic	Syllabus Item
42.10.8	Describe the effect of Coriolis force and pressure gradient on the movement of air relative to the isobars.
42.10.10	Describe the inter-relation between pressure gradient, Coriolis force, and centrifugal force on the curvature of isobars around high and low pressure systems in the northern and southern hemisphere.
40.10.12	Given equal spacing between isobars, explain why the wind strength is stronger around a high than around a low.
42.10.14	For the northern and southern hemisphere: (a) describe the typical diurnal variation of the surface wind (b) state the change in wind velocity when climbing out of, or descending into, the friction layer.
42.12	**Stability of air**
42.12.2	Describe the following processes: (a) adiabatic (b) non-adiabatic (c) isobaric
42.12.4	Using temperature versus altitude graphs, explain how stability and instability of unsaturated air can be determined.
42.12.6	Explain what is meant by: (a) convective stability (b) latent instability
42.18	**Cloud**
42.18.2	Describe the effect of latent heat release on stability inside cloud and its influence on the resulting type of cloud.
42.18.4	Describe three causes that tend to slow down the growth of water drops once droplets have formed on nuclei.
42.18.6	Name and describe the appearance and characteristics of the ten main types of cloud sub-divided as: (a) high cloud (b) middle cloud (c) low cloud
42.18.8	With regard orographic cloud: (a) explain the influence of stability/instability of air, and different surface dew point values, on the type and vertical extent of cloud formed orographically (b) describe the formation and characteristics of lenticular cloud.
42.22	**Visibility**
42.22.2	Explain why solar and lunar illumination do not affect visibility.

Sub Topic	Syllabus Item
42.22.4	Explain the factors involved in: (a) slant range (b) runway visual range
42.22.6	Explain the measurement of RVR.
42.26	**Fronts and depressions**
42.26.2	Explain what is meant by synoptic meteorology.
42.26.4	Define "air mass" and state the three properties that determine the uniformity of an air mass.
42.26.6	Explain what is meant by "source region" and: (a) state the location of the predominant global source regions (b) describe how (source region) anticyclones facilitate air masses to absorb the characteristics of the source region.
42.26.8	List the types of air masses and describe the main characteristics, and typical meteorological conditions, of each.
42.26.10	Explain what is meant by air mass modification.
42.26.12	Describe the likely weather conditions experienced in Equatorial and Continental regions during: (a) cold advection (b) warm advection
42.26.14	Explain the concept of convergence and divergence.
42.26.16	Explain what is meant by "vorticity advection" and describe its influence on the formation and development of pressure systems and fronts.
42.26.18	With respect to depressions found in mid latitudes of the southern hemisphere, describe the development and associated cloud of: (a) the typical mid latitude depression (b) the polar depression (c) sub tropical depression
42.26.20	Describe the effect of the following on the intensity of fronts, and on the extent of cloud and precipitation: (a) amount of moisture in the warm rising air (b) stability or instability of the rising air (c) the slope of the front (d) the speed of the front (e) the temperature contrast across the front
42.26.22	Interpret the symbols commonly used to denote frontal weather on international charts.
42.26.24	Describe the sequence of events with the passage of the 'idealised' cold front and warm front in both hemispheres in terms of: (a) pressure trend (b) temperature trend

Sub Topic	Syllabus Item
	(c) cloud
	(d) precipitation
	(e) visibility
	(f) dew point trend
	(g) relative humidity trend.
42.26.26	Explain factors involved in the formation and development of:
	(a) warm occlusions
	(b) cold occlusions
42.26.28	State the typical weather conditions during the passage of a warm sector depression.
42.26.30	Explain the associated weather, and factors involved, in the formation and development of:
	(a) an orographic depression
	(b) a thermal (heat type) depression
42.28	**Thunderstorms**
42.28.2	Explain the influence of latent heat in the development of thunderstorms.
42.28.4	Describe the effect of entrainment of colder air aloft on the development of thunderstorms.
42.28.6	Describe the processes involved in lightning.
42.28.8	State the three stages of development of thunderstorms, and describe the main factors involved in each stage.
42.28.10	Explain the factors involved in regeneration of thunderstorms.
42.28.12	Describe the following types of thunderstorm:
	(a) orographic type
	(b) heat type (thermally induced)
	(c) convergence type
	(d) nocturnal equatorial type
	(e) cold stream type
	(f) frontal type
42.28.14	Describe the following hazards associated with flight in the presence of thunderstorms:
	(a) turbulence
	(b) vertical draughts
	(c) gusts and squalls
	(d) wind shear
	(e) icing
	(f) lightning
	(g) hail
	(h) noise

Sub Topic	Syllabus Item
	(i) loss of instruments and impairment of accuracy.
42.28.16	With respect to downbursts, microbursts and tornadoes, describe their:
	(a) formation and development
	(b) recognition
	(c) structure
	(d) precipitation
	(e) turbulence and draughts
	(f) hazards to aviation
	(g) most likely locations – globally
42.30	**Icing**
42.30.2	Explain the following processes:
	(a) deposition
	(b) sublimation
42.30.4	Describe the processes involved when water changes to ice through the unstable supercooled stage to the stable solid state.
42.30.6	Explain the importance of heat energy (expressed in joules) in the process of changing the temperature of water, and changing the state of water.
42.30.8	Explain the sequence of events when supercooled water is disturbed by an aircraft in flight.
42.30.10	Describe the formation and characteristics of:
	(a) soft hail or graupel
	(b) snow pellets
42.30.12	Explain the effect on the height of the freezing level when stable saturated air or unstable saturated air is lifted orographically.
42.30.14	State the:
	(a) potential for ice accretion in the 10 main cloud types and in lenticular cloud
	(b) type of ice to be expected in each cloud type
	(c) height bands relative to the freezing level where clear or rime ice can be expected in each cloud type.
42.30.16	Identify the associated symbol indicating
	(a) light icing
	(b) moderate icing
	(c) severe icing
42.32	**Turbulence**
42.32.2	Define clear air turbulence (CAT).
42.32.4	Differentiate between turbulence and up/down draughts.
42.34	**Upper air meteorology**
42.34.2	Define:

Sub Topic	Syllabus Item
	(a) contour line
	(b) thermal wind
	(c) isotherm
42.34.4	State the information that can be obtained from spacing and orientation of contour lines.
42.34.6	Demonstrate proficiency in interpreting information contained on a contour chart.
42.34.8	Explain the factors involved in determining a thermal wind.
42.34.10	Explain why the wind at progressively higher altitudes in mid latitudes tends to become westerly.
42.34.12	Describe the vertical variation of pressure within low level:
	(a) depressions with a cold core
	(b) depressions with a warm core
	(c) anticyclones with a cold core
	(d) anticyclones with a warm core
42.34.14	State the characteristic slope ("lean") of axis of cold depressions and warm anticyclones with altitude in the southern hemisphere.
42.34.16	Define "jet stream".
42.34.18	Describe the structure of a jet stream including explanations of wind shear and turbulence.
42.34.20	List the four principal jet streams located globally in the troposphere.
42.34.22	Regarding the Southern Hemisphere polar jet stream, describe its:
	(a) association with fronts and thermal gradients
	(b) location relative to the frontal interface
	(c) usual, or typical, altitude
	(d) intensity and latitudinal location in winter compared to summer
	(e) preferred regions of turbulence.
42.34.24	Regarding the Southern Hemisphere subtropical jet stream, describe/state:
	(a) the origin of its associated thermal gradient
	(b) its location relative to the fractured tropopause
	(c) its usual altitude
	(d) the region where the strongest turbulence is generally found.
42.34.26	State the season during which jet streams are more active as the result of differing global thermal gradients.
42.34.28	With respect to (clear air) turbulence associated with jet streams, describe or state the:
	(a) relationship between wind shear value and severity of turbulence
	(b) regions where clear air turbulence is likely to be found
	(c) effect on the severity of turbulence where mountain waves and jet stream combine.

Sub Topic	Syllabus Item
42.34.30	With respect to cloud formations associated with jet streams, describe or state the type of cloud commonly found on the: (a) warm side of the jet stream (b) cold side of the jet stream
42.34.32	Describe how a pilot can anticipate the location and altitude of jet streams, and what telltale signs are often present in flight to locate a jet stream.
42.34.34	With respect to polar and subtropical jet streams in both hemispheres, list their locations and characteristics in terms of: (a) average wind velocity (direction and speed) (b) average pressure altitude (c) typical maximum wind speed (d) average latitudinal location
	Tropical Meteorology
42.38	**Tropical meteorology**
42.38.2	Interpret a simplified diagram of the tropical Hadley Cells (one in each hemisphere) showing the pattern of horizontal mixing in mid and high latitudes of both hemispheres.
42.38.4	Explain what is meant by: (a) meteorological (or thermal) equator (b) equatorial trough (c) intertropical convergence zone (ITCZ) (d) South Pacific convergence zone
42.38.6	Describe the seasonal location of the equatorial trough, and explain the reasons for the change in location.
42.38.8	State the region where maximum convergence, convection and cloud developments are found relative to the equatorial trough.
42.38.10	Describe the essential difference between ‘equatorial trough’ and ‘inter-tropical convergence zone’.
42.38.12	Describe the weather, icing, turbulence and cloud-related factors commonly associated with an: (a) ‘active’ ITCZ (b) ‘inactive’ ITCZ
42.38.14	Describe the origin, preferred location, and characteristics of the South Pacific Converge Zone.
42.38.16	With the aid of diagrams, explain the following aspects of the ‘trade winds’ in both hemispheres of the Pacific Ocean: (a) flow pattern (b) anti-cyclonic subsidence and associated meteorological conditions (c) approximate horizontal and vertical limits

Sub Topic	Syllabus Item
	(d) typical wind velocity normally found above the trade wind zone
	(e) seasonal changes in location and their effect on wind direction
	(f) typical wind strengths, including variation in strength during the summer and winter
	(g) the effect of the trade winds on the weather experienced in island groups and northern Australia.
42.38.18	Describe the following disturbances experienced in tropical latitudes:
	(a) individual cumulus disturbances
	(b) mesoscale convective areas
	(c) wave disturbances
42.38.20	Describe the factors involved in wet monsoons in terms of:
	(a) seasonal factors
	(b) effect of large land masses and orographic obstructions
	(c) the location of the major monsoon regions
42.38.22	With regard to the formation, development and decay of tropical cyclones, describe the:
	(a) relationship with the equatorial trough
	(b) requirement for, and supply of, thermal energy
	(c) effect of high level divergence
	(d) mechanics of formation, and characteristics, of the 'cyclone eye'
	(e) requirement for a 'warm core'
42.38.24	State the four stages of development of tropical cyclones.
42.38.26	For each stage of development, describe the:
	(a) atmospheric pressure tendency
	(b) typical wind strengths, including variations in wind velocity in, and either side of, the cyclone eye
	(c) typical radii of the affected areas
	(d) associated weather, and the location within the cyclone where the worst conditions are commonly experienced.
42.38.28	Describe the common causes that lead to the decay of tropical cyclones.
42.38.30	State the season during which tropical cyclones are generally experienced.
42.38.32	Explain what is meant by the Walker Circulation based on the factors involved in the:
	(a) east of the South Pacific Ocean
	(b) west of the South Pacific Ocean
42.38.34	Define the ENSO Index, describe the factors involved when the index changes from positive to negative and include the effect of these changes on:
	(a) prevailing winds in tropical and mid latitude regions
	(b) meteorological conditions experienced in Australasia.

Sub Topic	Syllabus Item
42.38.36	Describe what is meant by 'streamline analysis' and state the reason why this analysis is necessary in tropical latitudes.
42.38.38	Define 'isotach' and demonstrate proficiency in interpreting information provided by isotachs on a chart.
42.38.40	Interpret examples of streamline patterns commonly shown on streamline charts (e.g. inflows, outflows etc).
	Global Meteorology
42.40	**The general circulation**
40.40.2	State the predominant factors that control the transfer of heat around the globe.
42.40.4	Explain what is meant by 'zonal index', and 'zonal winds'.
42.40.6	Describe 'high zonal index' and 'low zonal index', and state how these situations relate to the: (a) speed and direction of low tropospheric weather systems (b) strength and uniformity of upper level westerlies and jet streams.
42.40.8	Explain what is meant by the term "Short Waves".
42.40.10	Describe the processes involved in the development of a 'blocking anticyclone', and explain its influence on meteorological conditions in New Zealand when the system is to the west of the country and when it is to the east.
42.40.12	Explain what is meant by the terms 'cold pools' and 'warm pools'.
	Hazardous Meteorological Conditions
42.42	**Hazardous meteorological conditions**
42.42.2	Describe the effects of volcanic ash on aircraft operations.
	Meteorological Services to Aviation
42.48	**International meteorological services, reports and forecasts**
42.48.2	Describe the World Area Forecast System (WAFS), Volcanic Ash Advisory Centre (VAAC), Tropical Cyclone Advisory Centre (TCAC) and explain the role played by these and other New Zealand authorities in providing meteorological services in the Auckland Oceanic and New Zealand FIR.
42.48.4	Describe the functions of Automatic Weather Stations and state the standard information normally available to aviation.
42.48.6	Explain the limitations of some data obtained from automatic weather stations.
42.48.8	Describe the information normally obtained from radiosondes and state the principle of operation of instruments and equipment carried by radiosondes.
42.48.10	Describe the meteorological products and services available to aviation for both domestic and international operations.
42.48.12	For International operations, interpret, understand and assess information contained in all the available Meteorological Services, Reports and Forecasts, including: (a) Surface synoptic charts (b) Forecast upper level wind and temperature charts (c) Satellite imagery

Sub Topic	Syllabus Item
	(d) Radar imagery
	(e) Significant weather charts
	(f) Route forecasts
	(g) Freezing level charts
	(h) Grid point winds and temperatures
	(i) OPMET (TAF, METAR/SPECI, METAR AUTO, TREND, SIGMET)
	(j) Pilot reports.
42.48.14	With respect to wind and temperature forecast charts:
	(a) determine issue time and validity period
	(b) identify the Office issuing the chart
	(c) identify the flight level for the chart
	(d) explain the meaning of chart symbols
	(e) interpret temperature information.
42.48.16	State the in-flight significance of the information available from the following charts:
	(a) effective wind component charts
	(b) upper level TAT charts.
42.48.18	With respect to Mid-level and High-level SIGWX Prognosis Charts:
	(a) determine the geographical and vertical airspace covered
	(b) state significant weather items shown
	(c) determine the office issuing the chart
	(d) determine issue and valid time
	(e) identify, interpret and assess significant zones of cloudiness, tropical cyclones, jet streams, clear air turbulence, icing, tropopause height.
42.48.20	State the issue time relative to ETD, and usual validity time relative to ETA applicable to Route Forecasts (ROFOR).
42.48.22	With respect to a specific ROFOR:
	(a) determine the route to which the forecast applies
	(b) determine the issue and validity time of the ROFOR
	(c) determine, through interpolation if necessary, the forecast wind velocity and temperature at any required pressure altitude
	(d) interpret and assess SIGWX information.

Subject No. 44 Instruments and Navigation Aids (Aeroplane)

NOTE: *This syllabus is based on a multi engine turbine air transport type aeroplane.*

The instruments and navigation aid items within this subject are those typically found in an airline-operated air-transport type aeroplane.

Assessment of this syllabus will include, but not be limited to, specific approved 'representative' aircraft

Each subject has been given a subject number and each topic within that subject a topic number. These reference numbers will be used on knowledge deficiency reports and will provide valuable feedback to the examination candidate.

This syllabus presupposes a knowledge and understanding already attained at instrument rating level.

Air Data Instruments

44.2 Machmeter

44.2.2 Explain the principle of operation of a Machmeter.

44.2.4 State the effect of temperature on the Mach number.

44.2.6 Describe the change in Mach number with a change in altitude at a constant IAS or TAS.

44.2.8 Describe the change of TAS and IAS with a change in altitude at a constant Mach number.

44.2.10 Use the Mach number formula to calculate Mach number, TAS or temperature, given two of the three variables.

44.2.12 Explain the following errors affecting a Machmeter:

(a) instrument

(b) position (pressure) error and

(c) lag.

44.2.14 Explain the symptoms, effects, and possible remedies available for blockages and leaks on the Machmeter.

44.2.16 State the serviceability checks for a Machmeter.

44.4 Air data computer (ADC)

44.4.2 State the purpose of the air data computer.

44.4.4 Explain the operating principle of the air data computer.

44.4.6 Describe the ADC inputs, outputs and the supplied units.

44.4.8 With the aid of a diagram, describe the processing of the input data of an ADC.

44.4.10 Explain the backup functions of the air data computer in the case of a pressure source blockage.

44.4.12 Describe the effect of loss of input/output signal of the ADC to the pilot's instrument indication.

44.6 Air temperature gauge

44.6.2 Explain the principle of operation of an air temperature gauge.

44.6.4 Define and compare the following temperatures:

(a) Total Air Temperature (TAT)

(b) Static Air Temperature (SAT)

(c) Outside Air Temperature (OAT).

44.6.6 Name and compare the measuring probes for total air temperature.

44.6.8 Calculate OAT given TAT and Mach number.

44.6.10 Calculate the true OAT, given indicated OAT, probe recovery factor and Mach number.

44.6.12 Calculate SAT given TAT and Mach number.

Integrated Flight Instrument Systems

44.8 Flight director (FD)

44.8.2 Explain the purpose of the flight director computer.

44.8.4 Explain the operating principle of the flight director computer.

44.8.6 Interpret the information provided by the split cue and integrated cue flight director command bars.

44.8.8 List the performance and navigation parameter guidance provided by the flight director.

44.8.10 Explain the function of the flight mode annunciator.

44.8.12 Describe the task of the gain program in the approach mode.

44.10 Electronic flight instrument system (EFIS)

44.10.2 Explain the operating principle of the EFIS.

44.10.4 Describe the inputs available to a typical EFIS.

44.10.6 Describe the outputs from a typical EFIS.

44.10.8 State the function and describe the operation of the EFIS control panel.

44.10.10 Given appropriate drawings of a typical aircraft installation, explain the EFIS function and information interchange.

44.10.12 Describe the switching options in case of EFIS display failure.

44.10.14 Describe the function of the Electronic Attitude Director Indicator/Primary Flight Display (EADI/PFD).

44.10.16 Identify the information available on the EADI/PFD.

44.10.18 Describe the colour coding on the EADI/PFD.

44.10.20 Describe the function of the Electronic Horizontal Situation Indicator/Navigation

Display (EHSI/ND).

44.10.22 Name the typical display modes for EHSI/ND.

44.10.24 Given suitable diagrams of instrument presentation, use an EHSI/ND to determine an aircraft's track, position and/or orientation.

44.10.26 Identify the information available in the different modes of the EHSI/ND.

44.10.28 Describe the colour coding on the EHSI/ND.

44.10.30 Explain the operating principle of a Head-Up-Display (HUD).

44.10.32 Describe the inputs available to a Head-Up-Display (HUD).

44.10.34 Identify the information on a Head-Up-Display (HUD).

44.10.36 Explain the operating principle of a synthetic vision display.

44.10.38 Describe the inputs available to a synthetic vision display.

44.10.40 Identify the information on a synthetic vision display.

44.12 Electronic engine displays (ECAM, EICAS)

44.12.2 Explain the purpose of the Electronic Centralized Aircraft Monitoring (ECAM) system and Engine Indication and Crew Alerting System (EICAS).

44.12.4 Describe the information available from an ECAM/EICAS system.

44.12.6 Describe the inhibiting functions in relation to different flight phases.

44.12.8 Describe the display units (DU) of ECAM/EICAS System.

44.12.10 Interpret the important colours used by the DUs.

44.12.12 State the redundancy provisions, in the case of a DU failure.

Warning Systems

44.14 Master warning system

44.14.2 Explain the function of a master warning system.

44.14.4 Explain the operating principle of a master warning system.

44.14.6 Explain the meaning of the following four degrees of urgency:

(a) warnings

(b) cautions

(c) advisories and

(d) status messages.

44.14.8 Explain and give examples of:

(a) visual alerts

(b) aural alerts and

(c) tactile alerts.

44.14.10	Explain the reasons for inhibiting alerts.
44.16	**Altitude alerter system**
44.16.2	Explain the function of an altitude alerter system.
44.16.4	Describe how to operate the altitude alerter system and how to interpret the information.
44.16.6	Describe the comparative relationship between the selected altitude and the actual altitude.
44.16.8	Explain how the system is monitored.
44.18	**Radar altimeter**
44.18.2	State the function of a radio altimeter.
44.18.4	Explain the principle of operation of the radio altimeter.
44.18.6	State the frequency band in which the radio altimeter operates.
44.18.8	State the purpose of the decision height warning light.
44.18.10	Describe the operator control options for a radio altimeter.
44.18.12	State the maximum range for indication.
44.18.14	List instruments or units which receive altitude information from the radio altimeter.
44.18.16	Describe the errors of the radio altimeter.
44.20	**Terrain awareness warning system (TAWS)**
44.20.2	Describe the function of the terrain awareness warning system.
44.20.4	Explain the principle of operation of TAWS.
44.20.6	Identify the standard TAWS warning profiles.
44.20.8	List and describe the different warning modes.
44.20.10	Explain the relationship between TAWS and EFIS navigation displays.
44.22	**Aircraft collision avoidance system (ACAS)**
44.22.2	Describe the function of the ACAS.
44.22.4	Explain the principle of operation of ACAS.
44.22.6	Identify the equipment with which an intruder must be fitted in order to be detected by ACAS.
44.22.8	Describe the appropriate ACAS graphic symbols.
44.22.10	Define a Resolution Advisory (RA) and a Traffic Advisory (TA).
44.22.12	State the minimum equipment requirements for the issuing of a Resolution Advisory and a Traffic Advisory.
44.22.14	Describe the proximity requirements for the issuing of a Resolution Advisory and

a Traffic Advisory.

44.22.16 Describe ACAS “escape manoeuvres”.

44.22.18 State how many “escape manoeuvres” ACAS equipment can calculate simultaneously.

44.24 Take-off configuration warning system

44.24.2 Explain the purpose of a take-off configuration warning system.

44.24.4 Explain the operating principle of a take-off configuration warning system.

44.24.6 Give examples of configuration errors typically warned of.

44.26 Overspeed warning

44.26.2 Explain the function of the overspeed warning system.

44.26.4 Explain the principle of operation of an overspeed warning system.

44.26.6 Describe the warnings generated by the overspeed warning system and explain how these warnings can be cancelled.

44.28 Stall warning system

44.28.2 Describe the function of the stall warning system.

44.28.4 Explain the principle of operation of the stall warning system.

44.28.6 Indicate the regulatory margin between stall and stall warning.

44.28.8 Identify the inputs of a stall warning system.

44.28.10 Describe the warnings generated by the stall warning system and explain how these warnings can be cancelled.

44.30 Windshear warning system

44.30.2 Describe the function of the predictive windshear warning system.

44.30.4 Explain the principle of operation of a windshear warning system.

44.30.6 Identify the inputs of a windshear warning system.

44.30.8 State the purpose of pitch limit indicator bars.

44.30.10 Explain the limitations of the predictive windshear warning system.

Recorder Systems

44.32 Cockpit voice recorder

44.32.2 Explain the purpose of the cockpit voice recorder.

44.32.4 List the components of the cockpit voice recorder.

44.32.6 Identify the power source of the CVR.

44.32.8 Explain how a cockpit voice recording is started and stopped.

44.32.10 Explain how recordings can be erased.

44.32.12 State the normal recording time of the voice recorder.

44.34 Flight data recorder

44.34.2 Explain the purpose of the flight data recorder.

44.34.4 Describe the parameters that are recorded by the flight data recorder.

44.34.6 Identify the power source of the FDR.

44.34.8 Explain the relation between the flight recorder and the Aircraft Integrated Data System.

44.34.10 Describe how data from the flight maintenance recorder can be accessed.

Navigation Aids

44.36 Flight management system (FMS)

44.36.2 Describe the two primary functions of a FMS.

44.36.4 Describe the main components of an FMS.

44.36.6 Explain the operating principle of an FMS.

44.36.8 Explain the function and operating principle of the attitude heading reference system (AHRS).

44.36.10 Explain how pilots interface with an FMS.

44.36.12 Describe the inputs the FMS accesses to achieve the navigation function.

44.36.14 Explain how the FMS achieves its performance functions in the various modes.

44.36.16 Explain the function and operating principle of the thrust management computer.

44.36.18 Explain how the flight guidance functions are achieved.

44.36.20 Describe how the FMS functions are monitored.

44.38 Ring laser gyro

44.38.2 Describe a ring laser gyro and compare it with a conventional gyro.

44.38.4 With the aid of a diagram, explain the principle of operation of a ring laser gyro.

44.38.6 State the pilot checks for serviceability.

44.40 Inertial navigation/reference system (INS/IRS)

44.40.2 Explain the function and basic operating principle of an inertial navigation/reference system (INS/IRS).

44.40.4 Explain the differences between an INS and an IRS.

44.40.6 Describe the inputs and output signals of an INS/IRS.

44.40.8 Identify the components of an INS/IRS.

44.40.10 Explain the conditions to be fulfilled when align mode is selected.

44.40.12 Explain the function of a gyro stabilised platform.

44.40.14 Explain the use of accelerometers in a gyro stabilised platform.

44.40.16 Describe how accelerations are integrated to derive velocity and distance.

44.40.18 Describe the differences between a gyro stabilised platform and a strapdown system.

44.40.20 State the advantages of a strapdown IRS over gyro stabilised INS.

44.40.22 State the purpose of the strapdown system.

44.40.24 Identify the types of gyro which are typically used for a strapdown system.

44.40.26 Explain how magnetic north is calculated.

44.40.28 Describe the limitations of a north referenced INS in polar regions.

44.40.30 Explain the principle of position updating by reference to ground stations or GNSS.

44.42 Lateral (LNAV) and vertical (VNAV) navigation systems

44.42.2 Explain the purpose of the LNAV and VNAV components of a flight management system.

44.42.4 Explain the basic operating principles of LNAV and VNAV.

44.42.6 Describe the inputs to LNAV and VNAV.

44.42.8 Describe the outputs of LNAV and VNAV.

44.42.10 Describe the operating modes of VNAV.

44.42.12 Describe the limitations of LNAV and VNAV.

FANS (CNS/ATM)

44.44 Communications

44.44.2 Explain the function and basic operating principle of each of the following:

(a) Aircraft Communications Addressing and Reporting System (ACARS).

(b) Controller Pilot Data Link Communications (CPDLC).

(c) Satellite Communications (SATCOM).

44.44.4 Describe the typical inputs to and outputs of each of the following:

(a) Aircraft Communications and Reporting System (ACARS).

(b) Controller Pilot Data Link Communications (CPDLC).

(c) Satellite Communications (SATCOM).

44.44.6 Describe limitations of each of the following:

(a) Aircraft Communications and Reporting System (ACARS).

(b) Controller Pilot Data Link Communications (CPDLC).

(c) Satellite Communications (SATCOM).

44.46 Navigation Capability Requirements

44.46.2 Describe the navigation capability requirements of the following types of airspace:

(a) Required Navigation Performance 4 (RNP4) airspace.

(b) Required Navigation Performance 10 (RNP10) airspace.

(c) Basic Area Navigation (B-RNAV) airspace.

(d) Minimum Navigation Performance Specification (MNPS) airspace.

(e) Precision Area Navigation (P-RNAV) airspace.

(f) RNAV procedural (terminal) airspace.

44.48 Surveillance

44.48.2 Explain the function and basic operating principle of each of the following:

(a) Automatic Dependent Surveillance - Broadcast (ADS-B).

(b) Automatic Dependent Surveillance - Contract (ADS-C).

(c) Multilateration.

44.48.4 Describe the inputs to and outputs of each of the following:

(a) Automatic Dependent Surveillance - Broadcast (ADS-B).

(b) Automatic Dependent Surveillance - Contract (ADS-C).

(c) Multilateration.

44.48.6 Describe limitations of each of the following:

(a) Automatic Dependent Surveillance - Broadcast (ADS-B).

(b) Automatic Dependent Surveillance - Contract (ADS-C).

(c) Multilateration.

Human Factors Matrix

		Topic No.	PPL	CPL	ATPL
			10	34	46
Human Factors - General	Airmanship and Responsibility	2	√	√	√
	Human Factors Models and Programmes	4	√	√	√
Physiology and the Effects of Flight	The Atmosphere	6	√	√	√
	Circulation and Respiratory Systems	8	√	√	√
	Hypoxia	10	√	√	√
	Hyperventilation	12	√	√	√
	Entrapped Gases	14	√	√	√
	Decompression Sickness	16	√	√	√
	Vision and Visual Perception	18	√	√	√
	Hearing and Balance	20	√	√	√
	Spatial Orientation	22	√	√	
	Gravitational Forces	24	√	√	
	Motion Sickness	26	√	√	
	Flight Anxiety	28	√	√	
Flying and Health					
	Fitness to Fly	30	√	√	√
	Alcohol and Drugs	32	√	√	√
	Blood Donation	34	√	√	
	Environmental Hazards	36	√	√	√
	Stress Management	38	√	√	√
	Sleep and Fatigue	40	√	√	√
	Ageing	42	√	√	√

Aviation Psychology	Information Processing	44	√	√	√
	Situational Awareness	46	√	√	√
	Judgement and Decision Making	48	√	√	√
	Social Psychology and Flight Deck Management	50	√	√	√
	Threat and Error Management	52	√	√	√
	Culture	54	√	√	√
Ergonomics	Flight Deck Design	56		√	√
	Design of Controls	58		√	√
	Instrumentation, Displays and Alerts	60	√	√	√
	Documents and Procedures	62	√	√	√
First Aid and Survival	First Aid	64	√	√	
	Survival	66	√	√	

Subject No 46 Human Factors

Each subject has been given a subject number and each topic within that subject a topic number. These reference numbers will be used on 'knowledge deficiency reports' and will provide valuable feed back to the examination candidate.

NOTE: *This syllabus is based upon multi-crew operations.*

This syllabus presupposes knowledge attained at PPL and CPL level.

Sub Topic	Syllabus Item
	Human Factors - General
46.2	**Airmanship, professionalism and responsibility**
46.2.2	Define professionalism.
46.2.4	Distinguish between piloting for personal reasons and for hire or reward.
46.2.6	Distinguish between safety, effectiveness and efficiency in terms of pilot responsibilities.
46.2.8	List the people to whom a pilot is responsible in carrying out his or her duties.
46.2.10	List the people to whom a co-pilot is responsible in carrying out his or her duties.
46.2.12	Describe key features of good and safe airmanship.
46.4	**Human factors models and programmes**
46.4.2	Define human factors as used in a professional aviation context.
46.4.4	Describe the fundamentals of the SHELL Model in relation to the interaction of humans with other humans, hardware, information sources, and the environment.
46.4.6	Explain the role of human factors programmes in promoting aviation safety in flight operations requiring an ATPL.
	Physiology and the Effects of Flight
46.6	**The atmosphere**
46.6.2	Describe the variation of pressure as altitude increases.
46.6.4	Explain how the partial pressure of oxygen changes as altitude increases.
46.8	**Circulation and respiratory systems**
46.8.2	Describe the physiology of the respiratory system.
46.8.4	Describe the physiology of the circulatory system.
46.10	**Hypoxia**
46.10.2	State the partial pressure of oxygen both inside and outside the lungs at sea level.
46.10.4	Explain the mechanical effect of the partial pressure of oxygen on oxygen transfer in the lungs.
46.10.6	Explain the causes of hypoxia.

Sub Topic	Syllabus Item
46.10.8	Describe the primary physiological and behavioural consequences of hypoxia for flight crew and passengers.
46.10.10	Describe the common symptoms of hypoxia.
46.10.12	Explain the reasons hypoxia symptoms are difficult to detect.
46.10.14	Explain the relationship between hypoxic onset and both vision and cognitive performance.
46.10.16	Describe how hypoxia can be prevented.
46.10.18	List the main factors influencing variation in hypoxia onset (tolerance) between individuals.
46.10.20	State the factors that affect the likelihood of suffering from hypoxia.
46.10.22	Describe how hypoxia can be treated.
46.10.24	Define the concept of ‘time of useful consciousness.
46.10.26	State the approximate time of useful consciousness at: (a) 18,000ft (b) 25,000ft (c) 35,000ft.
46.10.28	Explain oxygen paradox.
46.10.30	Describe the primary physiological effects of cabin pressurization loss at altitudes of 25,000ft and above.
46.10.32	List the key safety critical actions flight crew must take in the event of a high altitude cabin pressurization failure.
46.10.34	Identify the principle features of supplemental oxygen systems use to assist aircrew and passengers in the event of an in-flight pressurization emergency.
46.12	**Hyperventilation**
46.12.2	Describe the symptoms of hyperventilation.
46.12.4	Describe how hyperventilation can be treated.
46.14	**Entrapped gasses**
46.14.2	Explain the causes of barotrauma.
46.14.4	Describe the symptoms of barotrauma.
46.14.6	Describe the effects of barotrauma on various parts of the body.
46.14.8	Describe how barotrauma can be prevented.
46.14.10	Describe how barotrauma can be treated.
46.16	**Decompression sickness**
46.16.2	Explain the causes of decompression sickness.
46.16.4	Describe the symptoms of decompression sickness.

Sub Topic	Syllabus Item
46.16.6	Explain how decompression sickness can be prevented.
46.16.8	Describe how decompression sickness can be treated.
46.16.10	Explain the effects of an explosive decompression on the body.
46.16.12	Explain the actions that must be taken to deal with an explosive decompression.
46.16.14	Explain the dangers of flying after diving.
46.16.16	State the approximate required times between diving at various depths and flying.
46.18	**Vision and visual perception**
46.18.2	Describe methods of avoiding and/or coping with the: (a) stroboscopic illumination illusion/flicker vertigo (b) break-off phenomenon (c) sector whiteout (d) black hole phenomenon.
46.20	**Hearing and balance**
46.20.2	Describe the effect of prolonged noise exposure on hearing.
46.20.4	Describe methods of protecting hearing.
46.20.6	Specify the various levels of noise in decibels at which various grades of hearing protection are required.
46.20.8	Specify noise levels at which hearing damage may occur.
46.20.10	Describe what is meant by the action threshold for hearing protection.
46.20.12	Explain the effects of age induced hearing loss (presbycusis).
	Flying and Health
46.30	**Fitness to fly**
46.30.2	Explain the responsibilities of pilots towards medical fitness for flight.
46.30.4	Describe the problems associated with pregnancy and flying.
46.30.6	State when a pregnant pilot must stop flying.
46.30.8	With regard to the following factors describe their effects on pilot performance and methods by which they may be minimised/managed: (a) arterial disease (b) blood pressure (c) diet (d) exercise (e) obesity (f) smoking

Sub Topic	Syllabus Item
	(g) respiratory tract infection/allergies (including colds, sinus, hay fever, influenza, asthma)
	(h) food poisoning and gastroenteritis
	(i) neurological factors (including fits/epilepsy, brain injury, fainting, headaches, migraines)
	(j) emotional factors (including depression and anxiety)
	(k) psychiatric diseases
	(l) physical injuries
	(m) dehydration
	(n) hypoglycaemia.
46.30.10	Describe the symptoms of gastrointestinal problems.
46.30.12	Identify the primary causes of food poisoning.
46.32	**Alcohol and drugs**
46.32.2	Explain the effects of alcohol on pilot performance.
46.32.4	Explain the restriction associated with the consumption of alcohol and flying.
46.32.6	Describe how individuals differ in the effect of alcohol consumption.
46.32.8	Explain the effects of drugs on pilot performance.
46.32.10	Explain why illegal/recreational drugs are unacceptable for pilots.
46.36	**Environmental hazards**
46.36.2	Describe the symptoms, effects and immediate treatments for the following hazards present in the aviation environment:
	(a) carbon monoxide
	(b) fuel
	(c) chemical sprays
	(d) lubricating oils
	(e) hydraulic fluids
	(f) compressed gases
	(g) liquid oxygen
	(h) de-icing fluids
	(i) fire extinguishing agents
	(j) fire accelerant substances
	(k) ozone
	(l) solar radiation.

Sub Topic	Syllabus Item
46.38	**Stress management**
46.38.2	Identify and give examples of physical, environmental, task-related, organisational and psychological stressors.
46.38.4	Explain methods of identifying stress.
46.38.6	Describe the effects of stress on attention, motivation and performance.
46.38.8	Explain methods of managing stress.
46.40	**Sleep and fatigue (alertness management)**
46.40.2	Describe the stages of sleep.
46.40.4	Describe the mechanism of sleep regulation.
46.40.6	Describe problems associated with sleep at abnormal times of the day.
46.40.8	Explain what is meant by sleep debt.
46.40.10	Describe what is meant by sleep inertia, when it is most likely to occur and how long it takes to wear off.
46.40.12	Explain the effects of the following alertness management techniques: (a) napping (b) caffeine consumption (c) taking sedatives (d) taking stimulants other than caffeine.
46.40.14	Describe methods of managing fatigue.
46.40.16	Define the following terms: (a) biological clock (b) circadian rhythm (c) circadian dysrhythmia (d) desynchronisation (e) zeitgeber.
46.40.18	Describe the central human physiological processes underlying circadian rhythm processes.
46.40.20	Explain how circadian rhythms affect pilot performance.
46.40.22	Explain the effects of circadian dysrhythmia and methods of managing these.
46.40.24	Describe the rate of adjustment of crossing time zones, in easterly and westerly directions.
46.40.26	Explain why the rate of time zone adjustment varies between easterly and westerly directions.
46.40.28	Describe the impact of shiftwork on a pilot performance.

Sub Topic	Syllabus Item
46.40.30	Describe how the biological effects of shiftwork can be minimised.
46.40.32	Identify the principles of good rostering practice.
46.42	**Ageing**
46.42.2	Describe the effects of the normal processes of human ageing on: (a) the sensitivity and acuity of the sensory systems (b) muscular strength (c) resilience and reaction times (d) sleep/wakefulness patterns (e) cognitive or mental functioning (f) the acquisition of new information (g) the retention and retrieval of stored information in memory (h) the rate of information processing (i) insight and self-awareness of your individual capabilities.
46.42.4	Describe methods by which age-related changes in memory and speed of information processing can be moderated by older pilots.
46.42.6	Describe what changes would indicate early dementia or age related cognitive impairment in another pilot.
	Aviation Psychology
46.44	**Information processing**
46.44.2	Describe the brain's role in registering sensations, processing sensory information, storing information and controlling actions.
46.44.4	Describe a basic model of information processing, including the concepts of: (a) attention (b) divided attention (c) selective attention (d) attention getting stimulus (e) sensory threshold (f) sensitivity (g) adaptation (h) habitation.
46.44.6	Describe the following types of memory: (a) peripheral/sensory memory (b) short term/working memory (c) long term memory

Sub Topic	Syllabus Item
	(d) motor/skills memory
	(e) semantic memory
	(f) episodic memory.
46.44.8	Explain the following methods of retaining and retrieving information from memory:
	(a) chunking
	(b) mnemonics
	(c) associations (verbal and visual)
	(d) checklists
	(e) aide memoirs.
46.44.10	Explain the concept of mental workload.
46.44.12	Explain the concept of overload.
46.44.14	Describe methods of managing potential overload.
46.44.16	Describe and compare skill, rule and knowledge based behaviours.
46.44.18	Describe the process of acquiring a skill.
46.44.20	Describe failures of skill, rule and knowledge based behaviours.
46.44.22	Explain confirmation bias.
46.44.24	Describe the formation of mental models.
46.46	**Situational awareness**
46.46.2	Describe strategies to maintain and enhance situational awareness.
46.46.4	Explain the relationship between CRM and the building of situational awareness amongst flight-crew.
46.48	**Judgement and decision making**
46.48.2	Explain clues or red flags that can assist in identifying the error/poor judgement chain.
46.48.4	Identify risk assessment techniques.
46.48.6	Identify risk levels that compromise safety.
46.48.8	Describe the elements and risk levels associated with ultra-safe systems.
46.48.10	Identify risks that would degrade system safety goals.
46.48.12	Describe the following risk management strategies:
	(a) isolation
	(b) mitigation
	(c) elimination.

Sub Topic	Syllabus Item
46.48.14	Explain the application of decision-making models used in aviation: (a) DECIDE (b) SADIE (c) FDODAR.
46.48.16	Identify situations where time pressure compromises safety or increases risk levels.
46.50	**Social psychology and flight deck management**
46.50.2	Identify the broad characteristics of personality and distinguish individual differences.
46.50.4	Describe methods of maximising crew resource management.
46.50.6	Identify the factors that affect team performance.
46.50.8	Describe how effective teams or team working can reduce errors.
46.50.10	Explain the advantages and disadvantages of group decision making.
46.50.12	Explain the concepts of: (a) risk shift (b) conformity (c) compliance.
46.50.14	Describe the following personality traits and explain their effect on group decision making: (a) introversion (b) extraversion (c) anxiety.
46.50.16	Explain and differentiate between goal/task directed and relationship directed styles of behaviour.
46.50.18	Describe autocratic and democratic leadership styles.
46.50.20	Describe ideal leadership characteristics.
46.50.22	Explain problems that can arise from: (a) status/seniority differences (b) lack of assertiveness (c) cultural differences.
46.50.24	Explain the concept of authority gradient.
46.50.26	Explain the advantages and disadvantages of varying cockpit authority gradients.
46.50.28	Explain problems that can arise from an authority gradient that is too steep or too shallow.
46.50.30	Describe the cultural aspects of authority gradients.

Sub Topic	Syllabus Item
46.50.32	Explain the influence of the following on the effectiveness of cockpit communications: (a) the skills of enquiry, advocacy and assertion (b) listening (c) conflict resolution (d) critique/feedback.
46.50.34	Describe the barriers to effective communication.
46.50.36	Identify techniques to reduce communication barriers.
46.50.38	Explain the following strategies used to reduce communication errors in aviation: (a) read-backs (b) standard phraseology (c) standard calls (d) cross-checks (e) document verification checks (f) display and control setting checks (g) sterile cockpit policies.
46.50.40	Identify signs that information transfer has been successful or otherwise.
46.50.42	Describe the differences between upward, downward and horizontal communication and give examples of where each is used in the workplace.
46.50.44	Describe means of managing effective communications between flight crew and: (a) cabin crew (b) passengers (c) air traffic control services (d) maintenance personnel (e) company personnel.
46.52	**Threat and error management**
46.52.2	Describe threats which could potentially affect a safe flight.
46.52.4	Describe threat management, including the means of: (a) recognising threats (b) avoiding (c) mitigating the effects of threats.
46.52.6	Describe and identify examples of overt/active threats.
46.52.8	Describe and identify examples of latent threats.

Sub Topic	Syllabus Item
46.52.10	Identify methods and means for detecting error in the aviation system.
46.52.12	Describe error avoidance techniques.
46.52.14	Explain how incipient errors can be trapped after they have been committed.
46.52.16	Explain how the consequences of errors that are not trapped can be mitigated.
46.52.18	Explain how CRM countermeasures assist the management of threat and error.
46.52.20	Describe and identify examples of a latent failure/error.
46.52.22	Describe and identify examples of an active failure/error.
46.54	**Culture**
46.54.2	Explain the principles of SMS in air operations.
46.54.4	Describe reporting mechanisms to rectify safety problems.
46.54.6	Define the core concept of an organisational culture.
46.54.8	Outline the ways in which organisational culture affects performance.
46.54.10	Describe what is meant by harassment, its effects on employees and how it should be dealt with should it arise in the workplace.
46.54.12	Describe what is meant by stereotypes and stereotypical behaviour within organisations and give examples of where such behaviour may have a negative impact on safety.
46.54.14	Describe the inertia of large organisations with respect to safety messages.
46.54.16	List the key reasons for a safety reporting system within an aviation organisation.
46.54.18	Explain the relevance of internal hazard reporting.
46.54.20	Describe the key elements of the Just Culture approach to the management of errors, reporting, and the use of disciplinary sanctions under this approach.
46.54.22	Describe the concepts of risk creep and risk tolerance and their application within an aviation organisation.
	Ergonomics
46.56	**Flight deck design**
46.56.2	Describe the basic principles of control, display and workspace design.
46.56.4	Explain the importance of the following in flight deck design: (a) reach (b) comfort (c) posture (d) lighting levels.

Sub Topic	Syllabus Item
46.56.6	Distinguish between biometrics, biomechanics and anthropometry.
46.56.8	Describe applications of biomechanics in the design of flight decks.
46.56.10	Explain the relevance of anthropometry in the design of flight decks.
46.56.12	Describe the effects of a poorly designed cockpit on pilot performance.
46.56.14	Explain the importance of eye datum or eye design position.
46.56.16	Describe the problems associated with windshield design and visibility.
46.56.18	List the advantages and disadvantages of working in an automated cockpit.
46.56.20	Describe the effects of advanced cockpit automation, including: (a) failure to monitor (b) boredom and complacency (c) loss of proficiency (d) job satisfaction (e) crew coordination (f) problems associated with equipment failure.
46.56.22	Explain the concept of mode awareness in setting up and operating automated systems.
46.56.24	Describe elements of coping behaviour associated with automatic cockpits.
46.58	**Design of controls**
46.58.2	Explain the importance of the following in control design: (a) size (b) shape/recognition by touch (c) location (d) layout and the uniformity of spatial arrangement (e) direction of movement (f) visibility.
46.60	**Instrumentation, displays and alerts**
46.60.2	Explain the importance of the following in the design of instrumentation, displays and alerts: (a) size (b) position (c) layout (d) visibility (e) legibility (f) scale

Sub Topic	Syllabus Item
	(g) use of colour
	(h) illumination.
46.60.4	Describe problems associated with the presentation and misinterpretation of alerts.
46.62	**Documents and procedures**
46.62.2	Explain the importance of colour, font type and size for written checklists.
46.62.4	Describe problems associated with the design and use of checklists and manuals.
46.62.6	Describe problems associated with the design and use of maps and charts.

Subject No. 48 Advanced Aerodynamics, Performance, and Systems Knowledge (Aeroplane)

NOTE: *This syllabus is based on a multi engine turbine air transport type aeroplane.*

System and procedure items are those systems and procedures typically found in an airline-operated air-transport type aeroplane.

Assessment of this syllabus will be principally based on, but not limited to, a specific approved 'representative' aircraft and the associated performance manual data.

Each subject has been given a subject number and each topic within that subject a topic number. These reference numbers will be used on knowledge deficiency reports and will provide valuable feedback to the examination candidate. These reference numbers are common across the subject levels and therefore may not be consecutive.

This syllabus presupposes a knowledge and understanding already attained at PPL and CPL levels.

Mnemonics used are those in common use at the time of writing. The use of a specific mnemonic indicates this syllabus requires knowledge of the concept or system commonly or historically associated with that acronym.

Sub Topic	Syllabus Item
	Section 1 Aeroscience
48.2	**Transonic speed**
48.2.2	Explain the term 'speed of sound'.
48.2.4	Explain the factors determining the local speed of sound (LSS).
48.2.6	Calculate the speed of sound given the appropriate information.
48.2.8	Calculate 'Mach number' given the appropriate information.
48.2.10	Explain the change of IAS and TAS as a function of altitude at a given Mach number.
48.2.12	Explain the term critical Mach number (M_{crit}).
48.2.14	Explain the potential hazard of maintaining a constant Mach number in descent.
48.2.16	Explain the term 'crossover altitude'.
48.4	**Stability and control**
48.4.2	Explain swept wing pitching moments at subsonic and transonic speeds.
48.4.4	Explain the 'lateral stability' issues arising at high subsonic speeds.
48.4.6	Explain how the following factors affect lateral stability at high subsonic speeds: (a) dihedral (b) anhedral (c) tail surface shielding (d) wing position (e) keel surface/fin area

Sub Topic	Syllabus Item
	(f) sweepback.
48.4.8	Explain the requirement to match lateral and directional stability.
48.4.10	Explain the conditions of: (a) spiral instability (b) Dutch roll (c) snaking.
48.4.12	Describe the function of a yaw damper system.
48.4.14	Describe how 'active flight path stability' is managed by a fly-by-wire control system.
48.6	**Transonic aerodynamics**
48.6.2	Explain the meaning of the term 'shockwave'.
48.6.4	Explain the formation of shockwaves.
48.6.6	Describe the changes to the air as it passes over an aerofoil when the free airflow stream is between M_{crit} and Mach 1.0.
48.6.8	Describe the movement of the centre of pressure with increasing Mach number.
48.6.10	Describe the changes to the air as it passes through a shockwave.
48.6.12	Within the transonic range, describe the change in the: (a) lift coefficient (b) drag coefficient.
48.6.14	Describe the behaviour of the shockwaves as the Mach number increases.
48.6.16	Explain the meaning of the term 'bow wave'.
48.6.18	With respect to the streamline pattern, describe: (a) compression waves (b) expansion waves.
48.6.20	Describe the velocity behind: (a) a normal shockwave (b) an oblique shockwave.
48.6.22	Explain the meaning of the term 'sonic buffet/Mach buffet'.
48.6.24	Explain the effect of the following on M_{crit}: (a) aerofoil 'thickness to chord' ratio (b) angle of sweepback.
48.6.26	Define the drag-divergence Mach Number (M_{dd}).

Sub Topic	Syllabus Item
48.8	**Transonic aerofoils**
48.8.2	Describe the design characteristics of 'high subsonic flight' airfoils.
48.8.4	Explain the advantages of a 'supercritical' aerofoil section.
48.8.6	Explain the: (a) advantages of sweepback (b) disadvantages of sweepback.
48.8.8	Explain the phenomenon 'aileron reversal'.
48.8.10	Explain the advantages of 'vortex generators' in high speed flight.
48.8.12	Explain how an increase of the angle of attack influences the normal shockwave.
48.8.14	Explain shock stall, including its relationship with Mach buffet.
48.8.16	Describe the behaviour of an aeroplane at shock stall, including Mach tuck.
48.8.18	Describe wave drag.
48.8.20	Describe the effect of wave drag on: (a) control surface efficiency (b) control hinge moment.
48.8.22	Explain 'area ruling' in air-transport aeroplane design.
	Section 2 Aeroplane Systems
48.20	**Engine management systems**
48.20.2	Explain the function of an auto thrust system.
48.20.4	Explain the principle of operation of an auto thrust system.
48.20.6	For an auto thrust system, describe the system: (a) inputs (b) controls (c) indications (d) warnings.
48.20.8	Describe the functions of a Full Authority Digital Engine Control (FADEC).
48.22	**Flight control systems**
48.22.2	Describe the function of the primary flight controls of a swept wing air-transport aeroplane.
48.22.4	Describe the function of the secondary flight controls of a swept wing air-transport aeroplane

Sub Topic	Syllabus Item
48.22.6	Explain the operating principle of the primary and secondary flight controls of a swept wing air-transport aeroplane.
48.24	**Control systems**
48.24.2	Describe the control surface actuation methods found on a typical air-transport aeroplane.
48.24.4	Describe the function of a 'fly-by-wire' flight control system.
48.24.6	Explain the operating principle of a 'fly-by-wire' flight control system.
48.24.8	Explain how triple-redundancy is obtained in flight control systems.
48.24.10	Explain the requirement for air transport aeroplane control systems to include: (a) an aileron lock out system (b) a variable rudder ratio system.
48.24.12	Explain the effect of a total hydraulic system failure on flight control.
48.24.14	Describe the backup systems associated with powered flight controls.
48.24.16	Explain the purpose of 'feel or feedback systems' in powered flight controls.
48.26	**Hydraulic systems**
48.26.2	For an air-transport aeroplane, explain the: (a) advantages of using hydraulics to operate services (b) disadvantages of using hydraulics to operate services.
48.26.4	Describe the function of the following: (a) bypass valve (b) hydraulic fuse (c) standpipe.
48.26.6	Describe the operating principle of the following: (a) bypass valve (b) hydraulic fuse (c) standpipe.
48.26.8	For a hydraulic system, describe the effect of flow rate on system pressure.
48.26.10	Explain how redundancy is obtained in the hydraulic systems of air-transport aeroplanes.
48.26.12	Explain the operating principle of a ram air turbine (RAT).
48.26.14	Describe the methods of monitoring the hydraulic system.
48.26.16	Describe the warnings associated with a hydraulic system.

Sub Topic	Syllabus Item
48.28	**Pneumatic supply systems**
48.28.2	Describe the function of a pneumatic supply system.
48.28.4	Explain the principle of operation of a pneumatic supply system.
48.28.6	Describe the function of pneumatic leak warning systems.
48.30	**Electrical systems - DC**
48.30.2	Describe the battery installations installed in an air-transport aeroplane.
48.30.4	For an air-transport aeroplane battery system, explain the: (a) function of the system (b) battery types (c) associated hazards (d) safety measures required.
48.32	**Electrical systems - AC**
48.32.2	For an AC electrical system, explain the terms: (a) alternating current (b) frequency (c) RMS voltage (d) RMS current (e) phase.
48.32.4	Explain the function of the following: (a) transformer (b) inverter (c) rectifier (d) relay.
48.32.6	Explain the difference between a split system and parallel system of load distribution.
48.32.8	Explain the relative advantages and disadvantages of AC and DC systems.
48.32.10	Explain operating principle of a constant speed generator drive (CSD).
48.32.12	Explain operating principle of an integrated drive generator (IDG).
48.32.14	Explain the consequences of an IDG mechanical disconnect during flight.
48.32.16	Explain the function and operating principle of a variable speed constant frequency (VSCF) drive.
48.34	**Landing gear systems - retractable**
48.34.2	Explain the requirements placed on an air-transport aeroplane’s landing gear

Sub Topic	Syllabus Item
	system.
48.34.4	Describe the layout of an air-transport aeroplane's landing gear system.
48.34.6	Describe the function of the following landing gear components: (a) bogies (b) drag-strut (c) side-strut (d) torsion links (e) air/ground sensing (f) gear pins.
48.34.8	Describe the indications associated with landing gear systems: (a) in the cockpit (b) from the aeroplane cabin (c) during 'walk-round'.
48.34.10	Describe gear warning systems.
48.34.12	Explain the principles of operation of gear warning systems.
48.34.14	Describe the protection systems to avoid inadvertent gear retraction on ground.
48.34.16	Explain the methods for emergency gear extension.
48.34.18	Explain the reasons for using nitrogen gas to pressurise the tyres on air-transport aeroplanes.
48.34.20	Describe the function of thermal plugs.
48.34.22	Define 'tyre creep'.
48.34.24	Explain the requirement for speed limitations for landing gear operation.
48.36	**Aircraft wheel brake system**
48.36.2	Describe the function of an auto brake system.
48.36.4	Explain the principle of operation of an auto brake system.
48.36.6	Describe the function of an anti-skid system.
48.36.8	Describe the principle of operation of an anti-skid system.
48.36.10	Describe the RTO function of an auto brake system.
48.36.12	Explain the operation of an RTO system.
48.36.14	Explain the principle of operation of a park brake system.
48.36.16	Describe the various types of air-transport aeroplane brakes.

Sub Topic	Syllabus Item
48.36.18	Explain the implications of excessive wheel brake temperature.
48.36.20	Explain the requirement for brake wear indicators.
48.38	**Fuel pump systems**
48.38.2	Describe the function of: (a) low pressure engine-driven fuel pumps (b) high pressure engine-driven fuel pumps (c) submersible electric pumps (d) jet pumps.
48.40	**Fuel tanks systems**
48.40.2	Describe the function, and where appropriate, explain the operating principle of: (a) expansion spaces (b) fuel quantity detectors (c) fuel flow meters and totalisers (d) selector valves (e) non return valves (f) vent systems (g) firewall shutoff valve (h) manual de-fuelling valve (i) single point pressure refueling.
48.40.4	Describe the function of fuel cross feed systems.
48.40.6	Explain the order of fuel tank use in an air-transport aeroplane.
48.40.8	Explain the meaning of ‘unusable fuel’.
48.40.10	Explain why fuel quantity is measured by mass.
48.40.12	Describe how: (a) fuel imbalance can occur (b) a fuel imbalance situation is corrected.
48.40.14	Explain the significance of fuel temperature.
48.40.16	Explain the methods of fuel temperature management.
48.40.18	Explain the requirement for a fuel jettison (dump) system.
48.40.20	Describe a fuel jettison (dump) system.
48.42	**Fire warning systems**
48.42.2	Describe the function of fire and smoke warning systems.
	Explain the operation of:

Sub Topic	Syllabus Item
48.42.4	(a) unit type (spot or point) fire detectors (b) continuous loop fire detectors.
48.42.6	Explain the fire warning test procedures.
48.42.8	Explain the principle of operation of the fire warning system installed in the: (a) engine area (b) APU area (c) cargo area (d) avionics area (e) wheel well (f) toilets (g) cabin.
48.44	**Fire protection and suppression systems**
48.44.2	Describe aeroplane-installed fire extinguishing systems.
48.44.4	Explain the limitations of aeroplane-installed fire extinguishing systems.
48.44.6	With reference to portable extinguishers, explain the: (a) preferred extinguishing agent for the various types of fire (b) precautions associated with the various extinguishing agents.
48.44.8	Describe aeroplane-installed electrical fire protection systems.
48.46	**Ice and rain protection systems**
48.46.2	Explain the operating principles of the following types of ice protection systems: (a) bleed air thermal (b) pneumatic boots (c) electrical.
48.46.4	Explain the difference between anti-icing systems and de-icing systems.
48.46.6	Explain the effects of ice protection system operation on engine performance.
48.46.8	Explain the correct operation of a mechanical (pneumatic boot) system.
48.46.10	Explain the correct operation of a thermal ice protection system.
48.46.12	Explain the operating principles of ice detectors.
48.46.14	Describe the effect on the performance of an air transport aeroplane of: (a) airframe icing (b) engine icing.
48.46.16	Describe: (a) windscreen heating systems

Sub Topic	Syllabus Item
	(b) rain clearance systems.
48.48	**Auto flight systems**
48.48.2	Describe the function of a: (a) Flight Director (FD) system. (b) Automatic Flight Control system (AFCS).
48.48.4	Explain the operating principle of a: (a) Flight Director system. (b) Automatic Flight Control system.
48.48.6	Explain the use of the AFCS control panel.
48.48.8	Explain the operational modes available on an AFCS.
48.48.10	For an AFCS, describe the associated: (a) inputs (b) controls (c) indications (d) warnings.
48.48.12	Explain the principle of operation of an autoland system.
48.48.14	Explain the autoland systems component failure management.
48.48.16	Explain the principle of operation of flight envelope protection.
48.48.18	For a flight envelope protection installation, describe the associated: (a) inputs (b) indications (c) warnings.
48.48.20	For a yaw damper system, describe the associated: (a) inputs (b) indications (c) warnings.
48.48.22	Describe the function of the automatic trim system.
48.48.24	Explain the principle of operation of the automatic trim system.
48.48.26	For an automatic trim system, describe the associated: (a) component units (b) indications (c) warnings.

Sub Topic	Syllabus Item
48.50	**Oxygen systems**
48.50.2	Explain the purpose of a flight deck oxygen system.
48.50.4	Explain the principle of operation of a flight deck oxygen system.
48.50.6	Explain the purpose of passenger cabin oxygen systems.
48.50.8	Explain the principle of operation of a passenger cabin overhead oxygen system.
48.50.10	Describe the actuation methods for passenger cabin oxygen.
48.50.12	Explain the advantages and disadvantages of a: (a) chemical oxygen systems (b) gaseous oxygen system.
48.52	**Environmental control systems**
48.52.2	Describe the function of an air-conditioning system.
48.52.4	Explain the principle of operation of an air-conditioning system.
48.52.6	For an air-conditioning system, describe the associated: (a) controls (b) indications (c) warnings.
48.52.8	Describe the function of a pressurisation system.
48.52.10	Explain the principle of operation of a pressurisation system.
48.52.12	For a pressurisation system, describe the associated: (a) controls (b) indications (c) warnings.
48.52.14	Explain the following terms: (a) pressure hull (b) cabin altitude (c) cabin vertical speed (d) differential pressure (e) pressurisation profile (f) ‘catching the cabin’.
48.52.16	Describe the function of the following: (a) pressure controller (b) pressure rate selector (c) cabin landing altitude selector (d) barometric pressure selector.

Sub Topic	Syllabus Item
48.52.18	Explain the operating principle of the following: (a) pressure controller (b) pressure relief valve (c) negative pressure relief valve (d) outflow valve.
48.52.20	Describe the emergency operation of a pressurisation system.
48.54	**Master warning systems**
48.54.2	Describe the function of a master warning system.
48.54.4	Explain the principle of operation of a master warning system.
48.54.6	For a master warning system, describe the associated: (a) controls (b) indications (c) warnings.
	Section 3 Performance
48.60	**Performance factors – take-off**
48.60.2	Explain the meaning of the following: (a) runway (b) the 'slope' of a runway (c) stopway (d) clearway (e) take-off run (TOR) (f) take-off run available (TORA) (g) take-off run required (TORR) (h) take-off distance (TOD) (i) take-off distance available (TODA) (j) take-off distance required (TODR) (k) accelerate stop distance (ASD) (l) accelerate stop distance available (ASDA) (m) accelerate stop distance required (ASDR) (n) the 'screen height' on take-off (o) reduced thrust (p) balanced field length (BFL) (q) balanced take-off.
48.60.4	Explain the meaning of the following: (a) V_{EF} (b) V_1 (c) V_{MCG}

Sub Topic	Syllabus Item
	(d) V_{MCA} (e) V_R (f) V_{LOF} (g) V_{MBE} (h) V_2
48.60.6	Explain the factors affecting V_1.
48.60.8	Explain the factors affecting V_2.
48.60.10	State the relationship between: (a) V_{EF} and V_1 (b) V_1 and V_R (c) V_1 and V_{MCG} (d) V_1 and V_{MBE} (e) V_R and V_{MCA} (f) V_2 and V_S (g) V_S and V_{MCA} (h) V_2 and V_{MCA}.
48.60.12	Describe a rejected take-off (RTO).
48.60.14	Describe the procedures applied following an aeroplane malfunction on the take-off roll, prior to V_1.
48.60.16	Describe the procedures applied following an engine failure or fire at or above V_1.
48.60.18	Describe the likely outcome of continuing a take-off following an engine failure earlier than 2 seconds prior to V_1.
48.60.20	Describe the likely outcome of aborting a take-off following an engine failure after V_1 on a runway length limited take-off.
48.60.22	Explain the meaning of the following: (a) take-off path (b) take-off flight path (c) gross climb gradient (d) net climb gradient (e) reference zero (f) net take-off flight path (NTOFP).
48.60.24	State the minimum heights between the NTOFP and obstacles which must be maintained in the following situations: (a) straight flight path from a dry runway (b) straight flight path from a wet runway (c) turning flight path from a dry runway (d) turning flight path from a wet runway.

Sub Topic	Syllabus Item
48.60.26	Define: (a) 1st climb segment (b) 2nd climb segment (c) 3rd climb segment (d) 4th climb segment.
48.60.28	In each of the initial climb segments, describe the: (a) aeroplane configuration (b) required power/thrust setting (c) speed (d) obstacle clearance heights (e) minimum climb gradients (net and gross).
48.60.30	Describe the lateral dimensions of the net take-off flight path (NTOFP).
48.60.32	Explain the effect of near-in obstacles in the NTOFP on TODA.
48.60.34	Explain how initial climb performance is affected by various take-off: (a) configurations (b) procedures.
48.60.36	Describe the circumstances under which reduced power may be used for take-off.
48.06.38	Explain how the reduced thrust/power is determined for take-off.
48.60.40	Define a: (a) wet runway (b) contaminated runway.
48.60.42	Describe the effect of wet or contaminated runways on take-off performance.
48.60.44	Explain the environmental factors which affect an aeroplane's take-off performance.
48.60.46	Explain the environmental factors which affect an aeroplane's initial climb performance.
48.60.48	Explain the effect of runway dimensions on an aeroplane’s take-off performance.
48.60.50	Explain the effect of tyre and brake energy limitations on an aeroplane's take-off performance.
48.60.52	Explain how flight manual data is used to construct specimen runway performance charts.
48.60.54	Explain the application of a balanced field length including the: (a) effect of a stopway on the allowed take-off mass and appropriate V_1 (b) effect of a clearway on the allowed take-off mass and appropriate V_1 (c) relationship between take off distance, accelerate stop distance and V_1.

Sub Topic	Syllabus Item
48.60.56	Explain the factors which affect an aeroplane's en-route climb performance.
48.62	**Performance factors - cruise**
48.62.2	Define design manoeuvring speed (V_A).
48.62.4	Explain the derivation of V_A.
48.62.6	Explain the effect of mass on V_A.
48.62.8	Define turbulence penetration speed (V_B).
48.62.10	Explain the derivation of V_B.
48.62.12	Explain the meaning of 'low speed buffet'.
48.62.14	Explain the meaning of 'high speed buffet'.
48.62.16	Explain the meaning of 'buffet margin'.
48.62.18	Define the term 'coffin corner'.
48.62.20	Explain the 'coffin corner' recovery considerations.
48.62.22	Describe the influence of the following on the buffet margin: (a) pressure altitude (b) aeroplane mass (c) load factor.
48.62.24	Explain the purpose of step climbs used on long distance flights.
48.62.26	Explain the factors which affect the choice of optimum altitude.
48.62.28	Explain the factors which may limit the maximum operating altitude.
48.62.30	Explain the factors which affect an aeroplane's cruise performance.
48.62.32	Explain the use of 'cost index' to determine the appropriate speeds for climb and cruise.
48.62.34	Differentiate between max range cruise (MRC) speed and long range cruise (LRC).
48.62.36	Explain the effect of wind on cruise range (distance and speed).
48.62.38	Explain the effect of mass on cruise range (distance and speed).
48.62.40	Explain the meaning of 'drift down'.
48.62.42	Identify factors which affect the en-route drift down flight path.
48.62.44	Describe the minimum obstacle clearance en-route flight path (net and gross).
48.62.46	State the thrust to be set on the operating engine(s) during drift down.

Sub Topic	Syllabus Item
48.62.48	State the thrust to be set in the case of critical terrain clearance during drift down.
48.64	**Performance factors - approach and landing**
48.64.2	Explain the meaning of the following: (a) V_{MO}/M_{MO} (b) V_{LE} (c) V_{LO} (d) V_{FE} (e) V_{REF} (f) V_{AT} (g) V_T (h) V_{TT}/T_{TS}.
48.64.4	State the relationship between: (a) configuration and manoeuvring speed (V_A) (b) V_{REF} and V_S.
48.64.6	Explain the factors which affect an aeroplane's descent performance.
48.64.8	Explain the effect of mass on descent planning.
48.64.10	Explain the factors which affect an aeroplane's approach and landing performance.
48.64.12	Explain the meaning of 'screen height' on landing.
48.64.14	Explain the meaning of: (a) demonstrated landing distance (DLD) (b) landing distance required (LDR).
48.64.16	Describe the determination of: (a) demonstrated landing distance (b) landing distance required.
48.64.18	Explain the meaning of landing distance available (LDA).
48.64.20	Describe the determination of landing distance available.
48.64.22	State the relationship between demonstrated landing distance and landing distance available.
48.64.24	Explain the meaning of ‘approach climb’.
48.64.26	Explain the configuration and minimum climb gradient used to determine the approach climb limited landing mass.
48.64.28	Explain the meaning of ‘landing climb’.
48.64.30	Explain the configuration and minimum climb gradient used to determine the landing climb limited landing mass.

Sub Topic	Syllabus Item
48.64.32	Describe the one engine inoperative landing committal/decision height.
48.64.34	Describe the effect of the following system malfunctions on an aeroplane's landing performance: (a) flap restrictions (b) anti-skid failure (c) reduced brake availability.
48.64.36	Describe the effect of wet or contaminated runways on landing performance.
48.64.38	Define ‘hydroplaning’ (aquaplaning).
48.64.40	Calculate the speed at which hydroplaning may occur for a given tyre pressure.
48.64.42	Explain the technical factors determining minimum ‘turnaround time'.
48.90	**Performance - calculations and data extraction**
48.90.2	Using appropriate weather, load, airfield and aeroplane performance data, extract/calculate: (a) take-off distance available (b) maximum take-off mass (c) take-off thrust (including reduced thrust) (d) maximum continuous thrust (e) take-off speeds (f) flap retraction configuration (g) air conditioning pack configuration for take-off (h) stabiliser trim setting (i) climb thrust (j) climb speed schedules (k) time and distance to altitude (l) cruise thrust (m) cruise speed schedules (n) optimum and maximum altitudes (o) high and low speed buffet margins (p) turbulence penetration speeds (q) one engine inoperative (OEI) drift down thrust, speeds, flight paths and level-off altitude (r) time and distance to touchdown (s) landing distances available (t) landing speeds (u) landing distance required (v) maximum landing mass (w) go-around thrust.

Sub Topic	Syllabus Item
48.92	**Mass and balance - general**
48.92.2	Explain the meaning of the following: (a) % MAC (b) empty mass (empty aeroplane mass) (c) basic operating mass (aeroplane prepared for service mass) (d) maximum zero fuel mass (MZFM) (e) maximum ramp mass (f) take-off mass (TOM) (g) maximum take-off mass (MTOM) (h) regulated take-off mass (RTOM) (i) landing mass (j) maximum landing mass.
48.92.4	Explain why the centre of gravity (C of G) must be within the certified limits.
48.92.6	Describe the influence of fuel loading on the centre of gravity.
48.92.8	Explain the effect of centre of gravity on fuel consumption.
48.94	**Mass and balance - calculations and data extraction**
48.94.2	Using representative air-transport aeroplane loading and performance data, extract/calculate: (a) ramp mass (b) take-off mass (TOM) (c) regulated take-off mass (RTOM) (d) zero fuel mass (ZFM) (e) landing mass (f) compartment mass (g) available payload (h) the aeroplane's C of G at any given time.
48.94.4	Solve the following loading problems to determine the: (a) revised C of G position when loading or offloading mass (b) revised C of G position when relocating load components (c) load change required to place the C of G within limits (d) load position change to place the C of G within limits.
48.96	**Aeroplane and pavement classification systems**
48.96.2	Given representative air-transport aeroplane and runway data, determine the: (a) runway Pavement Classification Number (PCN) (b) aeroplane Aircraft Classification Number (ACN).

Sub Topic	Syllabus Item
48.96.4	Given representative air-transport aeroplane and runway data, use the ACN-PCN method to determine if the runway and associated taxiways will support the mass of the aeroplane.

Subject No. 50 ATPL Aerodynamics and Aircraft Systems (Helicopter)

Each subject has been given a subject number and each topic within that subject a topic number. These reference numbers will be used on knowledge deficiency reports and will provide valuable feedback to the examination candidate.

SubTopic	Syllabus Item
50.2	**Aeroscience**
50.2.2	Explain the meaning of: (a) velocity (b) equilibrium (c) momentum and (d) inertia.
50.2.4	State the value of the acceleration caused by the earth's gravity.
50.2.6	Describe motion on a curved path, and differentiate between centripetal force and centrifugal reaction.
50.2.8	State the factors affecting centripetal force and rate of turn.
50.2.10	Describe the trig functions for the sine, cosine and tangent of an angle.
50.2.12	Describe the moment of a force, and the moment of a couple.
50.2.14	Describe the conditions required for translational equilibrium, and for rotational equilibrium.
50.4	**Aerodynamic theory**
50.4.2	Explain the changes to the airflow and pressure distribution around a typical symmetrical aerofoil as the angle of attack is increased from the zero-lift angle of attack to the stalling angle.
50.4.4	Explain the term centre of pressure (CP) and describe typical movement of the CP with increasing angle of attack with a symmetrical aerofoil section and with a non-symmetrical aerofoil section.
50.4.6	Define aerodynamic centre.
50.4.8	Describe the total aerodynamic reaction force (TR) of an aerofoil.
50.4.10	Describe how TR varies with angle of attack.
50.4.12	Define the TR components of rotor thrust and rotor drag.
50.6	**Lift**
50.6.2	Given a CL graph of symmetrical and non symmetrical aerofoil against angle of attack, show: (a) the zero lift angle and (b) the angle for maximum CL (CL max).
50.6.4	Explain the benefits of a high CL max.
50.6.6	Explain the effects of camber and surface roughness on CL.
50.6.8	Explain the effects of aspect ratio on CL.
50.6.10	Explain the main advantages of using the symmetrical blade section in helicopters.
50.6.12	Explain the effects on the lift produced, as the rotor tip approaches transonic speeds.

SubTopic	Syllabus Item
50.8	**Drag**
50.8.2	Describe the method of reducing induced drag.
50.8.4	Explain the combination of the three types of drag into the total drag curve.
50.8.6	Explain the effects on drag, as the rotor tip approaches transonic speeds.
50.10	**Lift/drag ratio**
50.10.2	Explain the relationship between the lift/drag ratio and the CL/CD ratio.
50.10.4	Given a graph of lift/drag ratio against angle of attack of a symmetrical aerofoil section, show: (a) the 'most efficient' angle of attack (b) the zero lift angle of attack (c) the stalling angle of attack and (d) the minimum drag angle of attack.
50.10.6	Explain the factors affecting the lift/drag ratio.
	Helicopter Rotor Discs
50.12	**Terminology**
50.12.2	With the aid of a diagram, identify and explain the meaning of: (a) disc loading (b) blade loading (c) solidity (d) lapping (e) lead-lag (dragging) (f) rotational airflow (Vr) (g) induced flow (h) inflow angle (i) rotor thrust (j) total rotor thrust (k) rotor drag (torque).
50.14	**Forces acting on a helicopter rotor**
50.14.2	Explain the effect of a change of angle of attack and inflow angle on the rotor thrust/rotor drag ratio.
50.14.4	State and explain the three factors affecting rotor RPM limits.
50.14.6	Explain how changes in the following factors affect rotor drag: (a) disc loading (b) gross weight (c) altitude (d) configuration.
50.14.8	Explain how ground effect affects inflow angle angle of attack rotor drag and the power required to overcome rotor drag.
50.14.10	Explain how translational lift affects inflow angle angle of attack rotor thrust and the

SubTopic	Syllabus Item
	power required to overcome rotor drag in level flight.
50.14.12	Explain the principle of operation of delta-3 hinges and offset pitch horns in reducing blade flapping.
50.16	**Anti-torque tail rotor**
50.16.2	Explain the effect of the wind on tail rotor thrust.
50.16.4	Explain design techniques that can compensate for translating and rolling tendencies.
50.16.6	Describe pilot actions that may eliminate or reduce the effects of a loss of tail rotor thrust in flight.
50.18	**Disc control**
50.18.2	Explain the following causes of movement about the lead/lag hinge: (a) conservation of angular momentum (Coriolis effect) (b) Hookes joint effect (c) periodic drag changes (d) random changes.
50.18.4	Explain phase lag and advance angle.
	Helicopter Flight
50.20	**Hovering**
50.20.2	Explain the following factors affecting ground effect: (a) skid height AGL (b) density altitude (c) aircraft weight (d) nature of the surface (e) slope of the surface (f) the wind.
50.20.4	Describe: (a) the conditions likely to lead to over-pitching (b) the symptoms of over-pitching and (c) the recovery technique for over-pitching.
50.20.6	Describe: (a) the conditions likely to lead to recirculation (b) the symptoms of recirculation and (c) the recovery technique for recirculation.
50.22	**Forward flight**
50.22.2	Explain: (a) flapping to equality (b) means of overcoming dissymmetry of lift (c) flap-back (blow-back) (d) flap-forward and (e) reverse flow.

SubTopic	Syllabus Item
50.22.4	Describe how inflow roll is compensated for by the pilot.
50.22.6	With the aid of the power available/power required curves: (a) identify the TAS for minimum and maximum straight and level flight (b) describe the factors that affect this TAS.
50.24	**Climbing and descending**
50.24.2	On the power available/power required curves, identify TAS for: (a) maximum rate of climb (b) best angle of climb.
50.24.4	With the aid of power available/power required curves, explain the effects on rate of climb or descent, angle of climb or descent, and required TAS as applicable, of: (a) collective setting changes (b) altitude (c) aircraft weight (d) density altitude (e) angle of bank (f) external loads and (g) the wind.
50.26	**Turning**
50.26.2	State the effect of angle of bank on rate of turn and power required.
50.26.4	Explain the effect of the following factors on the rate and radius of turn: (a) altitude (b) gross weight (c) external loads and (d) the wind.
50.28	**Transitioning to the hover**
50.28.2	Explain the effects of the flare on: (a) rotor rpm (b) total rotor thrust and (c) rotor drag.
50.28.4	Describe the causes of rotor rpm changes during the flare.
50.28.6	Describe the power requirements during a zero-speed landing.
50.30	**Autorotation**
50.30.2	Identify, on a diagram, the dragging (stalled), driven and driving regions (sections) of a rotor disc in autorotation.
50.30.4	Describe the forces acting on the dragging (stalled), driven and driving regions of a rotor in autorotation.
50.30.6	Explain the effect of increased collective pitch on autorotation.
50.30.8	Explain the effect of rotor RPM and airspeed on autorotational rate of descent.
50.30.10	Identify on a graph, range and endurance speeds for autorotation.

SubTopic	Syllabus Item
50.30.12	Explain the hazards involved in operations within the avoid curve.
50.30.14	Identify, on a graph of the avoid curve, boundaries of safe operation.
50.32	**Stability**
50.32.2	Define convergent and divergent phugoid (oscillation).
50.32.4	Explain the differences in control power between helicopters fitted with a: (a) teetering rotor (b) articulated rotor (c) rigid rotor.
50.32.6	Explain how control power can be improved through: (a) offset flapping hinges (b) horizontal stabilisers.
50.32.8	Describe the advantages of control power on: (a) C of G limits and (b) maximum forward speed.
	Hazardous Flight Conditions
50.34	**Retreating blade stall**
50.34.2	Describe and explain the symptoms of retreating blade stall.
50.34.4	Describe the recovery technique for retreating blade stall.
50.34.6	Explain the hazards of inappropriate control input during recovery.
50.36	**Vortex ring state (settling with power)**
50.36.2	With respect to vortex ring state, describe: (a) the development (b) the symptoms and (c) the methods of recovery.
50.36.4	Explain tail rotor vortex ring state.
50.36.6	List the conditions that can lead to tail rotor vortex ring state.
50.36.8	State the indications that differentiate between vortex ring state and a rotor stall.
50.38	**Ground resonance**
50.38.2	Describe the conditions likely to cause ground resonance.
50.38.4	Describe the symptoms of ground resonance.
50.38.6	Describe the recovery technique for ground resonance.
50.40	**Blade sailing**
50.40.2	Describe the conditions likely to lead to blade sailing.
50.40.4	Describe the recovery technique for blade sailing.
50.42	**Dynamic rollover**
50.42.2	Explain the factors influencing the critical angle at which dynamic rollover will occur.
50.42.4	Describe the recovery technique for dynamic rollover.

SubTopic	Syllabus Item
50.44	**Mast bumping**
50.44.2	Describe the forces involved during mast bumping.
50.44.4	Describe the means of avoiding mast bumping.
50.44.6	Describe the recovery technique for mast bumping.
50.46	**Exceeding rotor RPM limits**
50.46.2	Explain the reasons for high and low RPM limits.
50.48	**Rotor stalls**
50.48.2	Describe the conditions likely to lead to a rotor stall.
50.48.4	Describe the symptoms of a rotor stall.
50.48.6	Describe the recovery technique for a rotor stall.
50.50	**Helicopter airframes**
50.50.2	List the main components of the landing gear and describe their function and principle of operation.
50.50.4	Describe typical gear warning systems and explain their operating principles.
50.50.6	Describe the protection device to avoid gear retraction on ground.
50.50.8	Describe various methods for emergency gear extension.
50.50.10	Describe basic principle of operation of wheel brake units.
50.50.12	Describe the operating principle of the park brake system.
50.50.14	Explain the function of brake wear indicators.
50.52	**Transmission systems**
50.52.2	State the purpose of a rotor brake.
50.52.4	State the purpose and describe the principle of operation of the swashplate (control orbit).
50.52.6	Explain the procedures and reasons for the laboratory analysis of transmission oil samples.
50.52.8	State the reason for employing chip detectors in the transmission.
	Rotor Systems
50.54	**Main rotor systems**
50.54.2	Explain the reason for sweepback design near main rotor blade tips.
50.54.4	Explain the reason for washout in the design of main rotor blades.
50.54.6	Explain the advantages of employing a “delta-three hinge” in a fully articulated rotor system.
50.54.8	Explain the purpose of employing an “offset pitch horn” in a rotor system.
50.54.10	Explain the normal methods of trimming controls in a helicopter.
50.54.12	Describe the various methods of rotor stabilisation.
50.54.14	Describe the various types of vibration which may occur in a helicopter and explain their causes and possible remedies.
50.54.16	Describe the design feature employed to reduce vibration in rotor systems.

SubTopic	Syllabus Item
50.56	**Tail rotor systems**
50.56.2	Explain the advantages and disadvantages associated with shrouded (Fenestron) tail rotors.
50.56.4	Describe alternate methods of anti-torque control.
50.56.6	Describe the effect of a jammed or failed tail rotor.
50.58	**Automatic flight control systems**
50.58.2	Explain the function and operating principle of helicopter flight controls.
50.58.4	Explain the function and operating principle of a 'fly-by-wire' flight control system.
50.58.6	Explain how redundancy is obtained in flight control systems.
50.58.8	Explain the effect of a complete hydraulic system failure on flight control.
50.58.10	Explain the purpose of 'feel systems' in flight controls.
50.58.12	Explain the function and operating principle of an automatic flight control system (AFCS).
50.58.14	Describe the use of the automatic flight control system control panel and the operational modes available.
50.58.16	Describe the inputs, controls, indications and warnings of an automatic flight control system.
50.58.18	Explain the function and operating principle of flight envelope protection.
50.58.20	Describe the inputs, indications and warnings of flight envelope protection.
50.58.22	Describe the functions of the Full Authority Digital Engine Control (FADEC)
50.60	**Hydraulics**
50.60.2	Calculate the force generated, given hydraulic piston sizes and system pressure.
50.60.4	Describe the function and operating principle of the following: (a) bypass valve (b) selector valve (c) fuse (d) standpipe.
50.60.6	Explain how redundancy is obtained in hydraulic systems.
50.60.8	Describe the instruments for monitoring the hydraulic system.
50.60.10	Describe the warnings associated with the hydraulic system.
50.60.12	Describe the trends in hydraulic system design.
50.62	**Electrical systems**
50.62.2	Explain the meaning of the various measures of electrical power.
50.62.4	Calculate battery life given rating and voltage, and system load.
50.62.6	Explain the method of calculating power consumption in an electrical circuit.
50.62.8	Explain the function and operating principle of: (a) a transformer-rectifier (b) an inverter (c) a rectifier

SubTopic	Syllabus Item
	(d) an inductor
	(e) a commutator
50.62.10	Explain the relative advantages and disadvantages of AC and DC systems.
50.62.12	Explain the function and operating principle of a constant speed generator drive (CSGD).
50.62.14	Explain the function and operating principle of an integrated drive generator (IDG).
50.62.16	Explain the consequences of an IDG mechanical disconnect during flight.
50.62.18	Explain the function and operating principle of a variable speed constant frequency (VSCF) drive.
50.64	**Environmental control systems**
50.64.2	Describe the function and principle of operation of a cabin air-conditioning system.
50.64.4	Describe the controls, indications and warnings of a cabin air-conditioning system.
50.66	**Ice, rain and particle protection**
50.66.2	Describe the function and operating principles of the following types of ice protection systems:
	(a) bleed air thermal
	(b) electrical.
50.66.4	Describe the effects of ice protection system operation on engine performance.
50.66.6	Explain the proper handling of ice protection systems.
50.66.8	Describe the operating principles of ice detectors.
50.66.10	Describe the effect of airframe, rotor and engine icing on the ground and in flight.
50.66.12	Describe windscreen heating and rain clearance systems.
	Instruments
50.68	**Ring laser gyro**
50.68.2	Describe a ring laser gyro and compare it with a conventional gyro.
50.68.4	With the aid of a diagram, explain the principle of operation of a ring laser gyro.
50.68.6	State the pilot checks for serviceability.
50.70	**Air data computer (ADC)**
50.70.2	State the purpose of the air data computer.
50.70.4	Explain the operating principle of the air data computer.
50.70.6	Describe the ADC inputs, outputs and the supplied units.
50.70.8	With the aid of a diagram, describe the processing of the input data of an ADC.
50.70.10	Explain the backup functions of the air data computer in the case of a pressure source blockage.
50.70.12	Describe the effect of loss of input/output signal of the ADC to the pilot's instrument indication.
50.72	**Air temperature gauge**
50.72.2	Define and compare the following temperatures:
	(a) Total Air Temperature (TAT).

SubTopic	Syllabus Item
	(b) Static Air Temperature (SAT).
	(c) Outside Air Temperature (OAT).
	Integrated Flight Instrument Systems
50.74	**Flight director (FD)**
50.74.2	Explain the purpose of the flight director computer.
50.74.4	Explain the operating principle of the flight director computer.
50.74.6	Interpret the information provided by the split cue and integrated cue flight director command bars.
50.74.8	List the performance and navigation parameter guidance provided by the flight director.
50.74.10	Explain the function of the flight mode annunciator.
50.74.12	Describe the task of the gain programme in the approach mode.
50.76	**Electronic flight instrument system (EFIS)**
50.76.2	Explain the operating principle of the EFIS
50.76.4	Describe the inputs available to a typical EFIS.
50.76.6	Describe the outputs from a typical EFIS.
50.76.8	State the function and describe the operation of the EFIS control panel.
50.76.10	Given appropriate drawing of a typical aircraft installation, explain the EFIS function and information interchange.
50.76.12	Describe the switching options in case of EFIS display failure.
50.76.14	Describe the function of the Electronic Attitude Director Indicator/Primary Flight Display (EADI/PFD).
50.76.16	Identify the information available on the EADI/PFD.
50.76.18	Describe the colour coding on the EADI/PFD.
50.76.20	Describe the function of the Electronic Horizontal Situation Indicator/Navigation Display (EHSI/ND).
50.76.22	Name the typical display modes for EHSI/ND.
50.76.24	Given suitable diagrams of instrument presentation, use an EHSI/ND to determine an aircraft's track, position and/or orientation.
50.76.26	Identify the information available in the different modes of the EHSI/ND.
50.76.28	Describe the colour coding on the EHSI/ND.
50.78	**Electronic engine displays (ECAM, EICAS)**
50.78.2	Explain the purpose of the Electronic Centralized Aircraft Monitoring (ECAM) system and Engine Indication and Crew Alerting System (EICAS).
50.78.4	Describe the information available from an ECAM/EICAS system.
50.78.6	Describe the inhibiting functions in relation to different flight phases.
50.78.8	Describe the display units (DU) of ECAM/EICAS System.
50.78.10	Interpret the important colours used by the DU's.
50.78.12	State the redundancy provisions, in the case of a DU failure.

SubTopic	Syllabus Item
50.80	**Flight management system (FMS)**
50.80.2	Describe the two primary functions of a Flight Management System (FMS).
50.80.4	Explain the operating principle of an FMS.
50.80.6	Describe the main components of an FMS.
50.80.8	Explain the function and operating principle of the attitude heading reference system (AHRS).
50.80.10	Explain how pilots interface with an FMS.
50.80.12	Describe the inputs the FMS accesses to achieve the navigation function.
50.80.14	Explain how the FMS achieves its performance functions in the various modes.
50.80.16	Explain how the flight guidance functions are achieved.
50.80.18	Describe how the FMS functions are monitored.
	Warning and Recording Systems
50.82	**Master warning system**
50.82.2	Explain the function of a master warning system.
50.82.4	Explain the operating principle of a master warning system.
50.82.6	Explain the meaning of the following four degrees of urgency: (a) warnings (b) cautions (c) advisories (d) status messages.
50.82.8	Explain and give examples of: (a) visual alerts (b) aural alerts.
50.82.10	Explain the reasons for inhibiting alerts.
50.84	**Altitude alerter system**
50.84.2	Explain the function of an altitude alerter system.
50.84.4	Describe how to operate the altitude alerter system and how to interpret the information.
50.84.6	Describe the comparative relationship between the selected altitude and the actual altitude.
50.84.8	Explain how the system is monitored.
50.86	**Radar altimeter**
50.86.2	State the function of a radar altimeter.
50.86.4	Explain the principle of operation of the radar altimeter.
50.86.6	Identify the frequency band in which the radar altimeter operates.
50.86.8	State the purpose of the decision height warning light.
50.86.10	Describe the operator control options for a radio altimeter.
50.86.12	State the maximum range for indication.
50.86.14	List instruments or units which receive altitude information from the radio altimeter.

SubTopic	Syllabus Item
50.86.16	Describe the errors of the radio altimeter.
50.88	**Rotor overspeed / underspeed warning**
50.88.2	Explain the function of the rotor overspeed/underspeed warning system
50.88.4	Explain the principle of operation of the rotor overspeed/underspeed warning system.
50.88.6	Describe the inputs and outputs of the rotor overspeed/underspeed warning system.
50.90	**Automatic engine data recording system (AEDRS)**
50.90.2	Explain the purpose and function of the AEDRS.
50.90.4	Explain the method of downloading information from the AEDRS.
50.90.6	Describe the method of actuation of the AEDRS.
50.92	**Terrain awareness and warning system (TAWS)**
50.92.2	Describe the function of the terrain awareness and warning system.
50.92.4	Explain the principle of operation of TAWS.
50.92.6	Identify the standard TAWS warning profiles.
50.92.8	List and describe the different warning modes.
50.92.10	Explain the relationship between TAWS and EFIS navigation displays.
50.94	**Aircraft collision avoidance system (ACAS)**
50.94.2	Describe the function of the ACAS.
50.94.4	Explain the principle of operation of ACAS.
50.94.6	Identify the equipment with which an intruder must be fitted in order to be detected by ACAS.
50.94.8	Describe the appropriate ACAS graphic symbols.
50.94.10	Define a Resolution Advisory (RA) and a Traffic Advisory (TA).
50.94.12	State the minimum equipment requirements for the issuing of a Resolution Advisory and a Traffic Advisory.
50.94.14	Describe the proximity requirements for the issuing of a Resolution Advisory and a Traffic Advisory.
50.94.16	Describe ACAS “escape manoeuvres”.
50.94.18	State how many “escape manoeuvres” ACAS equipment can calculate simultaneously.
50.96	**Fire warning and protection systems**
50.96.2	Describe the indications of typical fire warning systems.
50.96.4	Describe the principles, features and parameters of typical fire protection systems.
50.96.6	Describe the operation of unit-type and continuous loop fire detectors.
50.96.8	Describe common fire extinguishing systems and the limitations with their use.
50.96.10	List the common extinguishing agents and state any precautions with their use.
50.96.12	Describe the various types of fire likely to occur on a helicopter and the preferred extinguishing agents for each.
50.98	**Flight data recorder**
50.98.2	Explain the purpose of the flight data recorder.

SubTopic	Syllabus Item
50.98.4	Describe the parameters that are recorded by the flight data recorder.
50.98.6	Describe how data from the flight data recorder can be accessed.
50.100	**Cockpit voice recorder**
50.100.2	Explain the purpose of the cockpit voice recorder.
50.100.4	Describe the parameters that are recorded by the cockpit voice recorder.
50.100.6	Describe how data from the cockpit voice recorder can be accessed.

Subject No. 41 ATPL Flight Planning (Helicopter)

Each subject has been given a subject number and each topic within that subject a topic number. These reference numbers will be used on knowledge deficiency reports and will provide valuable feedback to the examination candidate.

SubTopic	Syllabus Item
41.2	**Definitions terminology and abbreviations**
41.2.2	Define:

(a) track required
(b) true and magnetic track
(c) wind velocity (W/V)
(d) wind angle
(e) wind correction angle (WCA)
(f) head wind
(g) tail wind
(h) cross wind
(i) true heading
(j) magnetic heading
(k) compass heading
(l) drift (planned & actual)
(m) track made good (TMG)
(n) port
(o) starboard
(p) fixed reserve (FR)
(q) variable reserve (VR)
(r) dead (deduced) reckoning
(s) track error (TE)
(t) closing angle (CA)
(u) visual flight rules (VFR).
(v) instrument flight rules (IFR)
(w) alternate (ALTN)
(x) minimum flight altitude (MFA)
(y) one engine inoperative (OEI)
(z) point of no return (PNR)
(aa) critical point/equi-time point (CP/ETP)
(bb) point of no return - one engine inoperative (PNR/OEI)
(cc) critical point - one engine inoperative (CP/OEI)
(dd) pressure altitude (PA)
(ee) density altitude (DA)
(ff) estimated time of departure (ETD)

SubTopic	Syllabus Item
	(gg) actual time of departure (ATD)
	(hh) estimated elapsed time (EET)/estimated time interval (ETI)
	(ii) estimated time of arrival (ETA) and
	(jj) actual time of arrival (ATA).
41.4	**Route selection**
41.4.2	Describe the factors to be considered when selecting a VFR cross-country navigation route.
41.4.4	Describe the factors to be considered when selecting an IFR cross-country navigation route.
41.4.6	Describe the factors to be considered when selecting altitudes at which to fly in the cruise.
41.4.8	Determine the most fuel efficient cruise altitude.
41.4.10	Describe the factors to be considered when selecting alternate routes and destination alternates.
41.6	**Navigation plan preparation**
41.6.2	Derive, from sample Company Operations Manual data, the following:
	(a) TAS
	(b) climb speeds and time allowances
	(c) descent speeds and time allowances.
41.6.4	Interpret and assess meteorological information contained in:
	(a) area forecasts (ARFOR)
	(b) meteorological reports (METAR/SPECI)
	(c) trend forecasts (TTL)
	(d) aerodrome forecasts (TAF)
	(e) SIGMET
	(f) special aerodrome reports (SPAR)
	(g) automatic terminal information service (ATIS)
	(h) aerodrome and weather information broadcast (AWIB)
	(i) (i) basic weather reports (BWR).
41.6.6	Complete flight plan calculations for an IFR cross-country flight, including:
	(a) top of climb point
	(b) level cruise portion
	(c) top of descent point
	(d) TAS
	(e) tracks
	(f) pressure altitudes
	(g) density altitudes
	(h) estimated wind velocities
	(i) estimated temperatures

SubTopic	Syllabus Item
	(j) headings
	(k) groundspeeds
	(l) distances
	(m) EETs
	(n) ETAs.
41.8	**Fuel planning**
41.8.2	Derive, from sample Company Operations Manual data, the following:
	(a) fuel capacities – useable
	(b) standard fuel flows
	(c) standard fuel allowances.
41.8.4	Calculate, using sample Company Operations Manual data, the following:
	(a) fuel flow for a given leg/flight
	(b) expected fuel burn off, on a given leg, two engines operating and one engine inoperative (OEI)
	(c) minimum reserve fuel for a given flight
	(d) minimum fuel required on a given flight
	(e) maximum holding time
	(f) specific air range
	(g) fuel required to the CP/ETP
	(h) fuel required from the CP/ETP to the departure, destination or alternate.
41.10	**En-route diversion calculations**
41.10.2	Calculate:
	(a) time and distance to the point of no return (PNR)
	(b) time and distance to the critical point/equi-time point (CP/ETP).
41.10.4	Estimate position following diversion off track.

Subject No. 51 ATPL Performance and Loading (Helicopter)

Each subject has been given a subject number and each topic within that subject a topic number. These reference numbers will be used on knowledge deficiency reports and will provide valuable feedback to the examination candidate.

Sub Topic	Syllabus Item
	Helicopter Performance
51.2	**Definitions Terminology and Abbreviations**
51.2.2	Explain the meaning of the following:

(a) alternate (ALTN)
(b) best rate of climb (Vy or BROC)
(c) best rate of climb - single engine (Vyse or BROC)
(d) Category A operations
(e) Category B operations
(f) clearway
(g) continued take-off (CTO)
(h) continued take-off distance (CTOD)
(i) critical decision point (CDP)
(j) density altitude (DA)
(k) elevation (ELV, ELEV or Elev)
(l) engine air particle separator (EAPS)
(m) fpm
(n) HW
(o) in ground effect (IGE)
(p) instrument flight rules (IFR)
(q) landing decision point (LDP)
(r) mean sea level (MSL)
(s) minimum flight altitude (MFA)
(t) one engine inoperative (OEI)
(u) outside air temperature (OAT)
(v) out of ground effect (OGE)
(w) pressure altitude (PA)
(x) QNH
(y) rate of climb (ROC)
(z) rate of descent (ROD)
(aa) rejected take-off (RTO)
(bb) rejected take-off distance (RTOD)
(cc) RWY
(dd) stopway
(ee) take-off safety speed (V2 or VTOSS)

Sub Topic	Syllabus Item
	(ff) TW
	(gg) visual flight rules (VFR).
51.4	**Factors of performance**
51.4.2	Explain the effect of altitude on a helicopter's performance.
51.4.4	Given the elevation and QNH of a location, calculate the pressure altitude.
51.4.6	Given a standard altimeter, determine the pressure altitude.
51.4.8	Given the pressure altitude and air temperature of a location, calculate the density altitude.
51.4.10	Given the elevation of a location, air temperature deviation from ISA, and QNH, calculate the ambient temperature.
51.4.12	Explain the effect of a change in air temperature on the power required to hover IGE or OGE.
51.4.14	Explain the effect of humidity on a helicopter's performance.
51.4.16	Describe the effect of a change in humidity on the density altitude of a location.
51.4.18	Explain the effect of the following on a helicopter's performance: (a) aircraft gross weight (b) external stores and loads (c) the wind.
51.4.20	Calculate the headwind and/or crosswind components, given wind velocity and the helicopter's flight path.
51.6	**Derivation of operational performance standards**
51.6.2	Derive, from sample Company Operations Manual data, the following: (a) the factors which limit the maximum take-off weight (b) the maximum gross take-off weight limitation, for day VFR operations (c) the en-route performance capability, for day VFR operations (d) the approach and landing performance capability, for day VFR operations (e) the maximum gross take-off weight limitation, for IFR and night VFR operations (f) the en-route performance capability, for IFR and night VFR operations (g) the approach and landing performance capability, for IFR and night VFR operations (h) the meaning of "OEI configuration" (i) the missed approach climb gradient capability, for IFR and night VFR operations (j) the rate of climb required to achieve a net one percent gradient of climb (k) the requirements for a OEI landing area (l) the weight limitations for helideck take-off and landing.
51.8	**Calculation of performance planning information**
51.8.2	Describe the: (a) Category A (Performance Class 1) take-off technique.

Sub Topic	Syllabus Item
	(b) Category B take-off technique.
51.8.4	Calculate the maximum take-off weight (MTOW), restricted by the following performance limitations: (a) Category A (Performance Class 1) operations (b) Category B operations (c) climb gradient restrictions (d) OGE hover capability (e) en-route restrictions (f) landing restrictions, both Categories A and B.
51.8.6	Calculate the critical decision point (CDP) and take-off safety speed (V2/VTOSS), given the available field length and conditions.
51.8.8	Calculate the rejected take-off (RTO) and continued take-off (CTO) distances, in given conditions.
51.8.10	Calculate the required field length, at a given take-off weight and conditions, using the Category A (Performance Class 1) take-off technique.
51.8.12	Calculate the take-off distance required, at a given take-off weight and conditions, using the Category B take-off technique.
51.8.14	Calculate the payload available given a performance limited take-off weight.
51.8.16	Calculate the climb performance capability of a helicopter: (a) two engines operating at maximum continuous power (b) two engines operating at normal cruise power (c) one engine inoperative (OEI) at 2½ minute power at take-off safety speed (d) one engine inoperative (OEI) at maximum continuous power.
51.8.18	Calculate the maximum weight, at a given pressure altitude, temperature and configuration, that a helicopter is capable of hovering OGE with two engines operating.
51.8.20	Calculate the maximum pressure altitude, at a given weight, temperature and configuration, that a helicopter is capable of hovering OGE with two engines operating.
51.8.22	Calculate the maximum cruise weight, at a given pressure altitude, configuration and conditions.
51.8.24	Describe the: (a) Category A (Performance Class 1) landing technique (b) alternate Category A landing technique (c) Category B landing technique.
51.8.26	Calculate the landing distance for a helicopter operating to: (a) Category A (Performance Class 1) landing technique (b) Category B landing technique.
51.8.28	Calculate the landing weight for a helicopter operating to: (a) Category A (Performance Class 1) landing technique (b) Category B landing technique.

Sub Topic	Syllabus Item
51.8.30	Given a typical height/velocity diagram derive, for a given airspeed, the band of heights from which a forced landing is not possible following an engine failure.
51.8.32	Explain the effects of the following on the size and shape of the avoid area of a height/velocity diagram: (a) gross weight (b) altitude (c) density altitude (d) parasite drag (e) carriage of a sling load.
	Helicopter Weight and Balance
51.10	**Definitions terminology and abbreviations**
51.10.2	Explain the meaning of the following: (a) arm (moment arm) (b) datum (c) moment (including units used) (d) centre of gravity (CofG or CG) (e) centre of gravity range and limits (f) longitudinal centre of gravity (g) lateral centre of gravity (h) station (i) index units (j) floor limits (k) loading zones (l) approved load control system (m) basic empty weight/aircraft empty weight (AEW) (n) empty weight centre of gravity position (o) basic operating weight/aircraft prepared for service weight (APS) (p) operating empty weight (OEW) (q) payload (commercial load) (r) zero fuel weight (ZFW) (s) ramp weight (RW) (t) gross weight (GW) (u) take-off weight (TOW) (v) maximum take-off weight (MTOW) (w) landing weight (LW) (x) maximum landing weight (MLW) (y) useable fuel (z) fuel on board (FOB) (aa) fuel burn off (FBO)

Sub Topic	Syllabus Item
	(bb) (ab) centre of gravity envelope
	(cc) (ac) the specific gravity and the weight of Jet A-1.
51.12	**Weight**
51.12.2	Explain the effect of operating a helicopter outside of its weight limits.
51.12.4	Solve the following loading problems: (a) calculate the take-off weight of a helicopter (b) calculate the landing weight of a helicopter (c) calculate the landing weight limited take-off weight (d) calculate the weight of a given volume of fuel, given the fuel's specific gravity (e) convert between US gallons and litres (f) convert between pounds and kilograms (g) calculate the payload available given a maximum take-off weight (h) calculate the payload available given a maximum zero fuel weight (i) calculate the allowable load in various compartments.
51.14	**Centre of gravity**
51.14.2	Explain the principles of helicopter balance.
51.14.4	Explain the effect of operating a helicopter outside of the centre of gravity limits.
51.14.6	Calculate the aircraft empty weight (AEW) and centre of gravity details, given an alteration to the helicopter's configuration.
51.14.8	Calculate the longitudinal centre of gravity position for a helicopter: (a) at take-off (b) at any time during flight (c) on landing.
51.14.10	Calculate the lateral centre of gravity position for a helicopter: (a) at take-off (b) at any time during flight (c) on landing.
51.14.12	Plot a helicopter's longitudinal centre of gravity position on a graph showing the centre of gravity limits.
51.14.14	Explain the effect of external sling loads on the centre of gravity position.
51.14.16	Explain the effect of external winch loads on the centre of gravity position.
51.14.18	Solve the following loading problems: (a) loading or offloading weight and find a new centre of gravity position (b) loading or offloading weight to place the centre of gravity at a given station (c) loading or offloading weight at a given station without exceeding centre of gravity limits (d) moving weight from one station to another and finding new centre of gravity position.
51.14.20	Explain the likely effect of fuel burn on the centre of gravity position.

Sub Topic	Syllabus Item
51.14.22	Calculate the movement of centre of gravity due to fuel burn off.
51.14.24	Explain the likely effect of a displaced lateral centre of gravity on the position of the cyclic control.

APPENDIX IV—ATPL Aeroplane Flight Test Syllabus

Acceptable performance parameters for the issue of an ATPL(A), are those published in the CAA "Flight Test Standards Guide ATPL Issue-Aeroplane".

Flight test syllabus

General requirements

The test is to include an oral general knowledge test followed by a pilot competency test. Failure to pass in any item of the test may result in the applicant and the instructor (where applicable) being advised of the failure aspects and the further training believed necessary before a further flight test may be undertaken.

An ATPL(A) issue flight test includes all elements of the instrument rating, is conducted over a route of at least 50 nm and is to include a diversion to an alternate.

The candidate is to demonstrate a professional attitude to aviation by arriving punctually for

The candidate is to present, for the examiner's inspection, their summarised and certified pilot log book, written exam credits, knowledge deficiency reports the flight test, suitably attired and fit for flying. (KDRs) improvement content listed against rule references and certified, current AIPNZ Volume 1,2 and 3 and appropriate charts or the Jeppesen equivalent.

Aeroplane equipment and facilities required for the flight test

The aeroplane is to be a multi-engine aeroplane of at least 5700 kilograms MCTOW or a multi-engine aeroplane which the Director has approved as performing to the equivalent operational standard as an aeroplane used in airline operations with:

- fully functioning dual flight controls
- those instruments essential to the manoeuvres planned to be demonstrated during the flight visible to both pilots without excessive parallax error
- at least three-point lap-and-sash harness
- intercommunication equipment of an approved type
- an acceptable means of simulating instrument flight.

All or selected manoeuvres may be demonstrated by means of a flight simulator approved for that purpose by the Director.

In all cases, the aircraft is to be at a weight that will give a positive indication of the candidate's competency to fly the aircraft in the most adverse configuration appropriate to the manoeuvre being demonstrated.

The candidate is to provide adequate and private facilities for briefing prior to and after the flight test.

General knowledge test

In the following areas the candidate will:

Licence privileges

- Demonstrate a sound knowledge of ATPL privileges and currency requirements.

Aircraft documents

- Demonstrate a sound knowledge of the certificate of airworthiness, aircraft technical log, flight manual and associated pilot's operating handbook.

Meteorology

- Obtain and analyse, aviation meteorological information including ARFOR's, SIGWX , wind and temperature charts, TAFs, METARS, SPECIs and SIGMETs and apply it to the planned flight.
- Make a sound decision, based on all available pre-flight planning data, whether or not to proceed with the flight.

Operational environment

- Apply knowledge and use of the AIP volumes 2/3 and appropriate charts, or the Jeppesen equivalent, combined with NOTAMs and AIP supplement information (including RAIM prediction where applicable) to the proposed flight so as to make a sound decision whether or not to proceed with the flight.

Flight planning

- Prepare an operational flight plan, at appropriate IFR cruising levels, over a route of at least 50 nm along promulgated routes between two aerodromes (at least one of which is controlled) and to include consideration of a suitable alternate.

Fuel management

- Accurately calculate fuel requirements including reserves and contingency for an air transport operation under IFR in accordance with Part 121/125.
- Establish fuel on board, accurately calculate endurance and reserves and operate the fuel system in accordance with the *Aircraft Flight Manual*.

Aircraft performance and limitations

- Demonstrate a sound knowledge of the effect of environmental conditions on aeroplane performance and the application of the performance charts in relation to air transport operations under Part 121/125.
- Accurately calculate the take-off and landing distances relating to air transport operations considering density altitude, wind, terrain and other relevant conditions.
- Demonstrate a sound knowledge of the aircraft's limitations and performance requirements in respect to departure, en-route and instrument approach requirements.

Aircraft loading

- Demonstrate a sound knowledge of the aircraft's weight limitations, including fuel, payload, load distribution and security.
- Accurately calculate the centre of gravity position for take-off and landing.

Aircraft airworthiness and technical documentation

- Exhibit knowledge of the airworthiness certificate, technical log, flight manual and associated operations manual and evaluate the airworthiness state of the aircraft.

External pre-flight inspection

- Demonstrate a sound knowledge of the aeroplane type by completing the external pre-flight inspection in accordance with the *Aircraft Flight Manual* or organisation's documentation.

Cockpit preparation

- Demonstrate the pre-flight cockpit preparation and flight management system initialisation, data insertion and confirmation (if applicable) in accordance with the *Aircraft Flight Manual* or organisation's documentation.

Crew briefings (conduct and quality)

- Establish an environment for open interactive communication with emphasis on the importance of questioning, offering information and critique.
- Establish a "team concept" for the management of the flight including the operation of automated systems and the division of labour.
- Cover pertinent safety and operational issues, identifying potential problems, provide guidelines for crew actions and include cabin crew as part of the team (if applicable).

Engine start

- Perform the normal engine start procedure and complete the required checklists in accordance with the *Aircraft Flight Manual* or the organisation's documentation.
- Recognise an abnormal start and/or demonstrate the actions required in the event of an abnormal start or engine fire.

Taxi

- Perform brake and instrument serviceability checks, control speed, recognise hazards, check and position controls for the existing wind conditions (as appropriate) and park at the holding point in accordance with the *Aircraft Flight Manual* and recommended practices.

Pre-take-off and pre-departure preparation

- Demonstrate knowledge of the crosswind, cloud base and visibility limitations for take-off.
- Complete all appropriate pre-take-off procedures, establish that the cabin is secure, obtain clearances (as required) and provide an appropriate crew pre-take-off briefing including go/no-go criteria.

Take-off roll

- Complete line up checks in accordance with the aircraft's checklist ensuring the correct runway is being used and that the approach, runway and take-off path are clear.
- Track the runway centreline, recognise and acknowledge the go/no-go decision point, rotate at the recommended Vr to establish the appropriate pitch attitude for the recommended climb and trim the aircraft.

Rejected take-off

- Recognise an abnormal situation (actual or simulated) which necessitates a rejected take-off and carry out the appropriate emergency procedure, maintaining control of the aircraft and reducing speed to stop within the ASDA.
- Make use of the QRH to follow up the recall emergency actions and nominate an appropriate plan of action.

Engine failure at or after V_1

- Recognise an engine failure, correctly identify which engine has become inoperative and maintain directional control of the aircraft.
- Set appropriate power on the remaining engine(s) to ensure adequate performance whilst flying an appropriate airspeed and carry out the appropriate emergency procedure using the aircraft's emergency checklist or QRH to follow up the recall emergency actions and subsequently nominate an appropriate plan of action.

Transition to instrument flight and initial climb

- Transition from visual flight to instrument flight at the published IFR take-off minima.

Instrument departure procedures

- Depart in accordance with the promulgated SID, departure procedure or ATS instructions.

Climb procedures

- Comply with IFR en-route climb procedures, and applicable altimeter settings.
- Maintain required tracks, report position as applicable to ATS and maintain an in-flight navigation, fuel and radio log.

Cruise procedures

- Comply with IFR en-route cruise procedures, maintain track, make appropriate position reports and maintain an in-flight navigation, fuel and radio log.

Descent, approach and landing preparation

- Obtain appropriate weather and operational information relating to the descent, approach and landing.
- Calculate an appropriate top of descent point and review endurance and fuel reserves.
- Review and brief the appropriate arrival, approach, landing, missed approach, holding, diversion and ground taxi procedures (as applicable).

Descent procedures

- Comply with IFR en-route descent procedures, and applicable altimeter settings.
- Maintain required tracks, report position as applicable to ATS and maintain an in-flight navigation, fuel and radio log.

Holding

- Enter a holding pattern in accordance with the standard sector entry, within the applicable speed range, at or above the minimum holding altitude.
- Use the lesser of a rate one turn or 25º angle of bank in the hold and adjust the outbound leg to compensate for drift as required to achieve the inbound leg (but not beyond any DME limiting distance).

Initial approach procedures

- Anticipate and identify station passage, configure the aircraft appropriately to the approach category or class (as applicable) and establish on the DME/GPS arc or complete the procedure turn including timing (as applicable).
- Maintain the required track and descent profile in accordance with ATS clearances and/or approach limits.

Radar vectoring for an approach

- Position the aircraft under radar vectoring, to a predetermined position or fix in an appropriate configuration, to intercept a specified track whilst maintaining orientation by monitoring other navigation aids.

Precision approach

- Demonstrate an ILS approach in accordance with published procedures, tracks and descent profile.
- Configure the aircraft to achieve an appropriate final approach speed so that a landing could be made and commence the go-around (if applicable) from not below DA/H.

Non-precision approach

- Demonstrate a non-precision approach in accordance with published procedures, tracks and descent profile.
- Configure the aircraft to conform with the appropriate approach category so that a landing could be made and commence the go-around (if applicable) no later than the designated missed approach point.

Instrument approach to circle visually for approach and landing

- Transition from an instrument approach to a visual circuit, for a landing on a runway at least 80º to the instrument final approach track, within the published visibility minima and in a configuration appropriate to visual manoeuvring, so as to maintain visual reference at the circling minima for the category of aircraft and aerodrome concerned.

One engine inoperative performance

- Maintain control of the aircraft after the failure of an engine, prior to or during an approach, and complete the approach.
- Use checklists to follow up memory/recall items and make radio calls as appropriate.
- Initiate a one engine inoperative missed approach from the minimum descent altitude in accordance with the published procedure.
- Subsequently demonstrate an appreciation of the effect of an engine failure on the aircraft's performance by nominating an appropriate plan of action.

Missed approach procedure

- Perform a missed approach when required and in accordance with the published missed approach procedure.

Diversion procedures

- Initiate a diversion (as required) with due regard to available fuel, ATS requirements and alternate weather.

Normal landing

- Demonstrate knowledge of the cloud base and visibility limitations for a normal landing. Use flap as applicable and achieve the nominated target threshold speed.

Crosswind landing

- Demonstrate knowledge of the aircraft's crosswind limitations and the ability to assess the crosswind component.
- Demonstrate a crosswind landing (up to the aircraft's maximum), achieve the nominated threshold target speed and correct for drift to touch down aligned with the runway.

One engine inoperative landing

- Demonstrate a one engine inoperative landing using flap as applicable, and achieve the nominated target threshold speed.

Taxi to parking

- Reconfigure the aircraft appropriately once clear of the active runway and perform a brake check prior to entering the parking area.
- Park the aircraft with due regard to marshalling directions, wind direction and other aircraft or objects (as applicable).

Engine shutdown and securing the aircraft

- Complete the shutdown procedure in accordance with the *Aircraft Flight Manual* or checklist, supervise the passengers (if appropriate), secure the aircraft (as applicable) and complete all post flight documentation.

Crew self-evaluation (debriefing/operational review/critique)

- Debrief at an appropriate time, involving the entire crew (where appropriate) to give constructive, specific, objective feedback (including positive and negative aspects) based on observable behaviour.
- Accept critique objectively and non-defensively.

Threat and error management (TEM)

- Recognise, assess and manage potential threats in the performance of various tasks, in accordance with TEM techniques.
- Follow SOPs with evident situational awareness to avoid or trap errors which may occur in the performance of various tasks, in accordance with TEM techniques.
- Apply strategies which mitigate the effects of errors that occur, in accordance with TEM techniques.

Communications process and decision making (inquiry/advocacy/assertion)

- Encourage questions regarding crew actions and decisions, answer questions openly and non-defensively, seek information from others, question the status and programming of automated systems, develop a challenge and response environment and persist appropriately until there is a clear resolution and decision.

Communications process and decision making (communications/decisions)

- State operational decisions to other crew members, acknowledge decisions made by other crew members and share the overall situational status with all crew members and/or others (as appropriate).
- Provide an atmosphere conducive to open and free communication and encourage crew members to state their own ideas, opinions and recommendations.
- Verbalise and acknowledge all entries and changes to automated systems.

Team building (leadership/followership/concern for tasks)

- Utilise all available resources and manage time available to achieve the most effective operation possible.
- Coordinate flight deck activities to establish and maintain a proper balance between authority and assertiveness whilst acting decisively when the situation requires.
- Recognise and deal with the demands on resources posed by automated systems when programming could reduce situational awareness or create work overload.

Team building (interpersonal relationships/group climate)

- Demonstrate the ability to remain calm under stressful conditions and adapt to other crew members personalities and personal characteristics.
- Ensure the appropriate group climate is established and maintained and recognise the effect of stress on fatigue and performance.
- Recognise the symptoms of stress and fatigue in self and other crew members and during times of low communication keeps a check on crew members.

Workload management and situational awareness (preparation/planning/vigilance)

- Demonstrate situational awareness by sharing the "model" of what is happening with other crew members and monitor all instruments and communications, sharing relevant information with the rest of the crew.
- Demonstrate awareness of the effects of stress on vigilance, monitor the performance of crew members and avoid "tunnel vision" by stating or asking for the "big picture".
- Include all crew members in the planning process to prepare for contingency situations (approaches, weather) and verbally ensure appropriate crew are aware of the plan.
- Provide sufficient time for the programming of automated systems and ensure all relevant crew members are aware of the status and changes to automated systems.

Workload management and situational awareness (work distribution/distraction avoidance)

- Distribute tasks and communicate priorities to maximise efficiency. Admit and report work overloads and recognise overloads in others.
- Prioritise secondary operational tasks and ensure that non-operational interaction does not interfere with necessary tasks.
- Recognise the potential for distractions posed by automated systems and take appropriate preventative action.

Communications with cabin crew, company and passengers

- Communicate relevant information to cabin crew, company and passengers when appropriate.

Completion of checks and use of checklists

- Use appropriate checklists as applicable to the phase of flight.

ATS procedures and compliance

- Obtain ATIS information when appropriate (if available) and obtain, record, read back and comply with clearances and ATS instructions when applicable.

RTF procedures

- Listen to communications from ground and other aircraft and use the aircraft's radio to communicate clearly and concisely using appropriate aeronautical phraseology at all times with appropriate assertiveness.
- Tune, test and operate the aircraft's transponder as required.

Loss of communications procedure

- Demonstrate knowledge of the procedure to be followed in the event of a communications failure during various phases of flight.

Aircraft handling by reference to instruments

- Demonstrate straight and level flight and turning manoeuvres (using an angle of bank appropriate to the procedure or manoeuvre) with smooth and coordinated control applications whilst maintaining the nominated climb and descent airspeed, heading (as applicable) and balanced flight.

Use of automation

- Carry out auto pilot serviceability checks, effectively utilise the autopilot and monitor its performance in flight.
- State (at examiner discretion) the limitations and capabilities of the autopilot and recognise autopilot failure in flight.

- Execute an approach using the autopilot and transition to a manual approach at the autopilot limiting altitude and/or initiate the missed approach utilising the autopilot missed approach mode.

Navaid management and tracking

- Tune, identify and test the aircraft's navigational equipment in accordance with company procedures and the manufacturer's instructions.
- Intercept and track specified tracks using the navigation aids fitted to the aircraft.

Systems operation and procedures

- Operate, manage and monitor the aircraft's systems in accordance with the *Aircraft Flight Manual* and/or company procedures.

Management of a systems malfunction

- Identify and interpret indications of a system malfunction and preform the appropriate procedure whilst maintaining control of the aircraft and its flight path.

Emergency equipment

- Demonstrate knowledge of the location, purpose and use of emergency equipment.

Unusual attitudes (upset recovery)

- Demonstrate the ability to recover from unusual attitudes as appropriate to the aircraft size and type.

Management of airborne collision avoidance system (ACAS) advisories

- Interpret and react appropriately to ACAS advisories, preforming the appropriate Resolution Advisory (RA) actions.

Go-around from a ground proximity warning system (GPWS) alert (if applicable)

- Recognise, react appropriately and perform the appropriate recovery actions in response to a GPWS alert.

Recovery from a windshear encounter

- Identify and react appropriately, performing appropriate manoeuvres, to recover from a wind shear encounter.

Knowledge of flight rules

- Demonstrate knowledge of the Civil Aviation Rules pertaining to multi-crew IFR flight in accordance with Part 125 and/or Part 121 air operations.

Adherence to the organisation's standard operating procedures (SOPs)

- Demonstrate knowledge of the organisation's SOPs and the need to adhere to them.
- Demonstrate adherence to the organisation's SOPs and set crew expectations for handling deviations from SOPs.

Lookout in visual meteorology conditions (VMC)

- Maintain a scan, both on the ground and in the air, to maintain separation from other aircraft and terrain during operations in VMC.
- Communicate traffic and terrain information to crew.

APPENDIX V—ATPL Helicopter Flight Test Syllabus

Acceptable performance parameters for the issue of an ATPL Helicopter are those published in the "Flight Test Standards Guide ATPL Issue – Helicopter".

Flight test syllabus

General requirements

The test is to include an oral general knowledge test followed by a pilot competency test. Failure to pass in any item of the test may result in the applicant and the instructor (where applicable) being advised of the failure aspects and the further training believed necessary before a further flight test may be undertaken.

The ATPL (H) issue flight test includes elements of the instrument rating, conducted over a route of at least 25 nm and a visual handling demonstration.

The candidate is to demonstrate a professional attitude to aviation by arriving punctually for the flight test, suitably attired and fit for flying.

The candidate is to present, for the examiner's inspection, their summarised and certified pilot log book, written exam credits, knowledge deficiency reports (KDRs) improvement content listed against rule references and certified, current AIPNZ Volume 1,2, 3 and 4 and appropriate charts or the Jeppesen equivalent.

Helicopter, equipment and facilities required for the flight test

The helicopter is to be multi-engine and approved for IFR operations fitted with:

- fully functioning dual flight controls
- those instruments essential to the manoeuvres planned to be demonstrated during the flight visible to both pilots without excessive parallax error
- at least three-point lap-and-sash harness
- intercommunication equipment of an approved type
- an acceptable means of simulating instrument flight.

All or selected manoeuvres may be demonstrated by means of a flight simulator approved for that purpose by the Director.

In all cases, the helicopter is to be at a weight that will give a positive indication of the candidate's competency to fly the aircraft in the most adverse configuration appropriate to the manoeuvre being demonstrated.

The candidate is to provide adequate and private facilities for briefing prior to and after the flight test.

In the following areas, the candidate will:

Licence privileges

- Demonstrate a sound knowledge of ATPL privileges and currency requirements.

Aircraft documents

- Demonstrate a sound knowledge of the certificate of airworthiness, aircraft technical log, flight manual and associated pilot's operating handbook.

Meteorology

- Obtain and analyse, aviation meteorological information including ARFORs, SIGWX, wind and temperature charts, TAFs, METARS and SPECIs with associated, SIGMETs and apply it to the planned flight.
- Make a sound decision, based on all available pre-flight planning data, whether or not to proceed with the flight.

Operational environment

- Apply knowledge and use of the AIP volumes 2,3, 4 and appropriate charts, or the Jeppesen equivalent, combined with NOTAMs and AIP supplement information (including RAIM prediction where applicable) to the proposed flight so as to make a sound decision whether or not to proceed with the flight.

Flight planning

- Prepare an operational flight plan, at appropriate IFR cruising levels, over a route of at least 25 nm along promulgated routes between two aerodromes/heliports.

Fuel management

- Accurately calculate fuel requirements including reserves and contingency for an air transport operation under Part 135.
- Establish fuel on board, accurately calculate endurance and reserves and operate the fuel system in accordance with the *Aircraft Flight Manual*.

Helicopter performance and limitations

- Demonstrate a sound knowledge of the effect of environmental conditions on helicopter performance and the application of performance charts in relation to air transport operations under Part 135.
- Accurately calculate the Category A take-off and landing distances, IGE and OGE hover ceiling and OEI climb performance relating to air transport operations considering density altitude, wind, terrain and other relevant conditions.
- Demonstrate a sound knowledge of the aircraft's limitations and performance requirements in respect to departure, en-route and instrument approach requirements.

Helicopter loading

- Demonstrate a sound knowledge of the helicopter's weight limitations, including fuel, payload, load distribution and security.
- Accurately calculate the centre of gravity position for take-off and landing.

Helicopter airworthiness and technical documentation

- Exhibit knowledge of the airworthiness certificate, technical log, flight manual and associated operations manual and evaluate the airworthiness state of the helicopter.

External pre-flight inspection

- Demonstrate a sound knowledge of the helicopter type by completing the external pre-flight inspection in accordance with the *Aircraft Flight Manual* or organisation's documentation.

Cockpit preparation

- Demonstrate the pre-flight cockpit preparation and Flight Management System initialisation, data insertion and confirmation (if applicable) in accordance with the helicopter's flight manual or organisation's documentation.

Crew briefings (conduct and quality)

- Establish an environment for open interactive communication with emphasis on the importance of questioning, offering information and critique.
- Establish a "team concept" for the management of the flight including the operation of automated systems and the division of labour.
- Cover pertinent safety and operational issues, identifying potential problems, provide guidelines for crew actions and include cabin crew as part of the team (if applicable).

Engine start

- Perform the normal engine start procedure and complete the required checklists in accordance with the *Aircraft Flight Manual* or the organisation's documentation.
- Recognise an abnormal start and/or demonstrate the actions required in the event of an abnormal start or engine fire.
- Hover manoeuvring/hover taxi/taxi
- Perform brake checks (if applicable) and instrument serviceability checks, recognise hazards and park in accordance with the *Aircraft Flight Manual* and recommended practices.

Pre-take-off and pre-departure preparation

- Demonstrate knowledge of the cloud base and visibility limitations for take-off.
- Complete all appropriate pre-take-off procedures, establish that the cabin is secure, obtain clearances (as required) and provide an appropriate crew pre-take-off briefing including go/no-go criteria.

Take-off—Clear area and/or VTOL Helipad

- Complete line up checks in accordance with the aircraft's checklist ensuring the correct runway is being used and that the approach, runway/FATO and take-off path are clear.
- Recognise and acknowledge the critical decision point, establish the appropriate pitch attitude for the recommended climb and trim the aircraft.
- Fly the Category A and B profiles (as appropriate) in accordance with the flight manual.

Rejected take-off—Clear area and/or VTOL Helipad

- Recognise an abnormal situation (actual or simulated) which necessitates a rejected take-off (prior to CDP) and carry out the appropriate emergency procedure, maintaining control of the helicopter.
- Correctly fly the Category A rejected take-off profile in accordance with the flight manual.
- Reduce the speed of the helicopter to at least taxi speed and to a stop within the RTOD or helipad area.
- Make use of the QRH to follow up the recall emergency actions and nominate an appropriate plan of action.

- Engine failure at or after CDP or Prior to LDP
- Recognise an engine failure, correctly identify which engine has become inoperative and maintain control of the helicopter.
- Set appropriate power on the remaining engine(s) to ensure adequate performance whilst flying an appropriate airspeed and carry out the appropriate emergency procedure using the emergency checklist or QRH to follow up the recall emergency actions and subsequently nominate an appropriate plan of action.

Engine failure after LDP – Clear area and/or VTOL Helipad

- Recognise an engine failure, correctly identify which engine has become inoperative and maintain control of the helicopter.
- Carry out the appropriate procedure, reducing the speed of the helicopter to at least translational speed/termination and well within the RTOD or helipad area (as appropriate).
- Follow up the recall emergency actions and subsequently nominate an appropriate plan of action.

Helicopter handling by reference to instruments

- Demonstrate straight and level flight and turning manoeuvres (using an angle of bank appropriate to the procedure or manoeuvre) with smooth and coordinated control applications whilst maintaining the nominated climb and descent airspeed, heading (as applicable) and balanced flight.

Use of automation (if applicable)

- Carry out auto pilot serviceability checks, effectively utilise the autopilot and monitor its performance in flight.
- State the limitations and capabilities of the autopilot and recognise autopilot failure in flight.
- Execute an approach using the autopilot and transition to a manual approach at the autopilot limiting altitude and/or initiate the missed approach utilising the autopilot missed approach mode.

Transition to instrument flight and initial climb

- Transition from visual flight to instrument flight at the published IFR take-off minima.

Navaid management and tracking

- Tune, identify and test the aircraft's navigational equipment in accordance with company procedures and the manufacturer's instructions.
- Intercept and track specified tracks using the navigation aids fitted.

Instrument departure procedures

- Depart in accordance with the promulgated SID, departure procedure or ATS instructions.

Climb procedures

- Comply with IFR en-route climb procedures, and applicable altimeter settings.
- Maintain required tracks, report position as applicable to ATS and maintain an in-flight navigation, fuel and radio log.

Cruise procedures

- Comply with IFR en-route cruise procedures, maintain track, make appropriate position reports and maintain an in-flight navigation, fuel and radio log.

Unusual attitudes (upset recovery)

- Demonstrate the ability to recover from unusual attitudes as appropriate to the helicopter size and type.

IMC autorotation profile procedure

- Execute an appropriate emergency procedure in the event of a total power failure in IMC by establishing autorotation speed, maintaining rotor RPM within normal limits and turning the helicopter into the last known wind direction.

Descent, approach and landing preparation

- Obtain appropriate weather and operational information relating to the descent, approach and landing.
- Calculate an appropriate top of descent point and review endurance and fuel reserves.
- Review and brief the appropriate arrival, approach, landing, missed approach, holding, and diversion procedure (as applicable).

Descent procedures

- Comply with IFR en-route descent procedures, and applicable altimeter settings.
- Maintain required tracks, report position as applicable to ATS and maintain an in-flight navigation, fuel and radio log.

Holding

- Enter a holding pattern in accordance with the standard sector entry, within the applicable speed range, at or above the minimum holding altitude.
- Use the lesser of a rate one turn or 25º angle of bank in the hold and adjust the outbound leg to compensate for drift as required to achieve the inbound leg (but not beyond any DME limiting distance).

Initial approach procedures

- Anticipate and identify station passage, configure the helicopter appropriately to the approach category or class (as applicable) and establish on the DME/GPS arc or complete the procedure turn (as applicable) including timing.
- Maintain the required track and descent profile in accordance with ATS clearances and/or approach limits.

Radar vectoring for an approach (optional)

- Position the aircraft under radar vectoring, to a predetermined position or fix in an appropriate configuration, to intercept a specified track whilst maintaining orientation by monitoring other navigation aids.

Precision approach (optional)

- Demonstrate an ILS approach in accordance with published procedures, tracks and descent profile.
- Configure the helicopter to achieve an appropriate final approach speed so that a landing could be made and commence the go-around (if applicable) from not below DA/H.

Non-precision approach

- Demonstrate a non-precision approach in accordance with published procedures, tracks and descent profile.

- Configure the aircraft to conform with the appropriate approach category so that a landing could be made and commence the go-around (if applicable) no later than the designated missed approach point.

One engine inoperative performance

- Maintain control of the helicopter after the failure of an engine, prior to or during an approach, and complete the approach.
- Use checklists to follow up memory/recall items and make radio calls as appropriate.
- Initiate a one engine inoperative missed approach from the minimum descent altitude in accordance with the published procedure.
- Subsequently demonstrate an appreciation of the effect of an engine failure on performance by nominating an appropriate plan of action.

Normal and crosswind landing

- Demonstrate knowledge of the cloud base and visibility limitations for a landing under the prevailing conditions.

Confined area and/or elevated helipad operations

- Operate within a confined area and/or a certified helipad.
- Carry out reconnaissance to evaluate power required/available, density altitude, wind direction, terrain, obstructions, size, shape and surface of the area.
- Consider the effect of loss of headwind, wind shear and turbulence on approach.
- Select a suitable circuit with consideration of a decision point for overshoot if necessary.
- Establish and maintain an appropriate approach profile to arrive at the aiming point or in a stabilised hover.
- Maintain adequate tail and main rotor clearance with an awareness of the hazards of recirculation.

Crew self-evaluation (debriefing/operational review/critique)

- Debrief at an appropriate time, involving the entire crew (where appropriate) to give constructive, specific, objective feedback (including positive and negative aspects) based on observable behaviour.
- Accept critique objectively and non-defensively.

Threat and error management (TEM)

- Recognise, assess and manage potential threats in the performance of various tasks, in accordance with TEM techniques.
- Follow SOPs with evident situational awareness to avoid or trap errors which may occur in the performance of various tasks, in accordance with TEM techniques.
- Apply strategies which mitigate the effects of errors that occur, in accordance with TEM techniques.

Communications process and decision making (inquiry/advocacy/assertion)

- Encourage questions regarding crew actions and decisions, answer questions openly and non-defensively, seek information from others, question the status and programming of automated systems, develop a challenge and response environment and persist appropriately until there is a clear resolution and decision.

Communications process and decision making (communications/decisions)

- State operational decisions to other crew members, acknowledge decisions made by other crew members and share the overall situational status with all crew members and/or others (as appropriate).
- Provide an atmosphere conducive to open and free communication and encourage crew members to state their own ideas, opinions and recommendations.
- Verbalise and acknowledge all entries and changes to automated systems.

Team building (leadership/followership/concern for tasks)

- Utilise all available resources and manage time available to achieve the most effective operation possible.
- Coordinate flight deck activities to establish and maintain a proper balance between authority and assertiveness whilst acting decisively when the situation requires.
- Recognise and deal with the demands on resources posed by automated systems when programming could **reduce** situational awareness or create work overload.

Team building (interpersonal relationships/group climate)

- Demonstrate the ability to remain calm under stressful conditions and adapt to other crew members personalities and personal characteristics.
- Ensure the appropriate group climate is established and maintained and recognise the effect of stress on fatigue and performance.
- Recognise the symptoms of stress and fatigue in self and other crew members and during times of low communication check on crew members to maintain the team.

Workload management and situational awareness (preparation/planning/vigilance)

- Demonstrate situational awareness by sharing the "model" of what is happening with other crew members and monitor all instruments and communications, sharing relevant information with the rest of the crew.
- Demonstrate awareness of the effects of stress on vigilance, monitor the performance of crew members and avoid "tunnel vision" by stating or asking for the "big picture".
- Include all crew members in the planning process to prepare for contingency situations (approaches, weather) and verbally ensure appropriate crew are aware of the plan.
- Provide sufficient time for the programming of automated systems and ensure all relevant crew members are aware of the status and changes to automated systems.

Workload management and situational awareness (work distribution/distraction avoidance)

- Distribute tasks and communicate priorities to maximise efficiency. Admit and report work overloads and recognise overloads in others.
- Prioritise secondary operational tasks and ensure that non-operational interaction does not interfere with necessary tasks.
- Recognise the potential for distractions posed by automated systems and take appropriate preventative action.

Communications with supplementary crew members, company and passengers

- Communicate relevant information to cabin crew, company and passengers when appropriate.

Completion of checks and use of checklists

- Use appropriate checklists as applicable to the phase of flight.

ATS procedures and compliance

- Obtain ATIS information when appropriate (if available) and obtain, record, read back and comply with clearances and ATS instructions when applicable.

RTF procedures

- Listen to communications from ground and other aircraft and use the aircraft's radio to communicate clearly and concisely using appropriate aeronautical phraseology at all times with appropriate assertiveness.
- Tune, test and operate the aircraft's transponder as required.

Loss of communications procedure

- Demonstrate knowledge of the procedure to be followed in the event of a communications failure during various phases of flight.

Systems operation and procedures

- Operate, manage and monitor helicopter systems in accordance with the flight manual and/or company procedures.

Management of a systems malfunction

- Identify and interpret indications of a system malfunction and preform the appropriate procedure whilst maintaining control of the helicopter and its flight path.

Straight-in autorotation

- Demonstrates an appropriate emergency procedure in the event of a total power failure into wind by establishing autorotation speed, maintaining rotor RPM within normal limits and coordinating cyclic, collective and anti-torque pedal with power to recover to a low hover or hover taxi.

180º autorotation

- Demonstrates an appropriate emergency procedure in the event of a total power failure out of wind by establishing autorotation speed, compensating for wind and varing the flight path, RRPM and/or IAS as required.
- Maintains rotor RPM within normal limits and coordinates cyclic, collective and anti-torque pedal with power, recovering to a low hover or hover taxi.

Vortex ring state (settling with power)

- Demonstrates adequate knowledge of the conditions which contribute to, and may result in vortex ring state.
- Demonstrates adequate knowledge of the relationship of gross weight, RRPM and density altitude to the severity of the vertical rate of descent.
- Demonstrates smooth, positive helicopter control and prompt, correct recovery techniques.

Emergency equipment

- Demonstrate knowledge of the location, purpose and use of emergency equipment.

Management of ACAS/TCAS advisories

- Interpret and react appropriately to ACAS/TCAS advisories, preforming the appropriate Resolution Advisory (RA) actions.

Go-around from a EGPWS/HTAWS alert (if applicable)

- Recognise, react appropriately and perform the appropriate recovery actions in response to a EGPWS/HTAWS alert.

Knowledge of flight rules

- Demonstrate knowledge of the Civil Aviation Rules pertaining to multi-crew IFR flight in accordance with Part 119/135 air operations.

Adherence to the organisation's standard operating procedures (SOPs)

- Demonstrate knowledge of the organisation's SOPs and the need to adhere to them.
- Demonstrate adherence to the organisation's SOPs and set crew expectations for handling deviations from SOPs.

Lookout in visual meteorology conditions (VMC)

- Maintain a scan, both on the ground and in the air, to maintain separation from other aircraft and terrain during operations in VMC.
- Communicate traffic and terrain information to crew.

Engine shutdown and securing the helicopter

- Complete the shutdown procedure in accordance with the flight manual or checklist, supervise the passengers (if appropriate), secure the helicopter (as applicable) and complete all post flight documentation.