CIVIL AVIATION AUTHORITY
OF NEW ZEALAND
Te Mana Rererangi Tūmatanui o Aotearoa

Advisory Circular
AC61-17

Revision 17

5 April 2025

Pilot Licences and Ratings—Instrument Rating

General

Civil Aviation Authority advisory circulars (ACs) 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.

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 AC.

Purpose

This AC describes an acceptable means of compliance with requirements for flight time experience and on the examination syllabus content for meeting the Civil Aviation Rule (CAR) requirements for the issue of an Instrument Rating (IR).

Related Rules

This AC relates specifically to Part 61, Subpart Q, *Instrument Ratings*.

Change Notice

Revision 17 amends the syllabus for Subject 52 IR Air Law (Aeroplane and Helicopter). The main changes are updating the abbreviations and definitions sections to align with the new rules.

We have also updated to align with redrafted rules under the Civil Aviation Act 2023 (CA Act 2023), made stylistic changes to align with current AC format, corrected minor errors and removed specific form numbers.

***Note**: While we have endeavoured to keep references to rules and other ACs current, there may be changes after this Revision is published. If in doubt, please check the subject and match with the correct table or reference in the other document.*

Version History

The record of revisions to this AC is outlined below:

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AC Revision No.	Effective Date	Summary of Changes
AC61-1.17, Rev 0	6 Oct 1998	Initial issue of this AC
AC61-1.17, Rev 1	10 Feb 2002	Included new paragraph (b) under AMC 61.801 reducing flight-time experience requirements for an instrument rating (IR) for pilots undertaking an integrated CPL(A) and IR training course conducted by a Part 141 certificated training organisation.
AC61-1.17, Rev 2	12 Jan 2004	Updated to account for the introduction of the Visual Navigation Charts and Visual Planning Charts along with the replacement of the Planning Manual, Instrument Flight Guide and Visual Flight Guide with the new AIP NZ Volumes. In the flight test syllabus changes are made to include GPS arc arrival procedures.
AC61-1.17, Rev 3	23 Jun 2004	Introduced format changes to the knowledge syllabus for Air Law with the content of each subject given a subject number and each topic within that subject a topic number, to be used on 'knowledge deficiency reports' (KDRs) to provide feedback to the examination candidate. Other changes were editorial or minor word amendments.
AC61-1.17, Rev 4	11 May 2006	Included amendments to instrument rating issue and renewal as a result of the continued withdrawal of non-directional radio beacons (NDBs), the increased availability of GPS approaches and the increasing number of modern aircraft being imported into New Zealand which are not fitted with automatic direction finder (ADF). The requirement to demonstrate ADF is no longer compulsory for IR issue or renewal. Therefore, the requirement to identify the aircraft's position by cross reference to a VHF omnidirectional radio range (VOR) radial and NDB cross track was removed. Guidance was given for the issue and renewal of IR in aircraft equipped with a 'glass cockpit' defined as Technically Enhanced Aircraft. The requirement to demonstrate an approach fully utilising the autopilot was removed as a compulsory requirement for IR issue. In Appendix II the IR flight test syllabus was updated in accordance with the published CAA Instrument Rating Flight Test Standards Guide. The specific performance parameters were removed from this AC as they are detailed in the CAA Instrument Rating Flight Test Standards Guide.

AC61-17, Rev 5	9 May 2007	Renumbered this AC from AC 61-1.17 to AC 61-17 as part of a project to standardise numbering of ACs.
AC61-17, Rev 6	29 Jun 2009	Inserted a revised Subject 54-Flight Navigation Instrument Flight Rules (IFR) and Subject 56-Instrument and Navigation Aids and included a Flight Navigation Subject Matrix.
AC61-17, Rev 7	14 Jun 2010	Inserted a revised syllabus for Subject 52-IR Law (Aeroplane and Helicopter) and included an Air Law Syllabus Matrix.
AC61-17, Rev 8	12 Sep 2012	Inserted a ground training syllabus for the endorsement of the global navigation satellite system (GNSS) approach aid (Appendix III) and amended the definition of a Technically Enhanced Aircraft (TEA) and the currency requirements for TEA and non-TEA aircraft.
AC61-17 Rev 9	18 Sep 2012	Minor editorial change to item 14 in the classroom training and examination requirements of Appendix III, *GNSS Theory Course Syllabus*.
AC61-17, Rev 10	29 Oct 2012	Minor editorial change to the course concept of Appendix III, *GNSS Theory Course Syllabus*.
AC61-17, Rev 11	4 Apr 2013	Minor editorial change to GNSS requirements (page 44 and 48).
AC61-17, Rev 12	5 Oct 2016	Introduced the requirement for performance-based navigation (PBN), and required navigation performance (RNP) RNP1, into the instrument rating and details transition arrangements.
AC61-17, Rev 13	24 Aug 2021	Deleted an obsolete item in the syllabus, under section 54.22.24 *With regard to uncharted routes* (on page 28) and adds this Version History.
AC61-17, Rev 14	1 June 2023	Inserted a revised Subject 52-IR Air Law, Subject 54-Flight Navigation IFR and Subject 56-Instruments and Navigation Aids syllabi. Inserted a new syllabus Subject 53-IR Operational Knowledge specifically for PPL holders only. Removed references to technically enhanced (TEA) and replaces with electronic flight instrument systems (EFIS) and defines competency requirements. Defined the requirements for single-pilot and multi-pilot privileges. Introduced training requirements for navigation specifications including a new training syllabus in Appendix III.

		Introduced 2D and 3D approach terminology and clarifies the approach procedures required for initial issue and competency demonstrations. Outlined the conditions in which FMS ratings can be recognised as GNSS endorsements for licence issue. Updated the requirements for GNSS receiver competency demonstration. Clarified what is determined as similar navigation systems. Updated Appendix II*, Instrument Rating Flight Test Syllabus* – Incorporates 'accuracy for all aircraft' section into the 'In flight' section. Added new Appendix III, *PBN Pilot Knowledge and Training Syllabus*. Added Appendix IV, ADF/NDB Theory Course Syllabus. Moved Appendix III, *GNSS Theory Course Syllabus* to Appendix V for transitional requirements. ***Note 1****: Because of the scale of this revision, the numbering and order of many of the Sub-sections has changed.* ***Note 2:*** *The terms CAR and "rule" to refer to specific rule parts are used interchangeably.*
AC061-17, Rev 15	2 October 2023	Added a note on the online application process for initial licence issue in the section for Rule 61.803*, Issue, Licence endorsement*.
AC061-17, Rev 16	20 March 2024	Updated the flight test requirements for an Instrument Rating (IR) in rule 61.801. Updated the suggested logbook format in the section on rule 61.803. Added guidance on the 2D approach in the section on rule 61.807. In Appendix II added: • detail on the 2D approach, and • guidance on straight-in approaches in the section on missed approach procedures in Appendix II. ***Note 1***: *On 15 April 2024, section 52.75.26, in the syllabus for IR Law, of this AC was updated to replace the out-dated term parachute drop zone (PDZ), with the correct term PLA (parachute landing area), after a participant noticed this error.*

		Note 2: *On 9 May 2024, in the section on Rule 61.801,* Eligibility Requirements, Written examination credit*, we corrected the applicable issue date and revision number of this AC, after a participant noticed this error.* ***Note 3:*** *On 31 January 2025*, *in Appendix V,* GNSS Theory Course Syllabus (Transitional Requirement Only), Introduction*, we corrected the applicable issue date and revision number of this AC, after a participant noticed this error.*
AC61-17, Rev 17	5 April 2025	Amends the syllabus for Subject 52 IR Air Law (Aeroplane and Helicopter) as follows: • Updates the abbreviations and definitions sections to align with the new rules, and • Removes the syllabus item 52.68.8 in the PBN section as this is no longer relevant. • Removes form numbers. Updates to align with redrafted rules under the CA Act 2023. Makes stylistic changes to align with current AC format and corrects minor errors. *Note: On 30 June 2026, section 54.46.2, in the syllabus for Flight Navigation - IFR of this AC, was updated. This removes the reference to contingency fuel to align with the operational requirements under Part 91 that the syllabus is based upon.* *Appendix II, IR Test Syllabus section, Knowledge of Flight Rules was also amended to include knowledge of contingency fuel only if applicable to the operation.* *The operational conditions for each theory syllabus have been updated to more clearly define the operational environment to which each syllabus applies (see pages 18, 32, 42 & 47).*

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Rule 61.801 Eligibility Requirements

Flight time experience

Rule 61.801(a)(2) requires an applicant for an instrument rating to have flight time experience acceptable to the Director.

The following is acceptable to the Director:

EITHER

(i) 50 hours of VFR cross-country navigation flight time as pilot-in-command (PIC), of which not less than 10 hours are in the appropriate category of aircraft; and

(ii) 10 hours' dual instrument cross-country flight time under an IFR flight plan

(iii) 40 hours' instrument time, and

(iv) 20 hours' instrument flight time in that category of aircraft, of which at least 10 hours are dual instruction as required by rule 61.801(a)(4).

OR

Where an applicant for an instrument rating is undertaking the instrument rating training course in conjunction with a 200-hour CPL (A) training course conducted in accordance with AC61-5, *Pilot Licences and Ratings - Commercial Pilot Licence,* by a training organisation certificated under Part 141, where the certificate authorises the holder to conduct that training.

(i) 50 hours' cross-country flight time in aeroplanes, which is to include the 20 hours training in accordance with the CPL (A) cross-country day navigation syllabus set out in Appendix II of AC61-5 and 10 hours dual instrument cross-country flight time under an IFR flight plan

(ii) 40 hours' instrument time, and

(iii) 20 hours' instrument flight time in that category of aircraft, of which at least 10 hours are dual instruction as required by rule 61.801(a)(4).

Ground training course

A ground course based on the syllabi detailed in Appendix I meets the requirements of the ground course in air law; flight navigation - IFR; meteorology; instruments and navigation aids; and human factors in rule 61.801(a)(3).

Flight training course

Appendix II, III and IV of this AC meets the requirements of the 10 hours of dual flight training in IFR procedures in rule 61.801(a)(4).

Written examination credit

The written examination credit required by rule 61.801(a)(5) comes into effect when all the written examinations have been passed in the qualifying period of three years and the written examination credit is valid for three years as detailed in rule 61.17(c) and (d).

The instrument rating written examinations are based on the syllabi detailed in Appendix I of this AC. The meteorology and human factors training, and examinations required by rules 61.801(a)(3) (iii) and (v) and 61.801(a)(5) are the same as those for the CPL; therefore, credits in these subjects are acceptable towards the issue of an instrument rating. Alternatively, for PPL holders only, a credit in Subject 53*, IR Operational Knowledge*, meets these requirements.

Candidates presenting for an Instrument Rating Test (IRT) with IR examinations sat prior to the issue of Revision 14 of this AC, dated 1 June 2023, are required to provide evidence of completion of a GNSS ground course as outlined in Appendix V.

Flight test

The IRT referred to in this document covers both the initial issue instrument rating and subsequent competency demonstrations. The requirements of the IRT in rule 61.801(a)(6) and 61.807(a)(1) are set out in the *Instrument Rating Flight Test Standards Guide* published by the Director. These are detailed in Appendix II of this AC, and the flight tests are conducted by appropriately authorised flight examiners on behalf of the Director.

An applicant for an IRT must hold a current licence and type rating on the aeroplane being used for the test. If the IRT is conducted in a multi-engine aircraft, then no further test is required for single-engine IR privileges. If the IRT is taken in a single-engine or centre-line thrust aircraft, then a further flight test is required for IR privileges in a multi-engine aircraft.

A candidate applying for multi-engine IR privileges from single-engine IR privileges must provide evidence to the examiner of a minimum of five hours of instrument rating training in a multi-engine aircraft in addition to the multi-engine type rating training before the initial multi-engine IRT can be completed. The purpose of this training is to familiarise the candidate with the handling differences, particularly when asymmetric, and performance differences of this class of aircraft, whilst flying on instruments.

Although a current medical is not required by the applicant for the completion of an annual competency demonstration, the privileges of an IR cannot be exercised without an appropriate current medical (see rules 61.801(a)(1) and 61.805 (b)(4)). A current Class 1 or 2 Medical is required for the initial IRT.

The IRT can be conducted on either an Electronic Flight Instrument System (EFIS) or non-EFIS flight display. Pilots who have successfully demonstrated IR competence on one of these displays or systems, who wish to then exercise these privileges on an alternative flight display or system, must complete an IRT demonstration of competence. Subsequent IRT competency demonstrations are only required on either the EFIS or non-EFIS flight display and are valid for both systems. However, before exercising the privilege of an IR, it is the responsibility of the PIC to ensure they are sufficiently current and competent on the applicable flight display or system.

For the purposes of this AC, a flight display is considered an EFIS when all the flight instruments, including the pitot static instruments, are integrated into one display. Systems where an electronic attitude indicator and/or an electronic horizontal situation indicator are installed, but a conventional system of pitot static instruments are displayed separately, are not considered EFIS.

***Note:** If initially qualified on an EFIS, the non-EFIS flight display competency demonstration must include limited panel techniques.*

If the aircraft is fitted with an autopilot the pilot must demonstrate competence in its use.

Pilots who already hold a TEA IR are considered to meet the EFIS requirement. Pilots who already hold a conventional IR are considered to meet the non-EFIS requirement.

Examiners who hold either a TEA or conventional IR prior to the issue of this AC will be allowed to continue to examine on both EFIS and non-EFIS systems during competency demonstrations where the examiner is not required to be the PIC. Examiners issued with these privileges after the publication of this AC are required to be rated on the system for which they are examining.

The IRT is to be conducted single-pilot where a single-pilot certificated aircraft is used, and multi-pilot where a multi-pilot certificated aircraft is used. In the case of an IFR Operational Competency Assessment (OCA) as part of an approved certificate holders training programme a multi-pilot IRT may be conducted in a single-pilot aircraft where the operator is approved by CAANZ for multi-pilot operations in that aircraft and has developed procedures that support the multi-pilot operation.

Pilots maintaining currency of their IR as part of a multi-pilot operation must conduct a separate IRT if they wish to utilise single-pilot privileges in accordance with (IAW) rule 61.805(b)(1).

Where a pilot is exercising the privileges of the IR on multiple aircraft types, it is recommended that the pilot renews their IR on the most sophisticated aircraft. For Part 91 operations that choose to operate multi-pilot, it is recommended that procedures are developed that support the multi-pilot operation.

Part 91 IR competency demonstrations conducted in synthetic training devices may only be undertaken on each alternate competency demonstration in devices approved for this purpose. Examiners must be qualified on the device. In this situation, the candidate must hold a valid IR. If the IR has expired the competency demonstration must take place in an aircraft.

An examination KDR is a report issued on completion of a written examination that details areas where questions were answered incorrectly. The applicant for an instrument rating 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 initial IRT is valid for 12 months. Subsequent IRTs can be completed within 60 days of the annual due date, see rules 61.807(a)(1)(i), and 61.807(c).

General guidance

Where a pilot is undertaking their instrument rating training as part of an integrated 200 hour CPL (aeroplane) training course conducted by a training organisation certificated under Part 141, where the certificate authorises the holder to conduct that training, the Director considers it acceptable for the pilot to spend more of the total flight time experience required for the CPL flying on IFR cross-country navigation rather than accumulating VFR cross-country navigation flight time, to meet the 50 hours that is acceptable to the Director under rule 61.801(a)(2).

Instrument time accumulated in an approved synthetic training device towards the instrument time experience under rule 61.801(a)(2) should be certified in the pilot's logbook in accordance with rule 61.33.

Rule 91.261 Requirements for navigation specification

PBN training and competency endorsement

Rule 91.261(2)(i) requires the person to be suitably trained and qualified for the navigation specification applicable to the planned route and airspace.

PBN training, and subsequent navigation specification endorsement, requires the candidate to demonstrate knowledge and competency in the practices and procedures identified in Appendix III for each applicable navigation specification. An initial issue Instrument Rating with GNSS includes PBN privileges as detailed below.

Rule 91.263(a)(5) requires suitable training as specified in a notice. Civil Aviation Notices NTC 91.263 outline the training and assessment requirements for pilots for each of the PBN specifications of which the training syllabus is detailed in Appendix III, *PBN Pilot Knowledge and Training Syllabus,* of this AC.

The GNSS endorsement included in the initial issue IRT includes the PBN specifications listed in Figure 1. The logbook endorsement is therefore only necessary for the applicable make of GNSS. The GNSS receiver make assessment examined as a part of this endorsement assesses the pilot's ability to utilise the equipment appropriately.

Figure 1: PBN Specifications for the initial issue of an IRT:

RNP 1
RNP 2
RNAV 5
RNAV 1 & 2
RNP APCH (LNAV)

The following additional PBN specifications listed in Figure 2 require a separate competency demonstration and subsequent logbook endorsement. For pilots within a Part 119 organisation, pilot competency is achieved through operator compliance with their training programme and adherence to the standard operating procedures specified in their exposition.

Figure 2: Additional PBN Specifications which require a separate competency demonstration and subsequent logbook endorsement:

Baro-VNAV
RNP APCH (LP and LPV)
RNP AR APCH (letter of authorisation)
RNP 0.3 (letter of authorisation)
RNP 4
RNAV 10
FRT
A-RNP
RF Legs
RNP APCH (LNAV/VNAV)

Rule 61.803 Issue

Licence endorsement

Instrument approach classification
An instrument approach is an approach and landing using instruments for navigation guidance based on a published instrument approach procedure. There are two methods for executing instrument approaches:

a) a two-dimensional (2D) instrument approach procedure, using lateral navigation guidance only (non-precision approaches) and

b) a three-dimensional (3D) instrument approach procedure, using both lateral and vertical navigation guidance (precision approaches or PBN APV).

Navigation aid or system

The approach aid or systems, which may be endorsed on the licence under rule 61.803(b) and (c), are: ADF, GNSS, ILS and VOR.

Pilots qualified on a Flight Management System (FMS) which forms part of the approved aircraft type rating course using an RNP approach are considered to have met the requirements for the issue of the GNSS. The pilot's logbook must be certified in accordance with rule 61.805(b)(3).

Privileges, such as, single-pilot or multi-pilot, single-engine or multi-engine, EFIS or non-EFIS flight display make of GNSS receiver, additional PBN specifications from Figure 2 and additional navigation aids must be entered in the pilot's logbook and recorded on the flight test report.

The following logbook format may be used:

I hereby certify that _____has satisfactorily demonstrated competency in Approach Procedures: 2D / 3D (circle as applicable), in an EFIS/non EFIS equipped aircraft, centreline-thrust/multi-engine/single-engine, aeroplane/helicopter to single-pilot/multi-pilot standard (delete as applicable).

Additional navigation aid/s endorsed: ----------,

Additional PBN navigation specification/s: _____

Annual Currency demonstration due _____(day/month/year)

GNSS Receiver Make_____

Examiner Name _____ Signature
_____

Client ID_____ Date _____

Two-pilot instrument rating

Pilots who have already been issued with the two-pilot instrument rating will retain these privileges until their next competency demonstration, at which time the single-pilot competencies will need to be demonstrated.

A newly issued two-pilot instrument rating will no longer be available one year from the issue date of Revision 14 of this AC, that is, from 1 June 2024.

***Note**: Applications for initial licence issue may be completed online using **MyAviation**, CAA's online portal for licensing requests, instead of filling in paper forms. **MyAviation** is CAA's preferred way to submit applications and is the equivalent of using the applicable paper form. Click the 'Online services' button in the top right corner of the CAA home page to get started.*

Rule 61.805 Privileges and Limitations

Competency demonstration on approach aid or system

The approach aids or systems that may be certified in the holder's logbook under rule 61.805(b)(3) are: ADF, VOR, GNSS and ILS.

Competency demonstration on navigation specification

On issue of Revision 14 of this AC, pilots holding a current GNSS endorsement hold the PBN specifications listed in Figure 1.

The RNP approach required during the annual competency demonstration will revalidate all the PBN specifications listed in Figure 1, and any additional specification listed in Figure 2 for which the pilot is qualified. This allows for the use of aircraft during the assessment that, whilst they are capable (as per the applicable PBN Specification Notice) for RNP approach, may not be capable of meeting all PBN specifications.

When exercising PBN privileges pilots must ensure the aircraft they are operating is capable of meeting those particular PBN specifications.

In accordance with rule 61.809, a PIC who had previously been certified competent in the use of a GNSS receiver under rule 19.205 (before 1 December 2021) is deemed to have met the requirements of rule 61.805(b)(3) and may carry out an instrument approach procedure under IFR using that GNSS receiver.

Prior to exercising the privileges of the IR on an alternative make of GNSS receiver, a pilot is required to demonstrate competence to a flight examiner qualified on that make of receiver, in an aircraft or an approved synthetic training device, IAW the Instrument Rating Flight Test Standards Guide.

It is the responsibility of the PIC to ensure they are sufficiently familiar with the particular model of GNSS receiver and PBN specification being utilised prior to IFR flight.

Rule 61.807 Currency Requirements

The annual IRT is completed by a demonstration of competency required by rule 61.807(a)(1) utilising the *Flight Test Standards Guide – Instrument Rating (A) & (H)* and syllabus located in Appendix II of this AC. The 2D approach required during the annual competency demonstration

will revalidate all 2D approaches for which the pilot is qualified. Similarly, a 3D approach conducted during the annual competency demonstration will revalidate all 3D approaches for which the pilot is qualified, as per Appendix II.

Instrument rated pilots are also required to maintain ongoing IR currency required by rule 61.807(a)(2) by completing at least three hours instrument time and three published instrument approach procedures within the preceding 90 days.

Alternatively, in accordance with rule 61.807(a)(5), for IFR operations under the authority of an air operator certificate issued under Part 119, competency is assessed in accordance with the approved training and assessment programme for Part 121, 125 or 135 operations.

General guidance

The three instrument approach procedures required by rule 61.807(a)(2) (ii) may be the same instrument approach procedure (2D or 3D). One approach may be carried out in a synthetic flight trainer approved for that purpose.

For the purpose of meeting this currency requirement, an 'approach' is one that conforms with the published approach procedure to include at least the final leg of the approach procedure to the missed approach point, minimum descent altitude (MDA), or decision altitude (DA).

The number and type of approach procedures carried out on each flight should be recorded in the pilot's logbook. Column 16 or 17 may be used for this purpose, for example: 1 x 2D IAP.

Where a safety pilot is used for the purpose of simulated instrument flight, the safety pilot must meet the requirements of rule 91.125*, Simulated instrument flight*. To gain instrument flight experience towards the required instrument flight time for the issue or recent experience requirements of an instrument rating, the safety pilot must also meet the requirements of rule 61.25. The name of the safety pilot should be entered in the pilot's logbook in the co-pilot column.

Similar navigation system

Rule 61.807(a)(4) allows for approach currency to be maintained by using a similar type of navigation system. While the rule does not define what type of navigation systems are similar, a 2D or 3D instrument approach conducted in accordance with a published approach procedure are regarded as similar types of navigation systems, as follows:

- A 2D instrument approach procedure (IAP) utilises instrument displays that provide only lateral (directional) navigation information; for example, VOR**,** NDB, LLZ, RNP APCH-LNAV (RNAV/GNSS) and *RNP APCH-LP (SBAS required)*.

- A 3D IAP utilises instrument displays that provide both lateral and vertical navigation information; for example, ILS, PAR, *MLS, GLS*, RNP APCH-LNAV/VNAV (Baro) and *RNP APCH-LPV*.

***Note:** The **italicised approaches** indicate the PBN operational approvals that may be issued to support international operations but are not yet implemented in the NZ Flight Information Region (FIR).*

RNP Approach 2D and 3D grouping classification

2D – Demonstration to an examiner of any one 2D RNP APCH

RNP APCH – LNAV (RNAV/GNSS) RNP APCH – LP RNP APCH – LNAV + V
3D – Demonstration to an examiner of any one 3D RNP APCH RNP APCH (baro NAV) RNP APCH – LPV

Co-pilots

Rule 61.807(a) for co-pilots. Instrument rating holders acting as co-pilot in a multi-pilot crew may not credit instrument time toward the currency requirement of rule 61.807(a) unless the aircraft's type certificate (TC), aircraft flight manual (AFM), operating rule or the operators' approved operating procedure/s, requires that the aircraft be operated by a multi-pilot crew and, in accordance with rule 61.31(c), *Pilot logbooks – crediting flight time,* the co-pilot is manipulating the controls during actual or simulated instrument conditions.

Appendix I Instrument Rating Written Examination Syllabuses

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	
Performance Based Navigation			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 52 IR Air Law (Aeroplane and Helicopter)

Note: *This syllabus is based on IFR flight as applicable to an IFR-equipped aeroplane or IFR-equipped helicopter operating within the New Zealand Domestic FIR under Rule Part 91.*

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

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

Sub Topic	Syllabus Item
	General
52.2	**Aviation Legislation**
52.2.2	Describe the requirements to hold an aviation document, as laid down in sections 55 and 78 of the CA Act 2023
52.2.4	Describe the duties of the pilot-in-command, as laid down in section 14 of the CA Act 2023
52.4	**Definitions**
	Note: *Since some definitions in Part 1 have changed to align with the CA Act 2023, participants are encouraged to check the new Part 1.*
	CAR Part 1 (unless otherwise noted)
	State the definition of:
	(a) Act;
	(b) ADS-B system;
	(c) aerodrome control service;
	(d) aerodrome traffic circuit;
	(e) aeronautical information circular;
	(f) aeronautical information publication;
	(g) AIP supplement;
	(h) air traffic control service;
	(i) airworthiness certificate;
	(j) alternate aerodrome;
	(k) alternate means of navigation;
	(l) altitude;
	(m) approach control service;
	(n) area control service;
	(o) area navigation;
	(p) ATC clearance;
	(q) ATC instruction;

Sub Topic	Syllabus Item	
	(r)	AWIB service;
	(s)	barometric vertical navigation (baro-VNAV); AIP GEN
	(t)	Category II precision approach procedure;
	(u)	ceiling;
	(v)	change-over point (COP); AIP GEN
	(w)	clearance limit;
	(x)	command practice;
	(y)	continental (en route); AC91-21
	(z)	controlled airspace;
	(aa)	controlled flight;
	(bb)	co-pilot;
	(cc)	crew member;
	(dd)	day;
	(ee)	decision altitude (DA);
	(ff)	decision height (DH);
	(gg)	dual flight time;
	(hh)	enhanced visual imaging system;
	(ii)	final reserve fuel;
	(jj)	flight examiner;
	(kk)	flight level;
	(ll)	GNSS database;
	(mm)	height;
	(nn)	IFR flight;
	(oo)	instrument approach procedure;
	(pp)	instrument flight;
	(qq)	instrument flight time;
	(rr)	instrument meteorological conditions;
	(ss)	instrument time;
	(tt)	Mach number;
	(uu)	minimum descent altitude (MDA);
	(vv)	minimum descent height (MDH);
	(ww)	minimum safe altitude (MSA); (AIP GEN)
	(xx)	minimum sector altitude (MSA 25M); (AIP GEN)
	(yy)	navigation specification;
	(zz)	night;

Sub Topic	Syllabus Item	
	(aaa)	NOTAM;
	(bbb)	pilot-in-command (PIC);
	(ccc)	performance-based navigation;
	(ddd)	precision approach procedure;
	(eee)	pressure altitude;
	(fff)	primary-means navigation system;
	(ggg)	procedure altitude; (AIP GEN)
	(hhh)	rated coverage; (AIP GEN)
	(iii)	RAIM warning;
	(jjj)	rating;
	(kkk)	reporting point;
	(lll)	RNP performance;
	(mmm)	runway visual range;
	(nnn)	segment OCA; (AIP GEN)
	(ooo)	SEIFR passenger operation;
	(ppp)	synthetic vision system;
	(qqq)	transition altitude; (AIP GEN)
	(rrr)	transition layer; (AIP GEN)
	(sss)	transition level; (AIP GEN)
	(ttt)	VFR flight;
	(uuu)	visibility;
	(vvv)	visual meteorological conditions;
	(www)	visual reference. (AIP GEN)

52.6 Abbreviations

CAR Part 1 (unless otherwise noted)

State the meaning of the following abbreviations:

(a) ABAS; (AC91-21)

(b) ACAS;

(c) ADF;

(d) ADS-B;

(e) ADS-C; (AIP GEN)

(f) AMoN; (AC91-21)

(g) ANP; (AC91-21)

(h) APCH; (AIP GEN)

(i) A-RNP; (AC91-21)

Sub Topic	Syllabus Item	
	(j)	Baro-VNAV; (AIP GEN)
	(k)	DA;
	(l)	DF;
	(m)	DME;
	(n)	FAF; (AIP GEN)
	(o)	FAP; (AIP GEN)
	(p)	FAS; (AC91-21)
	(q)	FD; (AC91-21)
	(r)	FDE; (AC91-21)
	(s)	FRT; (AC91-21)
	(t)	GBAS; (AC91-21)
	(u)	GBNA; (AC91-21)
	(v)	GLS; (AC91-21)
	(w)	GNSS;
	(x)	GPS; (AC91-21)
	(y)	GPWS;
	(z)	IAC; (AIP GEN)
	(aa)	IAF; (AIP GEN)
	(bb)	ILS;
	(cc)	LNAV; (AIP GEN)
	(dd)	LP; (AC91-21)
	(ee)	LPV; (AC91-21)
	(ff)	OPMA; (AC91-21)
	(gg)	PAR;
	(hh)	PBN;
	(ii)	PMoN; (AC91-21)
	(jj)	PRA;
	(kk)	P-RNAV; (AC91-21)
	(ll)	QFE;
	(mm)	QNH;
	(nn)	RAIM;
	(oo)	RF;
	(pp)	RNP APCH; (AC91-21)
	(qq)	RNP AR APCH; (AC91-21)
	(rr)	RVSM;

Sub Topic	Syllabus Item	
	(ss)	SBAS; (AC91-21)
	(tt)	STA; (AIP GEN)
	(uu)	TAWS;
	(vv)	TCAS;
	(ww)	TF; (AC91-21)
	(xx)	TSE; (AC91-21)
	(yy)	VNAV; (AC91-21)
	(zz)	VOR;
	(aaa)	VORSEC; (AIP GEN)
	(bbb)	VPA; (AIP GEN).
	Personnel Licensing	
52.10	**Requirements for Licences and Ratings**	
52.10.2	State the requirements for holding a pilot's licence. CAR Part 61	
52.10.4	State the requirements for a pilot-in-command to hold a type rating on the type of aircraft being flown. CAR Part 61	
52.10.6	State the requirements for entering flight details into a pilot's logbook. CAR Part 61	
52.10.8	State the requirements for holding an instrument rating. CAR Part 61	
52.10.10	State the licence and rating requirements for acting as a safety pilot during simulated instrument flight. CAR Part 91	
52.12	**Eligibility, Privileges and Limitations**	
52.12.2	Describe the allowance for a person who does not hold a current pilot's licence to fly dual with an instructor. CAR Part 61	
52.12.4	State the eligibility requirements for the issue of an instrument rating. CAR Part 61	
52.12.6	State the privileges of holding an instrument rating. CAR Part 61	
52.12.8	State the limitations on the holder of an instrument rating. CAR Part 61	
52.12.10	State the qualification requirements for carrying out various types of instrument approach. CAR Part 61	
52.14	**Competency, Currency and Recency**	
52.14.2	State the currency requirements of a pilot who is the holder of an instrument rating CAR Part 61	
52.14.4	State the currency requirements for carrying out an instrument approach. CAR Part 61	
52.16	**Medical Requirements**	
52.16.2	State the hearing standard required for the holder of an instrument rating. CAR Part 61	
	Airworthiness of Aircraft and Aircraft Equipment	
52.20	**Documentation**	

Sub Topic	Syllabus Item
52.20.2	State the documents which must be carried in aircraft operated in New Zealand. CAR Part 91
52.22	**Aircraft Maintenance**
52.22.2	State the inspection period for radios. CAR Part 91
52.22.4	State the inspection period for altimeters. CAR Part 91
52.22.6	State the inspection period for transponders. CAR Part 91
52.22.8	State the inspection period for the ELT. CAR Part 91
52.24	**Instruments and Avionics**
52.24.2	State the minimum instrument requirements for an IFR flight. CAR Part 91
52.24.4	State the communications and navigation equipment requirements for an IFR flight. CAR Part 91
52.24.6	State the equipment requirements of aircraft operating in airspace where RVSM is applied by ATC. CAR Part 91
52.26	**Equipment**
52.26.2	State the equipment requirements for an IFR flight. CAR Part 91
52.26.4	State the requirements for indicating the time in flight. CAR Part 91
52.26.6	State the requirements for night flight. CAR Part 91
52.26.8	Explain the requirement for altitude alerting/assigned altitude indicating. CAR Part 91
52.26.10	State the requirements for an ELT. CAR Part 91
	General Operating and Flight Rules
52.30	**General Operating Requirements**
52.30.2	State the requirements for operating an aircraft in simulated instrument flight. CAR Part 91
52.30.4	State the requirements for carrying appropriate aeronautical publications and charts in flight. CAR Part 91
52.30.6	State the requirements for the maintenance of an enroute track. CAR Part 91
52.30.8	State the requirements for IFR cruising altitude or flight level. CAR Part 91
52.32	**General Operating Restrictions**
52.32.2	State the restrictions on the use of portable electronic devices in flight. CAR Part 91
52.32.4	State the speed limitations on aircraft operating under IFR. CAR Part 91
52.32.6	State the restrictions when operating IFR in icing conditions. CAR Part 91
52.32.8	State the minimum altitudes for IFR flight. CAR Part 91
	Flight Planning and Preparation
52.50	**Flight Preparation**
52.50.2	Explain the requirements for obtaining and considering relevant information prior to flight. CAR Part 91

Sub Topic	Syllabus Item
52.50.4	Describe the publications and their content that provide operational route and aerodrome information.
52.50.6	Derive operational information from charts and publications that provide route, approach and aerodrome information.
52.52	**Alternate Requirements**
52.52.2	State the meteorological minima at destination which would require an alternate to be nominated. CAR Part 91
52.52.4	Determine the meteorological minima required at an aerodrome for it to be nominated as an IFR alternate. CAR Part 91
52.52.6	State the power supply requirements for the selection of an aerodrome as an alternate on an IFR air operation. CAR Part 91
52.52.8	State the reference datum for take-off meteorological minima for IFR operations. CAR Part 91
52.52.10	State the reference datum for landing meteorological minima for IFR operations. CAR Part 91
52.52.12	State the reference datum for alternate meteorological minima for IFR operations. AIP ENR
52.54	**Fuel Requirements**
52.54.2	State the fuel reserve required for an IFR flight in a non-turbine-powered aeroplane. CAR Part 91
52.54.4	State the fuel reserve required for an IFR flight in a turbine-powered aeroplane or a helicopter. CAR Part 91
52.56	**Flight Plans**
52.56.2	State the requirements for the filing of a flight plan for flight under IFR. CAR Part 91
52.56.4	State the notification lead time for filing an IFR flight plan. CAR Part 91 & AIP ENR
52.56.6	State the requirements for adhering to an IFR flight plan. CAR Part 91
52.56.8	State the requirements for the notification of changes to a filed IFR flight plan. CAR Part 91
52.56.10	State the requirements for an inadvertent departure from an IFR flight plan. CAR Part 91
52.56.12	State the requirements for the terminating an IFR flight plan at an aerodrome without ATS. CAR Part 91
	Air Traffic Services
52.60	**Communications**
52.60.2	Derive from operational publications, the required radio frequency for communicating with specified ATC units.
52.60.4	State the requirements for making position reports to an ATS unit. CAR Part 91 & AIP ENR
52.60.6	State the contents of various IFR position reports. AIP ENR

Sub Topic	Syllabus Item
52.60.8	State the purpose of Universal Communications Services (UNICOM). AIP GEN
52.60.10	State the purpose of an Aerodrome Frequency Response Unit (AFRU). AIP GEN
52.60.12	State the purpose of Aerodrome and Weather Information Broadcasts (AWIB). AIP GEN
52.60.14	State the meaning of the various light signals from a control tower. CAR Part 91 & AIP AD
52.60.16	State the communications requirements when TIBA procedures are in force. AIP ENR
52.62	**Clearances**
52.62.2	State the requirements for complying with ATC clearances and instructions. CAR Part 91 & AIP ENR
52.62.4	State the requirements for coordinating with an aerodrome flight information service. CAR Part 91
52.62.6	State the requirements for receiving an ATC clearance prior to entering various types of airspace and ground manoeuvring area. CAR Part 91 & AIP ENR
52.62.8	State the requirements for receiving an ATC clearance prior to re-entering controlled airspace. CAR Part 91 & AIP ENR
52.63	**Separation**
52.63.2	Describe the situations where Air Traffic Control is responsible for the provision of separation between VFR, SVFR and IFR traffic. AIP ENR
52.63.4	Describe the situations where the PIC of an IFR flight is responsible for maintaining separation from other traffic. AIP ENR
52.63.6	Describe the normal separation standards applied by ATC. AIP ENR
52.63.8	Describe the situations where the normal separation may be reduced. AIP ENR
52.63.10	State the meaning of the term “Essential Traffic”. AIP ENR
52.63.12	State the conditions under which longitudinal separation between reciprocal track aircraft may be reduced. AIP ENR
52.63.14	State the minimum lateral and longitudinal separation between RNP10 aircraft, as permitted by ICAO Regional Supplementary procedures (Doc 7030). AIP ENR
52.63.16	State the deviation from an assigned indicated airspeed or Mach number and ETA outside of which pilots are required to notify ATC. CAR Part 91
52.63.18	State the wake turbulence separation requirements for light and medium aircraft. AIP AD
52.63.20	State the maximum airspeed below 10,000 feet. CAR Part 91
52.63.22	State the minimum descent height in IMC at an unattended aerodrome where traffic conflict may exist. AIP ENR
52.64	**Terrain Clearance**
52.64.2	Describe the determination of the minimum safe altitude for IFR flight. AIP GEN
52.64.4	Explain the coverage and use of VORSEC charts. AIP GEN
52.64.6	Explain the coverage and use of 25nm Minimum Sector Altitude diagrams. AIP GEN

Sub Topic	Syllabus Item
52.64.8	State when the radar control service is responsible for the provision of terrain clearance. AIP ENR
52.64.10	Explain how radar control provides terrain clearance. AIP ENR
52.64.12	Describe the use of DME descent steps for maintaining terrain clearance during departure climb or descent for an approach. AIP GEN & ENR
52.65	**Weather Avoidance**
52.65.2	State the requirements for deviation off track for weather avoidance. AIP ENR
52.66	**Radar Services**
52.66.2	Describe the radar services available to IFR flights. AIP ENR
52.66.4	Describe the responsibility of the radar controller to keep an aircraft within controlled airspace. AIP ENR
52.66.6	State the accuracy limits required when under radar speed control. AIP ENR
52.66.8	State the distance from touchdown that radar speed control can be maintained on an instrument and a visual approach. AIP ENR
52.66.10	State the meteorological and other conditions which allow a radar controller to vector an aircraft for a visual approach. AIP ENR
52.66.12	State the criteria for a radar controller to consider an unknown aircraft to be on a conflicting path with another aircraft. AIP ENR
52.68	**Performance Based Navigation**
52.68.2	Describe the requirements which a Part 91 operator must meet to conduct a PBN operation. AC91-21*, Operational Approvals - Performance-Based Navigation*
52.68.4	Describe the PBN Operational Approval Process. AC91-21
52.68.6	Identify who is responsible for ensuring that electronic navigation data and equipment software is valid and updated for the equipment installation the PBN approval is based on. AC91-21
52.68.8	Reserved
52.68.10	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 Part 91
52.68.12	Describe the contingency procedures required by aircraft within the New Zealand flight information region, in the event of loss of Primary Means of Navigation. CAR Part 91 and AC91-21, Appendix I
52.68.14	State the ICAO PBN specifications implemented in the NZ FIR, in each of the following phases of flight: (a) En route Continental/Domestic; (b) Terminal; (c) Initial, Intermediate and Missed Approach; and (d) Final Approach. AC91-21, Table 1

Sub Topic	Syllabus Item
52.68.16	State the surveillance and communications requirements expected to apply in RNAV 2 in the enroute phase in the NZFIR. AC91-21, Table 2
52.68.18	State the navigation infrastructure required to support RNAV/RNP 2 in the enroute phase in the NZFIR. AC91-21, Table 2
52.68.20	State the CNS equipment requirements for operations in RNAV 2 enroute continental/domestic airspace in the NZFIR. AC91-21, Table 5
52.68.22	State the Total System Error (TSE) permitted in the RNAV/RNP 2 PBN specification in the e route phase in the NZFIR. AC91-21, Table 2
52.68.24	State the surveillance and communications requirements expected to apply in RNAV/RNP 1 in the terminal and approach phases in the NZFIR. AC91-21, Table 3
52.68.26	State the navigation infrastructure required to support RNAV/RNP 1 in the terminal and approach phases in the NZFIR. AC91-21, Table 3
52.68.28	State the CNS equipment requirements for operations in RNAV/RNP 1 in the terminal and approach phases in the NZFIR. AC91-21, Tables 3 and 5
52.68.30	State the Total System Error (TSE) permitted in the RNAV/RNP 1 PBN specification in the terminal and approach phases in the NZFIR. AC91-21, Table 3
52.68.32	State the limitation, during approach operations, on aircraft with advisory vertical navigation systems only. AC91-21
52.68.34	Describe the authorisation requirements applicable to RNP AR APCH procedures. AC91-21
52.68.36	State the surveillance and communications requirements expected to apply in RNP APCH in the approach phase in the NZFIR. AC91-21, Tables 4 and 5
52.68.38	State the navigation infrastructure required to support RNP APCH in the approach and missed approach phases in the NZFIR. AC91-21 Tables 4 and 5
52.68.40	State the CNS equipment requirements for operations in RNP APCH in the approach and missed approach phases in the NZFIR. AC91-21, Tables 4 and 5
52.68.42	State the Total System Error (TSE) permitted in the RNP APCH PBN specification in the approach and missed approach phases in the NZFIR. AC91-21, Table 4
	Airspace; Aerodromes; and Heliports
52.70	**Altimetry**
52.70.2	Explain the altimeter setting requirements for flight under IFR. CAR Part 91 & AIP ENR
52.70.4	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
52.70.6	Describe QNH zones and state when zone QNH should be used. AIP ENR
52.70.8	Describe the transition altitude, layer and level. AIP ENR
52.72	**Cruising Levels**
52.72.2	State the altitude/flight level requirements when cruising IFR within the New Zealand FIR. CAR Part 91 & AIP ENR
52.72.4	Determine from charts and publications the minimum flight altitude (MFA) for a route sector.

Sub Topic	Syllabus Item
52.72.6	Describe situations where ATC may assign cruising altitudes not in accordance with the IFR table of cruising altitudes. AIP ENR
52.72.8	State the position by which an aircraft must be at a higher MFA if changing to a track with a higher MFA. AIP GEN
52.74	**Transponders**
52.74.2	State the requirements for the operation of transponders within the New Zealand FIR. CAR Part 91 & AIP ENR
52.74.4	Describe the procedures required of pilots operating transponders. AIP ENR
52.74.6	Describe the procedure whereby ATC can verify the accuracy of the Mode C function of a transponder. AIP ENR
52.74.8	State the requirements and limitations on an aircraft operating in transponder mandatory airspace without an operating transponder. CAR Part 91 & AIP ENR
52.75	**Airspace**
52.75.2	State the rules pertaining to operating IFR in the various classes of airspace. CAR Part 91 & AIP ENR
52.75.4	Describe the vertical limits and purpose of control zones (CTR). CAR Part 71
52.75.6	Describe the vertical limits and purpose of control areas (CTA). CAR Part 71
52.75.8	State the status and conditions relating to flight in VFR transit lanes. AIP ENR
52.75.10	Describe the status and purpose of a general aviation area (GAA) and state the process for IFR flights to transit through GAA airspace. CAR Part 91 & AIP ENR
52.75.12	Describe visual reporting points.
52.75.14	Describe the status of controlled airspace when ATC go off duty. AIP GEN
52.75.16	State the restrictions on operating an aircraft in a restricted area. CAR Part 91 & AIP ENR
52.75.18	State the restrictions on operating an aircraft in a military operational area (MOA). CAR Part 91 & AIP ENR
52.75.20	State the restrictions and operating considerations relating to operating an aircraft in a mandatory broadcast zone (MBZ). CAR Part 91 & AIP ENR
52.75.22	State the restrictions and operating considerations relating to operating an aircraft in a volcanic hazard area (VHA). CAR Part 91 & AIP ENR
52.75.24	State the restrictions and operating considerations relating to operating an aircraft in a danger area. CAR Part 91 & AIP ENR
52.75.26	State the restrictions and operating considerations relating to operating an aircraft in a parachute landing area (PLA). AIP ENR
52.75.28	State the operating considerations relating to operating an aircraft in a common frequency zone (CFZ). AIP ENR
52.75.30	State the operating considerations relating to operating an aircraft over or close to temporary hazards/airspace. AIP ENR
52.75.32	Explain the requirements for the operation of an aircraft in RNP airspace. AIP ENR

Sub Topic	Syllabus Item
52.75.34	Interpret airspace information on aeronautical charts.
52.76	**Aerodromes and Heliports**
52.76.2	Describe the limitations on the use of a place as an aerodrome or heliport. CAR Part 91
52.76.4	Describe the method of runway designation. AIP AD
52.76.6	Describe the movement area of an aerodrome. CAR Part 1
52.76.8	Interpret information on aerodrome/heliport charts. AIP GEN & AIP Volume 4
52.78	**Aerodrome Lighting**
52.78.2	Describe the lighting intensity classifications.
52.78.4	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 end identifier lighting (REIL); (f) Approach lighting systems (ALS); (g) Circling guidance lighting (CGL); (h) Runway lead in lighting (RLLS); (i) Pilot activated lighting (PAL); (j) T-Visual approach slope indicators (T-VASIS); (k) Visual approach slope indicators (VASIS); and (l) Precision approach path indicators (PAPI).
52.78.6	Describe aerodrome beacons.
	Emergencies; Incidents; and Accidents
52.82	**Communications and Equipment**
52.82.2	State the transponder code a pilot should set to indicate an emergency condition. AIP ENR
52.82.4	State the transponder code a pilot should set to indicate a loss of communications. AIP ENR
52.82.6	State the transponder code a pilot should set to indicate that the aircraft is being subjected to unlawful interference. AIP ENR
52.82.8	Describe the means by which ATC will verify the transmission of an emergency SSR transponder code. AIP ENR
52.82.10	Describe the use of the speechless technique using un-modulated transmissions. AIP ENR
52.82.12	State the procedures for the emergency activation of an ELT. AIP GEN

Sub Topic	Syllabus Item
52.82.14	State the pilot action required following the inadvertent transmission of an ELT. AIP GEN
52.82.16	State the requirements for the operational testing of an ELT. AIP GEN
52.82.18	State the procedures to be followed on receiving an ELT signal. AIP GEN
	Instrument Departures and Approaches
52.90	**Departure Procedures**
52.90.2	Interpret information on SID and Departure Procedure charts.
52.90.4	Determine the IFR take-off minima for a departure off a given runway. AIP ENR
52.90.6	State the IFR take-off minima if it is not prescribed in the AIPNZ, VOL 2 & 3. AIP ENR
52.90.8	State the CAR Part 91 requirements and limitations of IFR reduced take-off minima. CAR Part 91 & AIP ENR
52.90.10	State the minimum height for a turn after take-off on departure. AIP ENR
52.90.12	State the minimum climb gradient on a SID unless otherwise specified. AIP ENR
52.90.14	Calculate the rate of climb required to meet the net climb gradient specified on instrument departures. AIP ENR
52.90.16	State when a departure procedure terminates. AIP ENR
52.90.18	State the limitation on the termination of radar vectoring for a departing IFR aircraft. AIP ENR
52.90.20	State the requirements for broadcasting intentions when departing from an unattended aerodrome. AIP ENR
52.90.22	State the requirements for and limitations on a visual departure. AIP ENR
52.90.24	Describe the operating restrictions where an IFR departure procedure is not promulgated. AIP ENR
52.92	**Holding Procedures**
52.92.2	State the maximum speed in enroute holding patterns. AIP ENR
52.92.4	State the maximum entry and holding pattern speeds. AIP ENR
52.92.6	Identify and describe appropriate holding pattern entry procedures. AIP ENR
52.92.8	State when an onwards clearance time will be passed to the pilots of an aircraft instructed to hold enroute. AIP ENR
52.92.10	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
52.92.12	State the angle of bank required during turns in a holding pattern. AIP ENR
52.94	**Approach Procedures**
52.94.2	Describe the descent limitations from cruise to approach commencement. AIP GEN
52.94.4	Interpret information on STAR charts.
52.94.6	State the limitation on a clearance to fly a STAR. AIP ENR
52.94.8	Define the minimum initial approach altitude. AIP ENR

Sub Topic	Syllabus Item
52.94.10	Interpret information on instrument approach charts.
52.94.12	Determine the IFR meteorological minima for an instrument approach to a given runway.
52.94.14	State the meteorological minima which must exist prior to a landing off an instrument approach. CAR Part 91 & AIP ENR
52.94.16	Describe the procedures for joining overhead a navigation aid for an instrument approach. AIP ENR
52.94.18	State the minimum meteorological conditions which must exist before ATC may clear an aircraft for an instrument approach with a descent restriction. AIP ENR
52.94.20	State the meteorological and other conditions which will allow a pilot to request a visual approach in controlled airspace. AIP ENR
52.94.22	State the meteorological and other conditions which allow ATC to advise that conditions are suitable for a visual approach. AIP ENR
52.94.24	State the meteorological and other conditions which will allow a pilot to carry out a visual approach in uncontrolled airspace. AIP ENR
52.94.26	Describe the provision of separation and terrain clearance during a visual approach. AIP ENR
52.94.28	Given an aircraft's Vs, determine its category for approach speeds and minima. AIP ENR
52.94.30	State the category A and B speed limitations during an instrument approach under ICAO PANS OPS II procedures. AIP ENR
52.94.32	State the requirements for making position reports during an instrument approach in controlled and uncontrolled airspace. AIP ENR
52.94.34	Describe the procedures for carrying out an instrument approach at an unattended aerodrome. AIP ENR
52.94.36	Determine the minimum descent altitude using a QNH from a remote location. AIP ENR
52.94.38	State when descent below decision altitude or minimum descent altitude may be made on an instrument approach. AIP ENR
52.94.40	Describe the missed approach procedures and limitations. AIP ENR
52.96	**Communications and Navigation Aid Failure**
52.96.2	Describe the procedures required following a communications failure enroute. AIP ENR
52.96.4	Describe the procedures required following a communications failure during an instrument approach. AIP ENR
52.96.6	Describe the procedure to be carried out in the event of a radio navigation aid failure during an approach. AIP ENR

Subject No 53 IR Operational Knowledge (Aeroplane and Helicopter)

Note: *This syllabus is based on IFR flight as applicable to an IFR-equipped aeroplane or IFR-equipped helicopter operating within the New Zealand Domestic FIR under Rule Part 91.*

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

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

Sub Topic	Syllabus Item
	Meteorology
53.104	**Weather Maps**
53.104.2	Describe the weather sequence and general flying conditions associated with: (a) cold fronts; (b) warm fronts; (c) occluded fronts; and (d) stationary fronts.
53.104.4	Describe typical wind speeds and directions ahead of and behind these fronts in mid-latitudes.
53.104.6	Explain how subsidence and ascent of air influences the type of weather commonly associated with pressure systems.
53.104.8	Identify the general direction of movement of pressure systems in the mid-latitudes of the Southern Hemisphere.
53.104.10	Define the “westerly index” over New Zealand.
53.104.12	Identify ‘high’ and ‘low’ westerly indices on weather maps.
53.104.14	Explain the weather distribution across New Zealand in high and low westerly index situations.
53.104.16	Describe the significance of high and low westerly index situations across New Zealand to aviation.
53.106	**Fundamentals of the Atmosphere**
53.106.2	Define ‘pressure gradient’.
53.106.4	Identify strong and weak pressure gradients on a weather map.
53.106.6	Given examples of ambient temperature at a stated altitude, calculate: (a) the ISA temperature at that altitude; and (b) the ISA height at that temperature.
53.106.8	Define: (a) QFE; (b) QNH; (c) QNE;

Sub Topic	Syllabus Item
	(d) pressure altitude; and
	(e) flight levels (FL).
53.106.10	Describe how localised pressure changes occur in association with:
	(a) lee troughs;
	(b) thermal (or 'heat') lows; and
	(c) thunderstorms.
53.106.12	Describe 'diurnal' pressure variations.
53.106.14	State the latitudes where diurnal pressure variation is most significant.
53.106.16	Explain the effects of changes in the following elements on air density:
	(c) pressure;
	(d) temperature;
	(e) altitude; and
	(d) moisture content of the air.
53.106.18	Define 'density altitude' (DA).
53.106.20	Calculate 'density altitude'.
53.106.22	Describe the 'gradient wind' in the Southern Hemisphere with respect to:
	(a) anticyclonically curved isobars; and
	(b) cyclonically curved isobars.
53.106.24	Describe the 'frictional wind balance'.
53.106.26	State typical wind direction deflections due to friction over:
	(a) the sea;
	(b) flat to undulating ground; and
	(c) mountainous regions.
53.106.28	Explain how the following affect the depth of the friction layer:
	(a) atmospheric stability;
	(b) wind strength; and
	(c) surface roughness.
53.106.30	Describe the general characteristics of a mountain wave set-up with reference to:
	(a) wavelengths;
	(b) position and rotation of any possible rotor zones;
	(c) position and type of any possible cloud development;
	(d) the heights of the friction layer;
	(e) areas of probable severe turbulence; and
	(f) areas of possible severe airframe icing.
53.106.32	With reference to mountain waves:

Sub Topic	Syllabus Item
	(a) explain the factors that affect the wave amplitude;
	(b) explain the factors that affect the wave-length; and
	(c) describe the flight conditions associated with mountain waves.
53.106.34	Explain the rotor streaming process.
53.106.36	Describe the flight conditions associated with rotor streaming.
53.106.38	Define the Föhn wind.
53.106.40	State the requirements for the development of a Föhn wind.
53.106.42	Describe the flight conditions when flying in Föhn conditions in the following positions:
	(a) to windward of the mountain range;
	(b) over the mountain range; and
	(c) on the lee side of the mountain range.
53.106.44	Describe the relationship between stability of air and cloud type.
53.106.46	Describe the 10 main cloud types as defined by the WMO.
53.106.48	Describe typical conditions for each of the 10 main cloud types with respect to:
	(a) turbulence;
	(b) icing; and
	(c) precipitation.
53.106.50	Identify the following cloud sub-sets and outline the atmospheric conditions indicated by each:
	(a) Asperitas;
	(b) Mammatus;
	(c) Altocumulus Lenticularis;
	(d) Rotor Cloud;
	(e) Kelvin Helmholtz waves;
	(f) Altocumulus Castellanus; and
	(g) Banner cloud.
53.106.52	Define runway visual range (RVR).
53.106.54	State the difference between fog, mist and haze.
53.106.56	Describe anticyclones (‘highs’) with reference to:
	(a) their formation processes;
	(b) pressure patterns and wind flow;
	(c) subsidence and subsidence inversions; and
	(d) typical associated weather conditions.
53.106.58	Describe the development of ‘cold’ highs.

Sub Topic	Syllabus Item
53.106.60	Discuss the hazards associated with anticyclones.
53.106.62	Outline the characteristics of: (a) mid to high-latitude depressions ('lows'); (b) sub-tropical depressions; and (c) tropical cyclones.
53.108	**Hazardous Meteorological Conditions**
53.108.2	Define 'super-cooled water droplets'.
53.108.4	Describe the formation process of: (a) clear (glaze) ice; (b) rime (opaque) ice; (c) mixed ice; (d) hoar frost; and (e) freezing rain.
53.108.6	With reference to clear, rime and mixed ice, describe the following: (a) associated cloud types; (b) temperature ranges; (c) droplet size; (d) height range relative to the freezing level; and (e) enhancing factors.
53.108.8	Explain the factors that influence the rate of ice accretion.
53.108.10	Describe the hazards of airframe icing to aircraft in flight.
53.108.12	List the intensity classifications of icing.
53.108.14	Describe the effect of different intensity classifications of icing on aircraft.
53.108.16	Explain methods of avoiding or mitigating airframe icing.
53.108.18	Describe the conditions required for the development of thunderstorms.
53.108.20	Describe the characteristics and development of: (a) convective localised (stationary) thunderstorms; (b) convective traveling thunderstorms; (c) orographic thunderstorms; (d) nocturnal tropical thunderstorms; (e) frontal and convergence-type thunderstorms; (f) surface trough and upper trough thunderstorms; and (g) warm front embedded thunderstorms.
53.108.22	With reference to flight in and around thunderstorms, describe the development, severity, and areas where the following are likely to be encountered:

Sub Topic	Syllabus Item
	(a) turbulence;
	(b) icing;
	(c) microbursts;
	(d) first gust (or gust front);
	(e) electrical phenomena;
	(f) tornadoes (if any);
	(g) hail; and
	(h) poor visibility.
53.108.24	Describe the characteristics of multi-cell thunderstorms
53.108.26	Describe the use of radar to identify thunderstorms.
53.108.28	Explain the precautions that can be taken by pilots to avoid or minimise the effects of flying in the vicinity of thunderstorms.
53.108.30	Describe the effects of the following enhancing factors on turbulence, from:
	(a) atmospheric stability;
	(b) surface roughness;
	(c) wind speed/direction; and
	(d) vertical windshear.
53.108.32	Describe the cause(s) and factors involved with the effects of low-level wind-shear due to:
	(a) surface friction;
	(b) thunderstorms;
	(c) temperature inversions;
	(d) frontal activity; and
	(e) wake turbulence from fixed and rotary winged aircraft.
53.108.34	Describe the techniques used to avoid or minimize the effects of low-level windshear.
53.108.36	Describe, in accordance with the ICAO definitions, the characteristics of:
	(a) light turbulence;
	(b) moderate turbulence; and
	(c) severe turbulence.
53.108.38	Explain the methods by which the aviation community is advised of volcanic eruptions within the New Zealand FIR.
53.108.40	Explain the hazards to aviation of volcanic ash encountered:
	(a) in flight; and
	(b) during the take-off and landing phases on an ash contaminated runway.
53.108.42	Explain the development of, and the hazards associated with, flight in the following conditions:

Sub Topic	Syllabus Item
	(a) dust storms;
	(b) blowing surface snow (blizzards);
	(c) whiteout (visual illusion type).
53.110	**Satellite and Radar Imagery**
53.110.2	With respect to NZ IFR operations, using given examples of satellite imagery, identify the following:
	(a) areas of stable and unstable air;
	(b) the processes causing each significant area or mass of cloud; and
	(c) likely cloud types and weather associated with each significant area of cloud.
53.110.4	With respect to NZ IFR operations, interpret radar imagery in terms of:
	(a) precipitation types and intensity causing the radar echo;
	(b) likely cloud types associated with the precipitation echo; and
	(c) speed of movement and timing of radar echoes, and the expected impact at given locations.
	Human Factors
53.201	**Physiology and the Effects of Flight**
53.201.2	Explain how the partial pressure of oxygen changes as altitude increases.
53.201.4	Describe the primary physiological and behavioural consequences of hypoxia for flight crew and passengers.
53.201.6	List the main factors influencing variation in hypoxia onset (tolerance) between individuals.
53.201.8	State the factors that affect the likelihood of suffering from hypoxia.
53.201.10	Describe how hypoxia can be treated.
53.201.12	Define the concept of ‘time of useful consciousness’.
53.201.14	State the approximate time of useful consciousness at:
	(a) 18,000ft;
	(b) 25,000ft; and
	(c) 35,000ft.
53.201.16	Explain oxygen paradox.
53.201.18	Describe how barotrauma can be prevented.
53.201.20	State the approximate required times between diving at various depths and flying.
53.201.22	Describe methods of cockpit/flight deck lighting and problems associated with each.
53.201.24	Describe the requirements for using corrective lenses.
53.201.26	Explain the visual illusions associated with sector whiteout.
53.201.28	Describe the methods of avoiding and/or coping with sector whiteout.

Sub Topic	Syllabus Item
53.201.30	Specify the various levels of noise in decibels at which various grades of hearing protection are required.
53.201.32	Specify noise levels at which hearing damage may occur.
53.201.34	Describe what is meant by the action threshold for hearing protection.
53.201.36	Describe the factors which affect an individual's susceptibility to disorientation.
53.201.38	Describe the symptoms of gastrointestinal problems.
53.201.40	Identify the primary causes of food poisoning.
53.201.42	Describe the symptoms, effects and immediate treatments for the following hazards present in the aviation environment: (a) compressed gases; (b) liquid oxygen; and (c) de-icing fluids.
53.201.44	Identify and give examples of physical, environmental, task-related, organisational and psychological stressors.
53.201.46	Describe the effects of stress on attention, motivation and performance.
53.201.48	Describe the stages of sleep.
53.201.50	Describe the mechanism of sleep regulation.
53.201.52	Describe problems associated with sleep at abnormal times of the day.
53.201.54	Explain what is meant by sleep debt.
53.201.56	Describe methods of managing fatigue.
53.201.58	Describe methods by which age-related changes in memory and speed of information processing can be moderated by older pilots.
53.201.60	Describe what changes would indicate early dementia or age-related cognitive impairment in another pilot.
53.203	**Aviation Psychology**
53.203.2	Explain the concept of mental workload.
53.203.4	Explain the concept of overload.
53.203.6	Describe methods of managing potential overload.
53.203.8	Describe and compare skill, rule and knowledge-based behaviours.
53.203.10	Describe the process of acquiring a skill.
53.203.12	Describe failures of skill, rule and knowledge-based behaviours.
53.203.14	Explain confirmation bias.
53.203.16	Describe the effect of the following on perception: (a) expectation; and (b) experience.
53.203.18	Describe the formation of mental models.

Sub Topic	Syllabus Item
53.203.20	Describe the special perceptual problems associated with transitioning from IMC to VMC off an instrument approach.
53.203.22	Explain the relationship between crew resource management (CRM) and the building of situational awareness by pilots.
53.203.24	Identify risk assessment techniques.
53.203.26	Identify risk levels that compromise safety.
53.203.28	Identify situations where time pressure compromises safety or increases risk levels.
53.203.30	Define cognitive dissonance.
53.203.32	Describe the following personality traits and explain their effect on group decision making: (a) introversion; (b) extraversion; and (c) anxiety.
53.203.34	Describe a basic model of communications.
53.203.36	Describe the barriers to effective communication.
53.203.38	Identify techniques to reduce communication barriers.
53.203.40	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; and (g) sterile cockpit policies.
53.203.42	Describe and identify examples of overt/active and latent threats.
53.203.44	Identify methods and means for detecting error in the aviation system.
53.203.46	Describe error avoidance techniques.
53.203.48	Explain the basic elements and features of the Reason Model.
53.203.50	Describe and identify examples of an active failure/error.
53.203.52	Describe and identify examples of a latent failure/error.
53.203.54	Identify and describe slips, lapses, mistakes and violations.
53.203.56	Identify the attributes of at-risk behaviour.
53.203.58	Describe the concepts of risk creep and risk tolerance and their application within an aviation organisation.
53.205	**Ergonomics**
53.205.2	Describe the effects of advanced cockpit automation, including:

Sub Topic	Syllabus Item
	(a) failure to monitor;
	(b) boredom and complacency;
	(c) loss of proficiency; and
	(d) problems associated with equipment failure.
53.205.4	Explain the concept of mode awareness in setting up and operating automated systems.
53.205.6	Describe elements of coping behaviour associated with automatic cockpits.
53.205.8	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; and
	(f) visibility.
53.205.10	Describe common errors in display interpretation.
53.205.12	Describe potential errors in the interpretation of the artificial horizon.
53.205.14	Describe problems associated with the presentation and misinterpretation of alerts.
53.205.16	Describe problems associated with the design and use of checklists and manuals.
53.205.18	Describe problems associated with the design and use of maps and charts.

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 (Dead) 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				√
	En route Diversion Calculation	58		√		√
Flight Management	Flight Management	60	√			
	Fuel Management	62	√			
GNSS	Global Navigation Satellite System	70	√	√		
Radar	Procedures	72	√			

Subject No 54 Flight Navigation - IFR

Note: *This syllabus is based on IFR flight as applicable to an IFR-equipped aeroplane or IFR-equipped helicopter operating within the New Zealand Domestic FIR under Rule Part 91.*

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

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

Sub Topic	Syllabus Item
	Fundamentals of Air Navigation
54.12	**Altimetry**
54.12.2	Define: (a) indicated altitude; (b) calibrated altitude; (c) true altitude; (d) pressure altitude (PA) (e) density altitude (DA); (f) flight level (FL); (g) transition altitude (h) transition layer; and (i) transition level.
54.12.4	Apply the table of IFR cruising levels below and above transition.
54.12.6	Explain how true and indicated altitudes are affected by changes in air pressure and air temperature.
54.12.8	Explain: (a) How changes in air pressure and air temperature affect the vertical profile during a non-ILS approach; and (b) The risks associated by low temperatures and QNH errors during a non-ILS approach.
54.12.10	Explain how true and indicated altitudes are related when using flight levels.
54.12.12	Explain what is meant by Reduced Vertical Separation Minimum (RVSM).
54.12.14	Describe the extent of RVSM airspace.
54.12.16	Explain the requirements for operating in RVSM airspace.
	Aeronautical Charts
54.22	**Properties and Principles**
54.22.2	List the aeronautical charts used in New Zealand for operations under IFR.
54.22.4	Identify the information published in the legends of aeronautical charts and in the CHART Symbols section of the AIPNZ Vol 2 & 3.

Sub Topic	Syllabus Item
54.22.6	Explain the meaning of abbreviations and codes used in Operational Data for aerodromes in the AIPNZ.
54.22.8	Explain what is meant by: (a) ADEP; (b) ADES; (c) waypoint; (d) SID; and (e) STAR.
54.22.10	Define the following terms presented on en route charts: (a) minimum en route altitude (MEA); (b) minimum reception altitude (MRA); (c) minimum safe altitude (MSA); (d) route operating limitations (ROL); (e) minimum flight altitude (MFA); (f) compulsory reporting point; (g) non-compulsory reporting point; (h) VOR change-over point; and (i) Distance steps.
54.22.12	With regard to Standard Routes, describe in detail the: (a) function of the routes; (b) associated standard route clearance system; (c) manner in which standard routes are highlighted on en route charts; (d) designator allocated to individual standard routes; and (e) documents where standard routes are published.
54.22.14	With regard to uncharted routes, state the: (a) document, and section, where the routes are published; (b) designator allocated to the routes; and (c) meaning of chart symbols (e.g. asterisks).
54.26	**Reading IFR Charts**
54.26.2	Determine on appropriate en route charts: (a) the magnetic tracks and distances of route segments; (b) the type or class of airspace in which an IFR flight is operating; (c) airspace boundaries; (d) airspace vertical limits; and (e) airspace controlling authority.

Sub Topic	Syllabus Item
54.26.4	With regard to the World Geodetic System 1984 (WGS 84) datum, state where this datum is published.
54.26.6	Interpret information contained in the following charts, tables and diagrams published in the AIPNZ VOL 2 & 3:
	(a) VOR/DME MRA Sector (VORSEC) charts;
	(b) 25 DME Minimum Sector Altitude diagrams;
	(c) Standard Instrument Departure (SID) diagrams;
	(d) Standard Arrival Route (STAR) charts;
	(e) visual arrival charts;
	(f) instrument approach charts;
	(g) ground movement charts;
	(h) instrument T/O procedure chart - rate of climb table; and
	(i) IFR alternate aerodrome minima table.
54.26.8	Explain compliance procedures associated with:
	(a) VOR/DME MRA Sector (VORSEC) charts;
	(b) 25 DME Minimum Sector Altitude diagrams;
	(c) Standard Instrument Departure (SID) diagrams;
	(d) Standard Arrival Route (STAR) charts;
	(e) visual arrival charts;
	(f) instrument approach charts; and
	(g) ground movement charts.
54.26.10	Interpret meteorological information for IFR takeoff minima.
54.26.12	Interpret meteorological information for IFR approach minima.
54.26.14	Explain the compliance procedures involved during precision and non-precision instrument approaches.
54.26.16	Describe the compliance procedures associated with published missed approaches.
	Flight Planning
54.40	**IFR Route Selection**
54.40.2	For the preparation of a flight plan, determine:
	(a) route details, including reporting points and turning points;
	(b) climb performance data including minimum climb gradients associated with published departure procedures;
	(c) descent performance data including rate of descent required to arrive at a position at a stipulated altitude, or to comply with published arrival procedures;
	(d) fuel consumption details during climb, cruise, descent, and during diversion (if different);

Sub Topic	Syllabus Item	
	(e)	cruising level(s) considering topography, navigational and meteorological considerations;
	(f)	ATC and Noise Abatement requirements;
	(g)	speed limitations, if applicable; and
	(h)	requirement for, and availability of, alternate(s).
54.44	**IFR Flight Plan Preparation**	
54.44.2	Prepare an IFR flight plan which contains the following details:	
	(a)	point of departure including minimum departure altitude or departure instructions, if applicable;
	(b)	rate of climb required to comply with published climb gradient;
	(c)	location and altitude of top of climb and top of descent;
	(d)	each sector of the flight identified as From/To;
	(e)	point of arrival including minimum procedure commencement altitude, if applicable;
	(f)	the altitude and time of each sector including mean climb and mean descent altitude;
	(g)	each sector distance;
	(h)	outside air temperatures for the calculation of TAS during climb, cruise and descent;
	(i)	the wind velocity used for climb, cruise and descent, including split climb and split descent;
	(j)	TAS for each sector;
	(k)	track (°M) of each sector;
	(l)	heading (°M), groundspeed and time for each sector; and
	(m)	climb, cruise and descent details of a diversion.
54.46	**IFR Fuel Planning**	
54.46.2	Calculate total fuel load required including provision for diversion and reserve fuel.	
54.52	**IFR Navigation-Procedures**	
54.52.2	Define:	
	(a)	drift, drift angle, drift correction;
	(b)	track error, closing angle, total correction;
	(c)	magnetic and true bearing;
	(d)	position line; and
	(e)	fix.
54.52.4	Describe the principles involved in obtaining an accurate fix.	

Sub Topic	Syllabus Item
54.52.6	Through the use of the navigation computer and mathematical means, solve problems involving: (a) the triangle of velocity; (b) the 1 in 60 rule; (c) time/speed/distance; (d) time/fuel used/fuel consumption rate; (e) height/time/distance/rate of climb/rate of descent; and (f) calculate the track miles flown on a segment of a DME arc.
54.52.8	Based on information derived from currently used VOR and DME displays, and from GNSS instrumentation: (a) describe navigation aspects associated with published departure procedures; (b) calculate magnetic headings required to maintain or regain required magnetic tracks; (c) determine a position in relation to a navigation aid or aids; (d) calculate magnetic tracks to specified point(s); (e) calculate groundspeed; (f) calculate estimated times of arrival at destination or intermediate positions; (g) determine requirements with respect TOC/TOD and rate of climb/rate of descent; (h) position in terms of a radial and distance to or from a navigation aid; (i) calculate fuel consumption, and operational details or requirements resulting from fuel flow information; (j) describe navigation aspects associated with published arrival procedures; (k) calculate holding time over a navigation aid before diversion must be commenced; (l) describe Distance steps; and (m) describe a DME arc procedure.

Subject No 56 Instruments and Navigation Aids

Note: *This syllabus is based on IFR flight as applicable to an IFR-equipped aeroplane or IFR-equipped helicopter operating within the New Zealand Domestic FIR under Rule Part 91.*

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56.2	**Pressure Instruments**
56.2.2	Define:
	(a) static pressure;
	(b) dynamic pressure; and
	(c) total (or pitot) pressure.
56.2.4	Distinguish between the following:
	(a) static pressure;
	(b) dynamic pressure; and
	(c) total (or pitot) pressure.
56.2.6	With the aid of diagrams:
	(a) identify the elements of a basic pitot-static system; and
	(b) label the basic elements of a typical pitot-static probe.
56.2.8	Distinguish between separate pitot probe/static vents, and a combined pitot-static probe.
56.2.10	Describe the precautions and correct method of operation of the pitot heater.
56.2.12	With respect to the airspeed indicator (ASI) and, where appropriate, with the aid of diagrams or charts:
	(a) explain the basic principle of operation;
	(b) identify the markings on a typical light twin-engine aeroplane ASI;
	(c) state the relationship between indicated, calibrated, equivalent and true airspeeds (IAS, CAS, EAS and TAS);
	(d) explain the effect of blockages and leaks, and the remedies available to the pilot; and
	(e) state the serviceability checks.
56.2.14	Explain the following errors affecting the airspeed indicator (ASI):
	(a) instrument error;
	(b) position error;
	(c) compressibility error; and
	(d) density error.
56.2.16	With respect to the altimeter and, where appropriate, with the aid of diagrams:

(a) explain the basic principle of operation;

(b) describe the use of the altimeter settings QNH, QFE and QNE;

(c) explain the effect of blockages and leaks, and the remedies available to the pilot; and

(d) state the serviceability checks.

56.2.18 Explain the following errors affecting the altimeter:

(a) instrument error;

(b) position error;

(c) lag; and

(d) temperature error; and

(e) an incorrectly set altimeter subscale setting.

56.2.20 With respect to the vertical speed indicator (VSI) and, where appropriate, with the aid of diagrams:

(a) explain the basic principle of operation;

(b) explain the effect of blockages and leaks; and

(c) state the serviceability checks.

56.2.22 Explain the following errors affecting the vertical speed indicator (VSI):

(a) position error; and

(b) lag.

56.4 Gyroscopic Instruments

56.4.2 Describe the gyroscopic principles of rigidity and precession.

56.4.4 Describe a typical pneumatic system for powering gyro instruments.

56.4.6 List the advantages of an electrically powered gyro system.

56.4.8 Describe:

(a) real wander; and

(b) apparent wander.

56.4.10 Differentiate between real and apparent wander.

56.4.12 With respect to the turn indicator/turn coordinator and, where appropriate, with the aid of diagrams:

(a) describe the basic principle of operation; and

(b) state the serviceability checks.

56.4.14 Explain the following errors affecting the turn indicator/turn coordinator:

(a) suction error; and

(b) yaw with pitch error.

56.4.16 With respect to the heading/direction indicator (HI/DI) and, where appropriate, with the aid of diagrams:

(a) describe the basic principle of operation;

(b) state that the advantages of an electrically driven HI/DI; and

(c) state the serviceability checks.

56.4.18 Explain the following errors affecting the heading/direction indicator (HI/DI):

(a) gimbal error;

(b) real drift; and

(c) apparent drift/wander.

56.4.20 With respect to the attitude indicator (AI) and, where appropriate, with the aid of diagrams:

(a) describe the basic principle of operation (for both air-driven and electrically driven instruments); and

(b) state the typical limits in freedom.

56.4.22 Explain the following errors affecting the attitude indicator (AI):

(a) pendulosity error;

(b) erection error;

(c) acceleration error; and

(d) turning error.

56.6 Remote Indicating Compasses

56.6.2 With respect to remote-indicating compasses and, where appropriate, with the aid of diagrams explain the basic principle of operation:

(a) describe the compass card presentation on the radio magnetic indicator (RMI);

(b) describe interpretation of the annunciator, and the operation of the compass synchronising knob of the RMI; and

(c) explain the errors which can affect remote indicating compasses (including deviation), and how these can be avoided or reduced.

56.8 Basic Radio Principles

56.8.2 With respect to radio waves and, where appropriate, with the aid of diagrams define:

(a) cycle;

(b) frequency, and state the unit describing frequency; and

(c) wavelength and explain how it is related to frequency.

56.8.4 Describe the propagation of direct waves and the rule of thumb formula for calculation range of reception.

56.10 Primary Surveillance Radar (PSR)

56.10.2 Explain the principle of operation of PSR, including the principles of radar ranging and direction.

56.10.4 Explain the effect of the following factors on the operational range of PSR.

(a) pulse repetition frequency (PRF);

(b) pulse width (PW); and

(c) antenna rate of rotation.

56.10.6 State the maximum range of PSR in New Zealand.

56.12 Secondary Surveillance Radar (SSR)

56.12.2 Explain the principle of operation of SSR.

56.12.4 Explain the factors affecting the operational range of SSR.

56.12.6 State the maximum operational range of the SSR system in New Zealand.

56.12.8 State the advantages of SSR over PSR.

56.14 Transponders

56.14.2 Describe the following functions on a typical transponder control panel:

(a) standby (SBY);

(b) ON;

(c) ALT;

(d) test (TST);

(e) IDENT;

(f) code selection controls; and

(g) reply monitor light.

56.14.4 Describe the correct use of the IDENT button (or switch).

56.14.6 Explain the meanings of typical transponder terminology.

56.14.8 State the operational limits of Mode C readouts.

56.14.10 State the transponder emergency codes.

56.14.12 Describe the operational precautions required when changing codes.

56.16 Airborne Weather Radar

56.16.2 Explain the principle of operation of airborne weather radar.

56.16.4 Describe the function of:

(a) the tilt control;

(b) the range control;

(c) the ANT STAB switch; and

(d) the GAIN control.

56.16.6 Interpret the indications from a weather radar, in its various modes.

56.16.8 Describe the weather radar return strengths of various types of precipitation.

56.18 Visual Landing Aids

56.18.2 Describe the purpose of approach lighting systems and distinguish between the three types of system commonly used in New Zealand.

56.18.4 Describe the purpose of circling guidance lighting and runway lead-in lighting.

56.18.6 Given suitable diagrams, interpret the approach slope indications given by the following systems.

(a) T-VASIS;

(b) RAE red-white VASIS; and

(c) precision approach path indicator (PAPI) and abbreviated PAPI.

56.18.8 Explain the standard PAPI angle setting, and the setting of PAPI threshold crossing height (TCH).

56.18.10 State the possible atmospheric effects on approach slope indication.

56.18.12 Describe typical layout and presentation of the following lighting:

(a) normal runway;

(b) displaced threshold;

(c) runway touchdown zone;

(d) runway end indicator lighting;

(e) taxiway;

(f) wind direction indicator lighting;

(g) aerodrome beacons;

(h) obstruction lighting; and

(i) aeronautical/marine beacons.

56.18.14 Describe pilot activated lighting (PAL).

56.18.16 Describe the standard system of keying PAL to:

(a) activate lighting;

(b) adjust the brilliance; and

(c) reactivate lighting.

56.18.18 Describe the means available for remote control of lighting other than PAL.

56.20 Reserved

56.22 VOR

56.22.2 Explain the basic operating principles of a VOR ground station, including the:

(a) reference phase signal;

(b) variable phase signal; and

(c) measurement of phase difference.

56.22.4 Describe what is meant by a VOR radial.

56.22.6 List the publications and charts that show VOR callsigns and frequencies.

56.22.8 Explain the importance of station identification before using the VOR.

56.22.10 Describe the presentation of the VOR CDI on a:

(a) fixed card;

(b) rotatable card; and

(c) HSI indicator.

56.22.12 Explain the operation of a typical VOR indicator, including:

(a) the omni-bearing selector (OBS);

(b) the course deviation indicator (CDI); and

(c) the TO/FROM indicator.

56.22.14 Describe how the VOR receiver can be used to:

(a) establish orientation of that aircraft to and from a VOR station;

(b) maintain a required track to a VOR station; and

(c) maintain a required track from a VOR station.

56.22.16 Describe the orientation of the CDI while maintaining the required radial when drift correction is being applied.

56.22.18 Describe the behaviour of the course deviation indicator (CDI) while the aircraft is off the selected radial, and the HDG °M and OBS selection are:

(a) within 90° of each other; and

(b) more than 90° apart.

56.22.20 Given suitable diagrams of VOR presentation (including RMI and HSI presentation), demonstrate its use for:

(a) orientation;

(b) crossing a radial and station passing; and

(c) intercepting radials inbound and outbound.

56.22.22 Discuss the factors affecting range and accuracy of VOR, including:

(a) maximum range;

(b) published route operating limitations; and

(c) errors, particularly terrain effect error with “scalloping” and “radial bending”.

56.24 Distance Measuring Equipment (DME)

56.24.2 State the primary functions of the DME.

56.24.4 Describe the basic principle of operation of DME.

56.24.6 Describe current DME presentations.

56.24.8 Explain the importance of station identification before using the DME.

56.24.10 Explain the operation of a typical DME controller, including:

(a) tuning with a paired VOR or ILS frequency;

(b) tuning directly to a DME frequency;

(c) DME ident;

(d) indication of signal loss; and

(e) saturation.

56.24.12 Explain the following:

(a) DME design maximum range; and

(b) DME distance (slant range) versus horizontal range.

56.24.14 Calculate the expected maximum range of the DME at different altitudes.

56.26 Instrument Landing System (ILS)

56.26.2 Explain the basic principle of operation of an instrument landing system **(**ILS), including:

(a) localiser principles;

(b) standard rated coverage;

(c) CDI indication;

(d) glideslope principles;

(e) glideslope angle; and

(f) glideslope indications.

56.26.4 State the localiser and glideslope displacement represented by full scale deviation of the CDI and glideslope indicators.

56.26.6 State the rule-of-thumb methods of calculating:

(a) the required height on a 3° glideslope at a given distance from the threshold; and

(b) the rate of descent required to maintain a 3° glideslope at any given groundspeed.

56.26.8 Given suitable diagrams of instrument presentation, interpret aircraft position with respect to ILS centreline and glideslope.

56.28 Global Navigation Satellite System (GNSS/GPS)

56.28.2 Describe in basic terms the principal GNSS systems – GPS, Galileo, GLONASS and BeiDou.

56.28.4 Describe the three main segments of the GNSS (GPS) system.

56.28.6 Outline the elements of the control segment.

56.28.8 Describe the user segment, including the basic principle of satellite ranging.

56.28.10 Explain the principles of fixing position using the GNSS system; including:

(a) the number of satellites required for 2D and 3D fixing;

(b) the operation of RAIM;

(c) the number of satellites required for fault detection (FD) and for fault detection and exclusion (FDE); and

(d) barometric aiding.

56.28.12 Explain how the receiver predicts the position of various satellites.

56.28.14 State the sources of GNSS error, and the maximum error which can be expected.

56.28.16 State the reasons for the display of a RAIM warning message, and the requirements under CAA Rules for continued navigation.

56.28.18 Explain the operation of:

(a) a RAIM prediction service; and

(b) onboard RAIM alerting.

56.28.20 Describe the application of the WGS 84 datum, and the likely effects on the GPS display of using coordinates from another datum.

56.28.22 Explain the methods of the augmentation of GPS accuracy.

56.28.24 Explain the factors influencing GNSS integrity, continuity and availability, including;

(a) data base validity;

(b) pilot data input; and

(c) GNSS/aircraft system integration.

56.30 Performance Based Navigation (PBN)

56.30.2 Describe Performance Based Navigation (PBN).

56.30.4 Describe the following elements of PBN:

(a) the Navigation Specification;

(b) the Navigation Aid Infrastructure; and

(c) the Navigation Application.

56.30.6 Explain what is meant by:

(a) 2D instrument approach operation;

(b) 3D instrument approach operation;

(c) ABAS;

(d) SBAS;

(e) GBAS;

(f) GBNA;

(g) AMoN;

(h) APCH;

(i) RNAV;

(j) RNP;

(k) AR;

(l) ANP;

(m) EPU;

(n) Total System Error (TSE);

(o) LP;

(p) LPV;

(q) LNAV;

(r) VNAV;

(s) Baro-VNAV;

(t) Fly-by waypoints;

(u) Fly-over waypoints;

(v) Desired track (DTK);

(w) Track to fix (TF);

(x) Direct to fix (DF);

(y) Course to fix (CF); and

(z) Radius to fix (RF).

56.30.8 Differentiate between RNAV and RNP navigation specifications.

56.30.10 Explain where the various navigation specifications are applied.

56.30.12 Describe the construction of a PBN containment area.

56.32 Performance Based Surveillance

56.32.2 Explain what is meant by:

(a) Automatic Dependent Surveillance - Broadcast (ADS-B); and

(b) Multilateration.

56.32.4 Explain the function of:

(a) ADS-B; and

(b) Multilateration.

56.32.6 Explain the basic operating principle of:

(a) ADS-B; and

(b) Multilateration.

56.32.8 Explain the inputs and outputs of:

(a) ADS-B; and

(b) Multilateration.

56.32.10 Explain the limitations of:

(a) ADS-B; and

(b) Multilateration.

Subject No 20 Meteorology

For CPL holders a pass in subject No 20 CPL meteorology meets the requirement for the instrument rating meteorology written examination.

Subject No 34 Human factors

For CPL holders a pass in subject No 34 CPL human factors meets the requirement for the instrument rating human factors written examination.

Appendix II Instrument Rating Test Syllabus

Flight test conduct

This flight test is conducted in accordance with the *Flight Test Standards Guide Instrument Rating (A) or (H*). All training and flight test syllabus areas of Appendix II, III, IV and V (where applicable), that can potentially be examined, must be trained to meet the requirements of rule 61.801(a)(4). The IRT is only a 'sample' of skills, not an exhaustive list. Schools and instructors are entrusted to provide the complete training, not just 'training to test'. Training records must be made available to the examiner. 'Examiner discretion' means the candidate must be ready to demonstrate the full span of skills.

The use of checklists is mandatory for the purpose of instrument rating issue or competency demonstrations.

Demonstrations of GNSS, NDB and VOR tracking, holding and approach procedures should be carried out individually (without the benefit of any other aid).

The flight examiner will assess the ability of the candidate to competently perform all normal and emergency phases of flight without autopilot use or any form of assistance from the examiner.

The extent to which autopilot use is permitted throughout the flight test is at the examiner's discretion. However, during an initial IRT it is expected that manual flying skills are thoroughly assessed during the climb to cruise altitude, level off and at least one hold and one approach. For the annual competency demonstration, the autopilot may be used more extensively, however, at least one approach must be hand flown.

If the flight examiner deems it necessary, in the interests of safety, to intervene with any physical action, then the test will result in mandatory failure.

Unless otherwise stated all manoeuvres and procedures are to be performed having recourse to all available instruments.

An IRT conducted as single-pilot, will be one in which the candidate is to carry out all the pilot duties relating to that flight. If any assistance in the form of oral advice is necessary from the flight examiner during the issue flight test, then the test will result in mandatory failure.

The degree of accuracy required is published in the Instrument Rating Flight Test Standard Guide, and while the applicant is expected to maintain flight within these tolerances, temporary minor excursions outside the established limits are acceptable providing positive remedial action is taken.

It is neither recommended nor required that unusual attitudes or simulated asymmetric (where applicable) be carried out in IMC.

Flight tests must be properly recorded and reported. To find the correct form, go to the 'Forms' tab on the CAA website, search under Part 61 and then for 'Aeroplane/helicopter competency demonstration report form'.

Aircraft and equipment

The aircraft must be certified for IFR flight and be capable of the PBN specification required for the flight test in accordance with the CAA Notices NTC 91.263, the PBN Specification Notices. The radio communication and navigation equipment are to be of an approved

standard, and an intercommunication system acceptable to the flight examiner is to be fitted. Should a flight examiner determine, during the course of the test, that the aircraft instrumentation or equipment fails to meet an acceptable standard, the flight examiner may cancel the test, and the aircraft is not to be used for such purposes again until such time as the defects have been remedied.

An acceptable means of simulating instrument flight conditions, such as a hood, foggles or screens that prevent peripheral external visual reference to the pilot being tested must be used.

The aircraft is to be equipped in accordance with rule 61.25*, Flight training and testing – general requirements.*

General requirements

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

The IRT is to include an oral knowledge test followed by a flight test. Failure to demonstrate competence in any item of the test may result in the applicant and the instructor being advised of the failure aspects and the further training believed necessary before a further flight test may be undertaken.

An applicant is to demonstrate an ability to perform solely by reference to instruments the flight manoeuvres and procedures applicable to the type of approach aid or system for which a rating is desired.

Approaches

The Instrument Rating **initial issue** flight test must include the following approaches:

- one VOR approach, and
- at least one RNP approach.

An **Instrument Rating Competency Demonstration** must include:

- two separate instrument approach procedures, of which at least one is a 2D approach, and
- if the pilot holds a 3D privilege and wishes to continue to exercise 3D privileges, of which at least one is a 3D approach, and
- at least one RNP approach is required for continued PBN privileges.

Additional approach aids or PBN specifications may be added to the IR at any time, either during the initial issue test, a competency demonstration or as a stand-alone test.

The requirement for a VOR approach in the initial IRT is based on there being a network of VORs in place in case of a GNSS system failure. As such, information displayed should be reduced as much as practical to simulate a loss of GNSS. For aircraft not equipped with a DME, and where a VOR timed approach is not practical, then GNSS distance may be used for the purpose of completing the test. However, prior to the test the candidate must produce logbook evidence, signed by the instructor, to the examiner that they have received training and been assessed as competent to conduct a VOR timed approach. This flight may be conducted in either an aircraft or a synthetic training device approved for the purpose.

Holds

For the initial issue, competency demonstration or the addition of another aid, one entry and one complete hold must be conducted. If the entry procedure is Sector 3 (direct), this counts as the entry and a further hold must be flown.

Personal preparation

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, evidence of identity, their summarised and certified pilot's logbook, IR training record, pilot's licence (that meets the night flight requirements of that licence), written exam credits, KDRs, current Navigation Charts and plates; and previous competency demonstration record (if applicable).

The candidate will demonstrate a sound knowledge of IR privileges, currency, and medical requirements.

Operational flight plan preparation

The candidate is to demonstrate proficiency in the following.

(a) Preparation of an operational flight plan along charted or promulgated routes between two aerodromes at least 35nm apart, one of which must be a controlled aerodrome. The applicant is to use appropriate meteorological information and is to have a good knowledge of the requirements governing such flights including fuel requirements, applicable weather minima, choice of altitudes, air traffic service procedures and choice of alternate (as and when required).

(b) Making a sound go/no-go decision based on all available information (including, if applicable, GNSS RAIM prediction).

(c) Assessing the aircraft's performance capabilities in respect to departure, en route and approach procedure requirements.

Knowledge of flight rules
The candidate is to demonstrate knowledge of:

(a) Fuel requirements under IFR, including contingency requirements if required.

(b) The conditions that would require an alternate to be nominated and the criteria for the selection of a suitable alternate including in the event of a loss of Primary Means of Navigation (PMoN).

(c) Take-off, en route, approach and circling minima.

(d) IFR cruising levels.

(e) Icing conditions.

Flight preparation
The candidate will exhibit knowledge of the:

(a) Aircraft documentation, including PBN capability, PBN tolerances appropriate for the route and qualification sought, suitable alternate means of navigational equipment (AMoN) and ADS-B.

(b) Aircraft technical log.

(c) Fuel requirements including reserves for IFR flight in accordance with Parts 91, 135 and 125 or Part 121 as appropriate, including contingency planning requirements in the event of a loss of primary means of navigation (PMoN).

(d) Fuel quantity on board the aircraft prior to flight, the aircraft's fuel consumption and endurance and the correct tank selection in accordance with the aircraft's flight manual.

(e) Pre-flight inspection with emphasis on items applicable to IFR operations, including anti-icing equipment where applicable.

(f) Aircraft's instruments serviceability checks, including RAIM availability.

RTF procedures and navigation aid tuning
The candidate will:

(a) Obtain, record, read back, clarify comply or reject clearances as appropriate.

(b) Make appropriate transmissions at compulsory reporting points.

(c) Use correct aeronautical phraseology with appropriate assertiveness and seek clarification where applicable.

(d) Tune, identify and test the aircraft's navigation equipment in accordance with recommended procedures and the manufacturer's instructions, including GNSS navigation databases.

(e) Tune, test and operate the aircraft's transponder as required.

(f) Load, check and operate any required PBN routes, procedures and approaches and ensure GNSS is in correct mode for phase of operation, i.e. ENR, TERM, LNAV etc.

Loss of communication or navigation aid failure procedures

The candidate will demonstrate knowledge of the loss of communications procedure or navigation aid failure for various phases of flight, including GPS loss of integrity or failure for PBN operations. For EFIS aircraft this will include failure of the multi-function display (MFD) if applicable.

In flight

Simulated instrument flight is to be introduced at the take-off minima for the aerodrome of departure and discontinued at the landing minima for the aerodrome of destination. The flight will be planned at least in part within controlled airspace.

Attention will be given to the applicant's ability to:

- Fly the aircraft smoothly and accurately by sole reference to instruments.
- Conform to the appropriate departure procedure.

- Intercept and track using the navigation aids or systems individually.
- Update estimated times of arrival where appropriate.
- Transition to the instrument approach procedure.
- Comply with ATC clearances and instructions.

Instrument transition
The candidate will transition smoothly from visual flight to instrument flight at the published IFR minimum for take-off.

The holder of a PPL (A or H) or CPL(H) will demonstrate for IR issue, without the use of autopilot, as specific exercises:

Straight and level flight:

Achieve and maintain accurate level flight at the nominated altitude. Accurately maintain the nominated heading and trim for level flight.

Level turns:

Coordinated level medium turns through 180º left and right, using and maintaining an accurate bank angle of 30º.

Climbing and descending:

Entering and maintaining climbing and descending flight, maintaining a constant airspeed and heading.

Climbing turns to altitude:

Climbing turns at Rate 1 whilst maintaining the nominated airspeed to enter level flight at a predetermined altitude.

Descending turns to altitude:

Descending turns at Rate 1 whilst maintaining the nominated airspeed to enter level flight at a predetermined altitude.

Limited panel:

By sole reference to basic flight instruments, and in the case of helicopters (where the flight manual permits), without benefit of stabilisation systems, or in the case of an EFIS equipped aircraft by sole reference to standby instruments as a result of a primary flight display (PFD) failure, demonstrate achieving and maintaining level flight, maintain the nominated compass heading and accurately trim for level flight.

Demonstrate level Rate 1 turns onto a nominated compass heading maintaining the nominated altitude.

Recognise and demonstrate recovery from power on (reduced power setting at examiner discretion) nose high, nose low and spiral dive attitudes (appropriate to the aircraft size and type). During the recovery, correctly identify the aircraft's attitude, apply the correct recovery technique to initially return to straight and level flight and then return to the nominated altitude and compass heading.

Note: *If the weather precludes, this item may be completed on a separate flight within 30 days of the initial part of the test.*

All candidates will demonstrate:

Departure procedures

By carrying out a departure procedure in accordance with a standard instrument departure (SID) using ground-based aids (GBA), PBN procedures or ATC instructions. Tolerances are to be maintained within the procedure design.

Engine failure after take-off (for multi-engine aeroplanes or helicopters)

- By maintaining control after a simulated engine failure under simulated instrument flight conditions, with continued climb in accordance with the departure procedure (or an appropriate emergency procedure).
- Using the emergency checklist or QRH to follow up memory items.
- Making appropriate simulated radio calls and nominating an appropriate plan of action.

Note: *Feathering the propeller (aeroplane) is neither required nor encouraged for instrument rating competency demonstrations.*

In synthetic training devices approved for the purpose, engine failures should be 'real' in that engine controls are manipulated to shut down the engine, rather than the use of touch drills.

En route procedures

- Adapting to ATC requirements, applying good airmanship as applicable, i.e., speed limitations, en route delays or holding, re-routing requirements.
- En route tolerances being subject to consideration of bends or fluctuations of track guidance and within the rated coverage of the navigation aid or where applicable meet PBN standards and minima.

Use of checklists

By using normal and emergency checklists as applicable to the operation.

General use of autopilot

- By carrying out the appropriate serviceability checks prior to flight.
- Utilising the autopilot in flight; able to programme, monitor and identify "capture" of armed modes (as appropriate and applicable).
- Demonstrating knowledge of the autopilot's capabilities, limitations and recognising autopilot mode failures (as applicable).

Holding procedures

By identifying and applying the correct hold entry and holding technique applicable to the published hold procedure.

The tracking tolerance is that applicable to the en route standards for the applicable aid. The holding procedure design is based on turns at 25º angle of bank or Rate 1 (whichever is the lesser). The pilot is to make adjustments for wind to ensure the interception and maintenance of the inbound track.

Unusual attitudes, full panel

Timely recognition and correct recovery to straight and level flight from steep climbing turns and spiral dives, as appropriate to the aircraft type. Note: If the weather precludes, this item may be completed on a separate flight within 30 days of the initial part of the test.

Arrivals

Carry out an arrival. Either a standard arrival (STAR), direct to join an arc or initial approach fix (IAF), or radar vectors as appropriate and in accordance with the published procedure and ATC instructions.

Descend as required to maintain profile in accordance with ATC clearances and published minimum altitudes. Arc arrival procedures are examined at the examiner's discretion, or when required by ATC, and are required to be flown to remain within +/- 1nm of the arc radius.

Approaches

During the briefing the examiner will nominate which approaches are to be flown. Before beginning an approach, confirm weather conditions are suitable. Altimeters must be correctly set with the appropriate QNH. Each approach is to be flown with the aeroplane correctly configured and in trim such that a stable approach path is maintained to DA/H or MDA/H. For 2D approaches the constant angle descent profile should be flown where published, during the competency demonstration IAW the Instrument Rating Flight Test Standards Guide.

GNSS approach:

A RAIM check must be completed prior to any RNP approach (before or during flight). Verify correct GNSS mode (CDI scaling) for the approach. Within half scale of the inbound track, descent may be commenced.

VOR approach:

The navigation aid must be identified prior to commencing the approach. Within 5º of the inbound track, descent may be commenced.

NDB approach:

The navigation aids must be identified prior to commencing the approach. Within 5º of the inbound track, descent may be commenced.

ILS approach:

The navigation aids must be identified prior to commencing the approach. Interception and maintenance of LLZ and glideslope within procedure tolerances.

Circling approach: (aeroplanes only, at examiner's discretion)

Demonstration of the transition from an instrument approach procedure to a circling approach and landing on a runway preferably at an angle of at least 80º to the final instrument approach track within the lowest circling minima authorised for the aircraft at the aerodrome concerned. A higher altitude may be nominated by the flight examiner.

The aircraft levels off and remains above circling MDA/H until in position for the final approach using normal manoeuvres and ROD.

Angle of bank and rate of turn

For all procedures except the circling approach, the approach procedures are designed to provide terrain clearance using a maximum of 25º angle of bank or Rate 1 (whichever is the lesser). Lesser angles of bank apply to procedure design for high performance aircraft on departure.

Circling approach procedure designs are based on, 20º angle of bank or Rate 1 (whichever is the lesser). The angle of bank and rate of turn should be monitored and adjusted for the conditions.

Speeds

Instrument procedures flown are to comply with the requirements of the aircraft flight manual and with the relevant approach procedure design speeds. If nominated, the higher minima are to be applied when a higher speed is utilised for the approach. During the briefing the candidate will nominate to the examiner the speeds they intend to target through the various phases of flight.

One engine inoperative performance (multi-engine aircraft only)

Failure of an engine will be simulated prior to, or during, an instrument approach procedure and an engine-out missed approach initiated from minimum altitude in accordance with the missed approach procedure for that aid.

Missed approach procedure

Prompt initiation of the published missed approach procedure is required.
All 2D missed approaches must be conducted without descent below the published MDA/MDH in accordance with the published procedure. For 3D approaches, a slight descent below DA/DH is acceptable if the go around has already been initiated. Tolerances are to be maintained within the procedure design.

For straight-in approaches using a constant angle descent profile, the missed approach should be initiated on reaching MDA/MDH.

For timed approaches where there are no advisory altitudes, it is normal to level off and remain above MDA whilst flying level to the missed approach point (MAP), from which the missed approach is initiated.

ATS compliance

- By maintaining a listening watch.
- Communicating clearly and concisely using aviation phraseology.
- Recording, clarifying, complying or rejecting clearances and instructions as appropriate.

IR annual competency demonstration

This will be to the same standard and contain the same elements (except where provided) as the initial issue flight test. Operators certificated to conduct annual competency demonstrations within their training organisations may be certificated to conduct annual instrument rating competency demonstrations using an approved synthetic flight training device, in accordance with the approved conditions of use.

IR approach aid endorsement

An applicant for an additional approach-aid endorsement to the instrument rating is to demonstrate competence to a flight examiner on that approach aid in accordance with the Instrument Rating Flight Test Standards Guide. Such a demonstration may be completed independently or as part of the annual competency demonstration. This may be conducted in an aircraft, or a synthetic training device approved for the purpose.

In addition to the practical competency demonstration, NDB approach aid endorsements require the successful completion of the ADF/NDB Theory Course as outlined in Appendix IV and be certified in their logbook.

Appendix III PBN Pilot Knowledge and Training Syllabus

The PBN navigation specifications outlined in this syllabus cover a wide range of operations, and training needs to be appropriate to the specific circumstances. Although this syllabus, derived from the ICAO Doc 9613, includes guidance for flight crew training for the published navigation specifications, the guidance is not consistent in detail and scope across the range of specifications. The amount and type of training required will vary significantly upon several factors including:

1. previous training and experience
2. complexity of operations, and
3. aircraft equipment.

The following knowledge requirements apply to all PBN operations, although the content and complexity will vary depending upon the specific operation (see AC91-21, Section 10, *Pilot Knowledge and Training* for further detail):

1. Area navigation principles
2. Navigation system principles
3. Equipment operation and functionality
4. Flight planning
5. Operating procedures
6. Contingency procedures
7. Performance monitoring and alerting
8. Operating limitations

When developing PBN training programmes, the following theoretical and practical items should be addressed to the extent that the pilots are familiar with and have knowledge of the items that are applicable to each individual navigation specification:

RNAV 1 and 2; RNP 1 and 2; RNP APCH (LNAV and LNAV/VNAV)

(a) the information contained in AC91-21 and applicable notice;

(b) the meaning and proper use of aircraft equipment/navigation suffixes;

(c) procedure characteristics (including route and airspace) as determined from chart depiction and textual description;

(d) depiction of waypoint types (fly-over and fly-by), required path terminators (IF, TF, DF) and any other types used by the operator (if applicable), as well as associated aircraft flight paths;

(e) required navigation equipment for operation on RNAV routes/SIDs/STARs and RNP APCH/SIDs/STARs, e.g. DME/DME, DME/DME/IRU, and GNSS;

(f) RNAV/RNP system-specific information:

i) levels of automation, mode annunciations, changes, alerts, interactions, reversions, and degradation;

ii) functional integration with other aircraft systems;

iii) the meaning and appropriateness of route discontinuities as well as related flight crew procedures;

iv) pilot procedures consistent with the operation;

v) types of navigation sensors (e.g. DME, IRU, GNSS) utilised by the RNAV/RNP system and associated system prioritisation/weighting/logic;

vi) turn anticipation with consideration to speed and altitude effects;

vii) interpretation of electronic displays and symbols; and

viii) understanding of the aircraft configuration and operational conditions required to support RNAV/RNP operations, i.e. appropriate selection of CDI scaling (lateral deviation display scaling);

(g) RNAV/RNP equipment operating procedures, as applicable, including how to perform the following actions:

i) verify currency and integrity of the aircraft navigation data;

ii) verify the successful completion of RNAV/RNP system self-tests;

iii) initialise navigation system position;

iv) retrieve and fly an RNAV/RNP route, SID, STAR and RNP APCH with appropriate transition;

v) adhere to speed and/or altitude constraints associated with a route, SID, STAR and RNP APCH procedure;

vi) select the appropriate STAR or SID for the active runway in use and be familiar with procedures to deal with a runway change;

vii) perform a manual or automatic update (with take-off point shift, if applicable);

viii) verify waypoints and flight plan programming;

ix) Fly an interception of an initial or intermediate segment of an approach following ATC notification;

x) fly direct to a waypoint;

xi) fly a course/track to a waypoint;

xii) intercept a course/track;

xiii) following vectors and re-joining an RNAV/RNP route from “heading” mode;

xiv) determine cross-track error/deviation. More specifically, the maximum deviations allowed to support RNAV/RNP must be understood and respected;

xv) resolve route discontinuities;

xvi) remove and reselect navigation sensor input;

xvii) when required, confirm exclusion of a specific NAVAID or NAVAID type;

xviii) when required by the authority, perform gross navigation error checks using conventional NAVAIDs;

xix) change arrival airport and alternate airport;

xx) perform parallel offset functions if capability exists. Pilots should know how offsets are applied, the functionality of their particular RNAV/RNP system and the need to advise ATC if this functionality is not available;

xxi) perform RNAV/RNP holding functions;

(h) operator-recommended levels of automation for phase of flight and workload, including methods to minimise cross-track error to maintain route centre line;

(i) R/T phraseology for RNAV/RNP applications; and

(j) contingency procedures for RNAV/RNP system failures.

RNAV 5

In addition to the above items, the following knowledge of RNAV 5 is required:

(a) the capabilities and limitations of the RNAV system installed;

(b) the operations and airspace for which the RNAV system is approved to operate; and

(c) the NAVAID limitations with respect to the RNAV system to be used for the RNAV 5 operation.

RNP 4 and 10

There are no specific additional training requirements for RNP 4 and 10, other than the general requirements prescribed in AC91-21, *Operational Approvals – Performance-Based Navigation*, Section 10 Pilot Knowledge and Training; and the applicable notices.

RNP APCH (LP & LPV)

In addition to the above items for RNP APCH, the following knowledge of LP & LPV minima is required:

(a) RNP approach concept containing LP or LPV minima:

i) theory of approach operations;

ii) approach charting;

iii) use of the approach system including:

1) selection of the LP or LPV approach procedure; and

2) ILS look alike principle;

iv) use of lateral navigation mode(s) and associated lateral control techniques;

v) use of VNAV mode(s) and associated vertical control techniques;

vi) R/T phraseology for LP or LPV approach operations; and

vii) the implication for LP or LPV approach operations of systems malfunctions which are not related to the approach system (e.g. hydraulic failure);

(b) RNP approach operation containing LP or LPV minima:

i) definition of LP or LPV approach operations and its direct relationship with RNAV(GNSS) procedures;

ii) regulatory requirements for LP or LPV approach operations;

iii) required navigation equipment for LP or LPV approach operations:

1) GPS concepts and characteristics;

2) augmented GNSS characteristics; and

3) MEL;

iv) procedure characteristics:

1) chart depiction;

2) aircraft display depiction; and

3) minima;

v) retrieving an LP or LPV approach procedure from the database (e.g. using its name or the SBAS channel number);

vi) change arrival airport and alternate airport;

vii) flying the procedure:

1) use of autopilot, autothrottle and flight director;

2) flight guidance mode behaviour;

3) lateral and vertical path management;

4) adherence to speed and/or altitude constraints;

5) fly interception of an initial or intermediate segment of an approach following ATC notification;

6) fly interception of the extended FAS (e.g. using the VTF function);

7) consideration of the GNSS approach mode indication (LP, LPV, LNAV/VNAV, lateral navigation); and

8) the use of other aircraft equipment to support track monitoring, weather and obstacle avoidance;

viii) ATC procedures;

ix) abnormal procedures; and

x) contingency procedures.

RNP-AR APCH

In addition to the above items in relation to RNP APCH (LNAV and LNAV/VNAV) and (LP & LPV), the following knowledge specific to RNP AR APCH is required:

(a) definition of RNP AR APCH;

(b) the differences between RNAV and RNP;

(c) the types of RNP AR APCH procedures and familiarity with the charting of these procedures;

(d) the programming and displaying of RNP and aircraft specific displays (e.g. actual navigation performance (ANP display));

(e) how to enable and disable the navigation updating modes related to RNP;

(f) the navigation accuracy appropriate for different phases of flight and RNP AR APCH procedures and how to select the navigation accuracy, if required;

(g) the use of GPS RAIM (or equivalent) forecasts and the effects of RAIM availability on RNP AR APCH procedures (pilot and dispatchers);

(h) when and how to terminate RNP navigation and transfer to traditional navigation due to loss of RNP and/or required equipment;

(i) how to determine database currency and whether it contains the navigational data required for use of GNSS waypoints;

(j) explanation of the different components that contribute to the TSE and their characteristics (e.g. effect of temperature on baro-VNAV and drift characteristics when using IRU with no radio updating); and

(k) temperature compensation — pilots operating avionics systems with compensation for altimetry errors introduced by deviations from ISA may disregard the temperature limits on RNP AR APCH procedures, if pilot training on the use of the temperature compensation function is provided by the operator and the compensation function is utilized by the crew. However, the training must also recognize the temperature compensation by the system is applicable to the VNAV guidance and is not a substitute for the pilot compensating for the cold temperature effects on minimum altitudes or the DA.

(l) Procedures for verifying that each pilot's altimeter has the current setting before beginning the final approach of an RNP AR APCH procedure, including any operational limitations associated with the source(s) for the altimeter setting and the latency of checking and setting the altimeters approaching the FAF;

(m) The use of aircraft radar, TAWS, GPWS, or other avionics systems to support the pilot's track monitoring and weather and obstacle avoidance;

(n) The effect of wind on aircraft performance during RNP AR APCH procedures and the need to remain within RNP containment area, including any operational wind limitation and aircraft configuration essential to safely complete an RNP AR procedure;

(o) The effect of ground speed on compliance with RNP AR APCH procedures and bank angle restrictions impacting the ability to remain on the course centre line. For RNP AR APCH procedures, aircraft are expected to maintain the standard speeds associated with the applicable category;

(p) The relationship between RNP and the appropriate approach minima line on an approved published RNP AR APCH procedure and any operational limitations noted on the chart, e.g. temperature limits, RF leg requirements or loss of GNSS updating on approach;

(q) Concise and complete pilot briefings for all RNP AR APCH procedures and the important role CRM plays in successfully completing an RNP AR APCH procedure;

(r) Alerts from the loading and use of improper navigation accuracy data for a desired segment of an RNP AR procedure;

(s) The performance requirement to couple the autopilot/flight director to the navigation system's lateral and vertical guidance on RNP AR APCH procedures requiring an RNP of less than RNP 0.3;

(t) The importance of aircraft configuration to ensure the aircraft maintains any required speeds during RNP AR procedures;

(u) The events triggering a missed approach when using the aircraft's RNP capability;

(v) Any bank angle restrictions or limitations on RNP AR APCH procedures;

(w) The potentially detrimental effect on the ability to comply with an RNP AR APCH procedure when reducing the flap setting, reducing the bank angle or increasing airspeed;

(x) Pilot knowledge and skills necessary to properly conduct RNP AR APCH operations;

(y) Programming and operating the FMC, autopilot, auto throttles, radar, GPS, INS, EFIS (including the moving map), and TAWS in support of RNP AR APCH procedures;

(z) The effect of activating TOGA while in a turn;

(aa) FTE monitoring and impact on go-around decision and operation;

(bb) Loss of GNSS during a procedure;

(cc) Performance issues associated with reversion to radio updating and limitations on the use of DME and VOR updating; and

(dd) Flight crew contingency procedures for a loss of RNP capability during a missed approach. Due to the lack of navigation guidance, the training should emphasise the flight crew contingency actions that achieve separation from terrain and obstacles. The operator should tailor these contingency procedures to their specific RNP AR APCH procedures.

A-RNP

A-RNP is an aircraft specific qualification that covers the following navigation specifications: RNAV 5, RNAV 1, RNAV 2, RNP 2, RNP 1 and RNP APCH. The pilot training syllabi for these individual specifications is located above.

Appendix IV ADF/NDB Theory Course Syllabus

Introduction

This syllabus is guidance for developing a course for ADF Instrument Rating privileges.

Pilot training must include classroom training and examination, and practical training on the equipment to be used (in an approved synthetic training device, procedure trainer, or aircraft), covering the following matters with appropriate logbook endorsement.

Course concept

This course is a prerequisite for the issue of ADF as a navigation aid endorsement to an instrument rating.

Before taking the endorsement demonstration, the applicant must provide evidence to the holder of a current flight examiner rating with the examiner privilege of additional navigation aid ADF that they have successfully completed a course in accordance with this syllabus.

The flight examiner must be satisfied with the content of the course as delivered to the candidate by questioning the candidate appropriately on the content of the course syllabus.

Classroom training and examination

Automatic Direction Finder (ADF) and Non-Directional Beacon (NDB) Principles

1) Describe the basic features of a non-directional beacon (NDB), including:

   (a) the range of frequencies usually employed;

   (b) the factors affecting operational range; and

   (c) typical name, frequency, identification and location details.

2) Describe the basic components of an aircraft automatic direction finder (ADF).

3) Explain the basic principles of loop direction finding, including the:

   (a) generation of maximum and null signals in different loop positions;

   (b) use of polar diagrams;

   (c) application of a sense aerial to resolve ambiguity; and

   (d) automatic seeking of the null position (hence ADF).

4) Describe the basic principle of operation of a fixed loop and state the advantages of a fixed versus rotating loop.

5) State the importance, when tuning an NDB, of making a positive identification of the station tuned, and of checking proper functioning of the ADF.

6) Describe the function of the controls on a typical ADF control panel, including:

   (a) ANT (or REC or VOICE) mode;

   (b) ADF (or COMP) mode;

(c) TEST mode;

(d) BFO (or CW); and

(e) the LOOP position, where fitted.

7) Given suitable diagrams of instrument presentation, describe the use of a relative bearing indicator (RBI), a rotatable card ADF, and a radio magnetic indicator to determine:

(a) magnetic bearing to an NDB (orientation);

(b) position in relation to required track to/from an NDB;

(c) interception of a required track to/from an NDB; and

(d) station passage.

8) Explain the following factors which affect the accuracy of ADF indications:

(a) night effect;

(b) coastal refraction;

(c) mountain effect; and

(d) precipitation static and thunderstorms.

9) Describe the presentation and function of the ADF needle on a fixed card, rotatable card and RMI indicator.

10) Describe the purpose of each control on the ADF control panel.

11) Be familiar with the publications and charts that show NDB callsigns, frequencies and route depiction.

12) Explain why it is important to check the NDB ident before using an NDB.

13) Explain what is meant by relative bearing.

14) Given an aircraft magnetic heading and a relative bearing, or an RMI presentation calculate:

(a) magnetic bearing to an NDB;

(b) magnetic bearing from an NDB.

15) Describe the track followed by an aircraft experiencing a crosswind when the ADF needle is kept on the 360°R position.

16) Explain how the ADF can be used to maintain track with drift correction applied:

(a) when tracking to an NDB;

(b) when tracking away from an NDB.

17) Identify aircraft position relative to NDB or multiple NDB’s.

In an aircraft, approved synthetic training device, or procedure trainer:

1) Correctly tune, ident and verify an NDB.
2) Brief and fly a published SID with transition to an NDB route.
3) Adhere to speed and/or altitude constraints associated with a SID.
4) Determine allowable deviation limits and maintain flight within those limits.
5) Carry out contingency procedures for NDB/ADF failures.
6) Perform NDB holding functions.
7) Retrieve and fly, an NDB arc and approach.
8) Adhere to speed and/or altitude constraints associated with an NDB Approach.
9) Initiate a missed approach procedure from the Missed Approach Point.

Appendix V GNSS Theory Course Syllabus (Transitional Requirement Only)

Introduction

This syllabus is guidance for developing a course for RNP and RNAV Instrument Rating privileges and is to be utilised only for those candidates who have undertaken IR theory examination credits prior to the issue of Revision 14 of this AC dated 1 June 2023.

Pilot training must include classroom training and examination, and practical training on the equipment to be used (in an approved synthetic training device, procedure trainer, or aircraft), covering the following matters with appropriate logbook endorsement.

Course concept

This course is a prerequisite for the issue of GNSS as a navigation aid endorsement to an instrument rating if the candidate holds IR theory examinations completed prior to the issue of this AC.

Prior to undertaking the endorsement demonstration, the applicant must provide evidence to the holder of a current flight examiner rating with the examiner privilege of additional navigation aid GNSS that they have successfully completed a course in accordance with this syllabus.

The flight examiner must be satisfied with the content of the course as delivered to the candidate by questioning the candidate appropriately on the content of the course syllabus.

Classroom training and examination

Performance Based Navigation (PBN) Principles

1. State the principles of RNAV 1 and 2, RNP 1 and 2 and RNP APCH
2. Describe in basic terms the principal GNSS systems – GPS, Galileo, GLONASS and BeiDou.
3. Explain navigation database menus and sub menus.
4. Explain how to confirm data validity and a verifiable source for current applicable software versions.
5. Understand system software configuration management.
6. Using the basic block diagram of an RNAV system explain the function and operation of each component.
7. Describe the effects of RAIM outages, Fault Detection (FD), and Fault Detection and Exclusion (FDE) on PBN.
8. Explain the difference between an almanac and ephemeris data on GNSS operations.
9. Explain the effect of barometric altitude input.
10. Explain the operating principle of RAIM.
11. Explain the difference between Fly-by and Fly-over waypoints.
12. List the required navigation and communication equipment for RNAV, RNP, and RNP APCH operations.
13. Describe the basic differences between TSO C129 and C145/146 receivers, including scaling differences.

14. State and apply the operational conditions required to support RNP 1 and 2 (no surveillance) operations and RNAV 1 and 2 operations (under surveillance).
15. State the actions to be taken in the event of loss of integrity, system failure and system messages.
16. List the effects on turn anticipation with consideration to speed and altitude.
17. Explain the contingency procedures for RNAV/RNP failures.
18. State the aviation documents required for PBN operations.

Charting

1. Demonstrate a working knowledge of definitions and abbreviations associated with RNP, RNAV and RNP APCH operations.
2. Be familiar with the interpretation of chart legends including route depiction, flyover and fly-by waypoints.
3. Explain the significance of the WGS-84 earth model.

Aircraft and equipment knowledge

1. Describe the use of navigation database menus and submenus.
2. Describe system software configuration management.
3. Describe annunciator message importance of warnings; both cautions and advisory, and their applicability.

Pilot operations

1. Discuss human factors in PBN.
2. Demonstrate filing of ICAO flight plans in compliance with current flight planning requirements.
3. Identify operator procedures, including methods to minimise cross track error.
4. Explain monitoring procedures for each stage of flight.
5. Explain turn anticipation with consideration of speed and altitude effects.
6. Demonstrate appropriate RTF phraseology.

Equipment specific training

On ground

1. Describe the capabilities and limitations of the installed system from the Aircraft Flight Manual or AFM Supplement.
2. Explain levels of automation, mode annunciations, changes, alerts etc.
3. Explain system software configuration management.
4. Demonstrate removal and re-selection of navigation sensor input.
5. Demonstrate confirmation of exclusion of sensor input.

6. Describe functional integration with other aircraft systems.
7. Interpret electronic displays and symbols.
8. Identify where HDG, GS, TK, XTK, G/S etc. are displayed.
9. Demonstrate RAIM prediction.
10. Verify currency and integrity of the aircraft navigation data.
11. Initialise navigation system self-tests.
12. Verify the successful completion of the navigation system self-tests.
13. Verify waypoints and flight plan programming.
14. Edit or amend current flight plan with routing changes.
15. Perform an FDE prediction for flights to a destination and alternate.

In an aircraft, approved synthetic training device, or procedure trainer:

1. Initialise system position.
2. Perform a manual or automatic update with take-off point shift if applicable.
3. Verify waypoints and navigation system flight plan programming.
4. Retrieve and fly a planned SID and reprogram with a subsequent runway change.
5. Adhere to speed and/or altitude constraints associated with a SID.
6. Vector off and re-join a route or procedure.
7. Determine allowable deviation limits and maintain flight within those limits.
8. Carry out contingency procedures for RNAV/RNP failures.
9. Demonstrate how to change CDI scaling.
10. Perform parallel track offset functions if capability exists.
11. Perform gross navigation error checks with legacy aids.
12. Perform RNAV/RNP holding functions.
13. Change the planned destination and alternate airport.
14. Select and fly the appropriate STAR and demonstrate and handle a runway change.
15. Adhere to speed and/or altitude constraints associated with a STAR.
16. Retrieve and fly, an RNAV (GNSS) approach.
17. Adhere to speed and/or altitude constraints associated with an RNP APCH.