

Republic of Iraq
Ministry of Transport
Iraq Civil Aviation Authority



REGULATIONS
(21)
AVIATION TRAINING
ORGANIZATIONS

INTRODUCTION

These Regulations addresses the certification and administration of approved training organizations (ATO). The use of an ATO for the training and qualification of airmen is common in modern aviation, most particularly as operators upgrade their aircraft inventory and airmen transition to new aircraft.

The interrelation between ATO requirements under these regulations and the licensing and certification requirements of Regulations No. 8 (Personnel Licensing) is plain. Even if Iraq does not have an ATO located in the country, the requirements for ATO operation do apply to the standards required for adequate training for qualification for an Iraq certification. Thus, Iraq citizens who receive training from a foreign ATO should be trained by an ATO meeting Iraq standards. The regulations set forth herein allow for this situation.

This document contains regulations, schedules and implementing standards. The regulations are the regulatory requirements which the maintenance organization must comply with as applicable to his scope of work; the schedules are guidelines for specific regulations, while implementing standards presents a supplement to some regulations.

The Director General may amend these regulations whenever it is determined that aviation safety requires such amendment.

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REPUBLIC OF IRAQ

REGULATIONS

Made by the Authority with the approval of the Director General of Iraqi Civil Aviation Authority under Act 148 of 1974 "The Civil Aviation Act", Article 87 and Article 208.

**REGULATIONS (NO. 21)
AVIATION TRAINING ORGANIZATIONS**

Citation

Citation 1. These Regulations may be cited as (Aviation Training Organizations) Regulations.

Definitions and Abbreviations

Interpretation 3.(1) In these Regulations:

- (a) Accountable manager (training). The manager who has corporate authority for ensuring that all training can be financed and carried out to the standard required by the Authority. The accountable manager may delegate, in writing, to another person in the organisation to become the accountable manager when authorised by the Authority.
- (b) Advanced flight training device. A flight training device that has a cockpit that accurately replicates a specific make, model, and type aircraft cockpit, and handling characteristics that accurately model the aircraft handling characteristics.
- (c) AMEL Course — A training course for AMEL maintenance ratings.
- (d) Approved training organisation. An organisation approved by a civil aviation authority in accordance with the requirements of this part to perform airman training and operating under the supervision of that civil aviation authority.
- (e) Authority. Means the Civil Aviation Authority established under the Civil Aviation Law No. 148 for 1974.
- (f) Flight Training Equipment. Flight simulators, flight training devices, and aircraft.

- (g) Finding. A finding is a conclusion by the operator's audit personnel that demonstrates non-conformity with a specific standard.
- (h) Level 1 Aviation Training Organisation (ATO). A flight training facility which conducts all or substantially all of each flight training course using aircraft.
- (i) Level 2 Aviation Training Organisation (ATO). A flight training facility which conducts all or substantially all of each flight training course using simulation media which are qualified and approved by the Authority.
- (j) Line-Operational Simulation. Simulation conducted using operational-oriented flight scenarios that accurately replicate interaction among flight crew members and between flight crew members and dispatch facilities, other crewmembers, air traffic control, and ground operations.
- (k) Line Operational Flight Training (LOFT). Training in a simulator with a complete crew using representative flight segments which contain normal, abnormal, and emergency procedures that may be expected in line operations.
- (l) Policy. A document containing the organisation's position or stance regarding a specific issue.
- (m) Procedure. A way of documenting a process.
- (n) Procedures manual. A manual containing procedures, instructions and guidance for use by personnel of the ATO in the execution of their duties in meeting the requirements of the certificate.
- (o) Process. A set of interrelated or interacted activities which transform inputs into outputs.
- (p) Quality. The totality of features and characteristics of product or service that bear on its ability to satisfy stated or implied needs.
- (q) Quality assurance. All the planned and systematic actions necessary to provide adequate confidence that all training activities satisfy given standards and requirements, including the ones specified by the approved training organisation in relevant manuals.
- (r) Quality audit. A systematic and independent examination to determine whether quality activities and related results comply

with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve objectives.

- (s) Quality inspection. That part of quality management involving quality control. In other words, inspections accomplished to observe events/actions/documents, etc., in order to verify whether established operational procedures and requirements are fulfilled during the accomplishment of the event or action, and whether the required standard is achieved. Student stage checks and skill tests are quality inspections, and they are also quality control functions.
 - (t) Quality manager. The manager responsible for the monitoring function and for requesting remedial action. In an ATO, the quality manager is responsible directly to the head of training.
 - (u) Quality manual. The document containing the relevant information pertaining to the approved training organisation's quality assurance system.
 - (v) Quality of training. The outcome of the training that meets stated or implied needs within the framework of set standards.
 - (w) Satellite aviation training organisation. An aviation training organisation at a location other than the aviation training organisation's principal place of business.
 - (x) Speciality curriculum. A set of courses that is designed to satisfy a requirement of the Civil Aviation Regulations and that is approved by the Authority for use by a particular Level 2 ATO or satellite Level 2 ATO. The speciality curriculum includes training requirements unique to one or more Level 2 ATO clients.
 - (y) Training manual. A manual containing the training goals, objectives, standards syllabi, and curriculum for each phase of the approved training course.
 - (z) Training specifications. A document issued to an ATO certificate holder by the Authority that specifies training program requirements and authorises the conduct of training, checking, and testing with any limitations thereof.
- (2) The following abbreviations are used in these regulations
- (a) ATO – Aviation Training Organisation.
 - (b) AFM — Aircraft Flight Manual

- (c) AMEL – Aviation Maintenance Engineer Licence
- (d) AMT – Aviation Maintenance Technician
- (e) AMM – Aviation Maintenance Mechanic
- (f) ATO – Aviation Training Organization
- (g) IFR – Instrument Flight Rules
- (h) NOTAM – Notice to Airmen

**PART I
CERTIFICATION AND ADMINISTRATION**

Applicability

Applicability of Part I 5. Part 1 prescribes the requirements for certifying and administering Aviation Training Organizations (ATO).

Certificate Requirements

7.(1) No person may operate an ATO without, or in violation of, an ATO certificate and training specifications issued under this part.

(2) Except for an AOC training its own flight crews, after 1 year of the adoption of this rule, no person may conduct training, testing, or checking in advanced flight training devices or flight simulators without, or in violation of, the certificate and training specifications required by these Regulations.

(3) The Authority will issue an applicant an ATO certificate and training specifications if the applicant shows that it meets the requirements of these regulations.

Application for Issuance or Amendment of ATO Certificate

Requirements to Apply for Issuance or Amendment of ATO Certificate 9.(1) An applicant for an ATO certificate and training specifications shall apply at least 120 calendar days before the beginning of any proposed training.

Schedule 1 part A (2) Each applicant for an ATO certificate and training specification shall provide to the Authority that information shown in Schedule 1 part A.

(3) An applicant for a certificate shall ensure that the facilities and equipment described in its application are:

- (a) Available for inspection and evaluation prior to approval; and
- (b) In place and operational at the location of the proposed Level 2 ATO prior to issuance of a certificate under this Subpart.

(4) The Authority will issue to an applicant who meets the requirements and is approved by the Authority-

- (a) An ATO certificate containing all business names included on the application under which the certificate holder may conduct operations and the address of each business office used by the certificate holder; and
- (b) Training specifications, issued by the Authority to the certificate holder, containing-
 - (i) Authorisation for the ATO to function as a Level 1 ATO

and/or Level 2 ATO.

- (ii) The type of training authorised, including approved courses;
- (iii) The category, class, and type of aircraft that may be used for training, testing, and checking;
- (iv) For each flight simulator or flight training device, the make, model, and series of aeroplane or the set of aeroplanes being simulated and the qualification level assigned, or the make, model, and series of rotorcraft, or set of rotorcraft being simulated and the qualification level assigned;
- (v) For each flight simulator and flight training device subject to qualification evaluation by the Authority, the identification number assigned by the Authority;
- (vi) The name and address of each satellite ATO, and the approved courses offered at each satellite ATO;
- (vii) Authorised deviations or waivers from this Subpart; and
- (viii) Any other items the Authority may require or allow.

(5) The Authority may deny, suspend, revoke, or terminate a certificate under this Subpart if the Authority finds that the applicant or the certificate holder-

- (a) Held an ATO certificate that was revoked, suspended, or terminated within the previous 5 years; or
- (b) Employs or proposes to employ a person who-
 - (i) Was previously employed in a management or supervisory position by the holder of an ATO certificate that was revoked, suspended, or terminated within the previous 5 years;
 - (ii) Exercised control over any certificate holder whose certificate has been revoked, suspended, or terminated within the last 5 years; and
 - (iii) Contributed materially to the revocation, suspension, or termination of that certificate and who will be employed in a management or supervisory position, or who will be in control of or have a substantial ownership interest in the ATO.
- (c) Has provided incomplete, inaccurate, fraudulent, or false

information for an ATO certificate.

- (6) At any time, the Authority may amend an ATO certificate-
- (a) On the Authority's own initiative, under applicable Iraq legislation; or
 - (b) Upon timely application by the certificate holder.

(7) The certificate holder shall file an application to amend an ATO certificate at least 60 calendar days prior to the applicant's proposed effective amendment date unless a different filing period is approved by the Authority.

- (8) The Authority may issue an ATO certificate to an applicant-
- (a) For an ATO inside or outside of Iraq; and
 - (b) Whose business office or primary location, or both are located inside or outside Iraq.

Curriculum and Personnel Requirements

11.(1) Each ATO shall adhere to its approved curriculum.

(2) A certificate holder may not change its approved curriculum unless the change is approved by the Authority in advance.

(3) An applicant for an ATO certificate shall show that:

- (a) For each proposed curriculum, the Level 2 ATO has, and shall maintain, a sufficient number of instructors who are qualified in accordance with items 67 thru 87 to perform the duties to which they are assigned;
- (b) Each applicant for, and holder of, a Level 1 ATO certificate shall meet the personnel requirements shown in items 67 thru 87.
- (c) Each applicant for, and holder of, an ATO certificate with AMEL courses shall meet the personnel requirements shown in item 115.

(4) Each Level 2 ATO shall have designated, and shall maintain, a sufficient number of approved evaluators to provide required checks and tests to graduation candidates within 7 calendar days of training completion for any curriculum leading to airman licenses or ratings, or both;

- (a) Each Level 2 ATO has, and shall maintain, a sufficient number of management personnel who are qualified and competent to

perform required duties; and

- (b) A management representative, and all personnel who are designated by the Level 2 ATO to conduct direct student training, are able to understand, read, write, and fluently speak Arabic and English.

(5) The persons listed in this subsection may serve in more than one position for an ATO, provided that person is qualified for each position.

Contents of an ATO Certificate

13.(1) The ATO certificate will consist of two documents:

- (a) A certificate for public display signed by the Authority, and
- (b) Training specifications containing the terms, conditions, and authorisations applicable to the ATO certificate.

Schedule 1
part B

(2) The ATO certificate will contain the following items and be in a format as shown in Schedule 1, part B:

- (a) The name and location (main place of business) of the ATO;
- (b) The date of issue and period of validity for each page issued;
- (c) The authorised locations of operations; and
- (d) Training specifications for the following categories, as applicable:
 - (i) Pilot training.
 - (ii) Other crewman training.
 - (iii) Other airman training.
 - (iv) AMEL training.
 - (v) Other training.
- (e) Other authorisations, approvals and limitations issued by the Authority in accordance with the standards which are applicable to the training conducted by the ATO.

Duration of Certificate

15.(1) Except as shown in paragraph (3), the Authority will issue an ATO certificate which expires, unless surrendered, suspended, or revoked:

- (a) On the last day of the 24th calendar month from the month the certificate was issued;
- (b) Except as provided in paragraph (2), on the date that any change in ownership of the school occurs;
- (c) On the date of any significant change in the school's facilities occurs; or
- (d) Upon notice by the Authority that the school has failed for more than 60 days to maintain the required facilities, aircraft, or personnel.

(2) A change in the ownership of an ATO does not terminate that school's certificate if, within 30 days—

- (a) The certificate holder makes application for an appropriate amendment to the certificate; and
- (b) No significant change in the facilities, operating personnel, or approved training courses is involved.

(3) The Authority will issue Level 2 ATO certificates with no expiration date, unless the certificate is surrendered, suspended, or revoked.

(4) If the Authority suspends, revokes, or terminates a certificate issued under this Part, the holder of that certificate shall return the certificate to the Authority within five working days after being notified that the certificate is suspended, revoked, or terminated.

Deviations or Waivers

17.(1) The Authority may issue deviations or waivers from any of the requirements of this Part.

(2) An ATO requesting a deviation or waiver under this section shall provide the Authority with information acceptable to the Authority that shows—

- (a) Justification for the deviation or waiver; and
- (b) That the deviation or waiver will not adversely affect the quality of instruction or evaluation.

Advertising Limitations

19.(1) The ATO may not:

- (a) Make any statement relating to its ATO certification and training specifications that is false or designed to mislead any person contemplating enrolment in that ATO.
- (b) Advertise that the ATO is certified unless it clearly differentiates between courses that have been approved under this Part and those that have not been approved under this Part.

(2) An ATO whose certificate has been surrendered, suspended, revoked, or terminated shall promptly—

- (a) Remove all indications, including signs, wherever located, that the ATO was certified by the Authority; and
- (b) Notify all advertising agents, and advertising media employed by the certificate holder to cease all advertising indicating that the ATO is certified by the Authority.

Facilities, Equipment, and Material

21.(1) Each certificate holder shall provide facilities, equipment, and material equal to the standards currently required for the issue of the certificate and rating that it holds.

(2) A certificate holder may not make a substantial change in facilities, equipment, or material that have been approved for a particular curriculum, unless that change is approved by the Authority in advance.

(3) A certificate holder with approved AMEL courses may not make any change in the ATO's location unless the change is approved by the Authority in advance. If the certificate holder desires to change the location of the ATO, the certificate holder shall notify the Authority, in writing, at least 30 days before the date the relocation. The Authority may prescribe the conditions under which the ATO may operate while it is changing its location or housing facilities. If the certificate holder changes the location of the ATO without notification, the certificate shall be revoked.

(4) An applicant for, or holder of, a certificate issued under this Part shall establish and maintain a principal business office that is physically located at the address shown on its certificate.

(5) The principal business office may not be shared with, or used by, another person who holds an ATO certificate.

(6) An applicant for, or holder of, a certificate issued under this Part shall ensure that—

- (a) Each room, training booth, or other space used for instructional purposes is heated, lighted, and ventilated to conform to local building, sanitation, and health codes; and
- (b) The facilities used for instruction are not routinely subject to significant distractions caused by flight operations and maintenance operations at the airport.

(7) Each certificate holder shall maintain the records required by this Part in facilities adequate for that purpose.

(8) An applicant for, or holder of, an ATO certificate with approved AMEL courses shall have and maintain the following instructional equipment as is appropriate to the rating sought:

- (a) Various kinds of airframe structures, airframe systems and components, power plants, and power plant systems and components (including propellers), of a quantity and type suitable to complete the practical projects required by its approved curricula.
- (b) At least one aircraft of a type acceptable to the Authority.
- (c) The equipment required by paragraph (8) need not be in an airworthy condition, and if damaged prior to use by the ATO, shall have been repaired enough for complete assembly.

(9) An applicant for, or holder of, an ATO certificate with an AMEL rating shall have:

- (a) Airframes, power plants, propellers, appliances, and components thereof, to be used for instruction and from which students will gain practical working experience, and shall insure that the airframes, power plants, propellers, appliances, and components thereof be sufficiently diversified as to show the different methods of construction, assembly, inspection and operation when installed in an aircraft for use.
- (b) Electrical equipments, generator, motors, instruments, radio components, to be used for instruction and from which students will gain practical working experience, and shall insure that the electrical equipments, generator, motors, instruments, radio components thereof be sufficiently diversified as to show the different methods of construction, assembly, inspection and operation when installed on an aircraft for use.

(10) Each applicant for, or holder of, an ATO certificate with an AMEL rating shall ensure that it maintains a sufficient number of units of the material described in paragraph (8)(c) so that no more than eight students will work on any one unit at one time.

(11) Each applicant for, or holder of, an ATO certificate with an AMEL rating using an aircraft for instructional purposes that does not have retractable landing gear and wing flaps, shall provide training aids, or operational mock-ups of the retractable landing gear and wing flaps which are acceptable to the Authority.

(12) An applicant for an ATO certificate with an AMEL rating, or and applicant seeking an additional AMEL rating, shall have at least the facilities, equipment, and materials appropriate to the rating sought.

(13) An applicant for, or holder of, an ATO certificate with an AMEL rating shall maintain, on the premises and under the full control of the ATO, an adequate supply of material, special tools, and shop equipment used in constructing and maintaining aircraft as is appropriate to the approved curriculum of the ATO, in order to assure that each student will be properly instructed.

(14) An applicant for, or holder of, an ATO certificate with an AMEL rating shall insure that the special tools and shop equipment required by paragraph (8) be in satisfactory working condition for instructional and practice purposes.

Schedule 1
part C

Implementing Standard: See Schedule 1 part C for specific requirements for facilities for AMEL courses.

Flight Training Facilities, Equipment, and Courseware

23.(1) An applicant for, or holder of, a Level 2 ATO shall have available exclusively, for adequate periods of time and at a location approved by the Authority, adequate flight training equipment and courseware, including at least one flight simulator or advanced flight training device.

(2) An applicant for, or holder of, an ATO certificate that plans to conduct pilot flight training shall show that it has continuous use of a briefing area located at each airport at which training flights originate that is:

- (a) Adequate to shelter students waiting to engage in their training flights;
- (b) Arranged and equipped for the conduct of pilot briefings; and
- (c) For an ATO with an instrument rating course or commercial pilot course, equipped with adequate communication to sources of weather and flight planning information.

Satellite ATOs

25.(1) The holder of an ATO certificate may conduct training in accordance with a training program approved by the Authority at a satellite

ATO if—

- (a) The facilities, equipment, personnel, and course content of the satellite ATO meet the applicable requirements;
- (b) The instructors and evaluators at the satellite ATO are under the direct supervision of management personnel of the principal ATO;
- (c) The certificate holder notifies the Authority in writing that a particular satellite ATO is to begin operations at least 60 days prior to proposed commencement of operations at that satellite ATO; and
- (d) The certificate holder's training specifications reflect the name and address of the satellite ATO and the approved courses offered at the satellite ATO.

(2) The Authority will issue training specifications which prescribe the operations required and authorized at each satellite ATO.

Changes Requiring Notice to the Authority

27.(1) Each ATO shall notify the Authority within 30 days of any of the following changes:

- (a) The accountable manager.
- (b) The instructional and evaluation staff.
- (c) The housing, training facilities and equipment, procedures, curricula, and work scope that could affect the approval.

(2) The Authority may prescribe the conditions under which the ATO may operate during such changes unless the Authority determines that the approval should be suspended.

Inspection

29.(1) The Authority may, at any time, inspect an ATO holder on the ATO holder's premises to determine the ATO's compliance with this Part.

(2) Inspections will normally be repeated on a twelve month basis, which may be extended to a twenty-four month basis if, in the opinion of the Authority, the holder continues to meet the requirements under which it was originally certificated.

(3) After an inspection is made, the certificate holder will be notified, in writing, of any deficiencies found during the inspection.

Record Keeping

31.(1) Each ATO shall maintain a record for each trainee that contains—

- (a) The name of the trainee;
- (b) A copy of the trainee's license, if any, and medical certificate, if required;
- (c) The name of the course and the make and model of flight training equipment used, if applicable;
- (d) The trainee's prerequisite experience and course time completed;
- (e) The date the student graduated, terminated training, or transferred to another school;
- (f) The trainee's performance on each lesson and the name of the instructor providing instruction;
- (g) A current progress record for each trainee showing the practical projects or laboratory work completed or to be completed for each subject;
- (h) The date and result of each knowledge test and end-of-course practical test and the name of the evaluator conducting the test(s); and
- (i) The number of hours of additional training that was accomplished after any unsatisfactory practical test.

(2) The Authority will not consider a student's logbook as sufficient for the records required by paragraph (1).

(3) Each ATO shall maintain a record for each instructor or evaluator designated to instruct a course approved in accordance with this Part that indicates that the instructor or evaluator has complied with the applicable requirements of this Part.

(4) Each ATO shall:

- (a) Maintain the records required by paragraph (1) for at least 2 year following the completion of training, testing or checking;
- (b) Maintain the qualification records required by paragraph (3) while the instructor or evaluator is in the employ of the certificate holder and for 2 year thereafter; and

- (c) Maintain the recurrent demonstration of proficiency records required by paragraph (3) for at least 2 years.

(5) Each ATO shall provide the records required by this section to the Authority upon request, within a reasonable time, and shall store and maintain the records required by:

- (a) Paragraph (2) at the ATO, or satellite ATO where the training, testing, or checking, if appropriate, occurred, or at another location acceptable to the authority; and
- (b) Paragraph (3) at the ATO or satellite ATO where the instructor or evaluator is primarily employed, or at another location acceptable to the authority.

(6) The trainee may submit a request for review of his training records to ATO.

(7) Each ATO shall keep a current record of each student enrolled, showing, if applicable:

- (a) The instruction credited under item 115, if any; and
- (b) The authenticated transcript of grades from a school previously attended.

Graduation Certificates and Transcripts

33.(1) Each ATO shall issue upon completion of training a graduation certificate to each student who completes its approved course of training.

(2) Each ATO shall include in each graduation certificate:

- (a) The name of the school and the certificate number of the ATO;
- (b) The name of the graduate to whom it was issued;
- (c) The approved curriculum title;
- (d) The date of graduation;
- (e) A statement that the student has satisfactorily completed each required stage of the approved course of training including the tests for those stages;
- (f) An authentication by an official of the school; and
- (g) A statement showing the cross-country flight training that the student received in the course of training, if applicable.

(3) An ATO may not issue a graduation certificate to a student, or recommend a student for a license or rating, unless the student has:

- (a) Completed the training specified in the approved course of training; and
- (b) Passed the required final tests.

Transcripts

35.(1) Upon request, each ATO shall provide a transcript of a student's grades to each student who is graduated from that ATO or who leaves it before being graduated.

(2) Each ATO shall include in the transcript required by paragraph (1):

- (a) The curriculum in which the student was enrolled;
- (b) Whether the student satisfactorily completed that curriculum;
- (c) The final grades the student received; and
- (d) An authentication by an official of the school.

Required Personnel

Required post holders

37. (1) The applicant for an ATO certificate or a current certificate holder shall have on the staff the following:

- (a) An accountable manager;
- (b) A quality manager;
- (c) A head of training;
- (d) A chief flight instructor, as applicable;
- (e) A chief ground instructor, as applicable; and
- (f) An adequate number of ground and flight instructors relevant to the courses provided.

(2) Each instructor to be used for training shall have received the appropriate training and hold the appropriate licences and/or ratings as required by Regulations (No. 8) "Personnel Licensing".

Schedule 1 part D

(3) The duties and qualifications of the personnel listed in this paragraph are contained in Schedule 1, part D.

Quality System

- Quality system 39. (1) The ATO shall establish a quality system to ensure that training and instructional practices comply with all relevant requirements.
- (2) The quality system shall be approved by the Authority.
- Schedule 1 part E (3) The quality system under (1) shall be based on outlines setout in Schedule 1, part E.

ATO Training and Procedures Manual

- Requirements of the training and procedures manual 41. (1) Each applicant for, or holder of an ATO certificate shall prepare and maintain a training manual and a procedures manual, approved by the Authority containing information and instructions to enable staff to perform their duties and to give guidance to students on how to comply with course requirements.
- (2) The manual under (1) may be issued in separate parts and shall contain at least the following information:
- (a) A general description of the scope of training authorized under the ATO's terms of approval;
 - (b) The content of the training programs offered including the courseware and equipment to be used;
 - (c) A description of the organizations quality system;
 - (d) The name, duties and qualification of the person designated as the accountable manager;
 - (e) A description of the duties and qualification of the personnel responsible for planning, performing and supervising the training;
 - (f) A description of the procedures used to establish and maintain the competence of instructional personnel;
 - (g) A description of the method used for the completion and retention of the training records;
 - (h) A description, when applicable, of additional training needed to comply with an operator's procedures and requirements; and
 - (i) A description of the selection, role and duties of authorized persons approved to conduct testing for a license or rating, when an ATO has been approved by the Authority to conduct such testing.
 - (j) The ATO shall ensure that the training and procedures manual is amended as necessary to keep the information contained therein

up to date.

(k) The ATO shall promptly furnish copies of all amendments to the training and procedures manual to the Authority and other personnel and organizations to whom the manual has been issued.

(3) The training manual and procedures manual may be combined.

(4) The ATO shall ensure that the training manual and the procedures manual are amended as necessary to keep the information contained therein up to date.

(5) Copies of all amendments to the training manual and the procedures manual shall be furnished promptly to all organisations or persons to whom the manual has been issued.

Schedule 1
part F and G

(6) The training and procedures manual under (1) shall be set out based on the outlines in schedule 1, part F and/or part G.

PART II
PILOT TRAINING

Pilot Training Courses

43.(1) The Authority will issue certificates and training specifications for two levels of ATO which conduct pilot flight training courses, as shown:

- (a) A Level 1 ATO is one which conducts the preponderance of each flight training course using an actual aircraft.
- (b) A Level 2 ATO is one which conducts all or substantially all of each flight training course using simulation media which are qualified and approved by the Authority.

(2) The Authority may approve the following courses of instruction to an applicant for, or holder of a Level 1 ATO certificate, provided the applicant meets the requirements of item 9:

- (a) Licensing and rating courses.
 - (i) Private pilot course. (Schedule 2, Part A)
 - (ii) Instrument rating course. (Schedule 2, Part B)
 - (iii) Commercial pilot course. (Schedule 2, Part C)
 - (iv) Airline transport pilot course. (Schedule 2, Part D)
 - (v) Flight instructor course. (Schedule 2, Part E)
 - (vi) Flight instructor instrument course. (Schedule 2, Part F)
 - (vii) Ground instructor course. (Schedule 2, Part G)
 - (viii) Additional aircraft category or class rating course. (Schedule 2, Part H)
 - (ix) Aircraft type rating course. (Schedule 2, Part I)
- (b) Special preparation courses. (Schedule 2, Part J)
 - (i) Pilot refresher course.
 - (ii) Flight instructor refresher course.
 - (iii) Ground instructor refresher course.
 - (iv) Agricultural aircraft operations course.

- (v) Rotorcraft external-load operations course.
 - (vi) Special operations course.
 - (vii) Test pilot course.
- (c) Pilot ground school course. (Schedule 2, Part K)

(3) The Authority may approve the following courses of instruction to an applicant for, or holder of a Level 2 ATO certificate, provided the applicant meets the requirements of item 9:

- (a) Any course for licensing or for any rating for which the applicant can show an effective curriculum and for which the Authority has qualified the simulation media.

Requirements for a Level 1 ATO Certificate

45. The Authority will issue to an applicant a Level 1 ATO certificate with associated ratings if the applicant—

(1) Held a provisional Level 1 ATO certificate issued under these regulations for at least 24 calendar months preceding the month of application;

(2) Meets the applicable requirements of this Subpart for the ratings sought; and

(3) Within 24 calendar months preceding the month of application, has trained, recommended, and had at least 80 percent of all applicants pass on the first attempt—

- (a) A knowledge or a practical test for a pilot license, flight instructor license, ground instructor license, or an additional rating; and

- (b) Any combination of tests specified in paragraphs (3)(a) and (b).

Implementing Standard: See Schedule 2. Part J: Special Preparation Courses for an end-of-course test for a special training course.

Provisional Level 1 ATO Certificate

47. The Authority may issue to an applicant that meets the applicable requirements of this Subpart, but does not meet the recent training activity requirements of item 43, a provisional Level 1 ATO certificate with ratings.

Renewal of Certificates and Ratings

49.(1) Level 1 ATO.

- (a) A Level 1 ATO may apply for renewal of its certificate and ratings within 30 days preceding the month the Level 1 ATO's certificate expires, provided the ATO meets the requirements prescribed in paragraph (1)(b).
- (b) The Authority will renew for an additional 24 calendar months a Level 1 ATO certificate and ratings if the Authority determines the ATO's personnel, aircraft, facility and airport, approved training courses, training records, and recent training ability and quality meet the requirements.
- (c) A Level 1 ATO that does not meet the renewal requirements in paragraph (1)(b), may apply for a provisional Level 1 ATO certificate if the school meets the requirements of item 47.

(2) Provisional Level 1 ATO.

- (a) Except as provided in paragraph (2)(c), the Authority will not renew a provisional Level 1 ATO certificate or the ratings on that certificate.
- (b) A provisional Level 1 ATO may apply for a Level 1 ATO certificate and associated ratings provided that ATO meets the requirements of this Subpart.
- (c) A former provisional Level 1 ATO may apply for another provisional Level 1 ATO certificate, provided 180 days have elapsed since its last provisional Level 1 ATO certificate expired.

Flight Training Equipment Requirements

Applicability of items 51 thru 57

51. Items 51 thru 57 prescribe—

- (1) The personnel and aircraft requirements for an ATO certificate; and
- (2) The facilities that an ATO shall have available on a continuous basis.

Airport Requirements

53. Each applicant for, and holder of, a Level 1 ATO certificate shall show that it has continuous use of each airport at which training flights originate, and that the airport has an adequate runway and the necessary equipment.

Aircraft Requirements

55.(1) An applicant for, or holder of, an ATO certificate shall ensure, for each aircraft used for flight instruction and solo flights—

- (a) Except for flight instruction and solo flights in a curriculum for agricultural aircraft operations, external load operations, and similar aerial work operations, that the aircraft has a Iraq standard airworthiness certificate or a foreign equivalent of a Iraq standard airworthiness certificate, acceptable to the Authority;
- (b) That each aircraft is maintained and inspected in accordance with the requirements of Regulations No. 5 “Aircraft Airworthiness”; and
- (c) That each aircraft is equipped as provided in the training specifications for the approved course for which it is used.

(2) Except as provided in paragraph (3), an applicant for, or holder of, an ATO certificate shall ensure that each aircraft used for flight instruction is at least a two-place aircraft with engine power controls and flight controls that are easily reached and that operate in a conventional manner from both pilot stations.

(3) A certificate holder may use aeroplanes with controls such as nose-wheel steering, switches, fuel selectors, and engine air flow controls that are not easily reached and operated in a conventional manner by both pilots for flight instruction if the certificate holder determines that the flight instruction can be conducted in a safe manner considering the location of controls and their unconventional operation, or both.

(4) Each certificate holder shall ensure that each aircraft used in a course involving IFR operations is equipped and maintained for IFR operations.

(5) The Authority may approve aircraft with a restricted airworthiness certificate for use in the agricultural aircraft operations, external-load operations, test pilot, and special operations courses listed in item 25, (1), if its use for training is not prohibited by the aircraft’s operating limitations.

Flight Simulators and Flight Training Devices

57.(1) An applicant for, or holder of, an ATO certificate shall show that each flight simulator and flight training device used for training, testing, and checking will be or is specifically qualified and approved by the Authority for—

- (a) Each maneuver and procedure for the make, model, and series of aircraft, set of aircraft, or aircraft type simulated, as applicable; and
- (b) Each curriculum or training course in which the flight simulator or flight training device is used, if that curriculum or course is used to satisfy any requirement of these regulations.

(2) An applicant for, and holder of, a Level 1 ATO certificate shall show

that each of its flight simulators and flight training devices—

- (a) Represent the aircraft for which the course is approved;
- (b) Is used only for training given by an authorized instructor; and
- (c) Is not used for more than 25 percent of the total flight training hour requirements.

(3) Each certificate holder shall ensure, prior to use, that the approval required by this section includes—

- (a) The set of aircraft or type aircraft;
- (b) If applicable, the particular variation within type for which the training, testing, or checking is being conducted; and
- (c) The particular maneuver, procedure, or crewmember function to be performed.

(4) Each certificate holder shall ensure that each flight simulator or flight training device used by an ATO is—

- (a) Maintained to ensure the reliability of the performances, functions, and all other characteristics that were required for qualification;
- (b) Modified to conform with any modification to the aircraft being simulated if the modification results in changes to performance, function, or other characteristics required for qualification;
- (c) Given a functional preflight check each day before being used; and
- (d) Provided with a discrepancy log in which the instructor or evaluator, at the end of each training session, enters each discrepancy.

(5) Unless otherwise authorized by the Authority, each certificate holder shall ensure that each component on a flight simulator or flight training device used by an ATO is operative if the component is essential to, or involved in, the training, testing, or checking of airmen.

(6) The Authority will not restrict ATO instructors or students to specific—

- (a) Route segments during line-oriented flight training scenarios; or
- (b) Visual data bases replicating a specific customer's bases of operation.

(7) An applicant for, or holder of, an ATO certificate may request evaluation, qualification, and continuing evaluation for qualification of flight simulators and flight training devices without—

- (a) Holding an air carrier certificate; or
- (b) Having a specific relationship to an air carrier certificate holder.

Curriculum and Syllabus Requirements

Applicability of
items 59 thru
63

59. Items 59 thru 63 prescribes the curriculum and syllabus requirements for the issuance of an ATO certificate and training specifications for training, testing, and checking conducted to meet the requirements of Part 1.

Approval of Training Program

61.(1) Each applicant for, or holder of, an ATO certificate shall apply to the Authority for training program approval.

(2) Each applicant for training program approval shall indicate in the application—

- (a) Which courses are part of the core curriculum and which courses are part of the speciality curriculum;
- (b) Which requirements of Part 1 would be satisfied by the curriculum or curricula; and
- (c) Which requirements of Part 1 would not be satisfied by the curriculum or curricula.

(3) After a certificate holder begins operations under an approved training program

(4) If the Authority requires an ATO certificate holder to make revisions to an approved training program and the certificate holder does not make those required revisions within 30 calendar days, the Authority may suspend, revoke, or terminate the Level 2 ATO certificate under the provisions of item 9, (5).

Training Program Curriculum Requirements

63. Each applicant shall ensure that each training program curriculum submitted to the Authority for approval meets the applicable requirements and contains—

- (1) A syllabus for each proposed curriculum;

(2) Minimum aircraft and flight training equipment requirements for each proposed curriculum;

(3) Minimum instructor and evaluator qualifications for each proposed curriculum;

(4) A curriculum for initial training and continuing training of each instructor or evaluator employed to instruct in a proposed curriculum; and

(5) For each curriculum that provides for the issuance of a license or rating in fewer than the minimum hours prescribed by Part 1—

- (a) A means of demonstrating the ability to accomplish such training in the reduced number of hours; and
- (b) A means of tracking student performance.

Personnel Requirements

Applicability of
items 65 thru
87

65. Items 65 thru 87 prescribe the personnel and flight training equipment requirements for a certificate holder that is training to meet the requirements of Part 1.

Level 2 ATO Instructor Eligibility Requirements

67.(1) A certificate holder may not employ a person as an instructor in a flight training course that is subject to approval by the Authority unless that person—

- (a) Is at least 18 years of age;
- (b) Is able to read, write, speak, and understand the English language;
- (c) If instructing in an aircraft in flight, holds a flight instructor license
- (d) If instructing in simulated flight, satisfies the requirements of paragraph (3); and
- (e) Meets at least one of the following requirements—
 - (i) Meets the aeronautical experience requirements for a commercial pilot license, excluding the required hours of instruction in preparation for the commercial pilot practical test;
 - (ii) If instructing in a flight simulator or flight training device that represents an aeroplane requiring a type rating or if instructing in a curriculum leading to the issuance of an

airline transport pilot license, meets the aeronautical experience requirements for an airline transport pilot; or

- (iii) Is employed as a flight simulator instructor or a flight training device instructor for an ATO providing instruction and testing to meet the requirements of Part 1 on [*insert date 30 days following adoption of this rule*].

(2) An ATO shall designate each instructor in writing for each approved course, prior to that person functioning as an instructor in that course.

(3) Prior to initial designation, each flight and simulator flight instructor shall complete the requirements of Schedule 3, Part B, (1).

Level 2 ATO Instructor and Evaluator Privileges and Limitations

69.(1) An ATO may allow an instructor to provide—

- (a) Instruction for each curriculum for which that instructor is qualified;
- (b) Testing and checking for which that instructor is qualified; and
- (c) Instruction, testing, and checking intended to satisfy the requirements of this Part.

(2) An ATO whose instructor or evaluator is designated in accordance with the requirements to conduct training, testing, or checking in flight training equipment, may allow its instructor or evaluator to give endorsements required by Part 1 if that instructor or evaluator is authorized by the Authority to instruct or evaluate in a curriculum that requires such endorsements.

(3) An ATO may not allow an instructor to—

- (a) Excluding briefings and debriefings, conduct more than 8 hours of instruction in any 24-consecutive-hour period, or more than 6 days or 40 hours in any 7 day period;
- (b) Provide flight training equipment instruction unless that instructor meets the requirements of item 71, (1)(a) through (1)(d), and item 71 (2), as applicable; or
- (c) Provide flight instruction in an aircraft unless that instructor—
 - (i) Meets the requirements of items 71, (1)(a), (1)(b), and (1)(e);
 - (ii) Holds a flight instructor license;

- (iii) Holds pilot licenses and ratings applicable to the category, class, and type aircraft in which instructing;
- (iv) If instructing or evaluating in an aircraft in flight while occupying a required crewmember seat, holds at least a valid second class medical certificate; and
- (v) Meets the recency of experience requirements of Regulations No.8 (Personnel Licensing).

Level 2 ATO Instructor Training and Testing Requirements

71.(1) Except as provided in paragraph (3), prior to designation and every 12 calendar months beginning the first day of the month following an instructor's initial designation, a certificate holder shall ensure that each of its instructors meets the following requirements.

- (a) Each flight instructor or simulator flight instructor shall satisfactorily demonstrate to an authorized evaluator knowledge of, and proficiency in, instructing in a representative segment of each curriculum for which that instructor is designated to instruct under Subpart IV.
- (b) Each instructor shall satisfactorily complete an approved course of ground instruction in at least—
 - (i) The fundamental principles of the learning process;
 - (ii) Elements of effective teaching, instruction methods, and techniques;
 - (iii) Instructor duties, privileges, responsibilities, and limitations;
 - (iv) Training policies and procedures;
 - (v) Cockpit resource management and crew co-ordination; and
 - (vi) Evaluation.
- (c) Each instructor who instructs in a flight simulator or flight training device shall satisfactorily complete an approved course of training in the operation of the flight simulator, and an approved course of ground instruction, applicable to the training courses the instructor is designated to instruct, which shall include—
 - (i) Proper operation of flight simulator and flight training device controls and systems;

- (ii) Proper operation of environmental and fault panels;
 - (iii) Limitations of simulation; and
 - (iv) Minimum equipment requirements for each curriculum.
- (d) Each flight instructor who provides training in an aircraft shall satisfactorily complete an approved course of ground instruction and flight training in an aircraft, flight simulator, or flight training device, which shall include—
- (i) Performance and analysis of flight training procedures and maneuvers applicable to the training courses that the instructor is designated to instruct;
 - (ii) Technical subjects covering aircraft subsystems and operating rules applicable to the training courses that the instructor is designated to instruct;
 - (iii) Emergency operations;
 - (iv) Emergency situations likely to develop during training; and
 - (v) Appropriate safety measures.
- (e) Each instructor who instructs in flight training equipment shall pass a knowledge test and annual proficiency check—
- (i) In the flight training equipment in which the instructor will be instructing; and
 - (ii) On the subject matter and maneuvers of a representative segment of each curriculum for which the instructor will be instructing.

(2) In addition to the requirements of paragraphs (1)(a) through (1)(e), each certificate holder shall ensure that each instructor who instructs in a flight simulator that the Authority has approved for all training and all testing for the airline transport pilot licensing test, aircraft type rating test, or both, has met at least one of the requirements of Schedule 3, Part B (2).

(3) The Authority will consider completion of a curriculum required by paragraph (1) or (2) taken in the calendar month before or after the month in which it is due as taken in the month in which it was due for the purpose of computing when the next training is due.

(4) The Authority may give credit for the requirements of paragraph (1) or (2) to an instructor who has satisfactorily completed an instructor training course for a Part 3 certificate holder if the Authority finds such a course equivalent to the requirements of paragraph (1) or (2).

Level 2 ATO Evaluator Requirements

73.(1) Except as provided by paragraph (4), each ATO shall ensure that each person authorized as an evaluator—

- (a) Is approved by the Authority;
- (b) Is in compliance with items 67, 69, and 71;
- (c) Prior to designation, satisfactorily completes a curriculum within 12 calendar months that includes the following—
 - (i) Evaluator duties, functions, and responsibilities;
 - (ii) Methods, procedures, and techniques for conducting required tests and checks;
 - (iii) Evaluation of pilot performance; and
 - (iv) Management of unsatisfactory tests and subsequent corrective action; and
- (d) If evaluating in-flight training equipment, satisfactorily pass a knowledge test and annual proficiency check in a flight simulator or aircraft in which the evaluator will be evaluating.

(2) For the purpose of computing when evaluator training is due, the Authority will consider that an evaluator who satisfactorily completes a curriculum required by paragraph (1)(c) in the calendar month before or the calendar month after the month in which it was due, to have taken it in the month it was due.

(3) The Authority may give credit for the requirements of paragraph (1)(c) to an evaluator who has satisfactorily completed an evaluator training course for an AOC holder if the Authority finds such a course equivalent to the requirements of paragraph (1)(c).

Level 1 ATO Personnel

75.(1) Each applicant for, and holder of, a Level 1 ATO certificate shall have adequate personnel, including licensed flight instructors, licensed ground instructors, and holders of a commercial pilot license with a lighter-than-air rating, if applicable, and a chief instructor who are qualified and competent to perform the duties assigned in each approved training course.

(2) Each instructor for ground or flight training shall hold a flight instructor license, ground instructor license, or commercial pilot license with a lighter-than-air rating, as appropriate, with ratings for the approved training

course and any aircraft used in that course.

Level 1 ATO Chief Instructor Qualifications

77. To be designated as a chief instructor for a Level 1 ATO course, a person shall meet one or more of the requirements of Schedule 3, Part C., as applicable.

Level 1 ATO Assistant Chief Instructor Qualifications

79. To be designated as an assistant chief instructor for a Level 1 ATO course, a person shall meet the requirements of Schedule 3, Part D.

Level 1 ATO Check Instructor Qualifications

81. To be designated as a check instructor for a Level 1 ATO conducting student stage checks, end-of-course tests, and instructor proficiency checks under this Part, a person shall meet the applicable requirements of Schedule 3, Part E.

Level 1 ATO Instructor Flight Training

83.(1) No person other than a licensed flight instructor or commercial pilot with a lighter-than-air rating who has the ratings and the minimum qualifications specified in the approved training course outline may give a student flight training under an approved course of training.

(2) No ATO may authorize a student pilot to start a solo flight until the flight has been approved by an authorized instructor who is present at the origination.

(3) Each chief instructor and assistant chief instructor assigned to a training course shall complete, at least once every 12 calendar months, an approved syllabus of training consisting of ground or flight training, or both, or an approved flight instructor refresher course.

(4) Each licensed flight instructor or commercial pilot with a lighter-than-air rating who is assigned to a flight training course shall satisfactorily complete the following tasks, which shall be administered by the school's chief instructor, assistant chief instructor, or check instructor—

- (a) Prior to receiving authorization to train students in a flight training course, accomplish:
 - (i) A review of and a briefing on the objectives and standards of that training course; and
 - (ii) An initial proficiency check in each make and model of aircraft used in that training course in which that person provides training.

- (b) Every 12 calendar months after the month in which the person last complied with paragraph (4)(a)(ii), accomplish a proficiency check in one of the aircraft the person trains students.

Level 1 ATO Instructor Ground Training

85.(1) Except as provided in paragraph (2), each instructor who is assigned to a ground training course, shall hold a flight or ground instructor license, or a commercial pilot license with a lighter-than-air rating with the appropriate rating for that course of training.

(2) A person who does not meet the requirements of paragraph (1) may be assigned ground training duties in a ground training course, if—

- (a) The chief instructor who is assigned to that ground training course finds the person qualified to give that training; and
- (b) The instructor serves under the supervision of the chief instructor or the assistant chief instructor who is present at the facility when the training is given.

(3) An instructor may not be used in a ground training course until that instructor has been briefed in regard to the objectives and standards of that course by the chief instructor, assistant chief instructor, or check instructor.

Level 1 ATO Chief Instructor Responsibilities

87. During training, each Level 1 ATO shall ensure that the chief instructor or an assistant chief instructor is available—

- (1) At the Level 1 ATO, or
- (2) By telephone, radio, or other electronic means.

Operating Rules

Applicability of
items 89 thru
97

89. Items 89 thru 97 prescribes the operating rules applicable to a certified ATO and operating a course or training program curriculum approved in accordance with this Part.

Privileges

91.(1) A Level 2 ATO certificate holder may allow flight simulator instructors and evaluators to meet recency of experience requirements through the use of a flight simulator or flight training device if that flight simulator or flight training device is used in a course approved in accordance with items 89 thru 97.

- (2) The holder of an ATO certificate may advertise and conduct

approved pilot training courses in accordance with the certificate and any ratings that it holds.

(3) A Level 1 ATO may credit towards the curriculum requirements of a course previous training and pilot experience and knowledge, provided the student meets the requirements of Schedule 3, Part F.

Limitations: ATO

93.(1) Each ATO shall—

- (a) Ensure that a flight simulator or flight training device freeze, slow motion, or repositioning feature is not used during testing or checking; and
- (b) Ensure that a repositioning feature is used during line operational simulation for evaluation and line-oriented flight training only to advance along a flight route to the point where the descent and approach phase of the flight begins.

(2) When practical testing, flight checking, or line operational simulation is being conducted, the Level 2 ATO shall ensure that one of the following occupies each supporting crewmember position—

- (a) A crewmember qualified as SIC in the aircraft category and class, provided that no flight instructor who is giving instruction may occupy a crewmember position; and
- (b) A student, provided that no student may be used in a crewmember position with any other student not in the same specific course.

(3) Maintenance of Personnel, Facilities, and Equipment: The holder of an ATO certificate may not provide training to a student who is enrolled in an approved course of training unless each airport, all flight training equipment, and each authorized instructor and evaluator continuously meets the requirements and the standards specified in the certificate holder's training specifications.

(4) A certified ATO may not require any student to attend classes of instruction more than 8 hours in any day or more than 6 days or 40 hours in any consecutive 7-day period.

Limitations: Enrolled Students in Actual Flight Curricula

95. Each student pilot shall carry the following items on each aircraft used for flight training and solo flights—

- (1) A pre-takeoff and pre-landing checklist; and

(2) The operator's handbook or AFM for the aircraft if one is furnished by the manufacturer or copies of the handbook to each student using the aircraft.

Level 1 ATO Enrolment documents

97.(1) The holder of a Level 1 ATO certificate shall furnish each student, upon enrolment, with a copy of the following.

- (a) A certificate of enrolment containing —
 - (a) The name of the course in which the student is enrolled; and
 - (b) The date of that enrolment.
- (b) A copy of the student's training syllabus.
- (c) For pilot students, a copy of the safety procedures and practices that describe—
 - (i) The use of facilities and the operation of its aircraft;
 - (ii) The weather minimums required by the school for dual and solo flights;
 - (iii) The procedures for starting and taxiing aircraft on the ramp;
 - (iv) Fire precautions and procedures;
 - (v) Redispatch procedures after unprogrammed landings, on and off airports;
 - (vi) Aircraft discrepancies and write-offs;
 - (vii) Securing of aircraft when not in use;
 - (viii) Fuel reserves necessary for local and cross-country flights;
 - (ix) Avoidance of other aircraft in flight and on the ground;
 - (x) Minimum altitude limitations and simulated emergency landing instructions; and
 - (xi) A description of and instructions regarding the use of assigned practice areas.
- (d) The holder of a Level 1 ATO certificate shall maintain a monthly listing of persons enrolled in each training course offered by the school.

(2) Each Level 1 ATO applicant shall ensure that each training course for which it seeks approval meets the minimum curriculum requirements.

**PART III
TRAINING OF OTHER CREW MEMBERS**

Special Curricula

99. An applicant for, or holder of, an ATO certificate may apply for approval to conduct a special course of airman training for which a curriculum is not prescribed in the implementing standards, if the applicant shows that the training course contains features that could achieve a level of pilot proficiency equivalent to that achieved by a training course prescribed in the requirements of Part 1, as applicable.

PART IV
AIRMEN OTHER THAN FLIGHT CREW

Applicability

- Applicability of Part IV 101.(1) Items 101 thru 105 provides an alternative means to accomplish flight training required by Parts 1 or 3.
- (2) Certification under this Subpart is not required for training that is:
- (a) Approved under the provisions of Part 3; and
 - (b) Conducted under Part 1, unless that Part requires certification under this Part.

Other Training Courses

- Training courses for airmen other than flight crew 103.(1) The Authority may approve the following courses of instruction to an applicant for, or holder of an ATO certificate, provided the applicant meets the applicable requirements of item 9, (4):
- (a) Flight operations officer.
 - (b) Flight engineer.
 - (c) Flight attendants.
 - (d) Material handlers.
 - (e) Ground servicing personnel.
 - (f) Security personnel.
 - (g) Others approved by the Authority.

(2) The Authority will approve a course for which the application is made if the ATO, or ATO applicant, shows that the course contains a curriculum that will achieve a level of competency equal to, or greater than, that required by the applicable Parts of these regulations.

Implementing Standard: See Schedule 4, Part A, for Flight Engineer Training Course Requirements.

Application, Duration, and Renewal

- 105.(1) *Application.* An ATO proposing to train flight operations officers shall submit an application containing:
- (a) Instruction in the areas of knowledge and topics;

- (b) A minimum of 200 total course hours; and
- (c) An outline of the major topics and subtopics to be covered and the number of hours proposed for each.

(2) *Duration and renewal.*

- (a) The authority to operate an aircraft flight operations officer licensing course expires 24 months after the last day of the month of issuance of the authority.
- (b) The holder of an approval for an aircraft flight operations officer licensing course shall apply to the Authority for renewal within 30 days prior to the expiration date.

(3) *Instruction.*

- (a) The holder of a course approval shall ensure that it maintains an adequate number of instructors who maintain a 24 calendar-month average of at least 80 percent of the graduates of that school passing the practical test on the first attempt.

Implementing Standard: See Schedule 3, Part G for course approval requirements.

General Requirements for AMEL Training Courses

Applicability of
item 107 thru
117

107. Items 107 thru 117 prescribe the requirements for—

- (1) Issuing ATO certificates and ratings;
- (2) Conducting licensing courses and associated ratings for AMELs; and
- (3) Instructing the general operating rules for the holders of AMEL licenses and ratings.

AMEL Training Courses

109. The Authority may approve the following courses of instruction to an applicant for, or holder of an ATO certificate, provided the applicant meets the requirements of item 9:

- (1) AMEL:
 - (a) Airframe rating;
 - (b) Power plant rating;
 - (c) Airframe and Power plant rating;

- (d) Electrical rating;
- (e) Instrument rating;
- (f) Radio rating; and
- (g) Avionic rating (electrical, instrument and radio).

General Curriculum Requirements

111.(1) Each ATO shall have an approved curriculum that is designed to qualify its students to perform the duties of an AMEL for a particular rating or ratings.

(2) The curriculum shall offer at least the following number of hours of instruction shown, and the instruction unit hour shall be not less than 50 minutes in length.

- (a) Airframe – 1,150 hours (400 general plus 750 airframe).
- (b) Power plant – 1,150 hours (400 general and 750 power plant).
- (c) Combined airframe and power plant – 1,900 hours (400 general plus 750 airframe and 750 power plant).
- (d) Electrical – 1,050 hours (400 general plus 650 electrical).
- (e) Instrument – 1,050 hours (400 general plus 650 instrument).
- (f) Radio – 1,050 hours (400 general plus 650 radio).
- (g) Avionics – 2,400 hours (400 general plus 2000 electrical and instrument and radio).

(3) The curriculum shall cover the subjects and items prescribed in Schedule 4, Part B and Part C.

(4) Each ATO shall teach each subject to at least the indicated level of proficiency defined in the applicable part to Schedule 4, Part B and Part C.

(5) The certificate holder shall maintain a curriculum that shows:

- (a) The required practical projects to be completed;
- (b) For each subject, the proportions of theory and other instruction to be given; and
- (c) A list of the minimum required tests to be given.

(6) Each ATO may issue AMEL licenses of competency to persons

successfully completing specialty courses provided that all requirements are met and the licenses of competency specifies the aircraft make and model to which the license applies.

Implementing Standard: See Schedule 4, Part B and Part C, for applicable AMEL course curriculum subjects and items.

AMEL Training Program Providers

113.(1) The holder of a training organization applicant may apply to the Authority for approval for an AMEL training program.

(2) An AOC holder, an AMO, or an ATO may apply to the Authority for approval for an AMEL training program that meets the requirements of this Subpart.

Implementing Standard: See Schedule 4, Part B and Part C, for AMEL training program curriculum requirements.

Instructor Requirements

115.(1) Each ATO shall provide the number of instructors holding appropriate licenses and ratings, issued under Part 1, that the Authority determines is necessary to provide adequate instruction and supervision of the students, including at least one such instructor for each 25 students in each class held in a shop where students are performing actual tasks appropriate to the curriculum.

(2) An ATO may provide specialized instructors, who are not licensed in accordance with Part 1, to teach mathematics, physics, basic electricity, basic hydraulics, drawing, and similar subjects.

(3) Each ATO shall maintain a list of the names and qualifications of such specialized instructors, and upon request, provide a copy of the list, with a summary of the qualifications of each specialized instructor to the Authority.

Attendance and Credit for Prior Instruction or Experience

117.(1) An ATO may credit a student with instruction or previous experience as follows:

- (a) Instruction satisfactorily completed at:
 - (i) An accredited university, college, or junior college;
 - (ii) An accredited vocational, technical, trade or high school;
 - (iii) A military technical school; or

- (iv) An ATO.
 - (b) Previous aviation maintenance experience comparable to required curriculum subjects:
 - (i) By determining the amount of credit to be allowed by documents verifying previous experience; and
 - (ii) By giving the student a test equal to the one given to students who complete the comparable required curriculum subject at the ATO.
 - (c) Credit to be allowed for previous instruction:
 - (i) By an entrance test equal to one given to the students who complete a comparable required curriculum subject at the crediting ATO;
 - (ii) By an evaluation of an authenticated transcript from the student's former school; or
 - (iii) In the case of an applicant from a military school, only on the basis of an entrance test.
 - (d) A certificate holder may credit a student seeking an additional rating with previous satisfactory completion of the general portion of an AMEL's curriculum.
- (2) Each ATO shall show hours of absence allowed and how it will make missed material available to the student.

SCHEDULE 1

Part A

(Item 9)

Application for Issuance or Amendment of ATO Certificate

1. Each applicant for an ATO certificate and training specification shall provide to the Authority the following information:
 - (a) A statement showing that the minimum qualification requirements for each management position are met or exceeded.
 - (b) A statement acknowledging that the applicant may notify the Authority within 10 working days of any change made in the assignment of persons in the required management positions.
 - (c) The proposed training specifications requested by the applicant.
 - (d) The proposed evaluation authorization.
 - (e) A description of the flight training equipment that the applicant proposes to use.
 - (f) A description of the applicant's training facilities, equipment, and qualifications of personnel to be used, and proposed evaluation plans.
 - (g) A training program curriculum, including syllabi, outlines, courseware, procedures, and documentation to support the items required in item 11, upon request by the Authority.
 - (h) A description of a recordkeeping system that will identify and document the details of training, qualification, and licensing of students, instructors, and evaluators.
 - (i) A description of quality control measures proposed.
 - (j) A method of demonstrating the applicant's qualification and ability to provide training for a license or rating in fewer than the minimum hours prescribed in Part 1 if the applicant proposes to do so.

Part B

(Item 13)

ATO Certificate Sample Form

*Republic of Iraq
Iraqi Civil Aviation Authority*

Approved Training Organization Certificate

*This certificate is issued to:
Whose business address is:
Number:*

Upon findings that its organization complies in all respects with requirements of the Iraqi civil aviation law no.148 for the year 1974, relating to the establishment of an approved training organization and is empowered to operate an approved Flight Training organization for the following courses:

This certificate, unless suspended or revoked, shall continue in effect until:

Date of issue:

Director General of Civil Aviation

Part C

(Item 21)

Facilities for AMEL Courses

1. An applicant for, and holder of, an ATO certificate shall have facilities the Authority determines are appropriate for the maximum number of students expected to be taught at any time, as follows:
 - (a) An enclosed classroom.
 - (b) Suitable facilities arranged to assure proper separation from the working space, for parts, tools, materials, and similar articles.
 - (c) Suitable area for application of finishing materials, including paint spraying.
 - (d) Suitable areas equipped with wash tank and degreasing equipment with air pressure or other adequate cleaning equipment.
 - (e) Suitable facilities for running engines.
 - (f) Suitable area with adequate equipment, including benches, tables, and test equipment, to disassemble, service, and inspect—
 - (g) Ignition systems, electrical equipment, and appliances;
 - (h) Carburetors and fuel systems; and
 - (i) Hydraulic and vacuum systems for aircraft, aircraft engines, and their appliances.
 - (j) Suitable space with adequate equipment, including tables, benches, stands, and jacks, for disassembling, inspecting, and rigging aircraft.
 - (k) Suitable space with adequate equipment for disassembling, inspecting, assembling, troubleshooting, and timing engines.

Part D**(Item 37)****Required Personnel**

1. The head of training shall have overall responsibility for ensuring satisfactory integration of flying training, synthetic flight training and theoretical knowledge instruction and for supervising the progress of individual students. The head of training shall have had extensive experience in training as a flight instructor for professional pilot licences and possess a sound managerial capability.
2. The CFI shall be responsible for the supervision of flight and synthetic flight instructors and for the standardisation of all flight instruction and synthetic flight instruction. The CFI shall:
 - a. Hold the highest professional pilot licence related to the flying training courses conducted;
 - b. Hold the rating(s) related to the flying training courses conducted;
 - c. Hold a flight instructor rating for at least one of the types of aircraft used on the course; and
 - d. Have completed 1,000 hours pilot-in-command flight time of which a minimum of 500 hours shall be on flying instructional duties related to the flying courses conducted, of which 200 hours may be instrument ground time.
3. Flight instructors shall hold—
 - a. A pilot licence and rating(s) in accordance with Part 2 related to the flying training courses they are approved to conduct; and
 - b. An instructor rating or authorisation in accordance with Part 2, relevant to the part of the course being conducted e.g. Flight instructor, flight instrument rating instructor, instructor for additional class or type rating(s), instructor for synthetic flight training, as appropriate.
4. Instructors for synthetic flight training shall hold the authorisation in accordance with Part 2 related to the synthetic flight training courses they are appointed to conduct.
5. Instructors for flight engineer licences and rating training shall hold:
 - a. The licence and the rating(s) in accordance with Part 2 related to the flight engineer licence and/or rating training courses they are appointed to conduct; and
 - b. An instructor rating in accordance with Part 2, relevant to the part of the course being conducted.
6. The chief ground instructor shall—
 - a. Be responsible for the supervision of all ground instructors and for the standardisation of all theoretical knowledge instruction; and
 - b. Shall have a practical background in aviation and have the appropriate ground instructor licence in accordance with Part 2.
7. Ground instructors shall be responsible for conducting ground training in subject areas required for a licence or rating. Ground instructors may have either a licence or be approved by the Authority in accordance with Part 2, depending upon the subject matter to be taught.
8. Ground instructors, who are approved by the Authority but not licensed, who teach knowledge subjects for licences and ratings shall have appropriate experience in aviation and shall, before appointment, give proof of their competency by giving a lecture based on material they have developed for the subjects they are to teach.

Part E**(Item 39)****Quality System**

In order to show compliance with item 39, an ATO should establish its quality system in accordance with the instruction and information contained in the following paragraphs.

1. Introduction
 - a. A basis for quality should be established by every ATO and problem-solving techniques to run processes should be applied. Knowledge in how to measure, establish and ultimately achieve quality in training and education is considered to be essential.
 - b. The purpose of this guidance material is to provide information and guidance to the ATO on how to establish a quality system that enables compliance with item 39.
2. Terminology
 - a. Quality. The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs.
 - b. Quality assurance. All those planned and systematic actions necessary to provide adequate confidence that all training activities satisfy given requirements, including the ones specified by the ATO in relevant manuals.
 - c. Quality manual. The document containing the relevant information pertaining to the ATO's quality system and quality assurance program.
 - d. Quality audit. A systematic and independent examination to determine whether quality activities and related results comply with planned arrangements and whether these arrangements are implemented effectively and are suitable to achieve objectives.
3. Quality policy and strategy
 - a. It is of vital importance that the ATO describes how the organisation formulates, deploys, reviews its policy and strategy and turns it into plans and actions. A formal written quality policy statement should be established that is a commitment by the head of training, as to what the quality system is intended to achieve. The quality policy should reflect the achievement and continued compliance with relevant parts of part 2 and 3 together with any additional standards specified by the ATO.
 - b. The accountable manager will have overall responsibility for the quality system including the frequency, format and structure of the internal management evaluation activities.
4. Purpose of a quality system
 - a. The implementation and employment of a quality system will enable the ATO to monitor compliance with relevant parts of part 2 and 3, the procedures manual and the training manual, and any other standards as established by the ATO, or the Authority, to ensure safe and efficient training.
5. Quality manager
 - a. The primary role of the quality manager is to verify, by monitoring activities in the field of training, that the standards required by the Authority, and any additional requirements as established by the ATO are being carried out properly under the supervision of the head of training, chief flight instructor and chief ground instructor.
 - b. The quality manager should be responsible for ensuring that the quality assurance program is properly implemented, maintained and continuously reviewed and improved. The quality manager should:

- i. have direct access to the head of training;
 - ii. have access to all parts of the ATO's organisation.
 - b. In the case of small or very small ATOs, the posts of the head of training and the quality manager may be combined. However, in this event, quality audits should be conducted by independent personnel.
6. Quality system
 - a. The quality system of the ATO should ensure compliance with and adequacy of training activities conducted.
 - b. The ATO should specify the basic structure of the quality system applicable to all training activities conducted.
 - c. The quality system should be structured according to the size of the ATO and the complexity of the training to be monitored.
7. Scope

A quality system should address the following:

 - a. Leadership
 - b. Policy and strategy
 - c. Processes
 - d. The provisions of part 2 and 3
 - e. Additional standards and training procedures as stated by the ATO
 - f. The organisational structure of the ATO
 - g. Responsibility for the development, establishment and management of the quality system
 - h. Documentation, including manuals, reports and records
 - i. Quality assurance program
 - j. The required financial, material and human resources
 - k. Training requirements
 - l. Customer satisfaction
8. Feedback system
 - a. The quality system should include a feedback system to ensure that corrective actions are both identified and promptly addressed. The feedback system should also specify who is required to rectify discrepancies and non-compliance in each particular case, and the procedure to be followed if corrective action is not completed within an appropriate timescale.
9. Documentation
 - a. Relevant documentation includes the relevant part(s) of the training and procedures manual, which may be included in a separate quality manual.
 - b. In addition relevant document should also include the following:
 - i. Quality policy
 - ii. Terminology
 - iii. Specified training standards
 - iv. A description of the organisation
 - v. The allocation of duties and responsibilities
 - vi. Training procedures to ensure regulatory compliance
 - vii. The quality assurance program, reflecting:
 - Schedule of the monitoring process
 - Audit procedures
 - Reporting procedures
 - Follow-up and corrective action procedures

- Recording system
 - The training syllabus
 - Document control
10. Quality assurance program
- a. The quality assurance program should include all planned and systematic actions necessary to provide confidence that all training are conducted in accordance with all applicable requirements, standards and procedures.
11. Quality inspection
- a. The primary purpose of a quality inspection is to observe a particular event/action/document etc., in order to verify whether established training procedures and requirements are followed during the accomplishment of that event and whether the required standard is achieved.
 - b. Typical subject areas for quality inspections are:
 - Actual flight, if approved for flight training;
 - Ground training
 - Maintenance;
 - Technical standards;
 - Training standards.
12. Audit
- a. An audit is a systematic, and independent comparison of the way in which a training is being conducted against the way in which the published training procedures say it should be conducted.
 - b. Audits should include at least the following quality procedures and processes:
 - i. An explanation of the scope of the audit
 - ii. Planning and preparation
 - iii. Gathering and recording evidence
 - iv. Analysis of the evidence
 - c. The various techniques that make up an effective audit are:
 - i. Interviews or discussions with personnel
 - ii. A review of published documents
 - iii. The examination of an adequate sample of records
 - iv. The witnessing of the activities which make up the training
 - v. The preservation of documents and the recording of observations
13. Auditors
- a. The ATO should decide, depending on the complexity of the training, whether to make use of a dedicated audit team or a single auditor. In any event, the auditor or audit team should have relevant training and/or operational experience.
 - b. The responsibilities of the auditors should be clearly defined in the relevant documentation.
14. Auditor's independence
- a. Auditors should not have any day-to-day involvement in the area of the operation or maintenance activity which is to be audited. An ATO may, in addition to using the services of full-time dedicated personnel belonging to a separate quality department, undertake the monitoring of specific areas or activities by the use of part-time auditors.
 - b. An ATO whose structure and size does not justify the establishment of full-time auditors, may undertake the audit function by the use of part-time personnel from within its own organisation or from an external source under the terms of an

- agreement acceptable to the Authority.
- c. In all cases the ATO should develop suitable procedures to ensure that persons directly responsible for the activities to be audited are not selected as part of the auditing team. Where external auditors are used, it is essential that any external specialist is familiar with the type of training conducted by the ATO.
 - d. The quality assurance program of the ATO should identify the persons within the company who have the experience, responsibility and authority to:
 - i. Perform quality inspections and audits as part of ongoing quality assurance
 - ii. Identify and record any concerns or findings, and the evidence necessary to substantiate such concerns or findings
 - iii. Initiate or recommend solutions to concerns or findings through designated reporting channels
 - iv. Verify the implementation of solutions within specific timescales
 - v. Report directly to the quality manager
15. Audit scope
- a. ATOs are required to monitor compliance with the training and procedures manuals they have designed to ensure safe and efficient training. In doing so they should as a minimum, and where appropriate, monitor:
 - i. Organisation
 - ii. Plans and objectives
 - iii. Training procedures
 - iv. Flight safety
 - v. Manuals, logs and records
 - vi. Flight and duty time limitations
 - vii. Rest requirements and scheduling
 - viii. Aircraft maintenance/operations interface
 - ix. Maintenance programs and continued airworthiness
 - x. Maintenance accomplishment
16. Audit scheduling
- a. A quality assurance program should include a defined audit schedule and a periodic review cycle. The schedule should be flexible, and allow unscheduled audits when trends are identified. Follow-up audits should be scheduled when necessary to verify that corrective action was carried out and that it was effective.
 - b. An ATO should establish a schedule of audits to be completed during a specific calendar period. All aspects of the training should be reviewed within a period of 12 months in accordance with the program unless an extension to the audit period is accepted as explained below.
 - c. An ATO may increase the frequency of their audits at their discretion but should not decrease the frequency without the acceptance of the [Authority]. It is considered unlikely that a period of greater than 24 months would be acceptable for any audit topic.
 - d. When an ATO defines the audit schedule, significant changes to the management, organisation, training, or technologies should be considered, as well as changes to the regulatory requirements.
17. Monitoring and corrective action
- a. The aim of monitoring within the quality system is primarily to investigate and judge its effectiveness and thereby to ensure that defined policy, training standards are continuously complied with. Monitoring activity is based upon quality inspections, audits, corrective action and follow-up. The ATO should establish and

publish a quality procedure to monitor regulatory compliance on a continuing basis. This monitoring activity should be aimed at eliminating the causes of unsatisfactory performance.

- b. Any non-compliance identified should be communicated to the manager responsible for taking corrective action or, if appropriate, the accountable manager. Such non-compliance should be recorded, for the purpose of further investigation, in order to determine the cause and to enable the recommendation of appropriate corrective action.
 - c. The quality assurance program should include procedures to ensure that corrective actions are developed in response to findings. These quality procedures should monitor such actions to verify their effectiveness and that they have been completed. Organisational responsibility and accountability for the implementation of corrective action resides with the department cited in the report identifying the finding. The accountable manager will have the ultimate responsibility for ensuring, through the quality manager(s), that corrective action has re-established compliance with the standard required by the Authority and any additional requirements established by the ATO.
18. Corrective action
- a. Subsequent to the quality inspection/audit, the ATO should establish:
 - i. The seriousness of any findings and any need for immediate corrective action
 - ii. The origin of the finding
 - iii. what corrective actions are required to ensure that the non-compliance does not recur
 - iv. A schedule for corrective action
 - v. The identification of individuals or departments responsible for implementing corrective action
 - v. Allocation of resources by the accountable manager, where appropriate
 - b. The quality manager should:
 - i. Verify that corrective action is taken by the manager responsible in response to any finding of non-compliance
 - ii. Verify that corrective action includes the elements outlined in paragraph (17) above
 - iii. Monitor the implementation and completion of corrective action
 - iv. Provide management with an independent assessment of corrective action, implementation and completion
 - v. Evaluate the effectiveness of corrective action through the follow-up process

19. Management evaluation

- a. A management evaluation is a comprehensive, systematic documented review by the management of the quality system, training policies, and procedures, and should consider:
 - i. The results of quality inspections, audits and any other indicators; as well as the overall effectiveness of the management organisation in achieving stated objectives.
 - ii. A management evaluation should identify and correct trends, and prevent, where possible, future non-conformities.
 - iii. Conclusions and recommendations made as a result of an evaluation should be submitted in writing to the responsible manager for action.
 - iv. The responsible manager should be an individual who has the authority to resolve issues and take action.
 - v. The accountable manager should decide upon the frequency, format, and

structure of internal management evaluation activities.

20. Recording

- a. Accurate, complete and readily accessible records documenting the result of the quality assurance program should be maintained by the ATO. Records are essential data to enable an ATO to analyse and determine the root causes of non-conformity, so that areas of non-compliance can be identified and subsequently addressed.
- b. The following records should be retained for a period of 5 years:
 - i. Audit schedules
 - ii. Quality inspection and audit reports
 - iii. Responses to findings
 - iv. Corrective action reports
 - v. Follow-up and closure reports
 - vi. Management evaluation reports

21. Quality assurance responsibility for satellite ATOs

- a. An ATO may decide to sub-contract out certain activities to external organisations subject to the approval of the Authority.
- b. The ultimate responsibility for the training provided by the satellite ATO always remains with the ATO. A written agreement should exist between the ATO and the satellite ATO clearly defining the safety related services and quality to be provided. The satellite ATO's safety related activities relevant to the agreement should be included in the ATO's quality assurance program.
- c. The ATO should ensure that the satellite ATO has the necessary authorisation/approval when required, and commands the resources and competence to undertake the task. If the ATO requires the satellite ATO to conduct activity which exceeds the satellite ATO's authorisation/approval, the ATO is responsible for ensuring that the satellite ATO's quality assurance takes account of such additional requirements.

22. Quality system training

- a. Correct and thorough training is essential to optimise quality in every organisation. In order to achieve significant outcomes of such training the ATO should ensure that all staff understand the objectives as laid down in the quality manual.
- b. Those responsible for managing the quality system should receive training covering:
 - i. An introduction to the concept of quality system
 - ii. Quality management
 - iii. Concept of quality assurance
 - iv. Quality manuals
 - v. Audit techniques
 - vi. Reporting and recording
 - vii. The way in which the quality system will function in the ATO
- c. Time should be provided to train every individual involved in quality management and for briefing the remainder of the employees. The allocation of time and resources should be governed by the size and complexity of the operation concerned.

23 Sources of training

- a. Quality management courses are available from the various national or international standards institutions, and an ATO should consider whether to offer such courses to those likely to be involved in the management of quality systems. Organisations with sufficient appropriately qualified staff should consider whether to carry out in-house training.

24. Quality systems for small/very small organisations
 - a. The requirement to establish and document a quality system, and to employ a quality manager applies to all ATOs.
 - b. Complex quality systems could be inappropriate for small or very small ATOs and the clerical effort required to draw up manuals and quality procedures for a complex system may stretch their resources. It is therefore accepted that such ATOs should tailor their quality systems to suit the size and complexity of their training and allocate resources accordingly.
 - c. For small and very small ATOs it may be appropriate to develop a quality assurance program that employs a checklist. The checklist should have a supporting schedule that requires completion of all checklist items within a specified timescale, together with a statement acknowledging completion of a periodic review by top management. An occasional independent overview of the checklist content and achievement of the quality assurance should be undertaken.
 - d. The small ATO may decide to use internal or external auditors or a combination of the two. In these circumstances it would be acceptable for external specialists and or qualified organisations to perform the quality audits on behalf of the quality manger.
 - e. If the independent quality audit function is being conducted by external auditors, the audit schedule should be shown in the relevant documentation.
 - f. Whatever arrangements are made, the main ato retains the ultimate responsibility for the quality system and especially the completion and follow-up of corrective actions.

Part F**(Item 41)****ATO Training and Procedures Manual (Flight Crew Training)**

1. The training manual for use at an ATO conducting approved training courses should include the following:
 - a. Chapter 1: the training plan:
 - i. The aim of the course: a statement of what the student is expected to do as a result of the training, the level of performance, and the training constraints to be observed.
 - ii. Pre-entry requirements: minimum age, educational requirements (including language), medical requirements.
 - iii. Credits for previous experience: to be obtained from the Authority before training begins.
 - iv. Training curricula: the flying curriculum (single-engine), the flying curriculum (multi-engine), the synthetic flight training curriculum and the theoretical knowledge training curriculum.
 - v. The time scale and scale in weeks, for each curriculum: arrangements of the course and the integration of curricula time.
 - vi. Training program: the general arrangements of daily and weekly programs for flying, ground and synthetic flight training. Bad weather constraints. Program constraints in terms of maximum student training times, (flying, theoretical knowledge, synthetic) e.g. per day/week/month. Restrictions in respect of duty periods for students. Duration of dual and solo flights at various stages. Maximum flying hours in any day/night. Maximum number of training flights in any day/night. Minimum rest period between duty period.
 - vii. Training records: rules for security of records and documents. Attendance records. The form of training records to be kept. Persons responsible for checking records and students' log books. The nature and frequency of records checks. Standardization of entries in training records. Rules concerning log book entries.
 - viii. Safety training: individual responsibilities. Essential exercises. Emergency drills (frequency). Dual checks (frequency at various stages). Requirement before first solo day/night/navigation etc.
 - ix. Checks and tests: flying: progress checks and skill tests. Knowledge: progress tests and knowledge tests. Authorization for test. Rules concerning refresher training before retest. Test reports and records. Procedures for test paper preparation, type of question and assessment, standard required for 'pass'. Procedure for question analysis and review and for raising replacement papers. Retest procedures.
 - x. Training effectiveness: individual responsibilities. General assessment. Liaison between departments. Identification of unsatisfactory progress (individual students). Actions to correct unsatisfactory progress. Procedure for changing instructors. Maximum number of instructor changes per student. Internal feedback system for detecting training deficiencies. Procedure for suspending a student from training. Discipline. Reporting and documentation.
 - xi. Standards and level of performance at various stages: individual responsibilities. Standardization. Standardization requirements and procedures. Application of test criteria.
 - b. Chapter 2: briefing and air exercises

- i. Air exercise: a detailed statement of the content specification of all the air exercises to be taught, arranged in the sequence to be flown with main and sub-titles.
- ii. Air exercise reference list: an abbreviated list of the above exercises giving only main and sub-titles for quick reference, and preferably in flip-card form to facilitate daily use by instructors.
- iii. Course structure – phase of training: a statement of how the course will be divided into phases, indication of how the above air exercises will be divided between the phases and how they will be arranged to ensure that they are completed in the most suitable learning sequence and that essential (emergency) exercises are repeated at the correct frequency. Also, the curriculum hours for each phase and for groups of exercises within each phase shall be stated and when progress tests are to be conducted, etc.
- iv. Course structure integration of curricula: the manner in which theoretical knowledge, synthetic flight training and flying training will be integrated so that as the flying training exercises are carried out students will be able to apply the knowledge gained from the associated theoretical knowledge instruction and synthetic flight training.
- v. Student progress: the requirement for student progress should include a brief but specific statement of what a student is expected to be able to do and the standard of proficiency he or she must achieve before progressing from one phase of air exercise training to the next. Include minimum experience requirements in terms of hours, satisfactory exercise completion, etc. As necessary before significant exercises, e.g. night flying.
- vi. Instructional methods: the ATO requirements, particularly in respect of pre-and post-flying briefing, adherence to curricula and training specifications, authorisation of solo flights, etc.
- vii. Progress tests: the instructions given to examining staff in respect of the conduct and document of all progress tests.
- viii. Glossary of terms: definition of significant terms as necessary.
- ix. Appendices: progress test report forms. Skill test report forms. ATO certificates of experience, competence, etc. As required.

Chapter 3: synthetic flight training: structure generally as for chapter 2.

Chapter 4: knowledge instruction: structure generally as for chapter 2 with a training specification and objectives for each subject. Individual lesson plans to include mention of the specific training aids available for use.

2. The procedures manual for use at an ATO conducting approved training courses should include the following:

Chapter 1: general:

- i. A list and description of all volumes in the procedures manual.
- ii. Administration (function and management).
- iii. Responsibilities (all management and administrative staff).
- iv. Student discipline and disciplinary action.
- v. Approval/authorization of flights.
- vi. Preparation of flying program (restriction of numbers of aircraft in poor weather).
- vii. Command of aircraft.
- viii. Responsibilities of pilot-in-command.
- ix. Carriage of passengers.
- x. Aircraft documentation.
- xi. Retention of documents.

- xii. Flight crew qualification records (licences and ratings).
- xiii. Revalidation (licences, ratings and medical certificates).
- xiv. Flying duty period and flight time limitations (flying instructors).
- xv. Flying duty period and flight time limitations (students).
- xvi. Rest periods (flying instructors).
- xvii. Rest periods (students).
- xviii. Pilots' log books
- xix. Flight planning (general).
- xx. Safety (general: equipment, radio listening watch, hazards, accidents and incidents (including reports), safety pilots, etc.

Chapter 2: technical

- i. Aircraft descriptive notes.
- ii. Aircraft handling (including checklists, limitations, aircraft maintenance and technical logs, in accordance with relevant requirements, etc.)
- iii. Emergency procedures.
- iv. Radio and radio navigation aids.
- v. Allowable deficiencies (based on MMEL, if available).

Chapter 3: Route

- i. Performance (legislation, take-off, route, landing, etc.).
- ii. Flight planning (fuel, oil, minimum safe altitude, navigation equipment, etc.)
- iii. Loading (loadsheets, mass, balance, limitations).
- iv. Weather minima (flying instructors)
- v. Weather minima (students: at various stages of training).
- vi. Training routes/areas

Chapter 4: Staff Training

- i. Appointments of persons responsible for standards/competence of flying staff.
- ii. Initial training.
- iii. Refresher training.
- iv. Standardization training.
- v. Proficiency checks
- vi. Upgrading training.
- vii. ATO staff standards evaluation.

Part G**(Item 41)****ATO Training and Procedures Manual (AME Training)**

1. The training manual for use at an ATO conducting approved maintenance training courses should include the following:
 - a. Chapter 1: The Training Plan:
 - i. The aim of the course: a statement of what the student is expected to do as a result of the training, the level of performance, and the training constraints to be observed.
 - ii. Pre-entry requirements: minimum age, educational requirements (including language).
 - iii. Credits for previous experience: to be obtained from the [Authority] before training begins.
 - iv. Training curricula: e.g., general, airframe, power plant, avionics, and other courses as applicable.
 - v. The time scale and scale in weeks, for each curriculum: arrangements of the course and the integration of curricula time.
 - vi. Training program: the general arrangements of daily and weekly programs for classroom and practical training.
 - vii. Training records: rules for security of records and documents.
 - viii. Attendance records. The form of training records to be kept. Persons responsible for checking student records. The nature and frequency of records checks. Standardization of entries in training records.
 - ix. Safety training: individual responsibilities. Essential exercises. Emergency drills (frequency). Use of tools and equipment found in the normal maintenance training environment.
 - x. Checks and tests: progress checks and skill tests. Knowledge: progress tests and knowledge tests. Authorisation for test. Rules concerning refresher training before retest. Test reports and records. Procedures for test paper preparation, type of question and assessment, standard required for 'pass'. Procedure for question analysis and review and for raising replacement papers. Retest procedures.
 - xi. Training effectiveness: individual responsibilities. General assessment. Liaison between departments. Identification of unsatisfactory progress (individual students). Actions to correct unsatisfactory progress. Procedure for changing instructors. Maximum number of instructor changes per student. Internal feedback system for detecting training deficiencies. Procedure for suspending a student from training. Discipline. Reporting and documentation.
 - xii. Standards and level of performance at various stages: individual responsibilities. Standardisation. Standardisation requirements and procedures. Application of test criteria.
 - b. Chapter 2: Briefing and Exercises
 - i. Exercise: a detailed statement of the content specification of all the exercises to be taught, arranged in the sequence to be flown with main and sub-titles.
 - ii. Exercise reference list: an abbreviated list of the above exercises giving only main and sub-titles for quick reference, and preferably in flip-card form to facilitate daily use by instructors.
 - iii. Course structure – phase of training: a statement of how the course will be divided into phases, indication of how the above exercises will be divided

between the phases and how they will be arranged to ensure that they are completed in the most suitable learning sequence and that essential (emergency) exercises are repeated at the correct frequency. Also, the curriculum hours for each phase and for groups of exercises within each phase shall be stated and when progress tests are to be conducted, etc.

- iv. Course structure integration of curricula: the manner in which theoretical knowledge and practical training will be integrated so that as the training exercises are carried out students will be able to apply the knowledge gained from the associated theoretical knowledge instruction and practical training.
- v. Student progress: the requirement for student progress and include a brief but specific statement of what a student is expected to be able to do and the standard of proficiency he or she must achieve before progressing from one phase of exercise training to the next. Include minimum experience requirements in terms of hours, satisfactory exercise completion, etc. As necessary before significant exercises.
- vi. Instructional methods: the ATO requirements, particularly in respect of pre-and post-exercise briefing, adherence to curricula and training specifications, etc.
- vii. Progress tests: the instructions given to examining staff in respect of the conduct and document of all progress tests.
- viii. Glossary of terms: definition of significant terms as necessary.
- ix. Appendices: progress test report forms. Skill test report forms. ATO certificates of experience, competence, etc. As required.
- c. Chapter 3: Synthetic Training for Maintenance Personnel: structure generally as for chapter 2.
- d. Chapter 4: Knowledge Instruction: structure generally as for chapter 2 with a training specification and objectives for each subject. Individual lesson plans to include mention of the specific training aids available for use.

Note: Aircraft with advanced systems may require training in a synthetic trainer with appropriate controls and displays. Troubleshooting and maintenance actions on modern aircraft require knowledge of on-board aircraft computerized test systems.

2. The procedures manual for use at an ATO conducting approved maintenance training courses should include the following:
 - a. Chapter 1—General and Management
 - i. Corporate commitment by accountable manager;
 - ii. Management personnel;
 - iii. Duties and responsibilities of management personnel;
 - iv. Management personnel organisation chart;
 - v. List of instructional and examination staff;
 - vi. List of approved locations of the ATO (principle place of business, any satellite locations, any sub-contracted facilities);
 - vii. General description of facilities at each approved location;
 - viii. Specific list of courses approved by the Authority;
 - ix. Notification procedures regarding changes to organisation;
 - x. Amendment procedures for procedures manual and associated manuals;
 - b. Chapter 2—Training and Examination Procedures
 - i. Organisation of courses
 - ii. Preparation of course material
 - iii. Preparation of classrooms and equipment;
 - iv. Preparation of workshops/maintenance facilities and equipment;

- v. Conduct of basic knowledge and practical training;
- vi. Records of training carried out;
- vii. Storage of training records;
- viii. Training at locations not listed in the ATO certificate (if applicable);
- ix. Organisation of examinations;
- x. Security and preparation of examination material;
- xi. Preparation of examination rooms;
- xii. Conduct of examinations;
- xiii. Conduct of basic practical assessments;
- xiv. Marking and records of examinations;
- xv. Storage of examination records;
- xvi. Examinations at locations not listed in the ATO certificate (if applicable);
- xvii. Preparation, control and issue of basic training course certificates;

c. Chapter 3—Training System Quality Procedures

Note: This may be a separate quality system manual.

- i. Audit of training;
 - ii. Audit of examinations;
 - iii. Analysis of examination results;
 - iv. Audit and analysis remedial action;
 - v. Accountable manager annual review;
 - vi. Qualifying the instructors;
 - vii. Qualifying the examiners;
 - viii. Records of qualified instructors and examiners;
- d. Chapter 4—Staff Training
- i. Initial training;
 - ii. Refresher training;
 - iii. Standardisation training;
 - iv. ATO staff standards evaluation.
- e. Chapter 5—Appendices
- i. Example of documents and forms used;
 - ii. Syllabus of each training course;
 - iii. Cross reference index – if applicable.

SCHEDULE 2**PART A****(Item 43(2), (a), (i))****Private Pilot Licensing Course**

1. Applicability. Part A prescribes the minimum curriculum for a private pilot licensing course with the following ratings—
 - (a) Aeroplane single-engine;
 - (b) Aeroplane multiengine;
 - (c) Rotorcraft helicopter;
 - (d) Rotorcraft gyroplane;
 - (e) Powered-lift;
 - (f) Glider;
 - (g) Lighter-than-air airship; and
 - (h) Lighter-than-air balloon.
2. Eligibility for enrolment. A person shall hold a student pilot license prior to enrolling in the flight portion of the private pilot licensing course.
3. Aeronautical knowledge training.
 - (a) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each approved course includes at least the following hours of ground training on the following aeronautical knowledge areas, appropriate to the aircraft category and class rating—
 - (i) 35 hours for an aeroplane, rotorcraft, or powered-lift category rating;
 - (ii) 15 hours for a glider category rating;
 - (iii) 10 hours for a lighter-than-air category with a balloon class rating; and
 - (iv) 35 hours for a lighter-than-air category with an airship class rating.
 - (b) Ground training shall include the following aeronautical knowledge areas—
 - (i) Applicable Republic of Iraq regulations for private pilot privileges, limitations, and flight operations;

- (ii) Accident reporting requirements of the Republic of Iraq;
- (iii) Applicable subjects of the Authority provided aeronautical information publications;
- (iv) Aeronautical charts for VFR navigation using pilotage, dead reckoning, and navigation systems;
- (v) Radio communication procedures;
- (vi) Recognition of critical weather situations from the ground and in flight, wind shear avoidance, and the procurement and use of aeronautical weather reports and forecasts;
- (vii) Safe and efficient operation of aircraft, including collision avoidance, and recognition and avoidance of wake turbulence;
- (viii) Effects of density altitude on takeoff and climb performance;
- (ix) Weight and balance computations;
- (x) Principles of aerodynamics, power plants, and aircraft systems;
- (xi) If the training course is for an aeroplane category or glider category rating, stall awareness, spin entry, spins, and spin recovery techniques;
- (xii) Aeronautical decision making and judgment; and
- (xiii) Pre-flight action that includes—
- (xiv) Obtaining information on runway lengths, data on takeoff and landing distances, weather reports and forecasts, and fuel requirements; and
- (xv) Planning for alternatives if a planned flight cannot be completed or delays are encountered.

4. Flight training.

- (a) Each applicant for, and holder of, an ATO certificate with this rating shall include at least the following hours of flight training on the areas of operation listed in paragraph (4), appropriate to the aircraft category and class rating—
 - (i) 35 hours for an aeroplane, rotorcraft, powered-lift, or airship rating;
 - (ii) 6 hours for a glider rating; and
 - (iii) 8 hours for a balloon rating.
- (b) Each applicant for, and holder of, an ATO certificate with this rating shall

include at least the following hours of flight training in each course—

- (i) For each category and class, unless otherwise noted, 20 hours from a licensed flight instructor on the applicable areas of operation that includes at least—
 - (A) 3 hours of cross-country flight training in the category and class involved;
 - (B) 3 hours of night flight training in the category and class involved that includes—
 - 1. One cross-country flight of more than 100-nautical-miles total distance; and
 - 2. 10 takeoffs and 10 landings to a full stop (with each landing involving a flight in the traffic pattern).
 - (C) 3 hours of instrument training in the category and class involved; and
 - (D) 3 hours in the category and class involved in preparation for the practical test within 60 days proceeding the date of the test.
- (c) Specific training for other categories and classes as shown:
 - (i) For a rotorcraft helicopter and gyroplane course:
 - (A) 3 hours of night flight training in a helicopter that includes one cross-country flight of more than 50-nautical-miles total distance.
 - (ii) For a glider course: 4 hours from a licensed flight instructor on the areas of operation in paragraph (4)(f) that includes at least—
 - (A) Five training flights in a glider on launch/tow procedures approved for the course and in the applicable areas of operation listed in paragraph (4)(e); and
 - (B) Three training flights in a glider in preparation for the practical test within 60 days proceeding the date of the test.
 - (iii) For a lighter-than-air airship course: 20 hours from a commercial pilot with an airship rating on the areas of operation in paragraph (4)(g) that includes at least—
 - (A) The training shown in paragraph (3)(a)(iv), taken in a lighter-than-air airship;
 - (B) 3 hours of night flight training in an airship that

includes—

1. One cross-country flight over 25 nautical-miles total distance; and
 2. Five takeoffs and five landings to a full stop (with each landing involving a flight in the traffic pattern).
- (iv) For a lighter-than-air balloon course: 8 hours, including at least five flights, from a commercial pilot with a balloon rating on the areas of operation in paragraph (5)(h), that includes—
- (A) If the training is being performed in a gas balloon—
1. Two flights of 1 hour each;
 2. One flight involving a controlled ascent to 3,000 feet above the launch site; and
 3. Two flights in preparation for the practical test within 60 days preceding the date of the test.
- (B) If the training is being performed in a balloon with an airborne heater—
1. Two flights of 30 minutes each;
 2. One flight involving a controlled ascent to 2,000 feet above the launch site; and
 3. Two flights in preparation for the practical test within 60 days preceding the date of the test.
- (d) Each approved course shall include flight training in the following areas of operation that are applicable to the aircraft category and class rating—
- (i) Preflight preparation;
 - (ii) Preflight procedures;
 - (iii) Airport and seaplane base operations;
 - (iv) Takeoffs, landings, and go-arounds;
 - (v) Performance maneuvers;
 - (vi) Ground reference maneuvers;
 - (vii) Navigation;
 - (viii) Slow flight and stalls;

- (ix) Basic instrument maneuvers;
 - (x) Emergency operations;
 - (xi) Night operations; and
 - (xii) Post flight procedures.
- (e) In addition, for the specific category and class of aircraft shown, each approved course shall include the applicable flight training in the following areas of operation:
- (i) For a multiengine aeroplane course—
 - (A) Multiengine operations.
 - (ii) For a rotorcraft helicopter course—
 - (A) Hovering maneuvers.
 - (iii) For a rotorcraft gyroplane course—
 - (A) Flight at slow airspeeds.
 - (iv) For a powered-lift course—
 - (A) Hovering maneuvers.
 - (v) For a glider course—
 - (A) Launches/tows, as appropriate, and landings;
 - (B) Performance speeds; and
 - (C) Soaring techniques.
 - (vi) For a lighter-than-air balloon course—
 - (A) Launches and landings.
5. Solo flight training. Each approved course shall include at least the following solo flight training—
- (a) For an aeroplane single-engine course: 5 hours of solo flight training in a single-engine aeroplane on the applicable areas of operation in paragraph (4) that includes at least—
 - (i) One solo cross-country flight of at least 100 nautical miles with landings at a minimum of three points, and one segment of the flight consisting of a straight-line distance of at least 50 nautical miles between the takeoff and landing locations; and

- (ii) Three takeoffs and three landings to a full stop (with each landing involving a flight in the traffic pattern) at an airport with an operating control tower.
- (b) For an aeroplane multiengine course: 5 hours of flight training in a multiengine aeroplane performing the functions of a pilot in command while under the supervision of a licensed flight instructor. The training shall consist of the applicable areas of operation in paragraph (4) and include at least—
 - (i) One cross-country flight of at least 100 nautical miles with landings at a minimum of three points, and one segment of the flight consisting of a straight-line distance of at least 50 nautical miles between the takeoff and landing locations; and
 - (ii) Three takeoffs and three landings to a full stop (with each landing involving a flight in the traffic pattern) at an airport with an operating control tower.
- (c) For a rotorcraft helicopter course: 5 hours of solo flight training in a helicopter on the areas of operation in paragraph (4) that includes at least—
 - (i) One solo cross-country flight of more than 50 nautical miles with landings at a minimum of three points, and one segment of the flight consisting of a straight-line distance of at least 25 nautical miles between the takeoff and landing locations; and
 - (ii) Three takeoffs and three landings to a full stop (with each landing involving a flight in the traffic pattern) at an airport with an operating control tower.
- (d) For a rotorcraft gyroplane course: 5 hours of solo flight training in gyroplanes on the applicable areas of operation in paragraph (4) that includes at least—
 - (i) One solo cross-country flight of more than 50 nautical miles with landings at a minimum of three points, and one segment of the flight consisting of a straight-line distance of at least 25 nautical miles between the takeoff and landing locations; and
 - (ii) Three takeoffs and three landings to a full stop (with each landing involving a flight in the traffic pattern) at an airport with an operating control tower.
- (e) For a powered-lift course: 5 hours of solo flight training in a powered-lift on the applicable areas of operation in paragraph (4) that includes at least—
 - (i) One solo cross-country flight of at least 100 nautical miles with landings at a minimum of three points, and one segment of the flight consisting of a straight-line distance of at least 50 nautical miles between the takeoff and landing locations;
 - (ii) Three takeoffs and three landings to a full stop (with each

landing involving a flight in the traffic pattern) at an airport with an operating control tower; and

- (iii) Transition from hover to forward flight using wing lift.
 - (f) For a glider course: Two solo flights in a glider on the applicable areas of operation in paragraph (4) and the launch and tow procedures appropriate for the approved course.
 - (g) For a lighter-than-air airship course: 5 hours of flight training in the applicable areas of operation shown in paragraph (4) in an airship performing the functions of pilot in command while under the supervision of a commercial pilot with an airship rating.
 - (h) For a lighter-than-air balloon course: Training on the applicable areas of operation in paragraph (4), as applicable, and—
 - (i) Two solo flights in a balloon with an airborne heater; or
 - (ii) At least two flights in a gas balloon performing the functions of pilot in command while under the supervision of a commercial pilot with a balloon rating.
6. Stage checks and end-of-course tests.
- (a) Each student, to graduate from a private pilot course shall satisfactorily accomplish the stage checks and end-of-course tests, consisting of the applicable areas of operation listed in paragraph (4) for the aircraft category and class rating.
 - (b) Each student shall demonstrate satisfactory proficiency prior to being endorsed to operate an aircraft in solo flight.

PART B**(Item 43(2), (a), (ii))****Instrument Rating Course**

1. Applicability. This part prescribes the minimum curriculum for an instrument rating course and additional instrument rating course, required under this Part, for the following ratings:
 - (a) Instrument: aeroplane.
 - (b) Instrument: helicopter.
 - (c) Instrument: powered-lift.
2. Eligibility for enrolment. A person shall hold at least a private pilot license with an aircraft category and class rating appropriate to the instrument rating for which the course applies prior to enrolling in the flight portion of the instrument rating course.
3. Aeronautical knowledge training.
 - (a) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each approved course includes at least the following hours of ground training on the aeronautical knowledge areas appropriate to the instrument rating sought—
 - (i) 30 hours for an initial instrument rating.
 - (ii) 20 hours for an additional instrument rating.
 - (b) Ground training shall include the following aeronautical knowledge areas—
 - (i) Applicable Republic of Iraq regulations for IFR flight operations;
 - (ii) Appropriate information in aeronautical information publications provided by the Authority;
 - (iii) Air traffic control system and procedures for instrument flight operations;
 - (iv) IFR navigation and instrument approaches to an airport by use of navigation systems;
 - (v) Use of IFR en-route and instrument approach procedure charts;
 - (vi) Procurement and use of aviation weather reports and forecasts, and the elements of forecasting weather trends on the basis of that information and personal observation of weather conditions;
 - (vii) Safe and efficient operation of aircraft under IFR conditions;

- (viii) Recognition of critical weather situations and wind shear avoidance;
 - (ix) Aeronautical decision making and judgment; and
 - (x) Crew resource management, to include crew communication and co-ordination.
4. Flight training.
- (a) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes at least the following hours of flight training on the applicable areas of operation listed in paragraph (3)—
 - (i) 35 hours for an initial instrument rating;
 - (ii) 15 hours for an additional instrument rating.
 - (b) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes the following flight training—
 - (i) For an instrument aeroplane course: Instrument training from a licensed flight instructor with an instrument rating on the applicable areas of operation in paragraph (3) including at least one cross-country flight that—
 - (A) Is in the category and class of aeroplane that the course is approved for, and is performed under IFR;
 - (B) Is a distance of at least 250 nautical miles with one segment of the flight consisting of at least a straight-line distance of 100 nautical miles between airports;
 - (C) Involves an instrument approach at each airport; and
 - (D) Involves three approaches with the using different kinds of navigation systems.
 - (ii) For an instrument helicopter course: Instrument training from a licensed flight instructor with an instrument rating on the applicable areas of operation in paragraph (3) including at least one cross-country flight that—
 - (A) Is performed in a helicopter under IFR;
 - (B) Is a distance of at least 100 nautical miles with one segment of the flight consisting of at least a straight-line distance of 50 nautical miles between airports;
 - (C) Involves an instrument approach at each airport; and
 - (D) Involves three approaches with the using different kinds of

navigation systems.

- (iii) For an instrument powered-lift course: Instrument training from a licensed flight instructor with an instrument rating on the areas of operation in paragraph (3) including at least one cross-country flight that—
 - (A) Is in a powered-lift and is performed under IFR;
 - (B) Involves transition from wing-borne to rotor-borne flight under IFR;
 - (C) Is a distance of at least 250 nautical miles with one segment of the flight consisting of at least a straight-line distance of 100 nautical miles between airports;
 - (D) Involves an instrument approach at each airport; and
 - (E) Involves three different kinds of approaches with the use of navigation systems.
- (c) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes the flight training on the applicable areas of operation listed in this paragraph appropriate to the instrument aircraft category and class rating—
 - (i) Preflight preparation;
 - (ii) Preflight procedures;
 - (iii) Air traffic control clearances and procedures;
 - (iv) Flight by reference to instruments;
 - (v) Navigation systems;
 - (vi) Instrument approach procedures;
 - (vii) Emergency operations; and
 - (viii) Postflight procedures.

5. Stage checks and end-of-course tests.

- (a) Each student, to graduate from an instrument rating course shall satisfactorily accomplish the stage checks and end-of-course tests, consisting of the areas of operation listed in paragraph (3) that are appropriate to the aircraft category and class rating.

PART C**(Item 43(2), (a), (iii))****Commercial Pilot Licensing Course**

1. **Applicability.** This part prescribes the minimum curriculum for a commercial pilot licensing course required under this Part, for the following ratings:
 - (a) Aeroplane single-engine.
 - (b) Aeroplane multiengine.
 - (c) Rotorcraft helicopter.
 - (d) Rotorcraft gyroplane.
 - (e) Powered-lift.
 - (f) Glider.
 - (g) Lighter-than-air airship.
 - (h) Lighter-than-air balloon.
2. **Eligibility for enrolment.** A person shall hold the following prior to enrolling in the flight portion of the commercial pilot licensing course—
 - (a) At least a private pilot license; and
 - (b) If the course is for a rating in an aeroplane or a powered-lift category—
 - (i) Hold an instrument rating in the aircraft that is appropriate to the aircraft category rating for which the course applies; or
 - (ii) Be enrolled concurrently in an instrument rating course that is appropriate to the aircraft category rating for which the course applies, and pass the required instrument rating practical test prior to completing the commercial pilot licensing course.
3. **Aeronautical knowledge training.**
 - (a) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes at least the following ground training on the applicable aeronautical knowledge areas listed in paragraph (2):
 - (i) 65 hours for an aeroplane category rating, powered-lift category rating, or a lighter-than-air category with an airship class rating.
 - (ii) 30 hours for a rotorcraft category rating.
 - (iii) 20 hours for a glider category rating.

(iv) 20 hours for a lighter-than-air category with a balloon class rating.

(b) Ground training shall include the following aeronautical knowledge areas:

- (i) Republic of Iraq regulations that apply to commercial pilot privileges, limitations, and flight operations.
- (ii) Accident reporting requirements of the Republic of Iraq.
- (iii) Basic aerodynamics and the principles of flight.
- (iv) Meteorology, to include recognition of critical weather situations, wind shear recognition and avoidance, and the use of aeronautical weather reports and forecasts.
- (v) Safe and efficient operation of aircraft.
- (vi) Weight and balance computations.
- (vii) Use of performance charts.
- (viii) Significance and effects of exceeding aircraft performance limitations.
- (ix) Use of aeronautical charts and a magnetic compass for pilotage and dead reckoning.
- (x) Use of air navigation facilities.
- (xi) Aeronautical decision making and judgment.
- (xii) Principles and functions of aircraft systems.
- (xiii) Maneuvers, procedures, and emergency operations appropriate to the aircraft.
- (xiv) Night and high-altitude operations.
- (xv) Descriptions of and procedures for operating within the Republic of Iraq Airspace System.
- (xvi) Procedures for flight and ground training for lighter-than-air ratings.

4. Flight training.

- (a) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes at least the following flight training on the applicable areas of operation listed in paragraph (3):
 - (i) 155 hours for an aeroplane, powered-lift, or an airship rating.

- (ii) 115 hours for a rotorcraft rating.
 - (iii) 6 hours for a glider rating.
 - (iv) 10 hours and 8 training flights for a balloon rating.
- (b) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes at least the following flight training—
- (i) For an aeroplane single-engine course: 55 hours of flight training from a licensed flight instructor on the areas of operation listed in paragraph (3)(1) that includes at least—
 - (A) 5 hours of instrument training in a single-engine aeroplane;
 - (B) 10 hours of training in a single-engine aeroplane that has retractable landing gear, flaps, and a controllable pitch propeller, or is turbine-powered;
 - (C) One cross-country flight in a single-engine aeroplane of at least a 2-hour duration, a total straight-line distance of more than 100 nautical miles from the original point of departure, and occurring in day VFR conditions;
 - (D) One cross-country flight in a single-engine aeroplane of at least a 2-hour duration, a total straight-line distance of more than 100 nautical miles from the original point of departure, and occurring in night VFR conditions; and
 - (E) 3 hours in a single-engine aeroplane in preparation for the practical test within 60 days preceding the date of the test.
 - (ii) For an aeroplane multiengine course: The flight training shown in paragraph (4)(a), accomplished in a multiengine aeroplane.
 - (iii) For a rotorcraft helicopter and gyroplane course—
 - (A) The flight training shown in paragraph (4)(a), accomplished in a helicopter; except 30 hours of flight training from a licensed flight instructor on the areas of operation listed in paragraph (5)(c) that includes at least—
 1. 5 hours of instrument training;
 2. One cross-country flight in a helicopter of at least a 2-hour duration, a total straight-line distance of more than 50 nautical miles from the original point of departure, and occurring in day VFR conditions; and
 3. One cross-country flight in a helicopter of at least a 2-hour duration, a total straight-line distance of more

than 50 nautical miles from the original point of departure, and occurring in night VFR conditions.

- (iv) For a powered-lift course: The applicable flight training shown in paragraph (4)(a), flown in a powered-lift aircraft.
- (v) For a glider course: 4 hours of flight training from a licensed flight instructor on the areas of operation in paragraph (5)(f), that includes at least—
 - (A) Five training flights in a glider on launch/tow procedures approved for the course and on the appropriate areas of operation listed in paragraph (5)(f); and
 - (B) Three training flights in a glider in preparation for the practical test within the 60 days proceeding the date of the test.
- (vi) For a lighter-than-air airship course: 55 hours of training in airships from a commercial pilot with an airship rating on the areas of operation in paragraph (3)(g) that includes at least—
 - (A) 3 hours of instrument training in an airship;
 - (B) One cross-country flight in an airship of at least a 1-hour duration, a total straight-line distance of more than 25 nautical miles from the original point of departure, and occurring in day VFR conditions; and
 - (C) One cross-country flight in an airship of at least a 1-hour duration, a total straight-line distance of more than 25 nautical miles from the original point of departure, and occurring in night VFR conditions; and
 - (D) 3 hours in an airship, in preparation for the practical test within 60 days proceeding the date of the test.
- (vii) For a lighter-than-air balloon course: Flight training from a commercial pilot with a balloon rating on the areas of operation in paragraph (5)(h) that includes at least—
 - (A) For a gas balloon—
 1. Two flights of 1 hour each;
 2. One flight involving a controlled ascent to at least 5,000 feet above the launch site; and
 3. Two flights in preparation for the practical test within 60 days proceeding the date of the test.
 - (B) For a balloon with an airborne heater—

1. Two flights of 30 minutes each;
 2. One flight involving a controlled ascent to at least 3,000 feet above the launch site; and
 3. Two flights in preparation for the practical test within 60 days proceeding the date of the test.
- (c) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes the flight training on the following areas of operation, as applicable—
- (i) For an aeroplane single-engine course—
 - (A) Preflight preparation;
 - (B) Preflight procedures;
 - (C) Airport and seaplane base operations;
 - (D) Takeoffs, landings, and go-arounds;
 - (E) Performance manoeuvres;
 - (F) Navigation;
 - (G) Slow flight and stalls;
 - (H) Emergency operations;
 - (I) High-altitude operations; and
 - (J) Post flight procedures.
- (d) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course for the following category and class ratings includes flight training on the applicable areas of operation:
- (i) For an aeroplane multiengine course—
 - (A) Multiengine operations.
 - (ii) For a rotorcraft helicopter course—
 - (A) Hovering maneuvers;
 - (B) Transition to wing-borne flight;
 - (C) Transition to hover; and
 - (D) Special operations.
 - (iii) For a rotorcraft gyroplane course—

- (A) Flight at slow airspeeds.
- (iv) For a powered-lift course—
 - (A) Hovering maneuvers; and
 - (B) Special operations.
- (v) For a glider course—
 - (A) Launches/tows, as appropriate, and landings; and
 - (B) Soaring techniques.
- (vi) For a lighter-than-air airship course—
 - (A) Fundamentals of instructing;
 - (B) Technical subjects; and
 - (C) Preflight lessons on a maneuver to be performed in flight.
- (vii) For a lighter-than-air balloon course—
 - (A) Fundamentals of instructing;
 - (B) Technical subjects;
 - (C) Preflight lesson on a maneuver to be performed in flight; and
 - (D) Launches and landings.

5. Solo training. Each applicant for, and holder of, a Level 1 ATO certificate, shall ensure that each approved course includes at least the following solo flight training—

- (a) For an aeroplane single-engine course: 10 hours of solo flight training in a single-engine aeroplane on the areas of operation in paragraph (4)(c)(i) that include at least—
 - (i) One cross-country flight, if the training is being performed on a small island, with landings at a minimum of three points, and one of the segments consisting of a straight-line distance of at least 150 nautical miles;
 - (ii) One cross-country flight, if the training is being performed on other than a small island, with landings at a minimum of three points, and one segment of the flight consisting of a straight-line distance of at least 250 nautical miles; and
 - (iii) 5 hours in night VFR conditions with 10 takeoffs and 10 landings with each landing involving a flight with a traffic pattern at an airport with an operating control tower.

- (b) For an aeroplane multiengine course: 10 hours of flight training in a multiengine aeroplane performing the functions of pilot in command while under the supervision of a licensed flight instructor, consisting of the areas of operation in paragraph (4)(d)(i) that include at least—
 - (i) One cross-country flight, if the training is being performed on a small island, with landings at a minimum of three points, and one of the segments consisting of a straight-line distance of at least 150 nautical miles;
 - (ii) One cross-country flight, if the training is being performed on a small island, with landings at a minimum of three points and one segment of the flight consisting of straight-line distance of at least 250 nautical miles; and
 - (iii) 5 hours in night VFR conditions with 10 takeoffs and 10 landings with each landing involving a flight with a traffic pattern at an airport with an operating control tower.
- (c) For a rotorcraft helicopter course: 10 hours of solo flight training in a helicopter on the areas of operation in paragraph (4)(d)(ii) that include at least—
 - (i) One cross-country flight with landings at a minimum of three points and one segment of the flight consisting of a straight-line distance of at least 50 nautical miles from the original point of departure; and
 - (ii) 5 hours in night VFR conditions with 10 takeoffs and 10 landings with each landing involving a flight with a traffic pattern at an airport with an operating control tower.
- (d) For a rotorcraft-gyroplane course: 10 hours of solo flight training in a gyroplane on the areas of operation in paragraph (4)(d)(iii) that include at least—
 - (i) One cross-country flight with landings at a minimum of three points, and one segment of the flight consisting of a straight-line distance of at least 50 nautical miles from the original point of departure; and
 - (ii) 5 hours in night VFR conditions with 10 takeoffs and 10 landings with each landing involving a flight with a traffic pattern at an airport with an operating control tower.
- (e) For a powered-lift course: 10 hours of solo flight training in a powered-lift on the areas of operation in paragraph (4)(d)(iv) that include at least—
 - (i) One cross-country flight, if the training is being performed on a small island, with landings at a minimum of three points, and one segment of the flight consisting a straight-line distance of at least 150 nautical miles;

- (ii) One cross-country flight, if the training is being performed on a small island, with landings at a minimum of three points, and one segment of the flight consisting of a straight-line distance of at least 250 nautical miles; and
 - (iii) 5 hours in night VFR conditions with 10 takeoffs and 10 landings with each landing involving a flight with a traffic pattern at an airport with an operating control tower.
 - (f) For a glider course: 5 solo flights in a glider the areas of operation in paragraph (4)(d)(v).
 - (g) For a lighter-than-air airship course: 10 hours of flight training in an airship, while performing the functions of pilot in command under the supervision of a commercial pilot with an airship rating consisting of the areas of operation in paragraph (4)(d)(vi) that include at least—
 - (i) One cross-country flight with landings at a minimum of three points, and one segment of the flight consisting of a straight-line distance of at least 25 nautical miles from the original point of departure; and
 - (ii) 5 hours in night VFR conditions with 10 takeoffs and 10 landings with each landing involving a flight with a traffic pattern.
 - (h) For a lighter-than-air balloon course:
 - (i) Training on the applicable areas of operation in paragraph (4)(d)(vii), while performing the duties of pilot in command under the supervision of a commercial pilot with a balloon rating.
 - (ii) Two solo flights is for a hot air balloon rating.
 - (iii) At least two flights in a gas balloon for a gas balloon rating.
- 6. Stage checks and end-of-course tests.
 - (a) Each student, to graduate from a commercial pilot course, shall satisfactorily accomplish the stage checks and end-of-course tests consisting of the applicable areas of operation listed in paragraph (4)(d).
 - (b) Each student shall demonstrate satisfactory proficiency prior to being endorsed to operate an aircraft in solo flight.

PART D**(Item 43(2), (a), (iv))****Airline Transport Pilot Licensing Course**

1. Applicability. This part prescribes the minimum curriculum for a airline transport pilot licensing course under this Part, for the following ratings—

- (a) Aeroplane single-engine.
- (b) Aeroplane multiengine.
- (c) Rotorcraft helicopter.
- (d) Powered-lift.

2. Eligibility for enrolment. Prior to enrolling in the flight portion of the airline transport pilot licensing course, a person shall—

- (a) Meet the aeronautical experience requirements prescribed in Regulations No. 8 “Personnel Licensing” for an airline transport pilot license that is appropriate to the aircraft category and class rating for which the course applies;
- (b) Hold at least a commercial pilot license and an instrument rating;
- (c) Meet the military experience requirements under Regulations No. 8 “Personnel Licensing” to qualify for a commercial pilot license and an instrument rating, if the person is a rated military pilot or former rated military pilot of an Armed Force of the Republic of Iraq; or
- (d) Hold a foreign airline transport pilot license or foreign commercial pilot license and an instrument rating, issued by a contracting State to the Convention on International Civil Aviation.

3. Aeronautical knowledge areas.

- (a) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes at least 40 hours of ground training on the applicable aeronautical knowledge areas listed in paragraph (2).
- (b) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that ground training includes the following aeronautical knowledge areas—
 - (i) Applicable Republic of Iraq regulations that relate to airline transport pilot privileges, limitations, and flight operations;
 - (ii) Meteorology, including knowledge of and effects of fronts, frontal characteristics, cloud formations, icing, and upper-air data;

- (iii) General system of weather and NOTAM collection, dissemination, interpretation, and use;
- (iv) Interpretation and use of weather charts, maps, forecasts, sequence reports, abbreviations, symbols;
- (v) Republic of Iraq Weather Service functions as they pertain to operations in the Republic of Iraq Airspace System;
- (vi) Wind shear and microburst awareness, identification, and avoidance;
- (vii) Principles of air navigation under instrument meteorological conditions in the Republic of Iraq Airspace System;
- (viii) Air traffic control procedures and pilot responsibilities as they relate to en route operations, terminal area and radar operations, and instrument departure and approach procedures;
- (ix) Aircraft loading; weight and balance; use of charts, graphs, tables, formulas, and computations; and the effects on aircraft performance;
- (x) Aerodynamics relating to an aircraft's flight characteristics and performance in normal and abnormal flight regimes;
- (xi) Human factors;
- (xii) Aeronautical decision making and judgment; and
- (xiii) Crew resource management to include crew communication and co-ordination.

4. Flight training.

- (a) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes at least 25 hours of flight training on the applicable areas of operation listed in paragraph (3)(b), including at least 15 hours of instrument flight training; and
- (b) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes flight training on the following areas of operation, as applicable—
 - (i) Preflight preparation;
 - (ii) Preflight procedures;
 - (iii) Takeoff and departure phase;
 - (iv) In-flight maneuvers;
 - (v) Instrument procedures;

- (vi) Landings and approaches to landings;
 - (vii) Normal and abnormal procedures;
 - (viii) Emergency procedures; and
 - (ix) Post flight procedures.
5. Stage checks and end-of-course tests.
- (a) Each student, to graduate from an airline transport pilot course shall satisfactorily accomplish the stage checks and end-of-course tests, consisting of the areas of operation listed in paragraph (3)(b) that are appropriate to the aircraft category and class rating for which the course applies.

PART E**(Item 43(2), (a), (v))****Flight Instructor Licensing Course**

1. **Applicability.** This Part prescribes the minimum curriculum for a flight instructor licensing course and an additional flight instructor rating course required under this Part, for the following ratings—

- (a) Aeroplane single-engine.
- (b) Aeroplane multiengine.
- (c) Rotorcraft helicopter.
- (d) Rotorcraft gyroplane.
- (e) Powered-lift.
- (f) Glider category.

2. **Eligibility for enrolment.** A person shall hold the following prior to enrolling in the flight portion of the flight instructor or additional flight instructor rating course—

- (a) A commercial pilot license or an airline transport pilot license with an aircraft category and class rating appropriate to the flight instructor rating for which the course applies; and
- (b) An instrument rating or privilege in an aircraft that is appropriate to the aircraft category and class rating for which the course applies, if the course is for a flight instructor aeroplane or powered-lift instrument rating.

3. **Aeronautical knowledge training.**

- (a) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes at least the following ground training in the aeronautical knowledge areas listed in paragraph (4)—
 - (i) 40 hours of training if the course is for an initial issuance of a flight instructor certificate; or
 - (ii) 20 hours of training if the course is for an additional flight instructor rating.
- (b) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that ground training includes the following aeronautical knowledge areas—
 - (i) The fundamentals of instructing, including—
 - (A) The learning process;

- (B) Elements of effective teaching;
 - (C) Student evaluation and testing;
 - (D) Course development;
 - (E) Lesson planning; and
 - (F) Classroom training techniques.
- (ii) The aeronautical knowledge areas required for—
 - (A) A private and commercial pilot license that is appropriate to the category and class rating sought; and
 - (B) An instrument rating that is appropriate to the aircraft category and class rating for which the course applies, if the course is for an aeroplane or powered-lift aircraft rating.
 - (c) A Level 1 ATO may credit a student who satisfactorily completes 2 years of study on the principles of education at a college or university with no more than 20 hours of the training required in paragraph (3)(a).
4. Flight training.
- (a) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes at least the following flight training on the applicable areas of operation of paragraphs (4)(b) and (4)(c)—
 - (i) 25 hours for an aeroplane, rotorcraft, or powered-lift rating; and
 - (ii) 10 hours and 10 flights for a glider category rating.
 - (b) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes flight training on the following areas of operation, as applicable for each category and class—
 - (i) Fundamentals of instructing;
 - (ii) Technical subject areas;
 - (iii) Preflight preparation;
 - (iv) Preflight lesson on a maneuver to be performed in flight;
 - (v) Preflight procedures;
 - (vi) Airport and seaplane base operations;
 - (vii) Takeoffs, landings, and go-arounds;

- (viii) Fundamentals of flight;
 - (ix) Performance maneuvers;
 - (x) Ground reference maneuvers;
 - (xi) Slow flight, stalls, and spins;
 - (xii) Basic instrument maneuvers;
 - (xiii) Emergency operations; and
 - (xiv) Post flight procedures.
- (c) For the category and class of aircraft shown below, each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes flight training in the following areas of operation, as applicable:
- (i) For an aeroplane: multiengine course—
 - (A) Multiengine operations.
 - (ii) For a rotorcraft: helicopter course—
 - (A) Hovering maneuvers; and
 - (B) Special operations.
 - (iii) For a rotorcraft: gyroplane course—
 - (A) Flight at slow airspeeds.
 - (iv) For a powered-lift course—
 - (A) Hovering maneuvers;
 - (B) Transition to wing-borne flight;
 - (C) Transition to hover; and
 - (D) Special operations.
 - (v) For a glider course—
 - (A) Launches, landings, and go-arounds;
 - (B) Performance speeds; and
 - (C) Soaring techniques.
5. Stage checks and end-of-course tests.

- (a) Each student, to graduate from a flight instructor course shall satisfactorily accomplish the stage checks and end-of-course tests, consisting of the applicable areas of operation listed in paragraph (4) of this part.
- (b) A student enrolled in a flight instructor-aeroplane rating or flight instructor-glider rating course shall have—
 - (i) Received a logbook endorsement from a licensed flight instructor certifying the student received ground and flight training on stall awareness, spin entry, spins, and spin recovery procedures in an aircraft that is certified for spins and that is appropriate to the rating sought; and
 - (ii) Demonstrated instructional proficiency in stall awareness, spin entry, spins, and spin recovery procedures.

PART F**(Item 43(2), (a), (vi))****Flight Instructor Instrument Licensing Course**

1. Applicability. This part prescribes the minimum curriculum for a flight instructor instrument licensing course required under this Part, for the following ratings—

- (a) Flight Instructor Instrument: Aeroplane.
- (b) Flight Instructor Instrument: Helicopter.
- (c) Flight Instructor Instrument: Powered-lift aircraft.

2. Eligibility for enrolment. A pilot shall hold, prior to enrolling in the flight portion of the course—

- (a) A commercial pilot license or airline transport pilot license with a category and class rating appropriate to the rating sought; and
- (b) For commercial pilot license holders, an instrument rating that is appropriate to the rating sought.

3. Aeronautical knowledge training.

- (a) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes at least 15 hours of ground training on the applicable aeronautical knowledge areas listed in paragraph (3)(b).
- (b) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes ground training on the following aeronautical knowledge areas—

- (i) The fundamentals of instructing including—

- (A) Learning process;
- (B) Elements of effective teaching;
- (C) Student evaluation and testing;
- (D) Course development;
- (E) Lesson planning; and
- (F) Classroom training techniques.

- (ii) The aeronautical knowledge areas required for the instrument rating that is appropriate to the category and class of aircraft.

4. Flight training.

- (a) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes at least 15 hours of flight training in the applicable areas of operation of paragraph (2).
- (b) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course for the flight instructor-instrument rating includes flight training on the following areas of operation in paragraph (4)(b)—
 - (i) Fundamentals of instructing;
 - (ii) Technical subject areas;
 - (iii) Preflight preparation;
 - (iv) Preflight lesson on a maneuver to be performed in flight;
 - (v) Air traffic control clearances and procedures;
 - (vi) Flight by reference to instruments;
 - (vii) Navigation systems;
 - (viii) Instrument approach procedures;
 - (ix) Emergency operations; and
 - (x) Post flight procedures.

5. Stage checks and end-of-course tests.

- (a) Each student, to graduate from a flight instructor instrument course shall satisfactorily accomplish the stage checks and end-of-course tests, consisting of the applicable areas of operation listed in paragraph (4).

PART G**(Item 43(2), (a), (vii))****Ground Instructor Licensing Course**

1. Applicability. This Part prescribes the minimum curriculum for a ground instructor licensing course and an additional ground instructor rating course, issued under Regulations No. 8 “Personnel Licensing” for the following ratings—

- (a) Ground Instructor: Basic.
- (b) Ground Instructor: Advanced.
- (c) Ground Instructor: Instrument.

2. Aeronautical knowledge training.

- (a) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes at least the following ground training on the applicable knowledge areas listed in paragraphs (2), (3), (4), and (5)—
 - (i) 20 hours of training for an initial issuance of a ground instructor certificate; or
 - (ii) 10 hours of training for an additional ground instructor rating.
- (b) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that ground training includes the following aeronautical knowledge areas—
 - (i) Learning process;
 - (ii) Elements of effective teaching;
 - (iii) Student evaluation and testing;
 - (iv) Course development;
 - (v) Lesson planning; and
 - (vi) Classroom training techniques.
- (c) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that ground training for a basic ground instructor license includes the aeronautical knowledge areas applicable to a private pilot.
- (d) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that ground training for an advanced ground instructor rating includes the aeronautical knowledge areas applicable to a private, commercial, and airline transport pilot.
- (e) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that

ground training for an instrument ground instructor rating includes the aeronautical knowledge areas applicable to an instrument rating.

- (f) A Level 1 ATO may credit a student who satisfactorily completed 2 years of study on the principles of education at a college or university with 10 hours of the training required in paragraph (1)(a).

3. Stage checks and end-of-course tests.

- (a) Each student, to graduate from a ground instructor course shall satisfactorily accomplish the stage checks and end-of-course tests, consisting of the applicable knowledge areas of this part.

PART H**(Item 43(2), (a), (viii))****Additional Aircraft Category or Class Rating Course**

1. **Applicability.** This part prescribes the minimum curriculum for an additional aircraft category rating course or an additional aircraft class rating course required under this Part, for the following ratings:

- (a) Aeroplane single-engine.
- (b) Aeroplane multiengine.
- (c) Rotorcraft helicopter.
- (d) Rotorcraft gyroplane.
- (e) Powered-lift.
- (f) Glider.
- (g) Lighter-than-air airship.
- (h) Lighter-than-air balloon.

2. **Eligibility for enrolment.** A person shall hold the level of pilot license for the additional aircraft category and class rating for which the course applies prior to enrolling in the flight portion of an additional aircraft category or additional aircraft class rating course.

3. **Aeronautical knowledge training.** Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course for an additional category rating and additional class rating includes the total number of hours of training in all the aeronautical knowledge areas appropriate to the aircraft rating and pilot license level sought.

4. **Flight training.** Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course for an additional aircraft category rating or additional aircraft class rating includes the total number of hours of flight training on all of the areas of operation of this paragraph appropriate to the aircraft rating and pilot license level for which the course applies.

5. **Stage checks and end-of-course tests.**

- (a) Each student, to graduate from an additional aircraft category rating course or an additional aircraft class rating course shall satisfactorily accomplish the stage checks and end-of-course tests, consisting of the applicable areas of operation in this part.
- (b) Each student shall demonstrate satisfactory proficiency prior to being endorsed to operate an aircraft in solo flight.

PART I**(Item 43(2), (a), (ix))****Aircraft Type Rating Course**

1. Applicability. This part prescribes the minimum Level 1 ATO curriculum for an aircraft type rating course for:

- (a) A type rating in an aeroplane category: single-engine class.
- (b) A type rating in an aeroplane category: multiengine class.
- (c) A type rating in a rotorcraft category: helicopter class.
- (d) A type rating in a powered-lift category.
- (e) Other aircraft type ratings specified by the Authority through the aircraft type certificate procedures.

2. Eligibility for enrollment.

- (a) Prior to enrolling in the flight portion of an aircraft type rating course, a person shall hold at least a private pilot license and—
 - (i) An instrument rating in the category and class of aircraft that is appropriate to the aircraft type rating for which the course applies, provided the aircraft's type certificate does not have a VFR limitation; or
 - (ii) Be concurrently enrolled in an instrument rating course in an aircraft of the type rating sought, and pass the required instrument rating practical test concurrently with the type rating practical test.

3. Aeronautical knowledge training.

- (a) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes at least 10 hours of ground training on the applicable aeronautical knowledge areas listed in paragraph (2).
- (b) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that ground training includes the following aeronautical areas—
 - (i) Subjects requiring a practical knowledge of the aircraft type and its powerplant, systems, components, operational, and performance factors;
 - (ii) The aircraft's normal, abnormal, and emergency procedures, and the operations and limitations relating thereto;
 - (iii) Appropriate provisions of the approved aircraft's flight

manual;

- (iv) Location of and purpose of inspecting each item on the aircraft's checklist that relate to the exterior and interior preflight; and
- (v) Use of the aircraft's pre-start checklist, appropriate control system checks, starting procedures, radio and electronic equipment checks, and the selection of proper navigation and communication radio facilities and frequencies.

4. Flight training.

- (a) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each course includes at least—
 - (i) Flight training on the applicable areas of operation of paragraph (2) in the aircraft type for which the course applies; and
 - (ii) At least 5 hours shall be instrument training in the aircraft for which the course applies.
- (b) Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each type rating course includes the flight training on the following areas of operation—
 - (i) Preflight preparation;
 - (ii) Preflight procedures;
 - (iii) Takeoff and departure phase;
 - (iv) In-flight maneuvers;
 - (v) Instrument procedures;
 - (vi) Landings and approaches to landings;
 - (vii) Normal and abnormal procedures;
 - (viii) Emergency procedures; and
 - (ix) Post flight procedures.

5. Stage checks and end-of-course tests. Each student, to graduate from an aircraft type rating course shall satisfactorily accomplish the stage checks and end-of-course tests, consisting of the applicable areas of operation for the airline transport pilot license.

PART J**(Item 43(2), (b))****Special Preparation Courses**

1. **Applicability.** This part prescribes the minimum curriculum for the special preparation courses that are listed in item 9.
2. **Eligibility for enrolment.** Prior to enrolling in the flight portion of a special preparation course, a person shall hold a pilot license, flight instructor certificate, or ground instructor license that is appropriate for the exercise of the operating privileges or authorizations sought.
3. **General requirements.**
 - (a) To be approved, an applicant for a special preparation course shall present to the Authority a proposal that:
 - (i) Meets the appropriate requirements of this Part.
 - (ii) Prepares the graduate with the necessary skills, competency, and proficiency to exercise safely the privileges of the certificate, rating, or authorization for which the course is established.
 - (iii) Includes ground and flight training on the operating privileges or authorization sought.
4. **Stage check and end-of-course tests.**
 - (a) Each person, to graduate from a special preparation course shall satisfactorily accomplish the stage checks and end-of-course tests, consisting of the areas of operation that are appropriate to the operating privileges or authorization sought, and for which the course applies.
5. **Agricultural aircraft operations course.**
 - (a) A special preparation course for pilots in agricultural aircraft operations shall include at least the following—
 - (i) 25 hours of training on—
 - (A) Agricultural aircraft operations;
 - (B) Safe piloting operating practices and procedures for handling, dispensing, and disposing agricultural and industrial chemicals, including operating in and around congested areas; and
 - (C) Applicable provisions of Regulations No. 8 “Personnel Licensing”¹.

- (ii) 15 hours of flight training on agricultural aircraft operations.
- 6. Rotorcraft external-load operations course.
 - (a) A special preparation course for pilots of external-load operations shall include at least the following:
 - (i) 10 hours of training on—
 - (A) Rotorcraft external-load operations;
 - (B) Safe piloting operating practices and procedures for external-load operations, including operating in and around congested areas; and
 - (C) Applicable provisions of Regulations No. 8 “Personnel Licensing”¹.
 - (ii) 15 hours of flight training on external-load operations.
- 7. Test pilot course.
 - (a) Each applicant for, and holder of, a special preparation course for test pilot duties shall include at least the following:
 - (i) Aeronautical knowledge training on—
 - (A) Performing aircraft maintenance, quality assurance, and certification test flight operations; and
 - (B) Applicable parts of these regulations that pertain to aircraft maintenance, quality assurance, and certification tests.
 - (ii) 15 hours of flight training.
- 8. Special operations course.
 - (a) A special preparation course for pilots in special operations that are mission-specific for certain aircraft shall include at least the following:
 - (i) Aeronautical knowledge training on—
 - (A) Performing that special flight operation;
 - (B) Safe piloting operating practices and procedures for performing that special flight operation;
 - (C) Applicable parts of these regulations that pertain to that special flight operation; and
 - (D) Pilot in command duties and responsibilities for

performing that special flight operation.

- (ii) Flight training on that special flight operation.

9. Pilot refresher course.

- (a) Each applicant for, and holder of, a special preparation pilot refresher course for a pilot license, aircraft category and class rating, or an instrument rating shall include at least the following:
 - (i) 4 hours of aeronautical knowledge training on—
 - (A) The aeronautical knowledge areas that are applicable to the level of pilot license, category rating, class rating, or instrument rating sought;
 - (B) Safe piloting operating practices and procedures; and
 - (C) Applicable provisions of Parts 1 and 3.
 - (ii) 6 hours of flight training on the areas of operation that are applicable to the level of pilot license, aircraft category and class rating, or instrument rating, as appropriate, for performing pilot-in-command duties and responsibilities.

10. Flight instructor refresher course.

- (a) Each applicant for, and holder of, a special preparation flight instructor refresher course shall include at least a combined total of 16 hours of aeronautical knowledge training, flight training, or any combination of ground and flight training on the following:
 - (i) Aeronautical knowledge training on—
 - (A) The aeronautical knowledge areas that apply to student, private, and commercial pilot licenses and instrument ratings;
 - (B) The aeronautical knowledge areas that apply to flight instructor certificates;
 - (C) Safe piloting operating practices and procedures, including airport operations and operating in the Republic of Iraq Airspace System; and
 - (D) Applicable provisions of Parts 1 and 3.
 - (ii) Flight training, to review—
 - (A) The areas of operations applicable to student, private, and commercial pilot licenses and instrument ratings; and
 - (B) The skills, competency, and proficiency for performing

flight instructor duties and responsibilities.

11. Ground instructor refresher course.

- (a) A special preparation ground instructor refresher course shall include at least 16 hours of aeronautical knowledge training on—
 - (i) The aeronautical knowledge areas that apply to student, private, and commercial pilots and instrument rated pilots and ground instructors;
 - (ii) Safe piloting operating practices and procedures, including airport operations and operating in the Republic of Iraq Airspace System; and
 - (iii) Applicable provisions of Parts 1 and 3.

PART K

(Item 43(2), (c))

Pilot Ground School Course

1. **Applicability.** This part prescribes the minimum curriculum for a pilot ground school course.
2. **General requirements.** Each applicant for, and holder of, an approved training course for a pilot ground school shall include training on the aeronautical knowledge areas that are—
 - (a) Needed to safely exercise the privileges of the certificate, rating, or authority for which the course is established; and
 - (b) Conducted to develop competency, proficiency, resourcefulness, self-confidence, and self-reliance in each student.
3. **Aeronautical knowledge training requirements.** Each applicant for, and holder of, an approved pilot ground school course shall include—
 - (a) The aeronautical knowledge training that is appropriate to the aircraft rating and pilot license level for which the course applies; and
 - (b) An adequate number of total aeronautical knowledge training hours appropriate to the aircraft rating and pilot license level for which the course applies.
4. **Stage checks and end-of-course tests.** Each person, to graduate from a pilot ground school course shall satisfactorily accomplish the stage checks and end-of-course tests, consisting of the areas of operation that are appropriate to the operating privileges or authorization that graduation from the course will permit.

SCHEDULE 3**PART A****(Item 53)****Airport Requirements**

Each applicant for, and holder of, a Level 1 ATO certificate shall show that the airport at which training flights originate has the following.

1. At least one runway or takeoff area that allows training aircraft to make a normal takeoff and landing at the aircraft's maximum certified takeoff gross weight under the following conditions —

- (a) Wind not more than 5 knots;
- (b) Temperatures equal to the mean high temperature for the hottest month of the year in the operating area;
- (c) If applicable, with the power plant operation, and landing gear and flap operation recommended by the manufacturer; and
- (d) In the case of a takeoff—
 - (i) With smooth transition from liftoff to the best rate of climb speed without exceptional piloting skills or techniques; and
 - (ii) Clearing all obstacles in the takeoff flight path by at least 50 feet.

2. A wind direction indicator that is visible from the end of each runway at ground level.

3. A traffic direction indicator when—

- (a) The airport does not have an operating control tower; and
- (b) Traffic and wind advisories are not available.

4. Except as provided in paragraph (1)(e), permanent runway lights if that airport is to be used for night training flights.

5. Adequate non-permanent lighting or shoreline lighting for an airport or seaplane base for night training flights in seaplanes, if approved by the Authority.

PART B**(Item 71)****Level 2 ATO Instructor Training and Testing Requirements**

1. Prior to initial designation, each flight and simulator flight instructor shall complete the following requirements—

- (a) Complete at least 8 hours of ground training on the following subject matter:
 - (i) Instruction methods and techniques.
 - (ii) Training policies and procedures.
 - (iii) The fundamental principles of the learning process.
 - (iv) Instructor duties, privileges, responsibilities, and limitations.
 - (v) Proper operation of simulation controls and systems.
 - (vi) Proper operation of environmental control and warning or caution panels.
 - (vii) Limitations of simulation.
 - (viii) Minimum equipment requirements for each curriculum.
 - (ix) Revisions to the training courses.
 - (x) Cockpit resource management and crew co-ordination.
- (b) Satisfactorily complete a knowledge test—
 - (i) On the subjects specified in paragraph (1)(a); and
 - (ii) That is accepted by the Authority as being of equivalent difficulty, complexity, and scope as the tests provided by the Authority for the flight instructor aeroplane and instrument flight instructor knowledge tests.

2. Each certificate holder shall ensure that each instructor who instructs in a flight simulator that the Authority has approved for all training and all testing for the airline transport pilot licensing test, aircraft type rating test, or both, has met at least one of the following requirements:

- (a) Each instructor shall have performed 2 hours in flight, including three takeoffs and three landings as the sole manipulator of the controls of an aircraft of the same category and class, and, if a type rating is required, of the same type replicated by the approved flight simulator in which that instructor is designated to instruct;

- (b) Each instructor shall have participated in an approved line-observation program as specified in Regulations No. 8 “Personnel Licensing”, and that—
 - (i) Was accomplished in the same aeroplane type as the aeroplane represented by the flight simulator in which that instructor is designated to instruct; and
 - (ii) Included line-oriented flight training of at least 1 hour of flight during which the instructor was the sole manipulator of the controls in a flight simulator that replicated the same type aircraft for which that instructor is designated to instruct.

PART C**(Item 77)****Level 1 ATO Chief Instructor Qualifications**

1. Each ATO shall designate a supervisory instructor for a flight training course who shall meet one or more of the following requirements, as applicable:

- (a) Hold a commercial pilot license or an airline transport pilot license, and, except for a chief instructor for a training course solely for a lighter-than-air rating, a current flight instructor license with appropriate aircraft category, class, and instrument ratings for the category and class of aircraft used in the course.
- (b) Meet the pilot in command recent flight experience requirements of Regulations No. 8 "Personnel Licensing" as applicable.
- (c) Pass a knowledge test on —
 - (i) Teaching methods;
 - (ii) Applicable provisions of Authority provided aeronautical information publications;
 - (iii) Applicable provisions of the relevant regulations; and
 - (iv) The objectives and approved course completion standards of the course for which the person seeks to obtain designation.
- (d) Pass a proficiency test on instructional skills and ability to train students on the flight procedures and maneuvers appropriate to the course.

2. Except for a training course for gliders, balloons, or airships, the chief instructor shall meet the applicable requirements in paragraphs (3), (4), and (5).

3. For a training course for a private pilot license or rating, a chief instructor shall have—

- (a) At least 1,000 hours as pilot in command; and
- (b) Primary flight training experience as a licensed flight instructor or an instructor in a military pilot flight training program, or a combination thereof, consisting of at least 2 years and a total of 500 flight hours.

4. For a training course for an instrument rating or a rating with instrument privileges, a chief instructor shall have—

- (a) At least 100 hours of flight time under actual or simulated instrument conditions;
- (b) At least 1,000 hours as pilot in command; and

- (c) Instrument flight instructor experience as a licensed flight instructor-instrument or an instructor in a military pilot flight training program, or a combination thereof, consisting of at least—
 - (i) 2 years and a total of 250 flight hours; or
 - (ii) 400 flight hours of instrument flight instruction.

5. For a training course for other than a private pilot license or rating, or an instrument rating or a rating with instrument privileges, a chief instructor shall have—

- (a) At least 2,000 hours as pilot in command; and
- (b) Flight training experience as a licensed flight instructor or an instructor in a military pilot flight training program, or a combination thereof, consisting of at least 3 years and a total of 1,000 flight hours.

6. A chief instructor for a training course for gliders or balloons is required to have only 40 percent of the hours required in paragraphs (3) and (4).

7. A chief instructor for a training course for airships is required to have only 40 percent of the hours required in paragraphs (3), (4), and (5).

8. To be eligible as chief instructor for a ground school course, a person shall have one year of experience as a ground school instructor at a certified Level 1 ATO.

PART D**(Item 79)****Level 1 ATO Assistant Chief Instructor Qualifications**

1. To be eligible for designation as an assistant chief instructor, a person shall meet the following requirements.

- (a) Hold a commercial pilot or an airline transport pilot license and, except for the assistant chief instructor for a training course for a lighter-than-air rating, a current flight instructor license with appropriate aircraft category, class, and instrument ratings for the category and class of aircraft used in the course.
- (b) Meet the pilot in command recent flight experience requirements of Regulations No. 8 "Personnel Licensing" as applicable.
- (c) Pass a knowledge test on—
 - (i) Teaching methods;
 - (ii) Applicable provisions of the Republic of Iraq-provided aeronautical information publications;
 - (iii) Applicable provisions of relevant regulations; and
 - (iv) The objectives and approved course completion standards of the course for which the person seeks to obtain designation.
- (d) Pass a proficiency test on the flight procedures and maneuvers appropriate to that course.
- (e) Meet the applicable requirements in paragraphs (2), (3), and (4), except that an assistant chief instructor for a training course for gliders, balloons, or airships is required to have only 40 percent of the hours required in paragraphs (2) and (3).

2. For a training course for a private pilot license or rating, an assistant chief instructor shall have—

- (a) At least 500 hours as pilot in command; and
- (b) Flight training experience as a licensed flight instructor or an instructor in a military pilot flight training program, or a combination thereof, consisting of at least 1 year and a total of 250 flight hours.

3. For a training course for an instrument rating or a rating with instrument privileges, an assistant chief flight instructor shall have—

- (a) At least 50 hours of flight time under actual or simulated instrument conditions;
- (b) At least 500 hours as pilot in command; and

- (c) Instrument flight instructor experience as a licensed flight instructor-instrument or an instructor in a military pilot flight training program, or a combination thereof, consisting of at least 1 year and a total of 125 flight hours.
4. For a training course other than for a private pilot license or rating, or an instrument rating or a rating with instrument privileges, an assistant chief instructor shall have—
- (a) At least 1,000 hours as pilot in command; and
 - (b) Flight training experience as a licensed flight instructor or an instructor in a military pilot flight training program, or a combination thereof, consisting of at least 1 1/2 years and a total of 500 flight hours.
5. To be eligible for designation as an assistant chief instructor for a ground school course, a person shall have 6 months of experience as a ground school instructor at a certified Level 1 ATO.

PART E**(Item 81)****Level 1 ATO Check Instructor Qualifications**

1. To be designated as a check instructor for conducting student stage checks, end-of-course tests, and instructor proficiency checks under this Part, a person shall meet the following requirements, as applicable.

- (a) Pass a test, given by the chief instructor, on—
 - (i) Teaching methods;
 - (ii) Applicable provisions of the Republic of Iraq-provided aeronautical information publications;
 - (iii) Applicable provisions of relevant regulations; and
 - (iv) The objectives and course completion standards of the approved training course for the designation sought.
- (b) For flight checks and tests—
 - (i) Meet the requirements in paragraph (1)(a);
 - (ii) Hold a commercial pilot license or an airline transport pilot license and, except for a check instructor for a training course for a lighter-than-air rating, a current flight instructor license, with appropriate aircraft category, class, and instrument ratings for the category and class of aircraft used in the course;
 - (iii) Meet the pilot in command recent flight experience requirements of Regulations No. 8 “Personnel Licensing”, as applicable; and
 - (iv) Pass a proficiency test, given by the chief instructor or assistant chief instructor, on the flight procedures and maneuvers of the approved training course.
- (c) For checks and tests that relate to ground training—
 - (i) Meet the requirements in paragraph (1)(a);
 - (ii) Except for a training course for a lighter-than-air rating, hold a current flight instructor license or ground instructor license with ratings appropriate to the category and class of aircraft used in the course; and
 - (iii) For a training course for a lighter-than-air rating, hold a commercial pilot license with a lighter-than-air category rating and the appropriate class rating.

2. Before functioning as a check instructor, a person who meets the eligibility requirements in paragraph (1) shall—

- (a) Be designated in writing by the chief instructor to conduct student stage checks, end-of-course tests, and instructor proficiency checks; and
- (b) Be approved by the Authority.

3. A check instructor may not conduct a stage check or an end-of-course test of any student for whom the check instructor has—

- (a) Served as the principal instructor; or
- (b) Recommended for a stage check or end-of-course test.

PART F

(Item 91)

Transfer Privileges

1. A Level 1 ATO receiving a student from another Level 1 ATO may credit that pilot's previous experience towards the curriculum requirements of a course subject to the following conditions:

- (a) If the credit is based upon Regulations No. 8 "Personnel Licensing" the gaining ATO may credit that student not more than 50 percent of the curriculum requirements;
- (b) If the credit is not based upon Regulations No. 8 "Personnel Licensing", the gaining ATO may credit that student not more than 25 percent of the curriculum requirements;

Note: The receiving ATO shall determine the amount of course credit to be credited under paragraph (a) or paragraph (b), based on a proficiency test or knowledge test, or both, of the student; and

2. The receiving ATO may grant credit for training specified in paragraph (1)(a) or paragraph (1)(b) only if the previous provider of the training has certified the kind and amount of training provided, and the result of each stage check and end-of-course test, if applicable, given to the student.

3. An AMEL training course holder may evaluate and grant credit for an entrant's previous training provided—

- (a) The AMEL training course holder determines that the training is verifiable and comparable to portions of the training program.
- (b) The individual requesting credit passes an examination given by the AMEL training course holder, which is equivalent to those examinations given by the AMEL training course holder for the same subject in the training program.

PART G**(Item 97)****Training Course: Contents**

1. Each applicant for, and holder of, a Level 1 ATO certificate shall ensure that each training course contains—
 - (a) A description of each flight simulator or flight training device used for training;
 - (b) A listing of the airports at which training flights originate and a description of the facilities, including pilot briefing areas that are available for use by the school's students and personnel at each of those airports;
 - (c) A description of the type of aircraft including any special equipment used for each phase of training.
 - (d) The minimum qualifications and ratings for each instructor assigned to ground or flight training; and
 - (e) A training syllabus that includes—
 - (i) The prerequisites for enrolling in the ground and flight portion of the course that include the pilot license and rating (if required by this Part), training, pilot experience, and pilot knowledge;
 - (ii) A detailed description of each lesson, including the lesson's objectives, standards, and planned time for completion;
 - (iii) Course learning objectives;
 - (iv) Stage learning objectives and standards; and
 - (v) A description of the checks and tests to be used to measure learning after each stage of training.
2. A Level 1 ATO may—
 - (a) Include training in a flight simulator or flight training device, provided it is representative of the aircraft for which the course is approved, meets the requirements of this paragraph, and the training is given by an authorised instructor; and
 - (b) Permit a student to credit training in a flight simulator that meets the requirements of item 55 for a maximum of 25 percent of the total flight training hour requirements of the approved course.

SCHEDULE 4

PART A

(Item 103)

Flight Engineer Course

1. Each flight engineer training course holder shall comply with the following—
 - (a) Training course outline:
 - (i) Format. An applicant shall prepare separate course outlines for each type of aeroplane.
 - (ii) Ground course outline.
 - (iii) The Authority will accept any arrangement of subjects if all the subject material listed here is included and at least the minimum programmed hours are assigned to each subject.
 - (iv) If any flight engineer training course holder desires to include additional subjects in the ground course curriculum, the hours allotted these additional subjects may not be included in the minimum programmed classroom hours.
 - (v) All subjects, except *Theory of Flight and Aerodynamics* and *Regulations*, shall apply to the same type of aeroplane in which the flight engineer training course holder presents training.

Subject Area		Classroom Hours
Civil Aviation Regulations		10
Theory of Flight and Aerodynamics		10
Aeroplane Familiarization, to include, as applicable:	Specifications Construction features Flight controls Hydraulic systems Pneumatic systems Electrical systems Anti-icing and de-icing systems Pressurization and air-conditioning systems Vacuum systems Pilot static systems Instrument systems Fuel and oil systems Emergency equipment	90
Engine Familiarization, to include, as applicable:	Specifications Construction features Lubrication	45

	Ignition Fuel systems Accessories Propellers Instrumentation Emergency equipment	
Normal Operations (Ground and Flight), to include, as appropriate	Servicing methods and procedures Operation of all the aeroplane systems Operation of all the engine systems Loading and centre of gravity computations Cruise control (normal, long range, maximum endurance) Power and fuel computation Meteorology as applicable to engine operation	50
Emergency Operations, to include	Landing gear, brakes, flaps, speed brakes, and leading edge devices Pressurization and air-conditioning Portable fire extinguishers Fuselage fire and smoke control Loss of electrical power Engine fire control Engine shut-down and restart Oxygen Corrosion and self-locking nuts Hijacking emergency procedure Hand signals	110
Total (exclusive of final tests)		315

(b) Flight Course Outline.

- (i) The flight training curriculum shall include at least 10 hours of flight instruction in an aeroplane. A student may not credit the flight time required for the practical test as part of the required flight instruction.
- (ii) The flight engineer training course holder shall present all of the flight training in the same type aircraft.
- (iii) As appropriate to the aircraft type, the flight engineer training course holder shall teach the following subjects in the flight training course:

Subject Area	
Normal Duties, Procedures And Operations	To include as appropriate— Aeroplane preflight. Engine starting, power checks, pre-takeoff, post landing and shut-down procedures. Power control. Temperature control. Engine operation analysis.

	Operation of all systems. Fuel management. Logbook entries. Pressurization and air conditioning.
Recognition And Correction Of In-Flight Malfunctions	Analysis of abnormal engine operation. Analysis of abnormal operation of all systems. Corrective action.
Emergency Operations In Flight	Engine fire control. Fuselage fire control. Smoke control. Loss of power or pressure in each system. Engine over speed. Fuel dumping. Landing gear, spoilers, speed brakes, and flap extension and retraction. Engine shut-down and restart. Use of oxygen.

- (iv) The Authority may allow the school to teach the flight training time in a flight simulator.
- (v) To obtain credit for flight training time in an flight simulator, the student shall occupy the flight engineer station and operate the controls.

2. Revisions. Each flight engineer training course holder shall request revisions of the course outlines, facilities or equipment by following the procedures for original approval of the course.

3. Ground school credits.

- (a) A flight engineer training course holder may grant credit to a student in the ground school course for comparable previous training or experience that the student can show by written evidence—
- (b) A flight engineer training course holder shall meet the quality of instruction described in this Part.
- (c) Before granting credit for previous training or experience, the flight engineer training course holder shall ensure that the student passes a test given by the flight engineer training course holder on the subject for which the credit is to be given.
- (d) The flight engineer training course holder shall incorporate results of the test, the basis for credit allowance, and the hours credited as part of the student's records.

4. Records and reports.

- (a) The flight engineer training course holder shall maintain, for at least two years after a student graduates, fails, or drops from a course, a record of the student's training, including a chronological log of the subject course,

attendance examinations, and grades.

- (b) Except as provided in paragraph (c), the flight engineer training course holder shall submit to the Authority, not later than January 31 of each year, a report for the previous calendar year's training, to include—
 - (i) Name, enrolment and graduation date of each student;
 - (ii) Ground school hours and grades of each student;
 - (iii) Flight and flight simulator hours, and grades of each student; and
 - (iv) Names of students failed or dropped, together with their school grades and reasons for dropping.
- (c) Upon request, the Authority may waive the reporting requirements of subparagraph (b) of this paragraph for an approved flight engineer course that is part of an approved training course under Part 3.

5. Quality of instruction.

- (a) The Authority shall revoke approval of a flight engineer training course holder's ground course whenever less than 80 percent of the students pass the Authority knowledge test on the first attempt.
- (b) The Authority shall revoke approval of a flight engineer training course holder's flight course whenever less than 80 percent of the student's pass the Authority practical test on the first attempt.
- (c) Notwithstanding paragraphs (a) and (b), the Authority may allow continued approval of a ground or flight course when the Authority finds—
 - (i) That the failure rate was based on less than a representative number of students; or
 - (ii) That the flight engineer training course holder has taken satisfactory means to improve the effectiveness of the training.

6. Time limitation. Each student shall apply for the written test and the flight test within 90 days after completing the ground school course.

7. Statement of course completion.

- (a) Each flight engineer training course holder shall give to each student who successfully completes an approved flight engineer ground school training course, and passes the Authority knowledge test, a statement of successful completion of the course that indicates the date of training, the type of aeroplane on which the ground course training was based, and the number of hours received in the ground school course.
- (b) Each flight engineer training course holder shall give each student who

successfully completes an approved flight engineer flight course, and passed the Authority practical test, a statement of successful completion of the flight course that indicates the dates of the training, the type of aeroplane used in the flight course, and the number of hours received in the flight course.

- (c) A flight engineer training course holder who is approved to conduct both the ground course and the flight course may include both courses in a single statement of course completion if the provisions of paragraphs (a) and (b) of this subsection are included.
- (d) The requirements of this paragraph do not apply to an AOC holder with an approved training course under Part 3, providing the student receives a flight engineer license upon completion of that course.

8. Duration. Except for a course operated as part of an approved training course under of Part 3, the approval to operate a flight engineer ground course or flight course terminates 24 months after the last day of the month of issue.

PART B**(Items 111 & 113)****AMEL Airframe and/or Power plant Rating****Curriculum Requirements**

This part defines terms used in Section A, B, and C of this part, and describes the levels of proficiency at which items under each subject in each curriculum must be taught, as outlined in Sections A, B, and C.

1. Definitions. As used in Sections A, B, and C:
 - (a) "Inspect" means to examine by sight and touch.
 - (b) "Check" means to verify proper operation.
 - (c) "Troubleshoot" means to analyse and identify malfunctions.
 - (d) "Service" means to perform functions that assure continued operation.
 - (e) "Repair" means to correct a defective condition. Repair of an airframe or powerplant system includes component replacement and adjustment, but not component repair.
 - (f) "Overhaul" means to disassemble, inspect, repair as necessary, and check.
2. Teaching levels.
 - (a) Level 1 requires:
 - (i) Knowledge of general principles, but no practical application.
 - (ii) No development of manipulative skill.
 - (iii) Instruction by lecture, demonstration, and discussion.
 - (b) Level 2 requires:
 - (i) Knowledge of general principles, and limited practical application.
 - (ii) Development of sufficient manipulative skill to perform basic operations.
 - (iii) Instruction by lecture, demonstration, discussion, and limited practical application.

- (c) Level 3 requires:
- (i) Knowledge of general principles, and performance of a high degree of practical application.
 - (ii) Development of sufficient manipulative skills to simulate return to service.
 - (iii) Instruction by lecture, demonstration, discussion, and a high degree of practical application.
3. Teaching materials and equipment.
- (a) The curriculum may be presented utilising currently accepted educational materials and equipment, including, but not limited to: calculators, computers, and audio-visual equipment.

Section A – General Curriculum Subjects

This section list the subjects required for at least 400 hours of general curriculum subjects. The number in parentheses before each item listed under each subject heading indicates the level of proficiency at which that item shall be taught.

Teaching
Level

A. BASIC ELECTRICITY

- (2) 1. Calculate and measure capacitance and inductance.
- (2) 2. Calculate and measure electrical power.
- (3) 3. Measure voltage, current, resistance, and continuity.
- (3) 4. Determine the relationship of voltage, current, and resistance in electrical circuits.
- (3) 5. Read and interpret aircraft electrical circuit diagrams, including solid state devices and logic functions.
- (3) 6. Inspect and service batteries.

B. AIRCRAFT DRAWINGS

- (2) 7. Use aircraft drawings, symbols, and system schematics.
- (3) 8. Draw sketches of repairs and alterations.
- (3) 9. Use blueprint information.
- (3) 10. Use graphs and charts.

C. WEIGHT AND BALANCE

- (2) 11. Weigh aircraft.
- (3) 12. Perform complete weight and balance check and record data.

D. FLUID LINES AND FITTINGS

- (3) 13. Fabricate and install rigid and flexible fluid lines and fittings.

E. MATERIALS AND PROCESSES

- (1) 14. Identify and select appropriate nondestructive testing methods.
- (2) 15. Perform dye penetrate, eddy current, ultrasonic, and magnetic particle inspections.
- (1) 16. Perform basic heat treating processes.
- (3) 17. Identify and select aircraft hardware and materials.

- (3) 18. Inspect and check welds.
- (3) 19. Perform precision measurements.

F. GROUND OPERATION AND SERVICING

- (2) 20. Start, ground operate, move, service, and secure aircraft and identify typical ground operation hazards.
- (2) 21. Identify and select fuels.

G. CLEANING AND CORROSION CONTROL

- (3) 22. Identify and select cleaning materials.
- (3) 23. Inspect, identify, remove, and treat aircraft corrosion and perform aircraft cleaning.

Teaching
level

H. MATHEMATICS

- (3) 24. Extract roots and raise numbers to a given power.
- (3) 25. Determine areas and volumes of various geometric shapes.
- (3) 26. Solve ratio, proportion, and percentage problems.
- (3) 27. Perform algebraic operations involving addition, subtraction, multiplication, and division of positive and negative numbers.

I. MAINTENANCE FORMS AND RECORDS

- (3) 28. Write descriptions of work performed including aircraft discrepancies and corrective actions using typical aircraft maintenance records.
- (3) 29. Complete required maintenance forms, records, and inspection reports.

J. BASIC PHYSICS

- (2) 30. Use and understand the principles of simple machines; sound, fluid, and heat dynamics; basic aerodynamics; aircraft structures; and theory of flight.

K. MAINTENANCE PUBLICATIONS

- (3) 31. Demonstrate ability to read, comprehend, and apply information contained in CAA and manufacturers' aircraft maintenance specifications, data sheets, manuals, publications, and related Civil Aviation Regulations, Airworthiness Directives, and Advisory Material.
- (3) 32. Read technical data.

L. ENGINEER PRIVILEGES AND LIMITATIONS

- (3) 33. Exercise Engineer privileges within the limitations prescribed by Part 1 of the ICARs.

Section B - Airframe Curriculum Subjects

This section list the subjects required in at least 750 hours of each airframe curriculum, in addition to at least 400 hours in general curriculum subjects. The number in parentheses before each item listed under each subject heading indicates the level of proficiency at which that item must be taught.

I. AIRFRAME STRUCTURES

Teaching
level

A. WOOD STRUCTURES

- (1) 1. Service and repair wood structures.
- (1) 2. Identify wood defects.
- (1) 3. Inspect wood structures.

B. AIRCRAFT COVERING

- (1) 4. Select and apply fabric and fiberglass covering materials.
- (1) 5. Inspect, test, and repair fabric and fiberglass.

C. AIRCRAFT FINISHES

- (1) 6. Apply trim, letters, and touchup paint.
- (2) 7. Identify and select aircraft finishing materials.
- (2) 8. Apply finishing materials.
- (2) 9. Inspect finishes and identify defects.

Teaching
level

D. SHEET METAL AND NONMETALLIC STRUCTURES

- (2) 10. Select, install, and remove special fasteners for metallic, bonded, and composite structures.
- (2) 11. Inspect bonded structures.
- (2) 12. Inspect, test and repair fiberglass, plastics, honeycomb, composite, and laminated primary and secondary structures.
- (2) 13. Inspect, check, service, and repair windows, doors, and interior furnishings.
- (3) 14. Inspect and repair sheet metal structures.
- (3) 15. Install conventional rivets.
- (3) 16. Form, layout, and bend sheet metal.

E. WELDING

- (1) 17. Weld magnesium and titanium.
- (1) 18. Solder stainless steel.
- (1) 19. Fabricate tubular structures.
- (2) 20. Solder, braze, gas weld, and arc weld steel.
- (1) 21. Weld aluminum and stainless steel.

F. ASSEMBLY AND RIGGING

- (1) 22. Rig rotary wing aircraft.
- (2) 23. Rig fixed wing aircraft.
- (2) 24. Check alignment of structures.
- (3) 25. Assemble aircraft components, including flight control surfaces.
- (3) 26. Balance, rig, and inspect moveable primary and secondary flight control surfaces.
- (3) 27. Jack aircraft.

G. AIRFRAME INSPECTION

- (3) 28. Perform airframe conformity and airworthiness inspections.

II. AIRFRAME SYSTEMS AND COMPONENTS

A. AIRCRAFT LANDING GEAR SYSTEMS

- (3) 29. Inspect, check, service, and repair landing gear, retraction systems, shock struts, brakes, wheels, tires, and steering systems.

B. HYDRAULIC AND PNEUMATIC POWER SYSTEMS

- (2) 30. Repair hydraulic and pneumatic power systems components.
- (3) 31. Identify and select hydraulic fluids.
- (3) 32. Inspect, check, service, troubleshoot, and repair hydraulic and pneumatic power systems.

C. CABIN ATMOSPHERE CONTROL SYSTEMS

- (1) 33. Inspect, check, troubleshoot, service, and repair heating, cooling, air conditioning, pressurization systems, and air cycle machines.
- (1) 34. Inspect, check, troubleshoot, service, and repair heating, cooling, air conditioning, and pressurization systems.
- (2) 35. Inspect, check, troubleshoot, service and repair oxygen systems.

D. AIRCRAFT INSTRUMENT SYSTEMS

- (1) 36. Inspect, check, service, troubleshoot, and repair electronic flight instrument systems and both Engineeral and electrical heading, speed, altitude, temperature, pressure, and position indicating systems to include the use of built-in test equipment.
- (2) 37. Install instruments and perform a static pressure system leak test.

E. COMMUNICATION AND NAVIGATION SYSTEMS

- (1) 38. Inspect, check, and troubleshoot autopilot, servos, and approach coupling systems.
- (1) 39. Inspect, check, and service aircraft electronic communication and navigation systems, including VHF passenger address interphones and static discharge devices, aircraft VOR, ILS, LORAN, Radar beacon transponders, flight management computers, and GPWS.
- (2) 40. Inspect and repair antenna and electronic equipment installations.

F. AIRCRAFT FUEL SYSTEMS

- (1) 41. Check and service fuel dump systems.
- (1) 42. Perform fuel management transfer, and Defuelling.
- (1) 43. Inspect, check, and repair pressure-fuelling systems.
- (2) 44. Repair aircraft fuel system components.
- (2) 45. Inspect and repair fluid quantity indicating systems.
- (2) 46. Troubleshoot, service, and repair fluid pressure and temperature warning systems.
- (3) 47. Inspect, check, service, troubleshoot, and repair aircraft fuel systems.

G. AIRCRAFT ELECTRICAL SYSTEMS

- (2) 48. Repair and inspect aircraft electrical system components; crimp and splice wiring to manufacturers' specifications, and repair pins and sockets of aircraft connectors.
- (3) 49. Install, check, and service airframe electrical wiring, controls, switches, indicators, and protective devices.
- (3) 50.a. Inspect, check, troubleshoot, service, and repair alternating and direct current electrical systems.
- (1) 50.b. Inspect, check, and troubleshoot constant speed and integrated speed drive generators.

H. POSITION AND WARNING SYSTEMS

- (2) 51. Inspect, check, and service speed and configuration warning systems, electrical brake controls, and antiskid systems.
- (3) 52. Inspect, check, troubleshoot and service landing gear position indicating and warning systems.

I. ICE AND RAIN CONTROL SYSTEMS

- (2) 53. Inspect, check, troubleshoot, service, and repair airframe ice and rain control systems.

J. FIRE PROTECTION SYSTEMS

- (1) 54. Inspect, check, and service smoke and carbon monoxide detection systems.
 (3) 55. Inspect, check, service, troubleshoot, and repair aircraft fire detection and extinguishing systems.

Section C - Powerplant Curriculum Subjects

This section list the subjects required in at least 750 hours of each powerplant curriculum, in addition to at least 400 hours in general curriculum subjects.

The number in parentheses before each item listed under each subject heading indicates the level of proficiency at which that item must be taught.

I. POWERPLANT THEORY AND MAINTENANCE

Teaching
level

A. RECIPROCATING ENGINES

- (1) 1. Inspect and repair a radial engine.
 (2) 2. Overhaul reciprocating engine.
 (3) 3. Inspect, check, service, and repair reciprocating engines and engine installations.
 (3) 4. Install, troubleshoot, and remove reciprocating engines.

B. TURBINE ENGINES

- (2) 5. Overhaul turbine engine.
 (3) 6. Inspect, check, service, and repair turbine engines and turbine engine installations.
 (3) 7. Install, troubleshoot, and remove turbine engines.

C. ENGINE INSPECTION

- (3) 8. Perform power plant conformity and airworthiness inspections.

II. POWERPLANT SYSTEMS AND COMPONENTS

A. ENGINE INSTRUMENT SYSTEMS

- (2) 9. Troubleshoot, service, and repair electrical and Engineeral fluid rate-of-flow indicating systems.
 (3) 10. Inspect, check, service, troubleshoot, and repair electrical and Engineeral engine temperature, pressure, and rpm indicating systems.

B. ENGINE FIRE PROTECTION SYSTEMS

- (3) 11. Inspect, check, service, troubleshoot, and repair engine fire detection and extinguishing systems.

C. ENGINE ELECTRICAL SYSTEMS

- (2) 12. Repair engine electrical system components.
 (3) 13. Install, check, and service engine electrical wiring, controls, switches, indicators, and protective devices.

D. LUBRICATION SYSTEMS

- (2) 14. Identify and select lubricants.

- (2) 15. Repair engine lubrication system components.
- (3) 16. Inspect, check, service, troubleshoot, and repair engine lubrication systems.

E. IGNITION AND STARTING SYSTEMS

- (2) 17. Overhaul magneto and ignition harness.
- (2) 18. Inspect, service, troubleshoot, and repair reciprocating and turbine engine ignition systems and components.
- (3) 19.a. Inspect, service, troubleshoot, and repair turbine engine electrical starting systems.
- (1) 19.b. Inspect, service, and troubleshoot turbine engine pneumatic starting systems.

Teaching
level

F. FUEL METERING SYSTEMS

- (1) 20. Troubleshoot and adjust turbine engine fuel metering systems and electronic engine fuel controls.
- (2) 21. Overhaul carburetor.
- (2) 22. Repair engine fuel metering system components.
- (3) 23. Inspect, check, service, troubleshoot, and repair reciprocating and turbine engine fuel metering systems.

G. ENGINE FUEL SYSTEMS

- (2) 24. Repair engine fuel system components.
- (3) 25. Inspect, check, service, troubleshoot, and repair engine fuel systems.

H. INDUCTION AND ENGINE AIRFLOW SYSTEMS

- (2) 26. Inspect, check, troubleshoot, service, and repair engine ice and rain control systems.
- (1) 27. Inspect, check, service, troubleshoot and repair heat exchangers, superchargers, and turbine engine airflow and temperature control systems.
- (3) 28. Inspect, check, service, and repair carburetor air intake and induction manifolds.

I. ENGINE COOLING SYSTEMS

- (2) 29. Repair engine cooling system components.
- (3) 30. Inspect, check, troubleshoot, service, and repair engine cooling systems.

J. ENGINE EXHAUST AND REVERSER SYSTEMS

- (2) 31. Repair engine exhaust system components.
- (3) 32.a. Inspect, check, troubleshoot, service, and repair engine exhaust systems.
- (1) 32.b. Troubleshoot and repair engine thrust reverser systems and related components.

K. PROPELLERS

- (1) 33. Inspect, check, service, and repair propeller synchronizing and ice control systems.
- (2) 34. Identify and select propeller lubricants.
- (1) 35. Balance propellers.
- (2) 36. Repair propeller control system components.
- (3) 37. Inspect, check, service, and repair fixed pitch, constant speed, and feathering propellers, and propeller governing systems.
- (3) 38. Install, troubleshoot, and remove propellers.
- (3) 39. Repair aluminum alloy propeller blades.

L. UNDUCTED FANS

- (1) 40. Inspect and troubleshoot unducted fan systems and components.

M. AUXILIARY POWER UNITS

- (1) 41. Inspect, check, service, and troubleshoot turbine driven auxiliary power units.

PART C**(Items 111 & 113)****AMEL Electrical Rating and/or Instrument rating and/or Radio rating or Avionic rating
(Electrical, Instrument and Radio).****Curriculum Requirements**

This part defines terms used in Section A, B, C and D of this part, and describes the levels of proficiency at which items under each subject in each curriculum must be taught, as outlined in Sections A, B, C and D.

1. Definitions. As used in Sections A, B, C and D:
 - (a) "Inspect" means to examine by sight and touch.
 - (b) "Check" means to verify proper operation.
 - (c) "Troubleshoot" means to analyze and identify malfunctions.
 - (d) "Service" means to perform functions that assure continued operation.
 - (e) "Repair" means to correct a defective condition. Repair of an airframe or power plant system includes component replacement and adjustment, but not component repair.
 - (f) "Overhaul" means to disassemble, inspect, repair as necessary, and check.
2. Teaching levels.
 - (a) Level 1 requires:
 - (i) Knowledge of general principles, but no practical application.
 - (ii) No development of manipulative skill.
 - (iii) Instruction by lecture, demonstration, and discussion.
 - (b) Level 2 requires:
 - (i) Knowledge of general principles, and limited practical application.
 - (ii) Development of sufficient manipulative skill to perform basic operations.
 - (iii) Instruction by lecture, demonstration, discussion, and limited practical application.
 - (c) Level 3 requires:
 - (i) Knowledge of general principles, and performance of a high degree of practical application.
 - (ii) Development of sufficient manipulative skills to simulate return to service.

- (iii) Instruction by lecture, demonstration, discussion, and a high degree of practical application.
3. Teaching materials and equipment.
- (a) The curriculum may be presented utilizing currently accepted educational materials and equipment, including, but not limited to: calculators, computers, and audio-visual equipment.

Section A – General Curriculum Subjects

This section list the subjects required for at least 400 hours of general curriculum subjects. The number in parentheses before each item listed under each subject heading indicates the level of proficiency at which that item shall be taught.

Teaching
Level

A. MATHEMATICS

- (3)1. Extract roots and raise numbers to a given power.
- (3)2. Determine areas and volumes of various geometric shapes.
- (3)3. Solve ratio, proportion, and percentage problems.
- (3)4. Perform algebraic operations involving addition, subtraction, multiplication, and division of positive and negative numbers.

B. BASIC PHYSICS

- (2) 5. Use and understand the principles of simple machines; sound, fluid, and heat dynamics; basic aerodynamics; aircraft structures; and theory of flight.

C. MATERIALS AND PROCESSES

- (1) 6. Identify and select appropriate nondestructive testing methods.
- (2) 7. Perform dye penetrate, eddy current, ultrasonic, and magnetic particle inspections.
- (1) 8. Perform basic heat treating processes.
- (3) 9. Identify and select aircraft hardware and materials.
- (3) 10. Inspect and check welds.
- (3) 11. Perform precision measurements.

D. MAINTENANCE FORMS AND RECORDS

- (3) 12. Write descriptions of work performed including aircraft discrepancies and corrective actions using typical aircraft maintenance records.
- (3) 13. Complete required maintenance forms, records, and inspection reports.

E. MAINTENANCE PUBLICATIONS

- (3) 14. Demonstrate ability to read, comprehend, and apply information contained in CAA and manufacturers' aircraft maintenance specifications, data sheets, manuals, publications, and related Civil Aviation Regulations, Airworthiness Directives, and Advisory Material.
- (3) 15. Read technical data.

F. ENGINEER PRIVILEGES AND LIMITATIONS

- (3) 16. Exercise Engineer privileges within the limitations prescribed by Part 1 of the ICARs.

Section B - Electrical Curriculum Subjects

This section list the subjects required in at least 650 hours of each electrical curriculum, in addition to at least 400 hours in general curriculum subjects. The number in parentheses before each item listed under each subject heading indicates the level of proficiency at which that item shall be taught.

1 Electromechanical Systems.

1.1 Pressurization Systems.

- (2) 1.1.1 Define the following terms and describe their application to aircraft pressurization:-
- a. Cabin altitude
 - b. Controlled leaks
 - c. Differential control mode
 - d. Differential pressure
 - e. Isobaric control mode
 - f. Maximum differential
 - g. Pressure altitude
 - h. Rate control
 - i. Uncontrolled leaks
- (2) 1.1.2 Identify from diagrams or schematic drawings the following pressurization components and describe their principles of operation.
- a. Cabin altimeters
 - b. Cabin differential pressure indicator
 - c. Cabin rate of climb indicators
 - d. Jet pumps
 - e. Negative pressure relief valves
 - f. Outflow valves
 - g. Pneumatic relays
 - h. Pressure controllers (automatic and manual)
 - i. Safety (positive pressure relief) valves
 - j. Safety switches
- (2) 1.1.3 Describe a typical system layout including the pneumatic or electrical interconnection of components.
- (2) 1.1.4 Describe the operation and indicate component function in given system operation modes, including the electrical interface and warning/indication systems.
- (3) 1.1.5 Diagnose faults in aircraft pressurization systems, including the electrical and instrument interface, and indicate how these can be rectified.

1.2 Air Conditioning–Vapor Cycle System

- (2) 1.2.1 Define the following terms:
- a. Adiabatic
 - b. Conduction
 - c. Convection
 - d. Humidity
 - e. Latent heat
 - f. Latent heat of vaporization
 - g. Radiation
 - h. Relative humidity
 - i. Sensible heat
 - j. Superheat

- (2) 1.2.2 Solve problems using the general (combined) gas law and state how this law relates to the transfer of energy in an air conditioning system.
- (1) 1.2.3 Describe the construction and operation of the following vapor cycle system components:
 - a. Blowers
 - b. Compressors
 - c. Condensers
 - d. Evaporators
 - e. Expansion valves
 - f. Isolation valves
 - g. Receiver-dryers
 - h. Super heaters and sub coolers
- (1) 1.2.4 Describe the construction features, principles of operation, location and function within a typical system of the above components.
- (1) 1.2.5 Describe the types and characteristics of refrigerants and oils used in an air conditioning system.
- (1) 1.2.6 Identify and state the function of the valves, gauges, fittings and hoses of a vapor cycle servicing manifold set.
- (1) 1.2.7 Describe the procedures and list the equipment used to carry out purging and charging of the system.
- (1) 1.2.8 State precautions necessary for the safe servicing of a vapor cycle system.
- (1) 1.2.9 Describe the procedures and list the equipment used to carry out leak tests, checking compressor oil and evacuating the system.
- (1) 1.2.10 Identify and name the procedures to rectify faults in vapor cycle systems.
- (1) 1.2.11 State the environmental requirements associated with the use of air conditioning fluids

1.3 Air Conditioning–Air Cycle System

- (2) 1.3.1 Define the following terms:
 - a. Adiabatic
 - b. Conduction
 - c. Convection
 - d. Humidity
 - e. Latent heat
 - f. Latent heat of vaporization
 - g. Radiation
 - h. Relative humidity
 - i. Sensible heat
 - j. Superheat
- (2) 1.3.2 From given information identify the schematic relationships of the following air cycle system components and describe their operating principles:
 - a. Air cycle machines
 - b. Flow control valves
 - c. Heat exchangers
 - d. Humidifiers
 - e. Mixing chambers
 - f. Pressure regulation valves
 - g. Recirculation fans
 - h. Recirculation filters
 - i. Silencers
 - j. Spill valves
- (2) 1.3.3 Identify by name and state the function of components in a basic air cycle system.
- (1) 1.3.4 Trace the airflow through the various schematic layouts provided, from air supply source to distribution outlet.

- (1) 1.3.5 Describe desired airflow paths in occupied cabins.
- (1) 1.3.6 Identify provisions for emergency and ground ventilation in a given system schematic drawing.
- (1) 1.3.7 From given information describe the operation of a trim air system.
- (1) 1.3.8 Describe the operating principles of gasper (eyeball) vents and systems.
- (2) 1.3.9 Describe the operating principles of cabin temperature control systems and identify appropriate sensor locations that contribute to stable temperature control.
- (2) 1.3.10 Describe the operation and trace airflows in given configurations including the electrical and instrument interface.
- (3) 1.3.11 Diagnose faults in a typical air cycle system.

1.4 Fuel Storage and Distribution Systems

- (2) 1.4.1 Describe the construction, operation and maintenance of the following:
 - a. Boost/auxiliary pumps
 - b. transfer valves
 - c. refueling and de-fuelling systems
- (2) 1.4.2 Describe the operation of a jet pump in an aircraft's fuel system.
- (2) 1.4.3 Describe the reasons why a jet pump is used in lieu of an electrical or mechanical driven fuel pump.
- (2) 1.4.4 Describe the operation (electrical and mechanical) of a typical fuel system when feeding an engine and when transferring fuel between tanks.
- (1) 1.4.5 Describe the construction, operation, function, inspection and maintenance of:
 - a. filters.
 - b. fuel heaters.
 - c. primers.
 - d. pumps.
 - e. strainers.
 - f. tanks (rigid, flexible and integral).
 - g. valves.
- (1) 1.4.6 Identify the location of fuel system components in a basic system including the instrument and electrical interface.
- (1) 1.4.7 Identify the location of fuel system components in a typical system.
- (1) 1.4.8 Describe the layout and operation of typical gas turbine engine aircraft fuel systems, including the instrument and electrical interface.
- (1) 1.4.9 Describe the procedures for the inspection and servicing of aircraft fuel systems and components.

1.5 Undercarriage Systems

- (2) 1.5.1 Describe the operation of the electrical position indicating and control system of a typical landing gear system.
- (2) 1.5.2 Describe the construction and operation of air/ground sensor systems.
- (3) 1.5.2 Given electrical diagrams, diagnose faults in typical undercarriage systems.

1.6 Auto-Braking and Anti-Skid Systems

- (2) 1.6.1 Describe the construction, operation function and control of automatic braking systems.
- (2) 1.6.2 In relation to an anti-skid system, be able to define its function and list its components.
- (2) 1.6.3 Describe the operation of an electrical powered anti-skid system in all situations (i.e. no skid, skid and landing).
- (2) 1.6.4 Describe system testing – ground and in-flight.
- (2) 1.6.5 Describe typical anti-skid system maintenance.

1.7 Hydraulic Systems

- (2) 1.7.1 Describe the function, operation, location, construction, indication and control of

electrically powered hydraulic pumps.

- (2) 1.7.2 Describe the function and operation of electrically controlled hydraulic valves.

2 Power Supplies

2.1 Aircraft Battery Systems

- (2) 2.1.1 Describe a multiple battery installation and how batteries are connected to obtain desired voltages and capacities.

- (2) 2.1.2 Describe battery-switching arrangements used to obtain desired voltages.

- (2) 2.1.3 Describe the construction and location of aircraft battery compartments with particular regard to the following:

- a. Heat dissipation
- b. Ventilation of gasses.
- c. Protection of airframe structure
- d. Location of main and battery buses
- e. Battery clamping
- f. Battery trays
- g. Vents and pipes
- h. Vent discharge locations and venting methods including the use of pressurization air.
- i. Vent non-return valves
- j. Acid traps

- (2) 2.1.4 Describe the common methods of battery connection to the aircraft electrical system.

- (2) 2.1.5 Describe the procedure and precautions associated with the connection or disconnection of batteries in an aircraft electrical system.

- (2) 2.1.6 Describe the emergency services commonly supplied from the battery bus bar.

- (2) 2.1.7 Describe the purpose and typical location in the electrical system of the following battery components:

- a. Power selector switch
- b. Emergency power switch
- c. Main DC bus bar
- d. Battery relay
- e. Reverse current circuit breakers
- f. Battery overheat isolation device
- g. Transformer rectifier units
- h. SCR switching circuits
- i. Power supply regulator
- j. Power supply monitor
- k. Power supply interrupt
- l. Power supply logic circuitry

2.2 AC Power Generation and Control (Frequency-Wild Systems)

- (2) 2.2.1 Describe the following criteria in respect of AC power generators:

- a. Phasing and phase relationships
- b. Interconnection of phases
- c. Generator power ratings
- d. Restrictions relating to the supply of purely reactive loads

- (2) 2.2.2 Describe what is meant by a frequency-wild generation system with regard to the following:

- a. How frequency-wild power is derived
- b. Aircraft systems that use frequency-wild power
- c. Transformation and rectification of frequency-wild power
- d. Excitation of frequency-wild generators
- e. Applications of frequency-wild systems and the types of aircraft in which they would

normally be found

- (2) 2.2.3 Describe the construction and principles of operation of a typical frequency-wild generator with particular regard to the following components:
- a. Rotor
 - b. Stator and stator windings
 - c. Output terminal block
 - d. Protection transformer
 - e. Excitation terminal block
 - f. Brush gear and slip-rings
 - g. Cooling
 - h. Overheat warning and protection
 - i. Casing
 - j. End frame

2.3 AC Power Generation and Control – Constant Frequency Systems

- (2) 2.3.1 Describe the following criteria in regard to constant speed systems:
- a. Purpose and use of constant frequency power
 - b. Why constant frequency is important for multi-generator systems
 - c. How field excitation is achieved
- (2) 2.3.2 Describe the construction and operation of a constant speed drive (CSD) unit with particular regard to the following:
- a. Power input
 - b. Hydraulic pump
 - c. Variable and constant displacement swash plates
 - d. Overdrive control
 - e. Under drive control
 - f. Cylinder block and pistons
 - g. Electro-mechanical disconnect mechanisms
 - h. Fault finding and troubleshooting
 - i. CSD Maintenance
- (2) 2.3.3 Describe the construction, operation and maintenance of a typical integrated drive unit (IDG).
- (2) 2.3.4 Describe the construction and principles of operation of a typical brushless generator with particular regard to the purpose and operation of the following components:
- a. Exciter shunt field and stabilizer windings
 - b. Exciter main poles
 - c. Exciter armature windings
 - d. Slotted rotor
 - e. Thermistor
 - f. Permanent magnet
 - g. AC stator
 - h. Rotating field pole
 - i. Stator frame
 - j. Output windings
 - k. Damper windings
 - l. Steel band
 - m. Copper band
 - n. Busbar
 - o. Diode
 - p. Rotating field windings
 - q. Damper bar

- r. Separator
 - s. Temperature compensation
 - t. Thermostatic switch
 - u. Winding connection methods
 - v. Cooling system
- (1) 2.3.5 State the advantages of using AC electrical power in aircraft systems.
- (1) 2.3.6 State the advantages of using a three-phase four-wire system over a three-wire distribution system.

2.4 Voltage Regulation

- (2) 2.4.1 Describe a voltage regulation system for a frequency-wild AC generator with particular regard to the purpose and operation of the following components:
- a. Three phase magnetic amplifier
 - b. Exciter rectifier
 - c. Three phase transformer
 - d. Signal rectifier
 - e. Single phase error sensing magnetic amplifier
- (2) 2.4.2 Describe the construction and operation of a transistorised voltage regulator used in conjunction with a frequency-wild generator. Particular regard should be paid to the arrangement of transistors and the reverse current function.
- (2) 2.4.3 Describe the method of voltage output regulation of a constant frequency system with particular regard to the purpose and operation of the following systems and components:
- a. Voltage error detection (sensing and reference)
 - b. Error control winding (Pre amplifier)
 - c. Signal control winding (Power amplifier)
- (2) 2.4.4 In a stabilized voltage regulator, describe the relationship between output voltage, load current changes and effective impedance of the supply.

2.5 Load-Sharing or Paralleling

- (2) 2.5.1 In a frequency-wild system describe how load sharing is achieved through the use of equalizing circuits.
- (2) 2.5.2 In a constant frequency system describe what is meant by:
- a. Real load
 - b. Reactive load
- (2) 2.5.3 Describe how each of the above loads is expressed.
- (2) 2.5.4 In a multi generator, constant frequency system, describe how:
- a. real load sharing is achieved.
 - b. reactive load sharing is achieved.
 - c. Alternators are protected from shorts using a parallel busbar disconnection device.
- (1) 2.5.5 State the factors that must be matched when an AC generator is connected in parallel to an aircraft bus.

2.6 Air-Driven Generators and Ram Air Turbines

- (2) 2.6.1 Describe where and when air driven generators and ram air turbines may be used on large transport aircraft.
- (2) 2.6.2 In regard to air driven generators and ram air turbines, describe the following factors:
- a. Construction
 - b. Principles of operation
 - c. Services supplied
 - d. Power output
 - e. Aircraft speed limitations
 - f. Airframe mounting

g. Deployment and stowage

3 Power Conversion Equipment

3.1 Power Transformers (Potential/Parallel)

- (2) 3.1.1 Describe the construction of a power transformer with particular regard to the following:
- Types used for single and three phase transformation
 - Core characteristics
 - Core Material
 - Core lamination
 - Core shape (L and T)
 - Core clamps
 - Mating of core surfaces
 - Common winding materials
 - Winding insulation
 - Circuit connections (star/delta)

3.2 Current Transformers

- (2) 3.2.1 Describe the purpose and uses of current transformers.
- (2) 3.2.2 Describe the construction and principles of operation of current transformers with particular regard to the following criteria:
- Turns ratio
 - Primary and secondary windings
 - Core materials and configuration
 - Use of resin moulding
 - Operating principle
 - Use of multiple transformers
 - Busbars
- (2) 3.2.3 Describe the precautions that must be taken when a current transformer is disconnected from its load circuit. State why such precautions are necessary.

3.3 Auto-Transformers

- (2) 3.3.1 Describe the purpose and common applications of auto-transformers.
- (2) 3.3.2 Describe the construction and principles of operation of auto-transformers, with particular regard to the following:
- Circuit arrangement
 - Tappings and voltage values
 - Linking of the magnetic flux
 - Self induced and applied voltages
 - Diameter of windings
 - Connection of windings
 - The effects of an open circuit in either the primary or secondary windings and precautions to be taken.

3.4 Transformer Ratings

- (2) 3.4.1 Describe the two methods of expressing transformer ratings.
- (2) 3.4.2 Describe what is termed the regulation of a transformer and how it is expressed.
- (2) 3.4.3 Describe the effects of changes in power supply frequency with particular regard to the following:
- Operation at a frequency below that for which the transformer was designed
 - Operation at a frequency above that for which a transformer was designed

3.5 Transformer Rectifier Units

- (2) 3.5.1 Describe the purpose and common applications of transformer-rectifier units.
- (2) 3.5.2 State the common design frequency and ratings of transformer-rectifier units.
- (2) 3.5.3 Describe the construction and principles of operation of transformer-rectifier units, with particular regard to the following:
 - a. Circuit layout
 - b. Transformer
 - c. Bridge rectifier assemblies
 - d. Arrangement and connection of windings
 - e. Ammeter shunt
 - f. Grouping of terminals
 - g. Cooling
 - h. Temperature warning and thermal switching
 - i. Level of resistance in forward and reverse current flow directions.

3.6 Rectifiers

- (2) 3.6.1 Describe the process of AC power rectification and identify the alternator/ rectifier arrangement that will produce the smoothest direct current output.
- (2) 3.6.2 Describe the uses, construction and operation of the following types of rectifier:
 - a. Semi-conductor/metal junction
 - b. Selenium rectifier
 - c. Silicon rectifier
 - d. Silicon controlled rectifiers
 - e. Triac
- (2) 3.6.3 Describe the operating limitations of rectifiers with particular regard to:
 - a. temperature limitations.
 - b. reverse voltage limits.
- (2) 3.6.4 Describe the principles of operation and rectifier circuit connections for:
 - a. single-phase half-wave rectification.
 - b. single-phase full-wave rectification.
 - c. three-phase half-wave rectification.
 - d. three-phase full-wave bridge rectifier.

3.7 Rotary Converting Equipment

- (2) 3.7.1 Describe the purpose, operation and construction of a rotary inverter with particular regard to the following:
 - a. Motor construction
 - b. Generator construction
 - c. Cooling
 - d. Voltage and frequency regulation
 - e. Mounting and damping

3.8 Static Inverters

- (2) 3.8.1 Describe the purpose, operation and construction of a static inverter with particular regard to the following:
 - a. Filter network
 - b. Pulse shaper
 - c. Constant current generator
 - d. Power driver stage
 - e. Output stage
 - f. Voltage and current sensor
 - g. Feedback signal

h. Notch control circuit .

4 Ground and Auxiliary Power Supplies

4.1 DC Ground Power Systems

- (2) 4.1.1 Describe the aircraft systems that are commonly powered externally by a DC ground power supply.
- (2) 4.1.2 Describe where on an aircraft a ground power connection is commonly found.
- (2) 4.1.3 Describe the operation and control of typical ground supply equipment including:
 - a. DC battery carts.
 - b. DC GPU.
 - c. AC/DC GPUs.
 - d. rectifiers.
 - e. inverters.
- (2) 4.1.4 Describe the operation of a typical ground power unit with regard to:
 - a. Starting
 - b. Connection
 - c. Load monitoring
 - d. stopping
 - e. safety precautions.
- (2) 4.1.5 Describe the construction and operation of a typical multiple DC busbar ground power supply system with particular regard to the following:
 - a. Ground supply master switch
 - b. Vital DC busbar
 - c. Ground supply contactor
 - d. Magnetic indicator
 - e. Bus tie contactors
 - f. Aircraft interface
 - g. Interlocks
 - h. Safety devices
- (2) 4.1.6 Describe the types/patterns, construction and operation of ground power sockets with particular regard to the following:
 - a. Positive, and earth pins
 - b. Pin length
 - c. Pin shrouding
- (2) 4.1.7 Describe how ground power will de-energize should the ground supply socket be removed with the circuit "live".

4.2 AC Ground Power Supplies

- (2) 4.2.1 Describe the construction and operation a typical AC ground power supply system with particular regard to the following:
 - a. Three phase supply ground power plug
 - b. Ground power TRU
 - c. Ground power breakaway relay
 - d. Phase sequence protection
 - e. Ground power switch
 - f. Indicating lights and meters
 - g. DC Busbar
 - h. Three phase AC main busbar
 - i. Selector switch
 - j. Control relay
 - k. GPU/APU interface and interlocks

4.3 Auxiliary Power Units (APU)

- (1) 4.3.1 Describe the functions and construction of a typical APU with particular regard to the following:
- Location on the aircraft
 - Electrical services supplied
 - Other services supplied
 - Fuel supply
 - Oil supply
 - Load control
 - Starter-generator
 - Intake doors
 - Accessory gearbox
- (1) 4.3.2 Describe the operation of a typical APU with particular regard to the following:
- Starting
 - EGT Sensing
 - Load control
 - Acceleration limiting
 - Starter duty cycle
 - Typical control panel layout
 - Fire protection and warning

5 Measuring Instruments, Warning Indicators and Lights

5.1 DC Meters

- (1) 5.1.1 Describe the functions and principles of operation of a frequency meter.
- (1) 5.1.2 Describe the functions and principles of operation of a power meter.

5.2 Warning and Indicating Lights

- (2) 5.2.1 Describe how lights may be dimmed.
- (2) 5.2.2 Describe the power source commonly used for warning and caution lights.
- (2) 5.2.3 Describe the purpose and typical use of synchronising lights.

5.3 Magnetic Indicators

- (2) 5.3.1 Describe the purpose and give examples of where magnetic indicators are used on modern aircraft.
- (2) 5.3.2 Describe the construction and operation of a typical magnetic indicator. 2

6 Power Distribution

6.1 Electrical Wires and Cables

- (2) 6.1.1 Distinguish between an electrical wire and an electrical cable.
- (2) 6.1.2 Describe the construction, composition, characteristics, advantages and disadvantages of common types of wires and cables of both British and American manufacture.
- (2) 6.1.3 Describe the methods and precautions to be observed during forming, identification, routing and securing of electrical cables in different aircraft environments.
- (2) 6.1.4 Distinguish between an open and a ducted system.
- (2) 6.1.5 Describe the following:
- Cable sealing techniques in pressurised aircraft
 - Construction and use of pressure proof bungs and sockets
- (2) 6.1.6 Be able to identify the correct heat shrink material to be used and list the precautions associated with its use.
- (2) 6.1.7 Describe the methods used to mark electrical cables and wires. 2
- (2) 6.1.8 Describe the following factors relating to electrical wire:
- Insulation resistance testing, defects and rectifications

- b. Strand metal composition
 - c. Strand number and diameter
 - d. Wire gauge rating
 - e. Voltage and current carrying capacity and rating
 - f. Temperature characteristics
 - g. Characteristics and uses
 - h. Identification of wire codes
 - i. Braiding and screening
 - j. Calculation of voltage drop in given wiring arrangements
 - k. Moisture sealing
 - l. Looms
 - m. Conduits and ducting
 - n. Clamps and clamping methods
- (2) 6.1.9 Describe the advantages, disadvantages, characteristics, uses and limitations of copper and aluminium cables and wiring in aircraft electrical systems.
- (2) 6.1.10 Describe the precautions, identification and routing associated with high-tension cable installations.
- (2) 6.1.11 Describe the following criteria relating to coaxial cables:
- a. Identification
 - b. Uses
 - c. Methods of attaching connectors
 - d. Testing
 - e. Installation precautions.
- (2) 6.1.12 Describe the construction, installation testing and handling precautions associated with thermocouple cables.

6.2 Bonding, Screening and Electrical Safety

- (2) 6.2.1 In relation to bonding and screening, be able to:
- a. describe the methods employed.
 - b. describe the operation and safety precautions associated with the use of meggers and bonding testers.
 - c. state precautions to be observed when creating and installing earth points.
 - d. state the minimum acceptable standards for insulation and bonding tests.
 - e. identify radio interference problems associated with the inadequate bonding of electrical components and how noise suppression may be achieved.
 - f. describe typical voltages associated with electrostatic discharge.
 - g. identify electrostatic damage.
 - h. describe the operation of static wick dischargers.
 - i. describe the construction and location of DC/ACIRF earths.
- (2) 6.2.2 Describe the environmental effects that electrical systems and components may be exposed to and how protection can be afforded.
- (2) 6.2.3 Identify the personal dangers associated with electrical systems and describe the voltage/current levels and conditions that would constitute a hazardous situation.

6.3 Power Distribution Systems and Associated Components

- (2) 6.3.1 Describe with examples, the classification of aircraft power service requirements into the following categories:
- a. Vital
 - b. Essential
 - c. Non-essential
- (2) 6.3.2 Using the appropriate terminology describe the construction, operation and uses of the following components:

- a. Split bus system
 - b. Parallel bus system
 - c. Load shedding system
 - d. Priority bus system
 - e. Emergency bus
 - f. Battery bus
 - g. Ground power bus
- (2) 6.3.3 Describe the purposes of the various bus switching components.
- (2) 6.3.4 Be able to troubleshoot typical aircraft split, parallel and emergency bus systems.
- (2) 6.3.5 Describe the operation of generator equalising circuits and be able to troubleshoot a typical system.
- (1) 6.3.6 Be able to state the purpose of overvoltage/undervoltage and reverse current protection.
- (3) 6.3.7 Describe the operation of, and be able to diagnose, typical faults in circuits designed to give reverse current protection.
- (2) 6.3.8 Describe the construction, contents, mounting, bonding, earthing, inspection and testing of a typical electrical junction box.

7 Circuit Controlling Devices

7.1 Electrical Control Devices

- (2) 7.1.1 With regard to the following devices, be able to define related terminology, describe the operation, state the uses and limitations and identify them on drawings:
- a. Switches, single and multi pole/throw varieties
 - b. Toggle and tumbler switches
 - c. Push-switches
 - d. Rocker button switches
 - e. Rotary (roller) switches
 - f. Micro-switches
 - g. Rheostats
 - h. Time switches
 - i. Mercury switches
 - j. Pressure switches
 - k. Thermal switches
 - l. Proximity switches
 - m. Limit Switches
 - n. Attracted-core heavy-duty relays
 - o. Attracted armature light-duty relays
 - p. Polarized armature relays
 - q. Slugged relays
 - r. Solenoids
 - s. Magnetic amplifiers
- (2) 7.1.2 Describe the operation, maintenance, testing, typical defects and rectification associated with the above relays, switches rheostats and solenoids.

8 Circuit Protection Devices

8.1 Reverse Current Protection

- (2) 8.1.1 Describe the construction, operation, identification, limitations and precautions relating to:
- a. Reverse current cut-out relays
 - b. Reverse current circuits breakers

8.2 Voltage Protection

- (2) 8.2.1 Describe the purpose, construction, operation, identification, limitations and precautions

relating to the following voltage protection devices:

- a. Over-voltage protection
- b. Under-voltage protection
- c. Under-frequency protection
- d. Over-frequency protection
- e. Merz-Price protection system

9 Power Utilization Components

9.1 Aircraft Lighting

(2) 9.1.1 Describe the operation, control, layout and testing of typical aircraft lighting systems.
(both internal and external)

(2) 9.1.2 Describe the purpose, construction, operation, maintenance and safety precautions associated with various types of external aircraft lights, such as:

- a. navigation lights.
- b. anti-collision lights. (rotating and flashing)
- c. strobe lights.
- d. landing lamps.
- e. taxi lamps.
- f. ice inspection lamps.
- g. area inspection lights
- h. logo lights

(2) 9.1.3 Describe the purpose, construction, operation and maintenance of the various types of internal aircraft lighting, such as:

- a. cockpit area lighting.
- b. flood-lighting.
- c. instrument panel lights.
- d. integral instrument lighting.
- e. post and bridge lighting.
- f. trans-illuminated panels.
- g. electroluminescent lighting.
- h. passenger cabin lighting.
- i. passenger instructional lighting. (no smoking and fasten seatbelts)
- j. strip lighting.
- k. Passenger service unit lighting
- l. Cargo compartment lighting

(2) 9.1.4 Describe the purpose, construction, operation and maintenance of the following emergency lighting and lighting components:

- a. Crash inertia switches
- b. Floor proximity emergency escape path lighting
- c. Emergency exit lighting

(3) 9.1.5 Given circuit diagrams, diagnose faults in typical lighting and dimming control circuits.

9.2 Electrical Load Analysis

(2) 9.2.1 Describe the purpose of an electrical load analysis.

(3) 9.2.2 Be able to determine when an electrical load analysis is required and be able to carry out an analysis as prescribed in CAR for an aircraft electrical system.

(2) 9.2.3 Identify Class 1 and Class 2 circuits and state the operating conditions and precautions that apply to each.

9.3 Alternating Current (AC) Motors

(2) 9.3.1 Using the relevant terminology be able to describe the uses, construction, operation and characteristics (starting and running) of the following types of motor:

- a. Single-phase
 - b. Two-phase
 - c. Three-phase
 - d. Induction
 - e. Synchronous motors of various types
- (3) 9.3.2 Determine the direction of rotation using the right hand rule for motors.
- (3) 9.3.3 Determine the RPM of induction and synchronous motors using the formula $RPM = 60f/p$.
- (2) 9.3.4 Describe the following methods of producing a rotating field:
- a. Capacitor.
 - b. Inductor.
 - c. Shaded or split pole.
- (2) 9.3.5 Describe the method of reversing the direction of rotation of an AC motor.

9.4 AC Actuators

- (2) 9.4.1 Describe the use, construction, principles of operation, maintenance and adjustment of the following motor actuators and associated components:
- a. Linear actuators
 - b. Rotary Actuators
 - c. Actuator gearing
 - d. Limit switches
 - e. Brakes
 - f. Clutches

10 Power Utilization Systems

10.1 Gas Turbine Engine Fuel Control and Metering Systems

- (1) 10.1.1 Describe the basic requirements, arrangements and principles of operation of gas turbine engine fuel control/metering systems including the following:
- a. Acceleration scheduling
 - b. Air density/altitude/OAT/airspeed compensation
 - c. Overspeed governing
 - d. Power limiting
 - e. Shutdown control
 - f. Starting control
 - g. Temperature limiting
- (1) 10.1.2 Describe the relationship, location and function of the following gas turbine engine fuel control system components:
- a. Engine sensing variables.
 - b. Fuel control unit (hydro-pneumatic, hydro-mechanical & electro-mechanical).
 - c. Fuel filters (HP and LP).
 - d. Fuel heaters.
 - e. Governors and limiter devices.
 - f. Main fuel pumps (HP and LP).
 - g. Valves (throttle/dump/shutoff).

10.2 Gas Turbine Engine Air Systems

- (1) 10.2.1 Describe the basic requirements, arrangements and principles of operation of gas turbine engine air distribution and anti-ice control systems, including the following:
- a. Internal cooling
 - b. Sealing
 - c. External air services
- (1) 10.2.2 Describe the relationship, location and operation of:

- a. air distribution/external services components.
- b. air starting system components.
- c. anti-icing system components.
- d. engine internal cooling/sealing system components.

10.3 Starting and Ignition Systems

- (2) 10.3.1 Describe the basic requirements, arrangements, principles of operation, maintenance, testing and trouble shooting of the following typical engine starter systems and components:
 - a. Air turbine starters
 - b. Electric starters
 - c. Pressure regulating and shut-off valves
 - d. Starter-generators
 - e. Starter relays
 - f. Clutches and overrun devices.
 - g. Engagement mechanisms
- (2) 10.3.2 Describe a typical start sequence in regard to the functioning of the starter and ignition circuits.
- (2) 10.3.3 Describe what is meant by “self sustaining” engine speed.
- (2) 10.3.4 Describe the basic requirements, arrangements, principles of operation maintenance and testing of the following engine ignition systems and components:
 - a. Harnesses
 - b. High tension spark igniter plugs
 - c. Low tension spark igniter plugs
 - d. Glow plug igniters
- (2) 10.3.5 Describe the safety requirements during servicing and maintenance of engine ignition systems.
- (2) 10.3.6 Identify the effects of faults in components on engine starting and ignition systems.
- (1) 10.3.7 Describe why turbine engine ignition systems require high electrical energy for their operation.
- (2) 10.3.8 Describe the operation and layout of high-energy ignition units (HEIU) both DC and AC powered.
- (2) 10.3.9 Describe the operation and layout of:
 - a. an intermittent duty low tension ignition unit with DC input.
 - b. an extended duty low tension ignition system.
 - c. a high tension intermittent duty AC input system.
 - d. an auto-ignition system.
 - e. a continuous-duty circuit.
- (2) 10.3.10 Describe the advantages and limitations of:
 - a. AC verses DC input systems.
 - b. high tension versus low tension systems.

10.4 Power Augmentation Systems

- (1) 10.4.1 Describe the basic requirements, arrangements and principles of operation of the following gas turbine power augmentation systems and components:
 - a. Water injection
 - b. Water/methanol injection
 - c. Afterburners

10.5 Engine Controls

- (1) 10.5.1 Describe the basic requirements, arrangements and principles of operation of the following engine controls:

- a. Linkages and controls to and from the propeller co-ordinator/interconnector and fuel control unit
 - b. Linkages and controls to and from the collective throttle and fuel control unit
 - c. Mechanical control inputs and outputs for electronic fuel control systems
 - d. Throttle/power/condition levers, cables and linkages
 - e. Units and components interconnected for emergency shut-down
- (1) 10.5.2 Describe the relationship, location and function of engine mechanical control system units and components.
- (2) 10.5.3 Describe the relationship, location and function of a supervisory electronic engine control (EEC) system both digital and analogue.
- (2) 10.5.4 Describe the relationship, location and function of a full authority digital electronic control (FADEC) system.
- (2) 10.5.5 Describe the function and operation of electrical engine temperatures and speed limiting systems.

10.6 Turbo-Propeller Control Systems

- (2) 10.6.1 Describe the function, operation and maintenance of a propeller:
- a. synchroniser system.
 - b. synchrophaser system.
- (1) 10.6.2 List the components that comprise each system and their location within each of the systems.
- (2) 10.6.3 Describe the function, operation and testing of electric propeller feathering systems.

10.7 Ice and Rain Protection Systems

- (2) 10.7.1 Describe the effects icing has on the operation/performance of an aeroplane and the difference between anti-ice and de-icing systems.
- (2) 10.7.2 Describe the layout, operation, maintenance (including safety precautions) and troubleshooting of engine, propeller and airframe anti-ice protection systems, including:
- a. electro-pneumatic de-ice systems.
 - b. propeller ice protection systems.
- (2) 10.7.3 Describe the operation of various types of ice detecting devices and temperature control methods.
- (2) 10.7.4 Describe the electrical components, layout, operation, power requirements, maintenance, troubleshooting, defects/failure, ground operating precautions, overheat indications and protection associated with a typical electrically heated windscreen anti-icing system.
- (1) 10.7.5 Describe the operation and system layout of various types of the following windscreen rain removal/repellent systems:
- a. Wipers
 - b. Repellent (chemical)
 - c. Hot air (Pneumatic)
- (2) 10.7.6 Describe the requirements for ground de-icing and the precautions associated with the use of de-ice chemicals.
- (2) 10.7.7 Describe the operation of a typical waste water and toilet drain heating system.
- (2) 10.7.8 Describe the construction, operation, maintenance, testing and trouble shooting of propeller electric de-icing overshoes and their supporting electrical systems.
- (2) 10.7.9 Describe the construction, operation, maintenance, testing, trouble shooting and precautions associated with anti-icing the following components and describe their supporting electrical systems:
- a. Pitot head
 - b. Static port
 - c. Angle of flow

- d. Temperature probes
- e. Antenna
- f. Ice warning and sensing devices

10.8 Cabin Heating

- (2) 10.8.1 Describe the construction, operation and maintenance of a typical combustion heater and troubleshoot a typical system.
- (2) 10.8.2 Describe the construction and operation of electrical cabin heating and temperature control systems

10.9 Fire Detection and Extinguishing Systems

- (1) 10.9.1 Describe the fire triangle. 1
- (2) 10.9.2 Describe the construction, wiring, operation, testing, troubleshooting, maintenance and advantages/disadvantages of the following types of fire detection system:
 - a. Continuous element or pressure type sensor responder.
 - b. Continuous loop (fire wire) (Fenwal and Kidde)
 - c. Thermal switch.
 - d. Thermocouple.
 - e. Infra-red.
 - f. Fenwal spot detector
- (2) 10.9.3 Describe the operation, layout, troubleshooting, maintenance and safety precautions of a typical aircraft fire extinguishing systems and components. (includes the "two-shot" system)
- (2) 10.9.4 Describe typical fixed fire extinguishing systems.
- (1) 10.9.5 Describe the contents, location and use of typical portable fire extinguishers.
- (2) 10.9.6 Describe the inspection and maintenance requirements for both detection and extinguishing systems.
- (2) 10.9.7 Describe the safety precautions to be observed when dealing with aircraft fire extinguishing systems including the handling of explosive cartridges (Squibs).
- (2) 10.9.8 Describe the properties of extinguisher agents in relation to types of fire, toxicity and cleanup.

10.10 Smoke Detection

- (2) 10.10.1 Describe the construction and operation of the following smoke detection systems:
 - a. carbon monoxide
 - b. photoelectric
 - c. visual
 - d. infra red
- (2) 10.10.2 Describe typical fire and smoke cockpit warning indications including:
 - a. lights.
 - b. bells.
 - c. annunciator panels.
 - d. audio warnings.

10.11 Flight Controls

- (2) 10.11.1 Describe the construction, principles of operation, protection, control and maintenance of the following flight control components:
 - a. Power control units (PCU)
 - b. Flap motors
 - c. Trim motors
 - d. Position indicators

10.12 Galley and Toilet Service Systems

- (2) 10.12.1 Describe the operation, safety devices and control of service power supplies for the equipment and systems associated with:

- a. water heaters
- b. ovens
- c. toilets

Section B - Instrument Curriculum Subjects

This section list the subjects required in at least 650 hours of each Instrument curriculum, in addition to at least 400 hours in general curriculum subjects. The number in parentheses before each item listed under each subject heading indicates the level of proficiency at which that item shall be taught.

1 Basic Aircraft Instrument Systems

1.1 Pitot Static Systems

- (2) 1.1.1 In relation to pitot static systems, describe the following:
- a. Pitot static leak tests as required in NZ CAR and AC
 - b. Pressure (position)error and its effects on pitot static instruments
 - c. Terms related to pitot static systems
 - d. Construction and operation of pitot, pitot/static probes and static vents (both primary and alternate)
 - e. The layout of a typical pitot static system with particular regard to the identification and placement of components.
 - f. The CAR requirements relating to the testing of instruments in VFR and IFR aircraft.
 - g. Maintenance of pitot static systems.

1.2 Altimeters

- (2) 1.2.1 Describe the following altimeter related conditions/terms:
- a. After effect
 - b. Friction
 - c. Scale error
 - d. Barometric scale error
- (2) 1.2.2 Describe the tests for altimeters as laid down in NZCAR and ACs.
- (2) 1.2.3 Describe the construction, operation and function of typical altitude alerting and reporting systems including encoding altimeters.

1.3 Air Speed Indicators

- (2) 1.3.1 Define the following terms and describe how they are affected by various factors:
- a. Mach number
 - b. Critical mach number
 - c. Maximum mach operation (MMO)
 - d. Sonic
 - e. Subsonic
 - f. Transonic
 - g. Supersonic
 - h. Speed of sound
 - i. Velocity maximum operating (Vmo)
- (2) 1.3.2 Describe the tests for airspeed indicators as laid down in NZCAR.

1.4 Air Data Computers and Servo Altimeters

- (2) 1.4.1 Describe the layout of a typical air data computer system.
- (2) 1.4.2 Describe the fundamental principles of operation of a typical air data computer system.
- (1) 1.4.3 List the inputs and outputs for a typical air data computer.
- (2) 1.4.4 Describe the construction, operation and function of total air temperature probes.

- (2) 1.4.5 Describe the construction, operation and function of servo altimeters.

1.5 Temperature Indicating Systems

- (2) 1.5.1 Calculate the value of an unknown resistor in a balanced Wheatstone bridge circuit.
(2) 1.5.2 Define static air temperature and describe how it is measured.
(2) 1.5.3 Define total air temperature.
(2) 1.5.4 Describe the operation and construction of radiation pyrometer type temperature indicating systems.

1.6 Fuel Flow and Basic Fuel Quantity Indicating Systems

- (2) 1.6.1 Describe the construction and operation of a basic electronic type fuel quantity indicating system including:
a. indicator.
b. transmitter.
c. power supply.
(2) 1.6.2 Describe the effect that changes in temperature have on fuel flow and quantity indicating systems.
(2) 1.6.3 Describe the adjustments that may be performed on fuel flow and quantity indicating systems.
(2) 1.6.4 Describe the operation and purpose of a densimeter installed in an aircraft fuel tank
(2) 1.6.5 Describe mandatory tests and calibrations that are performed on fuel flow and quantity indicating systems.

1.7 DC Synchronous Systems and Engine Speed Indicating Systems

- (2) 1.7.1 Describe the construction and operation of a DC Desyn system
(2) 1.7.2 Describe the construction and operation of a Selsyn system
(2) 1.7.3 Describe the construction and operation of mechanical engine speed indicating systems and their associated components.
(2) 1.7.4 Describe the construction and operation of electrical engine speed indicating systems and their associated components.
(2) 1.7.5 Describe the construction and operation of electronic engine speed indicating systems and their associated components.
(2) 1.7.6 Describe the calibration, adjustment, maintenance and trouble shooting of the above engine speed indicating systems.

1.8 Engine Indicating Systems – Piston and Turbine Engines

- (2) 1.8.1 Identify where the following instrument systems measurements are taken in respect of piston and gas turbine engines as appropriate:
a. AC inductor oil pressure system gauges
b. Ratiometer oil pressure system gauges
c. Engine pressure ratio gauges
d. Engine vibration systems
e. Exhaust gas temperature gauges
f. Manifold pressure gauges
g. Torquemeters
h. Turbine inlet temperature gauges
(2) 1.8.2 Describe the construction and operation of the following engine indicating system gauges:
a. AC inductor oil pressure system gauges
b. Ratiometer oil pressure system gauges
c. Engine pressure ratio gauges
d. Engine vibration systems
e. Exhaust gas temperature gauges

- f. Manifold pressure gauges
 - g. Torquemeters
 - h. Turbine inlet temperature gauges
- (2) 1.8.3 Describe the calibration, adjustment troubleshooting and maintenance of the following gauges:
- a. AC inductor oil pressure system gauges
 - b. Ratiometer oil pressure system gauges
 - c. Engine pressure ratio gauges
 - d. Engine vibration systems
 - e. Exhaust gas temperature gauges
 - f. Manifold pressure gauges
 - g. Torquemeters
 - h. Turbine inlet temperature gauges
- (2) 1.8.4 Define terminology relating to engine indicating systems.

1.9 Head-up Displays

- (2) 1.9.1 Describe the operation of, and the indications provided by a typical head-up display.

1.10 Stall warning

- (2) 1.10.1 Describe the construction and operation the following systems:
- a. Attack sensor
 - b. Stick pusher
 - c. Stick shaker

2 Gyroscopic Instrument Systems

2.1 Gyroscopic Principles

- (2) 2.1.1 In respect to apparent precession, define earth rate and calculate it for various positions on the earth.
- (2) 2.1.2 Describe gimbal lock and the gimbal layout for two and three gimballed gyroscopes.
- (2) 2.1.3 Describe real drift, apparent drift and list the factors that affect them.
- (2) 2.1.4 Describe the precautions associated with the use and handling of gyroscopic instruments.

2.2 Artificial Horizons

- (2) 2.2.1 Describe the construction, operation and function of air driven artificial horizons.
- (2) 2.2.2 Describe the construction, operation and function of electrically driven artificial horizons.
- (2) 2.2.3 Identify and describe information displayed on artificial horizons.
- (2) 2.2.4 Describe the following errors and methods used to overcome them:
- a. Acceleration
 - b. Turn
 - c. Erection
- (2) 2.2.5 Describe the operation of the following erection systems:
- a. Ball type
 - b. Levelling switch
 - c. Pendulous vane
 - d. Torque motor
- (2) 2.2.6 Describe the reasons for fast erection, operation and precautions associated with the use of the system.

2.3 Directional Gyros

- (2) 2.3.1 Describe gimbal rebalancing and gimbal errors.
- (2) 2.3.2 Describe the effect that the above errors have on the operation of the instrument.

3 Cockpit Display and Safety Monitoring Systems

3.1 Electronic Instrument and Information Display Systems

- (2) 3.1.1 Describe construction purpose and operation of the following types of electronic

- instrument display:
 - a. CRT
 - b. LED
 - c. LCD
- (2) 3.1.2 Describe symbol generation and symbol generators in cockpit display systems.
- (2) 3.1.3 Describe a typical electronic centralised aircraft monitoring system (ECAM) with particular regard to the following:
 - a. Basic system operation
 - b. A typical system layout
 - c. Interpretation of information presented on an ECAM system
- (2) 3.1.4 Describe a typical engine indicating and crew alerting system (EICAS) with particular regard to the following:
 - a. Basic system operation
 - b. A typical system layout
 - c. Interpretation of information presented on an ECAM system
- (2) 3.1.5 Describe a typical flight management system (FMS) with particular regard to the following:
 - a. Basic system operation
 - b. A typical system layout
 - c. Interpretation of information presented on an ECAM system
- (2) 3.1.6 Describe a typical electronic horizontal situation indicator (EHSI) with particular regard to the following:
 - a. Basic system operation
 - b. A typical system layout
 - c. Interpretation of information presented on an ECAM system
- (2) 3.1.7 Describe a typical electronic attitude direction indicator (EADI) with particular regard to the following:
 - a. Basic system operation
 - b. A typical system layout
 - c. Interpretation of information presented on an ECAM system
- (2) 3.1.8 Describe a typical head-up display and presentation.
- (2) 3.1.9 Describe a typical moving map and flight tracking system.
- 3.2 Ground Proximity Warning Systems (GPWS)
 - (2) 3.2.1 Describe the legal requirements for the installation of a GPWS in aircraft.
 - (2) 3.2.2 List the inputs required for the operation of a typical ground proximity warning system.
 - (2) 3.2.3 Describe the aircraft systems interfaces for a GPWS.
 - (2) 3.2.4 Describe the indications (visual and aural) provided by the system when a mode 1 to mode 5 (including sub-modes) situation is encountered.
 - (1) 3.2.5 Interpret the graphs associated with each GPWS mode and sub-mode.
 - (2) 3.2.6 Describe the operation of the GPWS when either of the OVERRIDE SWITCHES or the GLIDESLOPE INHIBIT switch is activated.
 - (2) 3.2.7 Describe to block diagram level, the operation of a GPWS.
 - (2) 3.2.8 Describe the differences between an enhanced GPWS (EGPWS) and a normal GPWS.
- 3.3 Flight Data and Cockpit Voice Recording Systems
 - (2) 3.3.1 Describe the following criteria relating to flight data recorders:
 - a. System requirements
 - b. Operation
 - c. Protection
 - d. Installation
 - (1) 3.3.2 List and describe the relevance of the following mandatory parameters that must be monitored on a FDR system:
 - a. Airspeed

- b. Magnetic heading
 - c. Press to transmit (radio transceiver/event marker)
 - d. Pressure altitude
 - e. Time
 - f. Vertical acceleration
- (2) 3.3.3 Describe the following methods of recording information:
- a. Trace recording
 - b. Electromagnetic recording
 - c. Semiconductor
- (2) 3.3.4 Describe the purpose and function of the following system components:
- a. Encoding panel
 - b. Signal conditioning unit
 - c. Data acquisition unit
- (2) 3.3.5 Describe how data is recovered, analysed and verified from FDR and CVR systems.
- (2) 3.3.6 Describe the location requirements for a flight data and cockpit voice recording system.
- (2) 3.3.7 Describe how FDR and CVR systems interface with other systems on an aircraft.

3.4 Vibration Measurement

- (1) 3.4.1 Describe the following criteria relating to on-board vibration monitoring and warning systems:
- a. Sensing devices
 - b. Signal conditioning and process
 - c. Display and indication
 - d. Alarm levels
 - e. Warning
 - f. Helicopter vibration indicating systems (HUMS)

4 Fixed Wing Autopilots and Flight Directors

4.1 Definitions, Terminology and Power Operated Control Surfaces

- (2) 4.1.1 Define the following terms associated with the theory of operation and use of automatic flight control and flight director systems:
- a. Authority
 - b. Capture
 - c. Couple
 - d. Decision height
 - e. Engaged
 - f. Gain
 - g. Single axis auto pilot
 - h. Multi axis autopilot
 - i. Wing leveller
 - j. Auto-stabiliser
 - k. Crosswind effect
 - l. Washout
 - m. Cone of confusion
 - n. Versine generation and application
- (2) 4.1.2 Describe and identify power assisted and power operated flight controls.
- (2) 4.1.3 Describe the purpose and operation of “artificial feel” systems.
- (2) 4.1.4 Describe the “q feel” method of achieving artificial feel and the factors that affect its operation.

4.2 Fundamentals of Automatic Control

- (2) 4.2.1 Describe the basic operation of an automatic flight control system and define the

following:

- a. Inner loop stabilization
 - b. Outer loop control
- (2) 4.2.2 Describe the operation of a typical interlock circuit.
- (2) 4.2.3 From given data troubleshoot a typical autopilot engage circuit.
- (2) 4.2.4 Describe the operation and typical layout of a single axis (roll) AFCS.
- (2) 4.2.5 Describe the purpose, advantages and disadvantages of control signal limiting and gain adjustment.
- (2) 4.2.6 Describe the difference between power-assisted and power-operated flight controls.
- (2) 4.2.7 Describe the methods by which roll and roll/yaw error signals are sensed in rate, displacement and inclined rate gyros.

4.3 Attitude Change Signal Detection

- (2) 4.3.1 Describe the operation of an autopilot system in providing for co-ordinated turns.
- (2) 4.3.2 Describe the purpose and operation of versine generators and dynamic vertical sensors.
- (2) 4.3.3 Describe the operation of moving vane and E and I bar sensors.

4.4 Command Signal Processing/Turbulence Penetration

- (2) 4.4.1 Describe the methods by which attitude changes are detected in roll, pitch and yaw.
- (2) 4.4.2 Describe the purpose of, and methods of achieving the following signal processes within an autopilot system:
- a. Gain and adaptive control
 - b. Limiting
 - c. Synchronization
- (2) 4.4.3 Describe the purpose, operation and layout of a control wheel steering system.
- (1) 4.4.4 State the purposes and describe the operation of trim indicators.
- (2) 4.4.5 Describe the effects of turbulence on the operation of the flight control system and describe how they are reduced or eliminated.

4.5. Modes of Operation – Roll, Pitch and Yaw Channels

- (2) 4.5.1 Describe the method of selecting and the operation of the following roll channel modes:
- a. Basic stabilization
 - b. Heading hold
 - c. Turn command
 - d. Very high frequency omni range (VOR)/localiser (LOC)
- (3) 4.5.2 From given information, diagnose defects within a roll channel.
- (2) 4.5.3 Describe the method of selecting and the operation of an autopilot in the following pitch channel modes:
- a. Altitude hold
 - b. Basic stabilization
 - c. Pitch command
 - d. Vertical speed
 - e. Airspeed
 - f. Mach hold
- (3) 4.5.4 From given information diagnose defects within a pitch channel.
- (2) 4.5.5 Describe the operation of the yaw channel.

4.6 Servomotors

- (2) 4.6.1 Describe the construction and operation of the following types of servomotor:
- a. Duplex
 - b. Electrohydraulic
 - c. Electromechanical
 - d. Electropneumatic

- (2) 4.6.2 Specify the reasons for, and be able to describe the various methods of torque limiting.
- (2) 4.6.3 Describe the differences between series and parallel-connected servomotors.

4.7 Automatic Trim Control

- (2) 4.7.1 State the reasons for, and describe the operation of, automatic pitch trim systems.
- (2) 4.7.2 Define the function of flap compensation systems.
- (2) 4.7.3 Describe how flap compensation is achieved.
- (2) 4.5.4 Describe the purpose and operation of the mach trim system.
- (2) 4.5.5 Describe the operation and function of alpha trim.
- (2) 4.5.6 Describe the operation and function of centre or gravity trimmers.

4.8 Yaw Damping

- (2) 4.8.1 Describe the function of yaw damper systems.
- (2) 4.8.2 Describe the layout of components in a yaw damper system.
- (2) 4.8.3 Describe the operation of a yaw damper system.
- (2) 4.8.4 Describe the relationship of a yaw damper system (parallel and series connected) with an autopilot. (including autopilot interlocks).
- (2) 4.8.5 Describe the phenomenon of Dutch Roll.
- (2) 4.8.6 Describe aileron and rudder control interaction during turns.

4.9 Autopilot – Navigation Aids Interface

- (2) 4.9.1 Describe the operation and function of the following navigation system inputs and their effects and interface with an autopilot:
 - a. VOR
 - b. LOC
 - c. Glideslope
 - d. Doppler
 - e. Compass systems
 - f. Inertial navigation
- (2) 4.9.2 With regard to an instrument landing system (ILS) be able to:
 - a. describe crosswind compensation
 - b. describe the changes which occur within and autopilot system when operating in ILS
 - c. interpret information displayed by course deviation bars, glideslope pointers, marker lights and system status flags
 - d. state the approximate Beamwidth and angle of inclination of glideslope and localiser beams
 - e. state the position of localiser, glideslope and marker transmitters in relation to the runway
 - f. state the sequence in which glideslope and localiser signals are captured
- (2) 4.9.3 Describe the composition of a VOR signal and describe how the airborne system identifies the station and calculates the bearing to that station,
- (2) 4.9.4 Describe the cone of confusion and describe how an indicator is affected during a flight in this region.
- (1) 4.9.5 List the factors that affect the indications on a VOR.
- (2) 4.9.6 Describe the purpose of an overstation sensor circuit.
- (1) 4.9.7 Interpret VOR displayed information on a horizontal situation indicator (HIS)

4.10 Flight Directors

- (2) 4.10.1 Describe the construction and operation of an attitude direction indicator (ADI).
- (2) 4.10.2 Describe the construction and operation of a horizontal situation indicator (HIS).
- (1) 4.10.3 Interpret the presentation of information provided on an ADI and HIS when the system is operating in various modes.

- (2) 4.10.4 Describe the layout and operation of a typical flight director system operating in various modes – coupled and uncoupled.
- (2) 4.10.5 From information provided, indicate signal flows (to block and line level) and identify causes of malfunctions.
- (2) 4.10.6 Describe the use of maintenance data to specification ATA 100 or 2100.

4.11 Flight Director Displays and Cathode Ray Tubes

- (2) 4.11.1 In relation to electronic flight instrument systems (EFIS) and using the listed references:
 - a. Describe basic system operation
 - b. Describe a typical system layout
 - c. Interpret information presented

4.12 Automatic Landing Systems

- (2) 4.12.1 With regards to an automatic landing system (ILS), describe the following:
 - a. System operation including inputs and outputs
 - b. Category of operation
 - c. Redundancy requirements
- (2) 4.12.2 Define the following terms:
 - a. Fail passive operation
 - b. Fail operation
 - c. Runway visual range

4.13 Autothrottle Systems

- (2) 4.13.1 Describe the operation of the Autothrottle system when operating in the following modes:
 - a. Takeoff
 - b. Speed control
 - c. Go-round
- (2) 4.13.2 Describe the interrelationship of the Autothrottle system with the AFCS and FMC

4.14 Fly By Wire (FBW) Control Systems

- (2) 4.14.1 Describe the advantages of FBW over the more conventional systems with particular regard to the following criteria:
 - a. Weight saving
 - b. Reduced maintenance
 - c. Gust load alleviation
 - d. Automatic manoeuvre envelope protection
 - e. Improved handling
 - f. Fuel saving
- (2) 4.14.2 Describe the following associated terms:
 - a. Active control
 - b. Cross voting
 - c. System architecture
 - d. Force gradient
- (2) 4.14.3 Describe how provision is made for “alternate” operation and how this improves redundancy.
- (2) 4.14.4 Describe the use of “Control Laws” in providing roll and pitch control.
- (2) 4.14.5 Describe the operation of “side stick” and “throttle levers”.

5 Helicopter Autopilots and Flight Directors

5.1 Fundamentals of Rotary Wing Auto Flight Control Systems (AFCS)

- (2) 5.1.1 Describe the following terms and their interaction with each other:

- a. Air Density
 - b. Angle of attack
 - c. Axis of rotation or shaft axis
 - d. Blade loading
 - e. Centrifugal force
 - f. Collective pitch
 - g. Coning angle
 - h. Cyclic pitch
 - i. Feathering
 - j. Lift thrust vector
 - k. Pitch angle
 - l. Relative airflow
 - m. Thrust or vertical axis
 - n. Tip path plane
- (2) 5.1.2 Describe the relationship between the following:
- a. Lift
 - b. Thrust
 - c. Weight
 - d. Drag
 - e. CG Range
- (2) 5.1.3 Describe the following terms and the relationship between each:
- a. Vortex ring state
 - b. Power settling
 - c. Over pitching
- (2) 5.1.4 Describe torque reaction and its effect on directional control of the helicopter.
- (2) 5.1.5 Describe gyroscopic precession and the use of this effect in providing control of the main rotor disc for forward, sideways and rearward flight.
- (2) 5.1.6 Describe dissymmetry of lift and its control.
- (2) 5.1.7 Describe coriolis effect and the features (such as lead/lag hinges and underslung rotor) used to relieve the stresses it creates.
- (2) 5.1.8 Describe ground effect and translational lift and their relationship.
- (2) 5.1.9 Describe translating tendency and its correction by mast offset and cyclic rigging.
- (2) 5.1.10 Describe the reason for blade tip stall and why it results in nose pitch up of the helicopter.

5.2 Helicopter Stability

- (2) 5.2.1 Describe static and dynamic stability and why most helicopters are considered to be statically stable and dynamically unstable.
- (2) 5.2.2 Describe how the inherent dynamic instability is overcome by the use of the following design methods:
- a. Stabilizer bar
 - b. Offset flapping hinges
 - c. Delta three hinges
- (2) 5.2.3 Describe ground resonance, its causes and remedial action to be taken should it occur

5.3 Roll and Pitch Control

- (2) 5.3.1 Describe the layout, purpose of components and the operation of a basic helicopter flight control system.
- (2) 5.3.2 Describe the operation of the pitch and roll channels.

5.4 Helicopter Yaw Control and Trim

- (2) 5.4.1 Describe the operation purpose and layout of yaw channel.

(2) 5.4.2 Describe the purpose and operation of yaw and gravity trim systems.

5.5 System Operation

(2) 5.5.1 Describe the operation of the helicopter automatic flight control system when operating in the following:

- a. Collective or power axis mode
- b. Coupled or instrument flight rules (IFR)
- c. Stability augmentation system (SAS)

(3) 5.5.2 Diagnose faults in helicopter autopilot systems using given data and diagrams.

5.6 Autopilot and Navigation Aids Interface

(3) 5.6.1 Explain the basic operation of a radio navigation system installed in a helicopter and its relationship with an auto flight system, with respect to the following:

- a. Glide slope
- b. Localizer
- c. Marker beacons
- d. VOR
- e. Instrument landing system (ILS)

5.7 Helicopter Flight Director Systems

(2) 5.7.1 Describe the construction and operation of an attitude direction indicator (ADI).

(2) 5.7.2 Describe the construction and operation of a horizontal situation indicator (HSI).

(2) 5.7.3 Interpret the presentation of information provided on an ADI and HIS when the system is operating in various modes.

(2) 5.7.4 Describe the layout and operation of a typical flight director system operating in various modes – coupled and uncoupled.

(2) 5.7.5 From information provided, indicate signal flows (to block and line level) and identify causes of malfunctions.

(3) 5.7.6 Evaluate maintenance data to specification ATA 100 or ATA 2100.

5.8 Flight Director Displays and Cathode Ray Tubes

(2) 5.8.1 In relation to electronic flight instrument systems (EFIS) and using the listed references:

- a. Describe basic system operation
- b. Describe a typical system layout
- c. Interpret information presented

6 Remote Indicating Compass Systems

6.1 System Architecture and Terminology

(2) 6.1.1 Describe the advantages of remote reading compasses over direct reading compasses.

(2) 6.1.2 In relation to remote reading compasses define and describe the following terms:

- a. Null
- b. Nutation
- c. Slaved
- d. Synchronised

(2) 6.1.3 Describe the operation of the flux valve detector element.

(1) 6.1.4 State the reasons why permalloy is used in the construction of a flux valves.

(2) 6.1.5 Describe the advantages of permalloy over iron in regard to the following factors:

- a. Permeability
- b. Saturation point
- c. Hysteresis curve
- d. Remanance
- e. Coercive force

6.2 Flux Valves

- (2) 6.2.1 Describe the construction, location and operation of a flux valve in determining the horizontal component of the earth's magnetic field.

6.3 RR Compass System Operation .

- (2) 6.3.1 Describe the construction and layout of a typical remote indicating compass system to a block diagram level.
- (2) 6.3.2 Describe the operation of a typical system in slaved and DG or free modes of operation.
- (2) 6.3.3 Describe synchronisation, how a system is synchronised and indications provided when a system, is either in or out of synchronisation.
- (2) 6.3.4 Describe the following errors:
- a. One cycle
 - b. Two cycle
 - c. Transmission
 - d. Coriolis
- (2) 6.3.5 Describe the effects that the above errors have on the indication of a compass.
- (2) 6.3.6 Describe methods used to overcome each of the above errors in a compass system.
- (2) 6.3.7 Describe the purpose and basic operation of the "spindown" brake system incorporated in some directional gyros (DG) elements of a remote reading compass system.
- (2) 6.3.8 Describe the problems associated with navigating over the polar regions.
- (2) 6.3.9 Describe the purpose and operation of the hemisphere switch and latitude selector in overcoming problems associated with navigation over polar regions.
- (2) 6.3.10 Describe the construction and operation of a typical heading indicator.
- (1) 6.3.11 Interpret information displayed on a heading indicator and describe the use of typical controls.
- (2) 6.3.12 Describe how deviation is removed using either mechanical or electrical type corrector
- (3) 6.3.13 Diagnose faults in a typical RR compass system.

6.4 Attitude Heading Reference System (AHRS)

- (2) 6.4.1 Describe the advantages of an AHRS over a normal remote reading compass system.
- (2) 6.4.2 Describe the sensors used and the operation of the system in providing a stable magnetic heading.
- (1) 6.4.3 List the outputs available and the systems that utilise the outputs from an AHRS system
- (2) 6.4.4 Describe the importance of a valid TAS signal in relation to the operation of the AHRS.
- (2) 6.4.5 Describe how a compass swing is carried out on an AHRS.

7 Inertial Navigation and Inertial Reference Systems

7.1 Terminology

- (2) 7.1.1 Define the following and describe their relevance to inertial system:
- a. Align
 - b. Area azimuth
 - c. Bearing (true, magnetic and relative)
 - d. Co-ordinate system
 - e. Course
 - f. Cross track
 - g. Cross track error
 - h. Crosscouple
 - i. Dead reckoning navigation
 - j. Drift
 - k. Drift angle
 - l. Elevation

- m. Great circle
- n. Grid
- o. Ground speed
- p. Gyrocompass
- q. Heading (true and magnetic)
- r. Latitude
- s. Local vertical
- t. Longitude
- u. Orthogonal
- v. Pendulum
- w. Present position
- x. Polar co-ordinates
- y. Rhumb line
- z. Track
- aa. Track angle error
- bb. Waypoint

7.2 Inertial navigation System (INS) Fundamentals and System Components

- (2) 7.2.1 Define Newton's second law and describe how it relates to inertial navigation.
- (2) 7.2.2 Define the following terms:
 - a. Inertia
 - b. Velocity
 - c. Acceleration
 - d. Displacement
- (2) 7.2.3 Describe how velocity and displacement vary with time.
- (2) 7.2.4 Describe the basic construction, operation and function of mechanical gyroscopes and accelerometers used in a typical INS system.
- (2) 7.2.5 Describe the basic construction and layout of a typical platform.
- (2) 7.2.6 Describe the following errors and how they are eliminated from an INS:
 - a. Gimbal lock
 - b. Random drift
 - c. Crosscouple

7.3 Reference System Stabilisation

- (2) 7.3.1 Describe the operation of the following items in maintaining the stable element level:
 - a. Gyroscopes
 - b. Accelerometers
 - c. Gimbal system.
 - d. Azimuth resolver
- (2) 7.3.2 Describe the method by which aircraft heading and attitude is measured.
- (2) 7.3.3 Describe the basic operation of a wander azimuth inertial system.
- (2) 7.3.4 Describe its advantage over a typical north pointing system.

7.4 Accelerometer Corrections

- (2) 7.4.1 Describe centripetal and coriolis errors.
- (2) 7.4.2 Describe how the above errors affect the output from the accelerometers.
- (2) 7.4.3 Describe the factors that affect the above errors.
- (2) 7.4.4 Describe how these errors are overcome in a typical system.

7.5 Operational Platforms

- (2) 7.5.1 Describe earth rate and transport rate and how they affect the orientation of the stable element.

- (2) 7.5.2 State the factors which affect them and describe how they are compensated for in the overall operation of the system.
- (2) 7.5.3 Describe the Schuler pendulum and list the factors that affect it.
- (2) 7.5.4 Describe how the Schuler pendulum affects the operation of an INS system and how the platform is Schuler tuned.

7.6 Platform Alignment

- (2) 7.6.1 Describe the operation of an inertial navigation system during the following modes of self-alignment:
 - a. Rough alignment (caging)
 - b. Fine alignment (levelling)
 - c. Gyrocompassing
- (2) 7.6.2 Describe the difference in the alignment between a typical north pointing system and an azimuth wander system.

7.7 System Integration

- (2) 7.7.1 Identify and state the purposes of the components in a typical INS system.
- (1) 7.7.2 List the inputs to and output available from an INS.
- (2) 7.7.3 Describe the procedure of aligning an INS before flight and indications provided during flight.

7.8 Strapdown Systems

- (2) 7.8.1 Describe the construction and operation of a strapdown inertial navigation system.
- (1) 7.8.2 State the differences between strapdown and conventional gimballed systems.
- (2) 7.8.3 Describe the differences between INS and inertial reference system (IRS)

7.9 Laser Gyros

- (2) 7.9.1 Describe the construction, operation, and readout technique of a typical laser gyro.
- (2) 7.9.2 Describe the limitations and methods of improving the limitations of laser gyros.

7.10 Inertial Reference Systems

- (1) 7.10.1 List the components which comprise a typical inertial reference system.
- (2) 7.10.2 Describe the operation, function and construction of a typical IRS.
- (2) 7.10.3 Describe the method by which information is passed between system components.
- (2) 7.10.4 Describe how redundancy is achieved in an IRS. (Various data buses)
- (2) 7.10.5 Describe the method by which true heading is converted in to magnetic heading.
- (1) 7.10.6 List the inputs required for system operation and information available from the system.
- (2) 7.10.7 In relation to maintenance BITE and failure monitoring, describe the limitations, indications provided, conditions and procedures for obtaining maintenance data.
- (2) 7.10.8 Describe the operation and identify the indications provided by the system during the various modes of operation.

8 Oxygen Systems

8.1 General

- (2) 8.1.1 Describe the gas composition of the atmosphere.
- (2) 8.1.2 Define hypoxia, anoxia, hyperventilation and carbon monoxide poisoning and the symptoms applying to them.
- (2) 8.1.3 Describe the properties and characteristics of oxygen.

8.2 Forms of Oxygen

- (1) 8.2.1 Describe the following forms of forms of oxygen as used in aviation:
 - a. Gaseous

- b. Liquid
 - c. Chemical or solid state
 - d. Mechanically separated
- (2) 8.2.2 Describe the differences between aviation breathing oxygen and oxygen available for commercial or medical use.

8.3 Oxygen System and Associated Components

- (2) 8.3.1 Describe the purpose, construction and operation of the following oxygen system components:
- a. High and low pressure cylinders
 - b. Manual continuous flow regulators
 - c. Automatic continuous flow regulators
 - d. Demand regulators
 - e. Diluter demand regulators
 - f. Pressure demand regulators
 - g. Airflow metering aneroid
 - h. Continuous flow masks, re breather type masks or bags
 - i. Demand type masks
 - j. Filler valves
 - k. Pressure gauges
 - l. Continuous flow couplings
 - m. Flow indicators
 - n. Oxygen plumbing including materials used for rigid pipes and fittings
 - o. Smoke protection equipment
 - p. Passenger service units
 - q. Charging valves
 - r. Quantity and pressure indicators

8.4 Continuous Flow and Pressure Demand Systems

- (2) 8.4.1 Describe the construction, layout and purpose of continuous flow and pressure demand oxygen systems.
- (2) 8.4.2 Describe how flow testing is carried out for each system.

8.5 Liquid Oxygen (LOX) Systems

- (1) 8.5.1 Describe the construction and layout of a liquid oxygen system with particular regard to the following components:
- a. Relief valves
 - b. LOX container
 - c. Check valves
 - d. Filter valves
 - e. Build up valve
 - f. Coils
 - g. Pressure closing valves

8.6 Chemical Oxygen Systems

- (2) 8.6.1 Describe the construction, layout and operation of a typical chemical oxygen system with regard to the following criteria:
- a. Candle construction
 - b. Performance characteristics
 - c. Precautions

8.7 Portable Oxygen Equipment

- (2) 8.7.1 Describe the construction, operation, performance limitations and uses of portable

oxygen equipment.

- (2) 8.7.2 Describe how the contents of portable oxygen cylinders are checked.

8.8 System Advantages

- (2) 8.8.1 Describe the features, advantages and disadvantages of solid state versus high-pressure gaseous oxygen systems.
- (2) 8.8.2 Describe the type of system most commonly used for crew oxygen.

8.9 Oxygen System Servicing and Precautions

- (2) 8.9.1 Describe oxygen system servicing with particular regard to the following factors:
- a. Leak testing of gaseous oxygen systems and the materials that may be used
 - b. Used graphs or other technical data to establish leak rates against system gauge pressure
 - c. Cleaning system components
 - d. Draining of the system
 - e. Purging the system and the purging gasses normally used
 - f. Filling the system
 - g. Pressure/ temperature correction
 - h. Filling a LOX system
 - i. Inspecting masks and hoses
 - j. Replacing tubing, valves and fittings
 - k. Clearance between oxygen lines and electrical wiring
 - l. Testing and lifing of cylinders and other components
 - m. Typical system inspection and maintenance procedures
 - n. Maintenance of a typical oxygen dispensing trolley
 - o. Breathing oxygen cylinder identification (colour and lettering)
 - p. Flaring and the types of flare used for rigid oxygen system lines
 - q. Typical charge pressures for the various types of oxygen cylinder
 - r. Colour code identification of oxygen system lines
 - s. Testing of oxygen systems
 - t. Use and maintenance of oxygen test equipment
- (2) 8.9.2 Describe precautions to be taken to prevent oxygen fires and explosions.

Section C - Radio Curriculum Subjects

This section list the subjects required in at least 650 hours of each radio curriculum, in addition to at least 400 hours in general curriculum subjects. The number in parentheses before each item listed under each subject heading indicates the level of proficiency at which that item shall be taught.

1 Radio Theory

1.1 Radio Wave Propagation

- (2) 1.1.1 Identify the bands of the frequency spectrum and be able to describe their use and propagation characteristics.
- (2) 1.1.2 Describe the properties of the ionosphere and troposphere.
- (2) 1.1.3 Describe the following factors relating to radio waves:
- a. Radio frequency
 - b. Spectrum
 - c. Bands
 - d. Uses
 - e. Propagation characteristics
- (2) 1.1.4 Describe the following criteria:
- a. Causes and effects of absorption
 - b. Scatter

- c. Reflection
 - d. Refraction
 - e. Fading
 - f. Cyclic and irregular variations
 - g. Critical Frequency
 - h. Maximum useable frequency
 - i. Temperature inversion
 - j. Ducting
- (2) 1.1.5 Describe the relationship between velocity of propagation, frequency and wavelength.
- (2) 1.1.6 Explain the following terms:
- a. Ground wave
 - b. Sky wave
 - c. Surface wave
 - d. Space wave
 - e. Radiation angle
 - f. Skip distance
 - g. Diffraction
 - h. Field Strength
 - i. Doppler effect
- (2) 1.1.7 Describe the effect that water and various land surfaces have on radio wave propagation.

2 Fundamentals of Antennas

2.1 Principles of Antennas

- (2) 2.1.1 Describe operation, construction, and radiation field patterns and typical uses of the following antenna types:
- a. Dipole (half wave length and folded)
 - b. Marconi
 - c. Long wire
 - d. Yagi
 - e. Parabolic
 - f. Loop
- (3) 2.1.2 Describe the voltage and current distribution along antennae of various lengths.
- (3) 2.1.3 Describe how the electrical length of an antenna may be altered.
- (2) 2.1.4 Describe ground planes, their characteristics and uses.
- (2) 2.1.5 Describe the following terms relating to antennae:
- a. Antenna impedance
 - b. Radiation resistance
 - c. Radiation power
 - d. Polarization
 - e. Effective height
 - f. Reciprocity
 - g. Gain
 - h. Directivity
 - i. Bandwidth
 - j. Beamwidth
 - k. Lobes
 - l. Isotropic radiator
- (2) 2.1.6 Describe the characteristics, advantages, disadvantages and typical aircraft locations of the following antennas:
- a. Blade
 - b. Notch
 - c. Probe

- d. Whip
- e. Wire
- f. Parabolic
- g. Flat plate
- h. Horn

(2) 2.1.7 Identify the particular communications system that each of the above antennas would be associated with.

3 Radio Circuit Analysis

3.1 Radio Circuit Principles

(2) 3.1.1 Describe the characteristics, and applications of series and parallel resonant circuits.

4 Radio Transmission Lines

4.1 Theory of Radio Transmission Lines

(2) 4.1.1 Describe the construction and characteristics of the following types of transmission line:

- a. Parallel wire
- b. Co-axial cable
- c. Wave guide
- d. Twisted pair

(2) 4.1.2 Define the following terms:

- a. Characteristic impedance
- b. Reflected power
- c. Forward power
- d. Standing wave ratio
- e. Balanced line
- f. Unbalanced line
- g. Velocity factor

(3) 4.1.3 Explain the effect on a transmission line when it is terminated in an:

- a. impedance equal to its characteristic impedance.
- b. open circuit.
- c. short circuit.

(3) 4.1.4 Explain how a transmission line can be used as a matching device or filter.

(3) 4.1.5 Explain how transmission lines can be used to feed various types of antenna.

5 Radio Receivers

5.1 Principles of Receivers

(2) 5.1.1 Describe the characteristics of following types of radio signal:

- a. Amplitude modulation
- b. Frequency modulation

(3) 5.1.2 Explain the sources of, and the steps taken to reduce both random and non-random noise.

(2) 5.1.3 Describe the following terms:

- a. Sensitivity
- b. Selectivity
- c. Stage gain
- d. Bandwidth
- e. Resonance
- f. Image rejection
- g. Adjacent channel rejection
- h. Noise factor
- i. Distortion

(2) 5.1.4 Explain the operation, characteristics and construction of:

- a. headphones

- b. speakers
- c. microphones
- (2) 5.1.5 Identify and be able to explain, both in the time and frequency domain, the following signals and methods used to demodulate them:
 - a. Amplitude modulated (AM)
 - b. Frequency modulated (FM)
 - c. Single sideband
 - d. Continuous wave
- (2) 5.1.6 Describe the function of the following:
 - a. Automatic frequency control
 - b. Clarifiers
 - c. Limiters
 - d. Noise limiters
 - e. Squelch control

6 Radio Transmitters

6.1 Principles of Transmitters

- (2) 6.1.1 Identify, describe and state the characteristics of the stages that comprise amplitude and frequency modulated transmitters.
- (2) 6.1.2 Describe the various types of modulator used to generate the following types of signal:
 - a. Amplitude modulated
 - b. Frequency modulated
 - c. Single sideband (SSB)
- (2) 6.1.3 Define the following terms:
 - a. Bandwidth
 - b. Modulation index
 - c. Clipping
 - d. Harmonics
 - e. High level modulation
 - f. Low level modulation
 - g. Frequency stability
 - h. Output power
 - i. Parasitic oscillation
 - j. Neutralisation
- (2) 6.1.4 Explain why a receiver is muted during transmission.
- (2) 6.1.5 Describe the classes of operation of transmitter power output stages.
- (2) 6.1.6 Describe the operation and limitations of regulated power supplies and switched mode power supplies, (DC to DC converter).

7 Communication Systems - General

7.1 Basic Communication Theory

- (2) 7.1.1 Identify the frequency bands and channel spacing allocated to the following airborne communications systems:
 - a. High frequency (HF)
 - b. Very high frequency (VHF)
 - c. Ultra high frequency UHF
 - d. Satellite (SATCOM)
- (3) 7.1.2 Detail the following factors for the above airborne communications systems:
 - a. Power output
 - b. Sensitivity
 - c. Stability
- (2) 7.1.3 In relation to HF, VHF and UHF airborne communications systems:

- a. Describe the methods of propagation and ranges expected both day and night.
 - b. Using given data calculate approximate ranges. (line of sight)
- (2) 7.1.4 Describe the purpose and principles of operation of a selective calling (Selcal) system for HF and VHF communications.

8 High Frequency (HF) Communication Systems

8.1 Theory of High Frequency (HF) Communication Systems

- (2) 8.1.1 Describe the principles of operation of a typical HF transceiver with particular regard to the following factors:
- a. Components comprising an airborne HF system
 - b. Type of modulation
 - c. Ground wave attenuation
 - d. Selective fading
 - e. ARINC 559A
 - f. Typical aircraft locations of HF hardware
 - g. Audio system interface
 - h. Power supplies
 - i. Typical data display on front cover
 - j. Antenna coupling via an ATU
 - k. Closed loop control
 - l. ATU Pressurisation
 - m. Antenna lightning protection methods
 - n. Precipitation dissipation methods
 - o. Trailing wire antenna
 - p. Fixed antenna couplings for light aircraft systems
 - q. Antenna selections for low and high speed aircraft
 - r. Composition, construction and corrosion protection of wire antennae
 - s. Moisture protection in antennae including water drains
 - t. Antenna weak links and shear points
 - u. Antenna tethering points and tethering hardware
 - v. Notch antenna
 - w. Notch inductance
 - x. Signal injection
 - y. Airframe radiation principles
 - z. Probe antenna principles
 - aa. Probe antenna location
 - bb. Functions on an interlock unit for dual installations
 - cc. Controllers
 - dd. Mode selection
 - ee. Data links
 - ff. Frequency selectors
 - gg. Transmitter keying
 - hh. Squelch control
 - ii. Audio volume control
 - jj. Functions of a clarifier
- (2) 8.1.2 Describe the purpose of an antenna tuning unit.
- (2) 8.1.3 Describe to block diagram level the basic theory of operation of an antenna tuning unit (ATU)
- (2) 8.1.4 Describe the differences between and preset and automatic antenna tuning units and state the advantages and disadvantages of each.
- (2) 8.1.5 Describe to block diagram level the components in typical HF AM SSB transceiver.
- (2) 8.1.6 Describe the principles of operation of a typical HF transceiver with particular emphasis

on the following:

- a. Amplitude modulated transmission
- b. Single side band transmission
- c. Amplitude modulated reception
- d. Single sideband reception
- e. Antenna tuning unit

8.2 Maintenance and Testing of HF Communications Systems

(2) 8.2.1 Describe typical maintenance activities performed on an HF radio system including the following:

- a. Antenna inspection relating to tensioning units and mounting points
- b. Spark gaps
- c. Functional testing and communication with other stations
- d. Safety precautions
- e. Inadvertent transmission following a frequency change
- f. Hardware security and bonding
- g. VSWR testing

9 VHF and UHF Communication Systems

9.1 Theory of Very High Frequency (VHF) Communication Systems

(2) 9.1.1 Describe the following factors relating to a VHF transceiver:

- a. Meaning of single or double conversion super heterodyne
- b. Components comprising a single airborne VHF system
- c. Transmitter modulation
- d. Number of channels available
- e. Single channel simplex (s.c.s) and double channel simplex (d.c.s)
- f. Multiple VHF systems in large aircraft
- g. ARINC 566 with satcom
- h. Typical aircraft locations of VHF hardware
- i. Audio system interface
- j. Power supplies
- k. Typical data display on front cover
- l. VHF antenna types and position on the aircraft
- m. Antenna polarisation
- n. In-use and standby frequencies
- o. Automatic test equipment facility

(2) 9.1.2 Describe to block diagram level the principles of operation of a typical VHF transceiver.

(2) 9.1.3 Describe the VHF system controls, their operation and limitations including the following:

- a. Frequency control
- b. Volume control
- c. Squelch control
- d. Mode selector control
- e. On-off switch
- f. Receiver selectivity switch

(2) 9.1.4 Describe to block diagram level the principles of operation of an ARINC Communications Addressing and Reporting System (ACARS).

(2) 9.1.5 Describe the following characteristics, functions and terms relating to an ARINC 566 airborne VHF communications and satcom:

- a. Channel spacing
- b. Receiver muting
- c. Channel selection

- d. Channelling time
- e. Receiver sensitivity
- f. Selectivity
- g. Cross modulation
- h. Undesired responses
- i. Gain
- j. Frequency response
- k. Harmonic distortion
- l. AGC
- m. Transmitter stability
- n. Power output
- o. Sidetone
- p. Microphone input
- q. Antenna vertically polarised and omnidirectional
- r. Antenna impedance

9.2 Maintenance and Testing of VHF Communications Systems

- (2) 9.2.1 Describe typical maintenance activities performed on an airborne VHF communications system including the following:
 - a. Antenna inspection including mounting points and ground planes as appropriate.
 - b. Functional testing and communication with other stations
 - c. Precautions especially during refuelling
 - d. Use of an emergency frequency
 - e. Hardware security and bonding
 - f. VSWR testing
 - g. A typical ramp test
- (2) 9.2.2 Describe the types and sources of radio interference associated with VHF systems and describe methods of eliminating interference.

9.3 Ultra High Frequency (UHF) Communications

- (2) 9.3.1 Describe to block diagram level, the principle of operation of a typical UHF transceiver.

9.4 Satellite Communications

- (2) 9.4.1 Describe to block diagram level, the principle of operation of a typical SATCOM transceiver.

10 Emergency Locator Transmitters (ELT)

10.1 Theory and Operation of Emergency Locator Transmitters

- (2) 10.1.1 Describe the procedure for testing an ELT.
- (2) 10.1.2 Describe battery life limitations as they pertain to an activated or unactivated ELT.
- (1) 10.1.3 State the safety precautions to be observed when working with ELTs with particular regard to spurious or unintentional transmissions.

11 Audio Systems

11.1 Audio Integration and Interphone

- (2) 11.1.1 Describe the characteristics of sound including the upper and lower hearing limits.
- (2) 11.1.2 Describe the use of matching transformers in audio systems.
- (2) 11.1.3 From given data, calculate the impedance and turns ratio of matching transformers.
- (2) 11.1.4 Describe the uses and characteristics of the following:
 - a. Isolation amplifiers
 - b. Attenuators
 - c. Distribution networks
 - d. Side tone

- e. Muting
- f. Insertion loss
- (2) 11.1.5 Describe the purpose of the following audio integration and interphone systems:
 - a. Public address (PA)
 - b. Flight interphone
 - c. Service interphone
 - d. Cabin interphone
- (2) 11.1.6 Describe the function of operating controls of integration and interphone systems.
- (2) 11.1.7 Describe to block diagram level, the theory of operation of audio integration and interphone systems.
- (2) 11.1.8 With respect to audio integration and interphone systems, describe the practices and procedures for the following:
 - a. Fault diagnosis and trouble shooting
 - b. Installation
 - c. Maintenance and testing
- (2) 11.1.9 Identify the interface protocols for the following passenger entertainment systems:
 - a. Video
 - b. Audio
 - c. Interactive
- (2) 11.1.10 Describe typical performance levels and specifications expected from an aircraft audio system.
- (2) 11.1.11 Describe how noise and other undesirable influences are eliminated from an aircraft audio system.
- (2) 11.1.12 Describe how audio systems interface with other aircraft systems.
- (2) 11.1.13 Describe how the life and condition of battery power supplies associated with audio systems is monitored and controlled.

11.2 Microphones

- (2) 11.2.1 In relation to microphones describe the following:
 - a. Output levels
 - b. Frequency response
 - c. Directional properties

12 Cockpit Voice Recorder (CVR) Systems

12.1 Theory of Cockpit Voice Recorder (CVR) Systems

- (2) 12.1.1 Describe the purpose and requirements of a cockpit voice recorder system.
- (2) 12.1.2 Describe the performance levels expected and the specifications of a typical CVR system.
- (2) 12.1.3 Describe to block diagram level, the theory of operation of a cockpit voice recorder.
- (2) 12.1.4 Describe typical locations for cockpit microphones.
- (2) 12.1.5 Describe the concept of “hot” and “area” microphones.
- (2) 12.1.6 Describe the following terms relating to cockpit voice recorders:
 - a. Cross talk
 - b. Wow and flutter
 - c. Record head
 - d. Erase head
 - e. Bias oscillator
 - f. Bulk erase
 - g. Track
 - h. Frequency response
 - i. Monitor head
- (2) 12.1.7 Describe the installation of a CVR with particular regard to the following:

- a. Favourable location
 - b. Power supplies
 - c. Interface with the audio system
- (2) 12.1.8 Describe audio and visual tests for a typical CVR system.
- (2) 12.1.9 Describe typical procedures for downloading CVR recordings.
- (2) 12.1.10 Describe the following in regard to an underwater locator beacon:
- a. Purpose
 - b. Function
 - c. Testing
 - d. Battery type
 - e. Battery life
- (2) 12.1.11 Describe how a CVR is protected against the following:
- a. Shock
 - b. Fire
 - c. Immersion in fluids
 - d. Erasure of recordings
- (2) 12.1.12 Describe typical procedures for CVRs in respect of the following:
- a. Maintenance
 - b. Fault diagnosis
 - c. Troubleshooting

13 Automatic Direction Finder (ADF) Systems

13.1 Principles of ADF Operation

- (2) 13.1.1 Describe the principles of aircraft navigation using an ADF system.
- (2) 13.1.2 Describe the following terms:
- a. Relative bearing
 - b. Magnetic bearing
 - c. Drift angle
 - d. Homing
 - e. Position fixing
 - f. Aural bearing
- (2) 13.1.3 Describe the difference between a relative bearing indicator (RBI) and a radio magnetic indicator (RMI).
- (2) 13.1.4 Describe the sources, effects and remedies of the following interference and system errors:
- a. Coastal refraction
 - b. Mountain effect
 - c. Night effect
 - d. Static interference
 - e. Station interference
 - f. Vertical effect
- (2) 13.1.5 Describe the field patterns for, or radiated by, the following:
- a. Non-directional radio beacon (NDB)
 - b. ADF ground station
 - c. Loop antenna
 - d. Sense antenna
 - e. Combined loop/sense antenna
- (2) 13.1.6 Describe the following:
- a. Composite field pattern of a loop and sense antenna (cardioid)
 - b. Phase relationship between loop and sense antenna output signals
 - c. Antenna feeder lengths
 - d. Sense antenna quality factor

- e. Sense antenna critical capacitance
- (2) 13.1.7 Describe the construction of the following:
 - a. Sense antenna
 - b. Loop antenna
- (2) 13.1.8 Describe the phase relationship between sense and loop antenna output signals.
- (2) 13.1.9 Describe the following characteristics of a typical ADF system:
 - a. Accuracy
 - b. ADF hunting
 - c. Frequency range
 - d. Sensitivity
- (2) 13.1.10 Describe the functioning of the following operating controls of an ADF receiver:
 - a. ADF
 - b. Antenna
 - c. Beat frequency oscillator
 - d. Frequency select
 - e. Gain
 - f. Loop
- (2) 13.1.11 Describe the principle of operation, to block diagram level, of a typical ADF receiver including the following:
 - a. ADF to RMI adaptors
 - b. Loop antennas a goniometer
 - c. Beat frequency oscillators
 - d. Balanced modulator
 - e. Frequency synthesis
 - f. Channel selection

13.2 ADF Installation and Maintenance

- (2) 13.2.1 Describe the practices and procedures used in the installation of ADF systems including the following:
 - a. Location and mounting
 - b. Power supplies
 - c. Interface with audio system
 - d. Interface with navigation system
- (2) 13.2.2 Describe the relevance of the critical lengths of antenna cables.
- (2) 13.2.3 Describe the procedures used to diagnose and rectify defects in ADF systems.
- (2) 13.2.4 Describe the practices and procedures used to test ADF systems after installation, replacement or adjustment of units.

14 Very High Frequency Omnidirectional Range (VOR) Systems

14.1 Principles of VOR Operation

- (2) 14.1.1 Describe the principles of aircraft navigation using VOR systems with particular emphasis on the following:
 - a. Intercepting an inbound track
 - b. Intercepting an outbound track
 - c. Tracking/homing directly to a VOR station
- (2) 14.1.2 Define the following terms and know how they relate to the operation of a VOR system:
 - a. Radial
 - b. Heading
 - c. Automatic
 - d. Automatic VOR
 - e. Manual VOR

- f. Selected course
 - g. Track
 - h. Cone confusion
- (2) 14.1.3 Describe the field patterns and signals radiated by ground VOR stations.
- (2) 14.1.4 Describe the following characteristics of a typical VOR receiver:
- a. Frequency range
 - b. Channel spacing
 - c. Signal polarization
 - d. Variable phase circuitry
 - e. Resolver
 - f. Reference phase amplifier
 - g. VOR warning and TO/FROM circuitry
 - h. Omni bearing selection
 - i. Omni accuracy
 - j. Omni sensitivity
- (2) 14.1.5 Describe the field patterns and signals radiated by ground VOR stations.
- (2) 14.1.6 With respect to VOR, describe the presentation of bearing information on a radio magnetic indicator (RMI) and omni-bearing selector. (OBS)
- (2) 14.1.7 Describe the following outputs of a typical VOR system and their interface with other systems:
- a. Distance measuring equipment (DME channelling)
 - b. Audio output
 - c. Autopilot output
 - d. Omni bearing information to RMI/OBS
 - e. TO/FROM
 - f. Warning
 - g. Deviation from selected radial
 - h. Audio to audio integration (AIS)
- (2) 14.1.8 Describe the purpose of the operating controls of a typical VOR receiver.
- (2) 14.1.9 Describe the errors that can affect a VOR system including the following:
- a. Course error
 - b. Reciprocal error
 - c. VOR site error
- (2) 14.1.10 Describe to block diagram level the theory of operation of a typical VOR receiver.
- (2) 14.1.11 Describe the purpose of compensating load resistors in place of indicators.
- (2) 14.1.12 Describe the following criteria in regard to VOR antenna:
- a. Types
 - b. Dual systems run from a single antenna
 - c. Receiver duplexer
 - d. Diplexers
 - e. Critical cable lengths

14.2 VOR Installation and Maintenance

- (2) 14.2.1 Describe the practices and procedures used in the installation of VOR systems, including the following:
- a. Location
 - b. Mounting
 - c. Antenna location
- (2) 14.2.2 Describe the practices and procedures used to diagnose and rectify faults in VOR systems.
- (2) 14.2.3 Describe the practices and procedures used to test VOR systems after installation, replacement or adjustment of units. Includes the proper use of a bearing simulation test set.

15 Instrument Landing Systems (ILS)

15.1 Principles of ILS Operation

- (2) 15.1.1 Describe a typical ILS system comprising a localiser, glideslope and marker.
- (2) 15.1.2 Describe the operation of an ILS, including ground station position, with respect to:
 - a. runway.
 - b. signal format.
 - c. range.
 - d. information displayed to the pilot.
- (2) 15.1.3 Describe the location of, and the field patterns radiated by, the following ground station transmitters:
 - a. Glideslope
 - b. Localiser
 - c. Marker
- (2) 15.1.4 Describe the characteristics of a typical localiser system with regard to the following:
 - a. Channel spacing
 - b. Frequency range
 - c. Modulation
 - d. Pairing of localiser and glideslope channels
 - e. Signal polarisation
 - f. Joint VOR/LOC antenna
- (2) 15.1.5 Describe the purpose and functioning of the operating controls of a typical localiser receiver.
- (2) 15.1.6 Describe the characteristics of a typical glideslope system in regards to the following:
 - a. Channel spacing
 - b. Frequency range
 - c. Modulation
 - d. Signal polarisation
 - e. Antenna
- (2) 15.1.7 Describe the characteristics of a typical marker beacon receiver system with particular regard to the following:
 - a. Operating frequency
 - b. Modulation
 - c. Antenna
- (2) 15.1.8 Describe the purpose of operating controls and indicators on a typical marker beacon receiver.
- (2) 15.1.9 Describe the presentation of localiser and glideslope information on the following:
 - a. Course deviation indicators
 - b. Horizontal situation indicators
 - c. Glideslope indicators
 - d. Attitude direction indicators
 - e. Marker lights
 - f. Tones
- (2) 15.1.10 Describe the following outputs of a typical ILS system:
 - a. Audio
 - b. Auto pilot
 - c. Localiser/glideslope
 - d. Warning
- (2) 15.1.11 Describe localiser back course switching, and when installed, the required glideslope precautions.
- (2) 15.1.12 Describe the use of load resistors to compensate for removal of one or more indicators in a multi-indicator ILS installation.

- (2) 15.1.13 Describe the meaning of the term difference in depth modulation (DDM).
- (2) 15.1.14 Describe, to block diagram level, the principle of operation of a typical localiser receiver with particular regard to the following:
- Receiver element
 - Filters
 - Oscillators
 - Flag circuit
 - Meter circuit
 - Power supplies
- (2) 15.1.15 Describe, to block diagram level, the principle of operation of a typical glideslope receiver with particular regard to the following:
- Receiver element
 - Filters
 - Oscillators
 - Flag circuit
 - Meter circuit
 - Power supplies
- (2) 15.1.16 Describe, to block diagram level, the principle of operation of a typical marker beacon receiver with particular regard to the following:
- Receiver element
 - Filters
 - Lamp circuits
 - Sensitivity circuitry
 - Power supplies

15.2 Localiser, Glideslope and Marker Beacon Installation and Maintenance

- (2) 15.2.1 Describe the practices and procedures used in the installation of the following receiver systems:
- Localiser
 - Glideslope
 - Marker beacon
- (2) 15.2.2 Describe the practices and procedures used to diagnose and rectify defects in ILS systems.
- (2) 15.2.3 Describe a typical system installation with regard to the following:
- Location of components
 - Mounting of components
 - Antenna locations
- (2) 15.2.4 Describe the practices and procedures used to test ILS systems after installation, replacement or adjustment of units with particular regard to the use of an appropriate ILS/MKR signal simulator test set.
- (2) 15.2.5 Describe the interface of the ILS/MKR system with audio and navigational systems.

16 Satellite Navigation Systems (GNS) (GPS) (GLONASS)

16.1 Principles of Satellite Navigation.

- (2) 16.1.1 Describe the following factors upon which GNS operation depends:
- Atmospheric errors
 - Constellation
 - Ephemeris errors
 - Geometry error (PDOP)
 - Principle of satellite ranging
 - Pseudo-random code
 - Timing requirements

- (2) 16.1.2 Describe the principles and characteristics of differential GNS, including:
 - a. wide area
 - b. local area
 - c. pseudo-lite
- (2) 16.1.3 Describe the necessity for Differential GNS.
- (2) 16.1.4 Describe the characteristics of typical GNS receivers, either stand alone (Panel mounted general aviation type) or fully integrated systems, including:
 - a. inputs
 - b. outputs
- (2) 16.1.5 Describe the purpose of receiver autonomous integrity monitoring (RAIM).
- (2) 16.1.6 Describe the process by which RAIM operates.
- (2) 16.1.7 Describe the construction, use and characteristics of GNS antennas and transmission lines.
- (2) 16.1.8 Describe the functioning of the operating controls and indications of a typical GNS receiver.
- (2) 16.1.9 Describe to block diagram level, the principle of operation of a typical GNS including the following:
 - a. Receiver inputs
 - b. Outputs
 - c. Interfaces
 - d. Integration aspects
- (2) 16.1.10 Describe the recommended practices and procedures used in the installation of GNS.
- (2) 16.1.11 Describe the recommended practices and procedures used to diagnose and rectify defects in GNS, including any subsequent testing and monitoring of the system.
- (2) 16.1.12 Describe the operation of a GPS landing system to block diagram level.
- (2) 16.1.13 In a GPS landing system list the components, inputs and outputs of the system and the interface and interrogation between it and other avionic systems.

17 Radar Systems Theory

17.1 Radar Theory

- (2) 17.1.1 Describe the following factors on which radar operation depends:
 - a. Channelling of radio frequency (RF) energy into beams
 - b. Scatter or reflection of RF energy
 - c. Speed of propagation of an RF wave
- (2) 17.1.2 Describe the following terms:
 - a. Beamwidth
 - b. Frequency of transmission
 - c. Pulse repetition frequency
 - d. Pulse width
 - e. Radar mile
 - f. Receiver signal strength
 - g. Automatic frequency control
 - h. Sensitivity time control
- (2) 17.1.3 Describe the principles of operation and uses of the following:
 - a. Antenna stabilisation
 - b. Antenna tilt
 - c. Gyro stabilisation
- (2) 17.1.4 Describe the construction, uses and principles of operation of the following:
 - a. Choke joints
 - b. Flexible wave guides
 - c. Non resonant lines
 - d. Resonant cavities

- e. Resonant lines
 - f. Rigid waveguides
 - g. Rotary joints
 - h. T/R switches
- (2) 17.1.5 Describe the construction, uses and principles of operation of the following:
- a. Circulators
 - b. Isolators
 - c. Gunn diodes
 - d. Impatt diodes
 - e. Klystrons
 - f. Magnetrons
 - g. Travelling wave tubes
 - h. Strip lines
 - i. Micro-strip devices
- (2) 17.1.6 Describe the construction and principles of operation of flat plate and parabolic antenna including their radiated field patterns.

18 Weather Radar Systems

18.1 Weather Radar

- (2) 18.1.1 Describe the functioning of the operating controls and indications of a typical weather radar system.
- (2) 18.1.2 Describe, to block diagram level, the principle of operation of a typical weather radar system with particular regard to the following:
- a. Weather radar transmitter
 - b. Weather radar receiver
 - c. Weather radar indicator
- (2) 18.1.3 Describe the following:
- a. CRT displays
 - b. Information presentation
 - c. Ranges
 - d. Weather
 - e. Mapping
- (2) 18.1.4 Describe the interface of weather radar with other aircraft systems.
- (2) 18.1.5 Describe the precautions to be observed when operating radar systems.
- (2) 18.1.6 Describe the operation of Stormscope weather detection system with particular regard to the following:
- a. Range
 - b. Area
 - c. Coverage
 - d. Antenna
 - e. Limitations
- (2) 18.1.7 Describe the practices and procedures used in the installation of weather radar systems.
- (2) 18.1.8 Describe the practices and procedures used to diagnose and rectify defects in weather radar systems
- (2) 18.1.9 Describe the practices and procedures used to test weather radar systems after installation, replacement or adjustment of units.

19 Distance Measuring Equipment (DME)

19.1 Theory of DME Systems

- (2) 19.1.1 Describe the theory of DME systems, including ground station responses.
- (2) 19.1.2 Describe the characteristics of interrogation and reply pulse trains.
- (2) 19.1.3 Describe the location and function of ground beacons including co-located VOR/DME

(or VORTAC, VOR and TACAN beacons)

- (2) 19.1.4 Describe the following terms:
- Jitter
 - Automatic standby
 - Squitter
 - Search
 - Track
 - Memory
 - Percentage reply echo protection
 - Suppression
- (2) 19.1.5 Describe the characteristics of a DME system including the following:
- Transmitted frequency
 - Received frequency
 - Transmitter power
 - Useful range
 - Number of channels
 - Outputs
- (2) 19.1.6 Describe the principles of operation of a typical DME receiver with particular regard to the including:
- Interrogation function
 - Reply and decoding circuitry
 - Indicator
 - Power supplies
 - Antenna
- (2) 19.1.7 Describe how interference with and from other avionics is minimised.
- (2) 19.1.8 Describe the installation of a typical DME system with particular regard to the following:
- Location
 - Mounting
 - Antenna position
- (2) 19.1.9 Describe the testing of DME systems and the operation of an appropriate DME test set.

20 Air Traffic Control Transponder Systems

20.1 Transponder Principles

- (2) 20.1.1 In relation to Air Traffic Control, describe the difference between primary and secondary surveillance radar (SSR).
- (2) 20.1.2 Describe the radiated field pattern of secondary surveillance radar.
- (2) 20.1.3 Describe the presentation of data on an ATC radar display.
- (2) 20.1.4 Describe the principle of operation of an ATC transponder system with particular regard to the following:
- Transmitter
 - Receiver
 - Code
 - Interrogation
 - Mode
 - Reply
 - Side lobe suppression
- (2) 20.1.5 Describe the following characteristics of a typical ATC transponder system:
- Antenna polarisation
 - Receive frequency
 - Suppression
 - Transmit frequency

- e. Transmitter power output
 - f. System range
- (2) 20.1.6 Describe the characteristics of the following secondary surveillance radar modes of operation:
- a. Mode A
 - b. Mode C
 - c. Mode S
- (2) 20.1.7 Describe the functions of modes “A” and “C” and the attitude reporting function.
- (2) 20.1.8 Describe the Mode “S” interface with Traffic Alert and Collision Avoidance Systems (TCAS).
- (2) 20.1.9 Describe the characteristics of ground transmitted interrogations and transponder reply pulse trains.
- (2) 20.1.10 Describe the functioning of the operating controls and indications of a typical ATC transponder system.
- (2) 20.1.11 Describe the interface of a transponder with other aircraft systems.
- (2) 20.1.12 Describe to block diagram level, the principle of operation of a typical ATC transponder receiver decoder.
- (2) 20.1.13 Describe to block diagram level, the principle of operation of a typical ATC transponder transmitter.
- (2) 20.1.14 Describe the practices and procedures used in the installation of a typical ATC transponder system
- (2) 20.1.15 Describe the practices and procedures used to diagnose and rectify defects in ATC transponder systems.
- (2) 20.1.16 Describe the practices and procedures used to test ATC transponder systems after installation, replacement or adjustment of units, including the correct use of test equipment.

21 Area Navigation (RNAV)

21.1 RNAV Principles of Operation

- (2) 21.1.1 Describe the principles of area navigation using VOR and DME systems.
- (2) 21.1.2 Describe waypoint offset computation.
- (2) 21.1.3 Describe the control of an RNAV system including the following:
- a. Data entry
 - b. Output information presentation.
 - c. Output information interpretation
- (2) 21.1.4 Describe the installation of a typical RNAV system and its interface with DME and VOR systems as well as other systems in the aircraft.
- (2) 21.1.5 Describe switching and annunciation of mode of operation of a typical RNAV system.
- (2) 21.1.6 Describe the testing of an RNAV system by using appropriate VOR and DME test sets.

22 Radio Altimeter Systems

22.1 Radio Altimeter Principles

- (2) 22.1.1 Describe the principles of operation of the following radio altimeter systems:
- a. Frequency modulated carrier wave (FMCW)
 - b. Constant difference frequency modulated carrier wave (CDFMCW)
 - c. Pulsed
- (2) 22.1.2 Describe the characteristics of a typical radio altimeter system with particular regard to the following:
- a. Accuracy
 - b. Frequency of operation
 - c. Maximum and minimum height

- d. Modulation frequency
 - e. Output power
 - f. Outputs
- (2) 22.1.3 With respect to conventional FMCW radio altimeter systems, describe the following:
- a. Frequency deviation
 - b. Frequency modulation
 - c. How radio height is measured
 - d. Modulation index
 - e. System errors
- (2) 22.1.4 Describe the construction, uses and characteristics of Radio Altimeter antennas including microwave and transmission line feeds.
- (2) 22.1.5 Describe the functioning of the operating controls and indications of a typical Radio Altimeter system.
- (2) 22.1.6 Describe to block diagram level, the principle of operation the following Radio Altimeter systems:
- a. Transmitter
 - b. Receiver
 - c. Indicator
- (2) 22.1.7 Describe the practices and procedures used in the installation of Radio Altimeter systems.
- (2) 22.1.8 Describe the practices and procedures used to diagnose and rectify defects in Radio Altimeter systems.
- (2) 22.1.9 Describe the practices and procedures used to test Radio Altimeter systems after installation, replacement or adjustment of units.
- (2) 22.1.10 Describe the interface of Radio Altimeter with other aircraft systems.

23 Aircraft Collision Avoidance Systems (ACAS) (TCAS)

23.1 Principles of Operation

- (2) 23.1.1 Describe the principles of operation of a typical ACAS system.
- (2) 23.1.2 Describe the differences between Traffic Alert and Collision Avoidance (TCAS)-1 and TCAS-2.
- (2) 23.1.3 Describe the difference between a Resolution Advisory (RA) indication and a traffic advisory (TA).
- (2) 23.1.4 Describe the range, altitude and resolution of the operating area including warning indications, both visual and aural, of potential and immediate threats.
- (2) 23.1.5 Describe the location of the ACAS/Mode "S" antennas and the reason for their placement.
- (2) 23.1.6 Describe the operation of an ACAS system and be able to draw a schematic of a typical system.
- (2) 23.1.7 Describe the interface of ACAS with other aircraft systems.
- (2) 23.1.8 Describe the recommended practices and procedures used to diagnose and rectify defects in ACAS.
- (2) 23.1.9 Describe the testing of ACAS including the operation and calibration of any special test equipment.

24 Arinc Communication and Reporting System (ACARS)

24.1 Principles of ACARS operation

- (2) 24.1.1 Describe the principle, operation and function of ACARS.
- (2) 24.1.2 Describe the information/data processes by an ACARS system with particular regard to parameters and limitations.
- (2) 24.1.3 Describe the function and operation of ACARS ground stations.
- (2) 24.1.4 Describe a typical ACARS installation, including the interface with other aircraft

systems.

- (2) 24.1.5 Describe the testing of ACARS including the operation and calibration of special test equipment.

25 Installation and Maintenance of Radio and Radar Systems

25.1 Installation

- (2) 25.1.1 With regard to airborne communication systems, describe the practices and procedures used in the installation of the following devices:
- Antenna tuning units, preset and automatic
 - Antennas
 - Transceivers
 - Interwiring between units
 - Controllers
 - Microphones, speakers and headsets

25.2 Maintenance

- (2) 25.2.1 Describe the procedures used to diagnose and rectify defects in airborne communications systems
- (2) 25.2.2 Describe the practices and procedures used to tune antenna tuning units.
- (2) 25.2.3 Describe the practices and procedures used to test airborne communications systems after installation, replacement and adjustment of units.
- (2) 25.2.4 With regard to airborne communications systems, describe the types and sources of interference and the methods used to eliminate it.

25.3 Measuring Instruments

- (2) 25.3.1 Describe the operation, use testing and calibration of the following equipment:
- AF and RF signal generators
 - Analogue and digital multimeters
 - Audio frequency (AF) and radio frequency (RF) output power meters
 - Dummy loads
 - Frequency meters and counters
 - Oscilloscopes
 - Spectrum analysers
 - Voltage standing wave ratio (VSWR) meter
 - Time domain reflectometers (TDR)