



# Advisory Circular

## AC66-2.35

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### Aircraft Maintenance Engineer Licence — Avionic Component Group Ratings (Group 7)

04 February 2016

#### General

Civil Aviation Authority Advisory Circulars contain information about standards, practices, and procedures that the Director has found to be an **Acceptable Means of Compliance (AMC)** with the associated rule.

An AMC is not intended to be the only means of compliance with a rule, and consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices, or procedures are found to be acceptable they will be added to the appropriate Advisory Circular.

An Advisory Circular may also include **guidance material (GM)** to facilitate compliance with the rule requirements. Guidance material must not be regarded as an acceptable means of compliance.

#### Purpose

This Advisory Circular provides an AMC for the syllabus content in respect of written examinations for Avionics Component Ratings (Group 7).

This Advisory Circular also provides GM for recommended study material in respect of the examination syllabi in this Advisory Circular.

#### Related Rules

This Advisory Circular relates specifically to Civil Aviation Rule Part 66 Subpart C - Aircraft Maintenance Engineer Ratings.

#### Change Notice

Subject to “Memorandum for Technical Cooperation” between the CAA of Mongolia and New Zealand on mutual cooperation in implementation of the International Civil Aviation Organization Resolution of Global Rule Harmonization, which urges States to promote global harmonization of national rules, dated 6<sup>th</sup> of May, 1999, Mongolian Civil Aviation Safety Regulation has been reconciled to the Civil Aviation Regulation of New Zealand.

Amendment 164 of Annex 1 to the Chicago Convention on International Civil Aviation urges flight crew members, ATC personnel and aircraft maintenance engineers to comply with the language proficiency requirements; and

Under Article 14 of the Civil Aviation Law of Mongolia 1999, “Use of foreign language in civil aviation” the AC has been released in English version only, in order to prevent any mistranslation and misuse of the aviation safety related documents.

This AC66-2.35 was developed based on NZ AC66-2.35 revision, dated on 01 December 2008.

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## **Eligibility requirements**

Rule 66.103(3) requires an applicant for an AME group or type rating to have successfully completed examinations acceptable to the Director or a course of training.

The examinations acceptable to the Director should comply with the syllabi contained in this Advisory Circular.

## **Knowledge Levels**

These syllabi provides for the subject material covered in the Avionic Component Ratings (Group 7) examinations.

Each topic within the syllabi has a level number which provides an indication of the degree or level of knowledge required. There are three level numbers and they are defined as follows:

- Level 1: General appreciation of principles and a broad understanding of the subject.
- Level 2: Comprehension of principles and salient features. Simple relevant calculations may be required.
- Level 3: Detailed knowledge of all aspects of the subject including relevant calculations.

**Subject 12 :****Avionics II****Resource Study Material**

This resource study guide is produced to show where suitable material may be obtained. CAA is not bound to use these books for examining purposes, nor is CAA liable if these books are unavailable at commercial bookshops. You are advised that this list is a sample only. Many other titles may be equally as helpful in preparing for this examination.

1.	Digital Electronic Technology	D.C. Green.
2.	Digital Techniques and Systems	D.C. Green.
3.	Microelectronics in Aircraft	Pallett.

1.	NUMBER SYSTEMS	2	<p>Comprehend the Decimal, Octal, Binary and hexadecimal numbering systems.</p> <p>Know how to add and subtract in Binary Arithmetic.</p> <p>Comprehend the principles of number complements.</p> <p>Comprehend the principles of signed two's complement notation.</p> <p>Know how to add in Binary Coded Decimal (BCD) arithmetic.</p> <p>Know of the Gray code and understand its uses.</p> <p>Know the fundamentals of Boolean Algebra and how gates are used to implement Boolean operations.</p>
2.	SHIFT REGISTERS	2	<p>Comprehend the principle of operation of flip-flops and their use within a computer. (Counters, shift registers and memory storage devices).</p> <p>Know the basic concepts of serial-in, parallel-out parallel-in, serial-out data applicable to a four bit register.</p>
3.	D/A, A/D	2	<p>Know how data is converted from analog to digital and digital to analog.</p>
4.	COMPUTER ARCHITECTURE	1	<p>Comprehend the principle functions of the basic building blocks which comprise a digital computer.</p> <p>Know the different types of ROM and the differences between a Read Only Memory (ROM) and a Random Access Memory (RAM).</p>
		1	<p>Know the various input/output devices that may be used with a typical computer system.</p> <p>Know the function of buses within a computer.</p> <p>Comprehend the meaning of the terms software, firmware, hardware, label and address.</p>

5.	DATA BUSES	2	Comprehend how numeric data transfer is accomplished by using Binary Coded Decimal (BCD).  Know of the ASCII code and understand its uses.  Comprehend the function of data buses between systems in an aircraft.
6.	MULTIPEXING	2	Comprehend the basic principles of multiplexing. (Data transfer and time division.)
7.	ESD	2	Know the effects of Electro Static Discharge with respect to electronic components, and the associated precautions to be observed.
8.	DISPLAYS	2	Comprehend the principles of operation of de-coder drivers, gas-discharge tubes, fluorescent displays, incandescent tubes and liquid-crystal displays.

**Subject 50 (Written) & 51 (Oral)****Electrical Equipment Overhaul****Resource Study Material**

Vendor Maintenance Manuals applicable to the specific items of equipment listed in this curriculum.

**Scope of the Subject**

	ELECTRICAL COMPONENTS	SPECIMEN MAKE AND MODEL
	Engine Starter	Prestolite MZ4216.
	DC Generator	Delco Remy 12 V.
	Alternator	Prestolite/Motorcraft ALU 8421.
	Starter/Generator	Lear-Seigler 23032 series.
	Auxiliary Fuel Pump	Weldon.
	Trim Actuators	CALCO 8222.M7. Fitted to HU 369 or candidate may select.
	Auto Pilot Actuators	Candidate may select.
	TACHO Generators (various)	Candidate may choose.
	Electric Motors (various)	Candidate may choose.
	Electronic Relay (various)	Candidate may choose.
	Mechanical Relay (various)	Candidate may choose.
	Magneto	Bendix 1200/2000 series.
	Control Transformers (various)	Candidate may choose.
	Auxiliary Starting Devices	Bendix shower of sparks.
	Electro-Hydraulic Components	Cessna Power Pack.
	Ignition Switches	Bendix.
	Carbon Pile Regulators	Eclipse 1032.
	Combustion Heaters	Janitrol.

**NOTE:** The following books are acceptable alternatives to the A & P Handbooks. EA-ITP-GB General, EA-ITP-AB Airframe, EA-ITP-P Powerplant.

1.	COMPONENT OPERATING THEORY CONSTRUCTION	1	Understand the construction and theory of operation of the listed electrical components.
2.	OVERHAUL PRINCIPLES & PRACTICES	2.	Understand the procedures commonly used in the dis-assembly, reconditioning, repair, reassembly, function testing and performance recording of equipment from the above list to approved or manufacturer's specifications.

3.	FAULT DETECTION	3.	Know how to fault find by the following detection techniques: <ul style="list-style-type: none"> <li>• voltage;</li> <li>• current;</li> <li>• flow diagrams.</li> </ul>
4.	DISCRETE COMPONENTS	4.	Know how to check the condition of discrete components including: <ul style="list-style-type: none"> <li>• resistors;</li> <li>• capacitors;</li> <li>• semi-conductor devices including diodes;</li> <li>• transistors and integrated circuits for all common applications.</li> </ul>
5.	ESD'S3		Know the precautions to be observed in the handling and installation of electro-static sensitive devices and LRU's containing such devices.
6.	TEST EQUIPMENT	2.	Understand the construction, control and maintenance of test beds for electrical components.
		3.	Understand the use and care of test equipment such as: <ul style="list-style-type: none"> <li>• digital and moving coil multi-meters;</li> <li>• frequency meters;</li> <li>• Tachometers;</li> <li>• meggers;</li> <li>• HT insulation testers;</li> <li>• thermo-couple testers;</li> <li>• dedicated special to type instruments.</li> </ul>
7.	SPECIAL OVERHAUL PROCESSES	2	Understand the following processes: <ul style="list-style-type: none"> <li>• commutator machining;</li> <li>• mica undercutting;</li> <li>• alodining;</li> <li>• painting/paint stripping;</li> <li>• varnishing;</li> <li>• glass bead.</li> </ul>
8.	BATTERIES	3	Know the maintenance procedures and practices associated with lead acid and nickel cadmium batteries.

9.	WORKSHOP ADMINISTRATION & CONTROL	1	Understand a typical overhaul workshop layout with special emphasis on: <ul style="list-style-type: none"> <li>• humidity control;</li> <li>• cleanliness;</li> <li>• location of bays;</li> <li>• location of test beds;</li> <li>• safety.</li> </ul>
		2	Understand a typical Quality Control System for the overhaul of electrical equipment.
		3	Know a typical recording and documentation system for equipment overhaul with special emphasis on: <ul style="list-style-type: none"> <li>• modifications;</li> <li>• design procedure;</li> <li>• overhaul documentation;</li> <li>• technical directives;</li> <li>• AD control.</li> </ul>
		2	Understand the stores procedure and control for a typical overhaul facility.
		3	Know the layout and operating procedure for battery rooms, including: <ul style="list-style-type: none"> <li>• special equipment;</li> <li>• ventilation;</li> <li>• safety.</li> </ul>
		3	Understand the layout and use of manufacturers service information, parts manuals and electrical wiring diagrams associated with the various electrical equipment specified in this curriculum.



## Subject 52 (Written) & 53 (Oral) Instrument Equipment Overhaul

### Resource Study Material

Vendor Maintenance Manuals applicable to the specific items of equipment listed in this curriculum.

### Scope of the Subject

	ELECTRICAL COMPONENTS	SPECIMEN MAKE AND MODEL
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**NOTE:** *The following books are acceptable alternatives to the A & P Handbooks. EA-ITP-GB General, EA-ITP-AB Airframe, EA-ITP-P Powerplant.*

1.	COMPONENT CONSTRUCTION & OPERATION	1	<p>Understand the construction and theory of operation of the following components:</p> <ul style="list-style-type: none"> <li>• Altimeters.</li> <li>• United instruments 5934 series.</li> <li>• Airspeed Indicator.</li> <li>• United instruments 8000 series.</li> <li>• Directional Gyro.</li> <li>• EDO Air (Sigma TEK) 4000 series.</li> <li>• Artificial Horizon.</li> <li>• EDO Air (Sigma TEK) 5000 series.</li> <li>• Turn and Slip.</li> <li>• RC Allen 28 series.</li> <li>• Position Indicators.</li> <li>• Candidate to select examples.</li> <li>• Tachometers.</li> <li>• GEC series.</li> <li>• Temperature and Pressure Sensing.</li> <li>• Engine and Airframe Instruments.</li> <li>• Candidate to select examples.</li> <li>• Vertical Speed Indicator.</li> <li>• United 7000 series.</li> <li>• Direct Reading Compass.</li> <li>• Airpath Model.</li> <li>• Remote Reading Compass.</li> <li>• King KCS 55A.</li> <li>• EDO Air NSD 306.</li> <li>• Flight Directors</li> <li>• EDO Air IU 367.</li> <li>• King KI 525 A.</li> <li>• King KFC 200-300.</li> <li>• Auto Pilot.</li> <li>• Century 3.</li> <li>• Cessna 300 series Navomatic.</li> <li>• King KFC 200-300.</li> </ul>
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2.	OVERHAUL PRINCIPLES & PRACTICES	2	Know accepted procedures used in the dis-assembly, reconditioning, repair, replacement, reassemble, functional testing and performance recording of the above instrument equipment to approve manufacturers' specifications.
	OVERHAUL PRINCIPLES & PRACTICES	2	Be aware of the common techniques for measurement, adjustment and calibration of: <ul style="list-style-type: none"> <li>• magnetism of tacho rotors;</li> <li>• dynamic balance of Gyro rotors;</li> <li>• temperature compensation of AD instruments;</li> <li>• airflow through Gyros;</li> <li>• electrical, magnetic, pressure and suction types of indicating, recording and reference instruments and indicators.</li> </ul>
		3	Know how to check the condition of discrete components, including: <ul style="list-style-type: none"> <li>• resistors;</li> <li>• capacitors;</li> <li>• semi conductors, including diodes;</li> <li>• transistors and integrated circuits for all common applications.</li> </ul>
		3	Know how to find fault by: <ul style="list-style-type: none"> <li>• gain comparison;</li> <li>• voltage;</li> <li>• current;</li> <li>• signal deflection;</li> <li>• component replacement.</li> </ul>
3	TEST EQUIPMENT	3	Understand fully the use and care of the following test equipment: <ul style="list-style-type: none"> <li>• water and mercury manometers;</li> <li>• Gyro tables;</li> <li>• tacho calibrators;</li> <li>• vacuum chambers;</li> <li>• instrument lathe;</li> <li>• magnetising/de-magnetising equipment;</li> <li>• magnifying lenses;</li> <li>• AC/DC power supplies;</li> <li>• clean air supplies;</li> <li>• dedicated auto-pilot test rigs;</li> <li>• oscilloscopes;</li> <li>• barometer;</li> <li>• thermocouple test sets;</li> <li>• digital meters;</li> <li>• analogue meters;</li> <li>• dead weight testers;</li> <li>• capacitance fuel gauge test rigs;</li> <li>• signal generators.</li> </ul>

4.	SPECIAL OVERHAUL PROCESSES	2	<ul style="list-style-type: none"> <li>• sonic cleaning;</li> <li>• machining;</li> <li>• painting/paint stripping;</li> <li>• varnishing;</li> <li>• preservation/hermetic sealing;</li> <li>• nitrogen purge/sealing;</li> <li>• precision soldering techniques;</li> <li>• printed circuit board repair.</li> </ul>
5	WORKSHOP ADMINISTRATION & CONTROL	1	<p>Understand a typical approved overhaul workshop layout with special emphasis on:</p> <ul style="list-style-type: none"> <li>• humidity control;</li> <li>• cleanliness;</li> <li>• location of bays;</li> <li>• location of test facilities;</li> <li>• safety;</li> <li>• electro static discharge sensitive devices.</li> </ul>
		2	Understand a typical Quality Control System for the overhaul of instrument equipment.
		2	Understand the stores procedure and control for a typical overhaul facility.
		3	<p>Know a typical recording and documentation system for instrument equipment overhaul with special emphasis on:</p> <ul style="list-style-type: none"> <li>• modifications;</li> <li>• overhaul documentation;</li> <li>• technical directives;</li> <li>• AD control.</li> </ul>
		3	Understand the layout and use of manufacturers' service information, parts manuals and electrical wiring diagrams associated with the various instrument equipment specified in this curriculum.

**Subject 54 (Written) & 55 (Oral)****Radio/Radar Overhaul****Resource Study Material**

Vendor Maintenance Manuals applicable to the specific items of equipment listed in this curriculum.

**Scope of the Subject**

	EQUIPMENT - MAKE & MODEL	SUB-ASSEMBLIES
	Audio System Components	Intercommunication Audio Selector
	King KMA 24 Series	Panels.
	King KMA 20	Audio Mixing and Distribution
	King KAA 445/455	Systems.
		Public Address and Entertainment Systems.
		Head-sets and Microphone Installations.
		Cockpit Voice Recorders.
	VHF	Transmitter/Receiver.
	King KX 175 NAV/COMM	VHF DF Module.
	Collins VHF20	Control Panel.
	King KY 92/197	
	HF	Transmitter/Modulator.
	Sunair ASB 100	Receiver.
	King KHF 950	Control Panel.
		Antenna Coupler.
		Antenna Switching Unit.
	SELCAL	SELCAL Decoder.
	King KHF 950	
	Emergency Locator Beacon	Beacon.
	Pointer 3000	
	Dorne Margolin	ELT 6
	Narco	ELT 10
	ADF	Receiver.
	King KR 85	Controller.
	Cessna R 546 E	Loop Antenna.
	King KR 87	Indicator.

	ILS	GS Receiver.
	Cessna 443 B	
	King KN 75	
	VOR/LOCr	Receive.
	King KN 72	Controller.
	Cessna RT 385	Indicator/Converter.
	Collins VTR 351	
	Marker	Receiver.
	Cessna R 402	
	King KR 21	
	Omega/VLF/R NAV	Receiver/Processor Unit.
	Global GNS 500/1000	Controller, Display Unit.
	LTN 3000	Antenna Coupler.
	Radio Altimeter	Transmitter/Receiver.
	King KRA 10	Antenna Unit.
		Indicator.
	ATC Transponder	Transponder.
	King KT 76/76A	Controller.
	Cessna RT 359 A	
	King KXP 755	
	DME Interrogator	Interrogator.
	King KN 64	Control Panel.
	Narco DME 190	Code Converter.
	Cessna DME 876 A	Indicator.
	Weather Radar	Wave Guides.
	King KWX 50/60/56	Antenna Unit.
	Bendix RDR 160 XD	Transmitter/Receiver.
	Sperry P40/50	Indicator.
		Control Panel.
	Radio Magnetic Indicator	Indicator.

	King KNI 582	
	Collins RMI 30	

**NOTE:** The following books are acceptable alternatives to the A & P Handbooks. EA-ITP-GB General, EA-ITP-AB Airframe, EA-ITP-P Powerplant.

1.	PRINCIPLES OF OPERATION	1	Select one make and model of each of the above components and understand the construction and principles of operation.
2.	OVERHAUL PROCEDURES & PRACTICES	2	Understand the accepted procedures and practices used in the disassembly, repair, replacement, re-assembly, function testing and performance recording of the above components to approved or manufacturers' specifications.
		2	Know the common techniques for the testing and/or adjustment of: <ul style="list-style-type: none"> <li>• frequency selectors/remote control units.</li> <li>• servo systems.</li> <li>• radio frequency alignment and tracking of receiver and transmitter circuits.</li> </ul>
		2	Know the basic procedure for testing and/or adjusting of: <ul style="list-style-type: none"> <li>• audio selecting, mixing and isolation amplifiers.</li> <li>• multiplexers.</li> <li>• encoders and decoders.</li> <li>• head-sets and microphones.</li> <li>• cockpit voice recorders.</li> <li>• power supplies.</li> </ul>
		2	Know the basic procedures for the overhaul/testing of: <ul style="list-style-type: none"> <li>• antennas.</li> <li>• switches.</li> <li>• mechanical and electronic relays and controls associated with receivers and transmitters.</li> <li>• solid state band and frequency selection equipment.</li> </ul>
3.	DISCRETE COMPONENTS	3	Know how to check the condition of discrete components including: <ul style="list-style-type: none"> <li>• resistors.</li> <li>• capacitors.</li> <li>• vacuum tubes.</li> <li>• semiconductor devices, including diodes.</li> <li>• transistors and integrated circuits for all common applications.</li> </ul>
4.	FAULT ANALYSIS	3	Know how to fault find by the following detection techniques: <ul style="list-style-type: none"> <li>• flow diagrams.</li> <li>• voltage.</li> <li>• current.</li> <li>• gain comparison.</li> <li>• signal analysis.</li> </ul>

5.	PRINTED CIRCUIT BOARDS	3	Know the common methods of removal and replacement of faulty components and circuit assemblies on printed circuit boards, including: <ul style="list-style-type: none"> <li>• repairs to printed circuits;</li> <li>• precision soldering techniques.</li> </ul>
6.	ESD'S	3	Know the precautions to be observed in the handling and installation of electro-static sensitive devices and LRUs containing such devices.
7.	OVERHAUL ADMINISTRATION	2	Understand a typical recording and documentation system for component overhaul with emphasis on: <ul style="list-style-type: none"> <li>• modifications.</li> <li>• design.</li> <li>• overhaul documentation.</li> <li>• technical directives.</li> <li>• AD control.</li> </ul>
		2	Understand a typical QA system for the overhaul of radio/radar equipment.
		2	Understand the stores procedure and control for a typical overhaul facility.
		3	Understand the layout and use of manufacturers' service information, parts manuals and electrical wiring diagrams associated with the various radio/radar equipment specified in this curriculum.