

Revision 0

1 December 2008

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

#### 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 Mechanical 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

This is a new Advisory Circular that contains, unchanged, all the information (resource study material, scope and outline syllabus) for Mechanical Component Ratings (Group 7) previously promulgated in AC66-2.5.

AC66-2.5 now contains the objectivised syllabus for Subject 5 (Aeroplanes 2).

Published by  
Civil Aviation Authority  
PO Box 31441  
Lower Hutt

Authorised by  
Manager Rules Development

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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 provide for the subject material covered in the Mechanical 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 10****Machine Overhaul****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.	A & P Mechanics Handbooks	AC65 Series.
2.	Manufacturing Processes	Amstead, Ostwald, Begeman.
3.	Workshop Technology, Book 1	Chapman.
4.	Component Manufacturers Handbooks	e.g. Pratt & Whitney
5.	FAA AC120-17A - Maintenance Control by Reliability Methods.	

*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.	TECHNICAL DRAWING	3	<p>Interpretation of assembly and detail drawings.</p> <p>Fits, clearances and repair tolerances.</p> <p>Interpretation of parts lists.</p> <p>Thread forms. Keys, keyways.</p>
2.	METROLOGY	2	<p>DTI's. Comparitor gauges. V blocks. Surface plates. Bore gauges. Mercer gauges. Mandrels. Optical gauges.</p> <p>Hardness testing.</p>
3.	CLEANING PROCESSES	2	<p>Blasting methods including: vapour, glass, sand, shot, water, prunus.</p> <p>Solvent cleaners including, Trichlorethylene, Freon, Naptha.</p> <p>Emulsion cleaners including detergents and emulsions. (Restar, Tergasol, Paragon.)</p> <p>Mechanical methods including: steam blasting, (kerrick), sonic cleaning, washing machines, buffs, sanding, wire brushing.</p>

4.	BEARINGS	2	<p>Types and common uses. (Plain and anti-friction.)</p> <p>Selection of alternatives. Interpretation of manufacturers. Identification.</p> <p>Cleaning, viewing, handling.</p> <p>Repair and recovery.</p> <p>Removal and installation.</p> <p>Roll staking.</p> <p>Associated bearing hardware, seals, spacers, lubricants.</p>
		2	<p>Fitting process for plain bearings, including scraping, reaming and line boring.</p> <p>Bearing alignment checks and adjustments.</p>
5.	CALIBRATION OF MECHANICAL EQUIPMENT	2	<p>Calibration recording.</p> <p>Laboratory standards.</p> <p>Torque wrenches.</p> <p>Measurement gauges.</p> <p>Test pieces.</p>
6.	MACHINING PROCESSES	2	<p>Cutting processes including milling, turning, drilling, tapping and boring.</p> <p>Grinding processes: surface, centreless, cylinder and face.</p> <p>Broaching. Reaming.</p> <p>Finishing processes; polishing, burnishing, planishing, honing.</p> <p>Spark erosion.</p>
7.	HEAT TREATMENT PROCESSES	2	<p>Grain structure of steel and aluminium alloys.</p> <p>Grain structure refinement by heat treatment including annealing and normalising.</p> <p>Treatment for hydrogen embrittlement.</p> <p>Post weld treatment.</p> <p>Hardening and tempering of steels.</p> <p>Solution heat treat and precipitation of steel alloys, and aluminium alloys.</p>

8.	REPAIR & RECOVERY PROCESSES	2	Plating.  Metal and plasma spray.  Carburising and nitriding.  Threaded inserts including solid and helicoil.  Sleeving.  Anaerobic filling compounds including Loc tite.  Epoxy fillers: metal set, devcon, epons.  Hand stoning and types of stones.  Lapping.
9.	INSPECTION	2	Optical gauging.  Mechanical measurement.  Mechanical gauging.
10.	IDENTIFICATION OF WEAR& DEFECTS PREVENTATIVE MEASURES	3	Fatigue damage.  Mechanical overload failure.  Causes of cracking.  Overheating, lack of lubrication.  Corrosion Damage and control.  Pitting galling, spalling, chipping, flaking, fretting etc.
11.	SURFACE PROTECTION METHODS	2	Common cast and wrought metal defects.  Metal deposition.  Organic coatings.  Inorganic coatings.
12.	GEARS	2	Common types of gears and gear tooth shapes.  Gear arrangements and their meshing requirements.  Gear wear and failure modes.  Gear tooth measurement and inspection techniques.
13.	BALANCING PRINCIPLES		Types of balancing processes. (static/dynamic)  Balancing machines.  Addition and removal of balance material.  Identification of out of balance defects.

14.	PRESERVATION	2	<p>Preservation prior to overhaul.</p> <p>Preservation during overhaul.</p> <p>Preservation prior to shipment.</p> <p>Common methods of preservation.</p> <p>Common materials used in preservation.</p>
15.	TESTING		<p>Machine run in procedure.</p> <p>Wear debris analysis.</p>
16.	WELDING/BRAZING	2	<p>Preparation - fluxes, welding/brazing rods.</p> <p>Expansion/contraction effects and control</p> <p>Hollow parts - internal protection.</p> <p>Welding methods; gas/arc resistance welding.</p> <p>Brazing/hard soldering methods.</p> <p>Approval of welders.</p> <p>Inspection of welded/brazed joints.</p> <p>Identification of typical weld defects.</p>
17.	RELIABILITY FUNDAMENTALS		<p>Maintenance criteria:</p> <ul style="list-style-type: none"> <li>- Hard Time.</li> <li>- On condition.</li> <li>- Condition monitoring.</li> </ul> <p>Scheduled maintenance.</p> <p>Unscheduled maintenance.</p> <p>Reliability.</p> <p>Importance of reliability.</p> <p>Failure considerations including:</p> <ul style="list-style-type: none"> <li>- Failure detection methods.</li> <li>- Consequences of failure.</li> <li>- Failure rates.</li> <li>- Meantime between failure.</li> </ul>

18.	TECHNICAL REPORT	1	The candidate may be required to write a brief technical report with sketches on a component defect or failure.
19.	QUALITY CONTROL & AIRWORTHINESS	1	Purpose of quality control. Typical quality control system. Methods of Quality Assurance. Function and responsibility of a Chief Inspector and QA Staff.



**Subject 34 (Written) & 35 (Oral)****Airframe Component Overhaul****Resource Study Material**

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1.	Civil Aviation Inspection Procedures	
2.	FAA EA-AC 43-13-1 & 2 Aircraft Inspection and Repairs	
3.	EA AC 65-9	
4.	EA-AC-65-15	
5.	Component Overhaul manuals or service manuals applicable to Groups 5 or 6 aeroplanes	

1.	CONTROL SYSTEM COMPONENTS	2	Control wheels, pulleys, sprockets, brackets and bearings.  Cables, chains, push rods, torque tubes and fittings.  Gearboxes.  Bellcranks, quadrants and sectors.  Friction control and regulating devices.  Hydraulic and electric servo systems.  Tension regulators, turnbuckles, quick releases, bulkhead seals and fairleads.  Trim jacks: mechanical/electrical.
2.	FUEL SYSTEM	2	Tanks: tinned steel, riveted or welded aluminium alloys, flexible bag.  Integral, Fixed or removeable  Filters: screen, metal element, wafer, sintered micronic.  Selectors: cone, poppet, disc.  Fuel pumps: oscillating and rotary vane, gear, gerotor, centrifugal, ejector.  Non-return valves.

3.	HYDRAULIC SYSTEM COMPONENTS	2	<p>Construction and overhaul of:</p> <p>Reservoirs.</p> <p>Hydraulic pumps: single and double acting hand, gear, gerotor, vane, piston (fixed and variable displacement).</p> <p>Filters, pressure regulators, accumulators, check and non-return valves, pressure and thermal valves, intensifiers, reducing valves, selectors and restrictors.</p> <p>Hydraulic actuators and jacks.</p> <p>Hydraulic motors.</p> <p>Understanding of Hydraulic fluids</p>
4.	PNEUMATIC SYSTEM COMPONENTS	2	<p>Method of air supply.</p> <p>Construction and operation of compressors.</p> <p>Storage receivers, dehydrators/deicers.</p> <p>Regulators and load reducers.</p> <p>Check control, shuttle, relief and selector valves.</p> <p>Fixed and variable restrictors.</p> <p>Filters.</p> <p>Actuators and motors.</p>
5.	PIPES AND HOSES	2	<p>Materials used in manufacture of rigid pipes.</p> <p>Types of flexible hose.</p> <p>Procedure for assembly of end fittings to flexible hoses.</p> <p>Inspection and testing of pipes and hoses.</p> <p>Storage of pipes and hoses.</p>

6.	LANDING GEAR	3	<p>Landing gear: single wheel, dual wheel, bogie type.</p> <p>Shock struts: metering pin, metering tube, floating piston, torque arms, splined piston.</p> <p>Shock absorbers including, spring steel, GRP, bungees, rubber in compression, coil springs, oleo struts, liquid springs.</p> <p>Shimmy dampers: piston, vane, steering.</p> <p>Retraction: electro-mechanical, electro-hydraulic, engine driven hydraulic, pneumatic hydraulic.</p> <p>Brakes: pneumatic, hydraulic (master slave), hydraulic (power brake), hydraulic (power boost).</p> <p>Brake units: single disc and calliper (both types), dual disc, multiple disc, segmented rotor.</p> <p>Wheels: split hub, detachable rim, split rim, cast and forged aluminium and magnesium alloys.</p> <p>Tyres: construction, identification, maintenance, installation, balancing</p>
7.	ENVIRONMENTAL	2	<p>Methods of obtaining pressure.</p> <p>Overspeed controls, dump valves etc.</p> <p>Airflow valve.</p> <p>Differential pressure gauge.</p> <p>Pressure controller.</p> <p>Safety valve.</p>
		2	<p>Combustion heaters:</p> <p>Fuel systems.</p> <p>Ignition systems.</p> <p>Combustion air blower.</p> <p>Heater limit switch.</p> <p>Heater thermostat.</p> <p>Heater cycling switch.</p> <p>Combustion air pressure switch.</p> <p>Rear circulating fan.</p>

		2	<p>Air cycle cooling:</p> <p>Primary heat exchanger.</p> <p>Primary heat exchanger bypass valve.</p> <p>Shut off valve.</p> <p>Refrigeration bypass valve.</p> <p>Secondary heat exchanger.</p> <p>Refrigeration unit.</p> <p>Water separator.</p> <p>Ram air valve.</p> <p>Cabin temperature control system.</p>
		2	<p>Vapour cycle cooling:</p> <p>Compressor types.</p> <p>Condensers.</p> <p>Receiver dryer.</p> <p>Expansion valve.</p> <p>Evaporator.</p>
		2	<p>De-icing systems:</p> <p>Pneumatic systems - pumps, controls, distributors, overshoe or boot.</p> <p>Alcohol systems: reservoir, pumps, pump controller, ice detector, distributors, slingers.</p> <p>Thermal systems: combustion heaters, compressor bleed air.</p>
8.	CABIN FURNISHINGS	2	<p>Safety harness: manufacture, overhaul and testing.</p> <p>Aircraft seats. Aircraft toilets. Galley equipment.</p>
9.	ADMINISTRATION/ DOCUMENTATION	3	<p>Know and be able to prepare a model of a suitable recording system for the processing of lifed and non-lifed components through an overhaul facility including certification requirements.</p>
		2	<p>Know the preparation of: repair schemes, minor and major modifications, strip reports with a view to possible TBO escalation.</p>

**Subject 40 (Written) & 43 (Oral)****Piston Engine Overhaul****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.	Airframe & Power Plant Mechanics Power Plant Handbook EA AC65-12A (FAA)	
2.	Civil Aircraft Inspection Procedures Parts 1 & 2 (UK CAA)	
3.	Power Plants for Aerospace Vehicles Northrop Institute of Technology (McGraw Hill)	J.E. Heywood (T & AD Poyser)
5.	Aircraft Reciprocating Engines EA-ARE (Intl. Aviation Publishers)	
6.	Aircraft Fuel & Metering Systems EA-FMS (Intl. Aviation Publishers)	
7.	Aircraft Ignition & Electrical Power Systems EA-IGS (Intl. Aviation Publishers)	
8.	Overhaul manuals applicable to:  Lycoming Range  Continental Range  Pratt & Whitney R1830, R1340, R980  Gypsy Major	

1.	ENGINE THEORY	1	Principles of normally aspirated and supercharged engine operation.  Four stroke cycle, piston displacement, compression ratio. Valve timing, lead, lag, overlap.  Volumetric and thermal efficiency. Mechanical efficiency.  Pre-ignition and detonation.  Terminology: BHP, IHP, IMEP, BMEP.  Power measurement, dynamometer, prony brake.  Standard temperature, pressure altitude.
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2.	ENGINE CONSTRUCTION	1	<p>General arrangements of representative types - radial, in-line, horizontally opposed, inverted, vee.</p> <p>Air and liquid cooling.</p> <p>Arrangement of crankcase, cylinders pistons, crankshaft, camshaft, valve gear.</p> <p>Hydraulic tappets.</p> <p>Accessory casing and drives.</p> <p>Reduction gear, propeller shaft and sealing.</p>
3.	IGNITION SYSTEMS	1	<p>Magnetos - terminology, principles.</p> <p>Primary and secondary windings, contact breaker, capacitor.</p> <p>Flux reversal, eddies, E-gap, ventilation, safety gap.</p> <p>Compensated cam.</p> <p>Ignition harness, ignition systems.</p> <p>Ignition timing - internal and external.</p> <p>Magneto speed.</p>
		1	<p>Advance and retard mechanisms.</p> <p>Screening harnesses.</p> <p>Impulse couplings, booster coils.</p> <p>Spark plugs - temperature classification, cleaning and testing.</p>
4.	FUELS AND SYSTEMS	1	<p>Specifications and characteristics.</p> <p>Volatility, Reid vapour pressure, octane rating, vapour lock, tetraethyl lead (TEL).</p>
5.	FUEL METERING SYSTEMS	1	<p>Principles of combustion.</p> <p>Fuel/air ratio.</p> <p>Operation and construction of float type carburettors.</p> <p>Manual and automatic mixture, throttle and cut-off controls.</p> <p>Altitude effects.</p> <p>Direct fuel injection systems.</p> <p>Priming systems.</p>
		2	<p>Intakes - induction manifolds, alternate air supply.</p> <p>Air filters.</p>

6.	LUBRICATION SYSTEMS	1	<p>Properties of lubricating oils - grades, viscosity. Straight, detergent and ashless dispersant oils.</p> <p>Temperature effects and control.</p> <p>Lubricating systems - dry and wet sump.</p> <p>Filters - pressure control.</p> <p>Cooling functions of oil systems - oil coolers.</p> <p>Oil tanks - valves and other components.</p> <p>Pipes - rigid and flexible - internal passages.</p> <p>Pressure, splash and jet lubrication.</p>
		2	Oil analysis in trouble shooting - SOAP reports.
7.	SUPERCHARGING, TURBO-CHARGING SYSTEMS	1	<p>Purpose of supercharging - effects on engine performance.</p> <p>Turbocharging effects.</p>
		2	<p>Basic arrangement of superchargers, turbochargers. Internal direct driven superchargers. Exhaust driven turbochargers.</p> <p>Manual and automatic control.</p> <p>Indications.</p>
8.	ENGINE STARTING	2	<p>Starter motors - engagement methods.</p> <p>Manual, Bendix, solenoid, inertia systems. Starter relays and earthing straps.</p> <p>Internal and external power supply.</p>
9.	INSPECTION	3	Abrasion, burning, burrs, corrosion, deformation, fretting, galling, pitting or spalling, runout, scoring NDT and metrology.

10.	ENGINE OVERHAUL	3	<p>Overhaul procedures for:</p> <ul style="list-style-type: none"><li>- Pistons</li><li>- Valve rockers</li><li>- Push rods</li><li>- Valves</li><li>- Hydraulic tappets</li><li>- Valve springs</li><li>- Valve guides</li><li>- Valve seals</li><li>- Spark plug inserts</li><li>- Crank shaft</li><li>- Bearings</li><li>- Counterweights</li><li>- Con rods</li><li>- Camshaft</li><li>- Reduction gears</li><li>- Gears</li><li>- Drives.</li></ul>
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11.	COMPONENT OVERHAUL	2	<p>Know typical overhaul procedures for:</p> <ul style="list-style-type: none"> <li>- Engine mount frames</li> <li>- Turbo chargers and control devices</li> <li>- Carburettors and injectors</li> <li>- Oil coolers and temperature control valves</li> <li>- Vacuum pumps</li> <li>- Fuel pumps</li> <li>- Hydraulic pumps</li> <li>- Generators and alternators</li> <li>- Starters</li> <li>- Ignition harnesses</li> <li>- Magnetos</li> <li>- Tacho systems</li> <li>- Fuel flow systems</li> <li>- Temperature and pressure sensing systems</li> <li>- Flexible hoses</li> <li>- Oil pumps.</li> </ul>
12.	STANDARD PRACTICES	3	Dismantling, cleaning, repair/reclamation, assembly. Painting, corrosion control.
13.	TESTING	3	Test stands, instruments, test clubs and fans, power corrections for temperature, barometric pressure and humidity. Preparation of documentation.
14.	ADMINISTRATION	2	<p>Know how to prepare a model of a suitable recording system for the processing of lified and non-lified engine components through an overhaul facility including:</p> <p>Relevant release systems. Methods of ensuring the required standards are met throughout the entire overhaul process.</p>
		2	The procedure for raising of modifications and repair schemes.
		3	<p>The provisions of NZCAR Vol. 1 Leaflet F18, 19.</p> <p>Defect reporting and AD procedure.</p>

**Subject 42 (Written) & 43 (Oral)****Turbine Engine Overhaul****Resource Study Material**

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1.	Airframe and Powerplant Mechanics Powerplant  Handbook EA AC65-12A (FAA)	
2.	Civil Aircraft Inspection Procedures  Parts 1 & 2 (CAA UK)	
3.	The Jet Engine - Rolls Royce	
4.	Aircraft Gas Turbine Engine Technology  Irwin E. Tregar (McGraw Hill)	
5.	The Aircraft Gas Turbine Engine  Pratt & Whitney	
6.	Aircraft Gas Turbine Powerplants  EA-TEP-1	
7.	Jet Aircraft Power Systems  Cassamassa & Bert (McGraw Hill)	
8.	Overhaul Manuals applicable to:  RR Dart  A250  JT8D  RB211  CF6	

1.	GAS TURBINE THEORY	3	Principles of jet propulsion - fan engines, by-pass engines and propeller turbines.  Effects of pressure, density, temperature and humidity on engine and aircraft combination.
		1	Gas turbine cycle, Brayton constant pressure cycle.
		3	Compressor theory - aerodynamics, stall, thermodynamics, gas laws, surge. Centrifugal and axial flow.  Combustion theory: burner types, operation and performance.  Turbine theory: nozzle guide vanes reaction and reaction-impulse turbine.  Exhaust systems: convergent nozzle convergent-divergent nozzle. Sound suppression.  Thrust augmentation - water methanol injection.  Thrust reversal. Clamshell doors, front fan target type doors, retractable ejector system.
2.	CONSTRUCTION	2	Inlet ducts, subsonic, supersonic, variable geometry.  Compressors: construction features, casings, blades, shafts, bearings.  Combustion chambers: can, annular, can-annular.  Turbines: construction, nozzle guide vanes.
		1	Turbine disc, blades, matching compressor to turbine.  Materials, balancing.  Exhaust ducts: nozzles.  Noise-suppression - materials.
		2	Thrust reversers: mechanical arrangement, materials.  Modular construction.  Inspection capability and condition monitoring.
3.	FUEL	1	Gasoline, kerosene, wide-cut high flash point fuels.  Fuel requirements.

4.	FUEL CONTROL	2	Theory of operation: types of controls. Starting, acceleration, deceleration, stopping.
		3	Typical fuel control: principles, operation.
		2	Fuel pumps.
		1	Fuel nozzles: simplex, duplex.
		3	Fuel filters. Pressurising and dump valves. Fuel flow meters. Fuel-oil coolers and heaters. Typical fuel system. Governor speed sensing.
5.	THRUST AUGMENTATION	2	Water injection/water methanol operation. Compressor inlet and combustion chamber injection. Sensing control and safety provision. Pumps and plumbing.
6.	LUBRICATION SYSTEM	1	Types of lubricants - requirements and characteristics. Handling. Ester-based synthetic lubricants.
		3	Systems: tanks, pumps, filters, coolers. Breathers and pressurisation systems. Heat exchangers: oil/fuel, oil/air.
		1	Sealing: labyrinth and carbon seals. Main bearing, accessory and gear train lubrication.
		2	Propeller system supply. Reduction gears. Anti-ice applications.
		1	Compatibility of lubricants from various manufacturers.

7.	STARTING, IGNITION & ENGINE INDICATORS	3	Starting systems: motors, starter-generators, air starter, start cycle.  Provision of clutch, overspeed pneumatic.  Ground power: electrical, pneumatic.
		1	Ignition system requirements.  Capacitor-discharge type systems - high energy.  Spark generation - surface discharge igniter plug and leads.
		3	Safety precautions during maintenance operations.  Altitude re-light.  Engine indicators: performance, gas temperature measurement, thermocouples. Controls.
		2	Power levers, thrust reverser, propeller controls.  Valve controls: manual/electric.
8.	AIR FLOW CONTROL	1	Internal cooling and sealing.  Accessory cooling.  Overboard dump: temperature monitoring.
		3	Bleed air supplies and control.  Bleed valves.  Variable inlet guide vanes: scheduling, operating systems.  Surge sensing and control.
9.	FIRE PROTECTION	1	Prevention of ignition.
		2	Fire detection, fire wires, detection units.
		3	Firewalls, bulkheads, flame holders.
		1	Fire extinguishants.  Indicators and warnings.  Engine overheat detection.

10.	ENGINE PERFORMANCE	3	<p>Performance testing - operating procedures.</p> <p>Starting: overtemperature procedures.</p> <p>Thrust and horsepower: operating curves, altitude effects on fuel consumption and SHP, climatic effects. Propulsive efficiency.</p> <p>Fuel consumption, power/weight relationship.</p>
		2	Compressor contamination/turbines damage.
11.	INSPECTION	3	<p>Abrasion, burning, burrs, corrosion, deformation, fretting, galling, pitting or spalling, runout, scoring, creep, erosion, torching, leakages, distortion, shingling.</p> <p>Hot section inspections.</p>
12.	ENGINE OVERHAUL	3	<p>Overhaul procedures of:</p> <p>Intakes, fans, compressors, combustor sections, turbines, gearboxes, accessory drives, exhausts, lubrication systems.</p>
13.	COMPONENT OVERHAUL	3	<p>Know typical overhaul procedures for:</p> <p>Fuel control units.</p> <p>Fuel pumps.</p> <p>Hydraulic pumps.</p> <p>Bleed air actuators and systems.</p> <p>Ignition units.</p> <p>Vacuum pumps.</p> <p>Overspeed governors.</p> <p>Pressure and temperature sensing units.</p> <p>Tacho units.</p> <p>Start valves, solenoids and relays.</p> <p>Oil pumps.</p> <p>Torque meter systems.</p>
14.	STANDARD PRACTICES	3	Dismantling, cleaning, repair, reclamation, assembly.
15.	TESTING	2	Test house layout, engine installation, pre-run check, start-up test runs, analysis of data. Preparation of data.
16.	ADMINISTRATION	3	<p>Know how to prepare a model of a suitable recording system for the processing of life and non-life engine components through an overhaul facility including:</p> <p>Relevant release systems. Methods of ensuring the required standards are met throughout the entire overhaul process. Procedure for raising modifications and repair schemes. Defect reporting and AD control procedures.</p>

**Subject 44 (Written) & 45 (Oral)****Propeller Overhaul****Resource Study Material**

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1.	EA-APC Aircraft Propellers and Controls	
2.	EA-AC65-12 Power Plant Handbook	
3.	Service manuals relevant to the overhaul of propellers and propeller control units of the following manufacturers fitted to an aircraft on the New Zealand register.  McCauley  Hartzell  Dowty Rotol  Hamilton Standard	

1.	PRINCIPLES	1	Propeller types and characteristics.
		2	Fixed and variable pitch propellers and spinners. Constant speeding units and feathering systems.  Ground and flight functioning - characteristics.
2.	THEORY	1	Centrifugal twisting moment thrust and torque, bending force. Vibrational forces and critical RPM range.
3.	CONSTRUCTION	3	Pitch change mechanisms - pitch control. Governors, constant speed units. Pitch stops - fixed centrifugal, manual, electrical.  Crankshaft attachment - assembly methods.  Methods of achieving balance - static and dynamic.
4.	MAINTENANCE	3	Materials of construction - wood and metal, composites.  Limitations of damage acceptance areas, cropping, contour control.  Stone damage, cracking and corrosion.  Protective coatings - anodic, organic coatings, shot peening.  Anti-ice, de-ice systems - liquid, electrical - repairs and inspection.  Use of propeller protector.  Overhaul of governors and control units.

5.	OVERHAUL PRACTICES	3	Dismantling, cleaning, inspection including NDT, repair/recovery, balancing, assembly, testing, inhibiting, storage.
6.	SIDE SHOP PROCESSES	2	Glueing. Painting. Anodising. Cadmium plating. Shot peening. Cold rolling.
7.	STANDARDS	3	Maintenance of: Vernier levels, balancing equipment, knife edges.
8.	COMPOSITE PROPELLERS	2	Design and construction methods. Materials. Glues. Resins. Fillers. Grinding processes. Safety precautions. Storage procedures and shelf life control. Finishing procedures.
9.	BOOTS & LEADING EDGE PROTECTION	2	Removal procedure. Installation of boots. Installation of nickel and stainless steel protectors.
10.	ADMINISTRATION	2	Describe a typical propeller overhaul facility. Prepare a system for processing lified and non-lified propeller components through the overhaul facility above. Relevant stores and release systems and return to stock procedures. Procedure for raising modification and repair schemes. Provisions of NZCAR 1 Leaflet F18. Defect reporting and AD control procedure.



## Subject 46 (Written) & 47 (Oral)

### Helicopter Dynamic Component Overhaul

#### 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.	Aerospatiale AS 350 Manufacturer's Component Overhaul manuals	
2.	Bell 206B and B212 Manufacturer's Component Overhaul manuals	
3.	Hughes 269 Manufacturer's Component Overhaul manuals	
4.	Hughes 369 Manufacturer's Component Overhaul manuals	
5.	CAA Civil Aircraft Inspection Procedures Parts I and II	
6.	AC 65.12A Aircraft and Powerplant Mechanics Powerplant Handbook	

1.	ROTORHEADS	1	Basic construction of articulating, rigid, semi-rigid and composite rotorheads.
		3	Identify life limited components in each type of rotor head.  Typical rotor head defects found during major maintenance.  Overhaul procedures, special techniques, special tooling and restorative processes applicable to the overhaul of rotor heads fitted to rotorcraft listed in the resource study material.
2.	MAIN ROTOR DRIVE SHAFTS (MASTS)	1	Basic construction of main rotor drive shafts fitted to the rotorcraft listed in the resource study material.
		2	Overhaul principles and techniques for masts.  Repair and reclamation processes applicable to masts.
3.	SWASH PLATE ASSEMBLIES	1	Know the basic construction and principle of operation of swashplates fitted to the rotorcraft listed in the resource study material.
		2	Understand the overhaul principles and techniques listed in the appropriate overhaul manuals.  Understand the repair and reclamation processes applicable to swashplate assemblies.
		3	Identify likely life limited components in swashplates.

4.	MAIN GEARBOXES & INPUT DRIVE SHAFTS	1	Construction and principles of operation of main gearboxes fitted to the helicopters listed in the resource study material.
		2	Overhaul techniques and processes applicable to each gearbox type.
		3	Backlash, shimming, gear wear patterns and gear defects.
		2	Lubrication systems applicable to transmissions listed in the resource study material.  Repair and reclamation processes for transmission components.
		3	Typical transmission defects.  Transmission decontamination procedures after component failure.
5.	OVER-RUNNING CLUTCHES & ROTOR BRAKES	1	Basic construction of over-running clutches and rotor brakes fitted to rotorcraft specified in the resource study material.
		2	Overhaul principles and practices applicable to over-running clutches.
		3	Likely defects on free wheel clutches.
		2	Reclamation processes applicable to over-running clutches.
6.	TAIL ROTOR GEARBOXES	1	Basic construction of tail rotor gearboxes fitted to rotorcraft specified in the resource study material.
		2	Overhaul principles and practices applicable to tail rotor gearboxes.  Reclamation processes applicable to over-running clutches.
7.	TAIL ROTORS & TAIL ROTOR DRIVE SHAFTS	1	Basic construction and principle of operation of tail rotors fitted to rotorcraft specified in the resource study material.
		3	Typical tail rotor defects.  Identify life limited components fitted to tail rotors.  Tail rotor static balancing.
		2	Typical tail rotor blade repair processes.

8.	GENERAL	2	<p>Workshop layout and plant which is necessary for operations as an approved firm.</p> <p>Release note procedure.</p> <p>Record keeping and use of component history cards.</p> <p>Component storage, packing and transit procedure.</p>
		3	<p>Defect reporting and investigation.</p> <p>ADs, service information, overhaul manuals and data applicable to component overhaul.</p>
		2	<p>Stores procedure, parts manuals, the identification of bogus parts, bond and quarantine stores.</p> <p>Pre-strip inspection.</p> <p>Cleaning processes and materials.</p> <p>Corrosion protection and inhibiting methods.</p> <p>Drawing interpretation.</p>
		3	Sudden stoppage and other special inspections.
		2	Special tools, such as: static balancing kits, torque fixtures, holding fixtures and alignment tools.