

1. Title	Gas turbine engine II (Mechanics Repair and Maintenance)
2. Code	EMAMBG501A
3. Range	The knowledge is needed for a wide range of aircraft repair and maintenance works, e.g. applicable to aircrafts, analysis, machineries, airworthiness, airframes, avionics, materials, tests, documentation, safety, health and tools etc.
4. Level	5
5. Credit	3
6. Competency	<p style="text-align: center;"><u>Performance Requirement</u></p> <p>6.1 Knowledge</p> <ul style="list-style-type: none"> ◆ Able to understand the gas turbine engine fundamentals <ul style="list-style-type: none"> • Potential energy, kinetic energy, Newton's laws of motion, Brayton cycle. • The relationship between force, work, power, energy, velocity, acceleration. • Constructional arrangement and operation of turbojet, turbofan, turboshaft, turboprop. ◆ Able to understand the engine performance <ul style="list-style-type: none"> • Gross thrust, net thrust, choked nozzle thrust, thrust distribution, resultant thrust, thrust horsepower, equivalent shaft horsepower, specific fuel consumption. • Engine efficiencies. • By-pass ratio and engine pressure ratio. • Pressure, temperature and velocity of the gas flow. • Engine ratings, static thrust, influence of speed, altitude and hot climate, flat rating, limitations.

- ◆ Able to understand the inlet
 - Compressor inlet ducts.
 - Effects of various inlet configurations.
 - Ice protection.
- ◆ Able to understand the compressors
 - Axial and centrifugal types.
 - Constructional features and operating principles and applications.
 - Fan balancing.
 - Operation.
 - Causes and effects of compressor stall and surge.
 - Methods of air flow control: bleed valves, variable inlet guide vanes, variable stator vanes, rotating stator blades.
 - Compressor ratio.
- ◆ Able to understand the combustion section
 - Constructional features and principles of operation.
- ◆ Able to understand the turbine section
 - Operation and characteristics of different turbine blade types.
 - Blade to disk attachment.
 - Nozzle guide vanes.
 - Causes and effects of turbine blade stress and creep.
- ◆ Able to understand the exhaust
 - Constructional features and principles of operation.
 - Convergent, divergent and variable area nozzles.
 - Engine noise reduction.
 - Thrust reversers.

- ◆ Bearings and Seals
 - Constructional features and principles of operation.
- ◆ Able to understand the lubricants and fuels
 - Properties and specifications.
 - Fuel additives.
 - Safety precautions.
- ◆ Able to understand the lubrication systems
 - System operation/lay-out and components.
- ◆ Able to understand the fuel systems
 - Operation of engine control and fuel metering systems including electronic engine control (FADEC).
 - Systems lay-out and components.
- ◆ Able to understand the air systems
 - Operation of engine air distribution and anti-ice control systems, including internal cooling, sealing and external air services.
- ◆ Able to understand the starting and ignition systems
 - Operation of engine start systems and components.
 - Ignition systems and components.
 - Maintenance safety requirements.
- ◆ Able to understand the engine indication systems
 - Exhaust Gas Temperature / Interstage Turbine Temperature.
 - Engine Thrust indication: Engine Pressure Ratio, engine turbine discharge pressure or jet pipe pressure systems.
 - Oil pressure and temperature.
 - Fuel pressure and flow.

- Engine speed.
- Vibration measurement and indication.
- Torque.
- Power.
- ◆ Power Augmentation Systems
 - Operation and applications.
 - Water injection, water methanol.
 - Afterburner systems.
- ◆ Able to understand the turbo-prop engines
 - Gas coupled/free turbine and gear coupled turbines.
 - Reduction gears.
 - Integrated engine and propeller controls.
 - Overspeed safety devices.
- ◆ Able to understand the turbo-shaft engines
 - Arrangements, drive systems, reduction gearing, couplings, control systems.
- ◆ Able to understand the auxiliary power units (APUs)
 - Purpose, operation, protective systems.
- ◆ Able to understand the powerplant installation
 - Configuration of firewalls, cowlings, acoustic panels, engine mounts, anti-vibration mounts, hoses, pipes, feeders, connectors, wiring looms, control cables and rods, lifting points and drains.
- ◆ Able to understand the fire protection systems
 - Operation of detection and extinguishing system.
- ◆ Able to understand the engine monitoring and ground operation
 - Procedures for starting and ground run-up.

	<ul style="list-style-type: none"> • Interpretation of engine power output and parameters. • Trend (including oil analysis, vibration and boroscope) monitoring. • Inspection of engine and components to criteria, tolerances and data specified by engine manufacturer. • Compressor washing / cleaning. • Foreign Object Damage. ◆ Engine Storage and Preservation <ul style="list-style-type: none"> • Preservation and depreservation for the engine and accessories / systems. ◆ Able to apply the following knowledge in the aircraft maintenance. <ul style="list-style-type: none"> • Gas turbine engine fundamentals • Engine performance • Inlet • Compressors • Combustion section • Turbine section • Exhaust • Bearings and seals • Lubricants and fuels • Lubrication systems • Fuel systems • Air systems • Starting and ignition systems • Engine indication systems • Turbo-prop engines • Turbo-shaft engines • Auxiliary Power Units (APUs) • Powerplant installation • Fire protection systems • Engine monitoring and Ground operation • Engine storage and preservation
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6.2 Theoretical and practical aspects

6.3 Professional approach

- ◆ Able to understand the principal elements of the subjects.
- ◆ Able to understand the general knowledge of the theoretical and practical aspects of the following subjects.
 - Gas turbine engine fundamentals
 - Engine performance
 - Inlet
 - Compressors
 - Combustion section
 - Turbine section
 - Exhaust
 - Bearings and seals
 - Lubricants and fuels
 - Lubrication systems
 - Fuel systems
 - Air systems
 - Starting and ignition systems
 - Engine indication systems
 - Turbo-prop engines
 - Turbo-shaft engines
 - Auxiliary Power Units (APUs)
 - Powerplant installation
 - Fire protection systems
 - Engine monitoring and Ground operation
 - Engine storage and preservation
- ◆ Able to apply the knowledge in the aircraft maintenance task.
- ◆ Able to understand the detailed knowledge of the theoretical and practical aspects of the following subject.
 - Engine monitoring and Ground operation
- ◆ Able to combine and apply the separate elements of knowledge in a logical and comprehensive manner.

<p>7. Assessment Criteria</p>	<p>The integral outcomes requirement of this UoC are:</p> <ul style="list-style-type: none"> (i) Able to understand the theory of the subjects and interrelationships with other subjects. (ii) Able to give a detailed description of the subject using theoretical fundamentals and specific examples. (iii) Able to understand and be able to use mathematical formulae related to the subject. (iv) Able to read, understand and prepare sketches, simple drawings and schematics describing the subject. (v) Able to apply the knowledge relating to mechanics repair and maintenance in a practical manner using manufacturer's instructions. (vi) Able to interpret results from various sources and measurements and apply corrective action where appropriate.
<p>8. Remarks</p>	<p>Ref: HKAR-66 Module 15: Gas turbine engine</p>