

1. Title	Aeroplane aerodynamics, structures and systems II (Simple Light Aeroplane Repair and Maintenance)
2. Code	EMAMBY502A
3. Range	The knowledge is needed for a wide range of simple light aeroplane 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	5
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 theory of aeroplane aerodynamics and flight controls <ul style="list-style-type: none"> • Operation and effect of of: <ul style="list-style-type: none"> ▸ Roll control: ailerons and spoilers. ▸ Pitch control: elevators, stabilators, variable incidence stabilisers and canards. ▸ Yaw control, rudder limiters. • Control using elevons, ruddervators. • High lift devices, slots, slats, flaps, flaperons. • Drag inducing devices, spoilers, lift dumpers, speed brakes. • Effects of wing fences, saw tooth leading edges. • Boundary layer control using, vortex generators, stall wedges or leading edge devices. • Operation and effect of trim tabs, balance and antibalance (leading) tabs, servo tabs, spring tabs, mass balance, control surface bias, aerodynamic balance panels.

- ◆ Able to understand the general concept of the airframe structures
 - Airworthiness requirements for structural strength.
 - Structural classification, primary, secondary and tertiary.
 - Fail safe, safe life, damage tolerance concepts.
 - Zonal and station identification systems.
 - Stress, strain, bending, compression, shear, torsion, tension, hoop stress, fatigue.
 - Drains and ventilation provisions.
 - System installation provisions.
 - Lightning strike protection provision.
 - Construction methods of: stressed skin fuselage, formers, stringers, longerons, bulkheads, frames, doublers, struts, ties, beams, floor structures, reinforcement, methods of skinning, anti-corrosive protection, wing, empennage and engine attachments.
 - Structure assembly techniques: riveting, bolting, bonding.
 - Methods of surface protection, such as chromating, anodising, painting.
 - Surface cleaning.
 - Airframe symmetry: methods of alignment and symmetry checks.
- ◆ Able to understand the aeroplanes airframe structures
 - Fuselage (ATA 52/53/56)
 - Construction and pressurisation sealing.

- Wing, stabiliser, pylon and undercarriage attachments.
- Seat installation and cargo loading system.
- Doors: construction, mechanisms, operation and safety devices.
- Windows and windscreen construction and mechanisms.
- Wings (ATA 57)
 - Construction.
 - Fuel storage.
 - Landing gear, pylon, control surface and high lift/drag attachments.
- Stabilisers (ATA 55)
 - Construction.
 - Control surface attachment.
- Flight control surfaces (ATA 55/57)
 - Construction and attachment.
 - Balancing - mass and aerodynamic.
- Nacelles/Pylons (ATA 54)
 - Construction.
 - Firewalls.
 - Engine mounts.
- ◆ Able to understand the Instruments/Avionic Systems
 - Instrument Systems (ATA 31)
 - Pitot static: altimeter, air speed indicator, vertical speed indicator.
 - Gyroscopic: artificial horizon, attitude director, direction indicator, horizontal situation indicator, turn and slip indicator, turn coordinator.
 - Compasses: direct reading, remote reading.

- Compass compensation and adjustment.
- Angle of attack indication, stall warning systems.
- Other aircraft system indication.
- Avionic Systems
 - Fundamentals of system lay-outs and operation of:
 - Auto Flight (ATA 22).
 - Communications (ATA 23).
 - Navigation Systems (ATA 34).
- ◆ Able to understand the electrical power (ATA 24)
 - Batteries Installation and Operation.
 - DC power generation.
 - AC power generation.
 - Emergency power generation.
 - Voltage regulation.
 - Power distribution.
 - Inverters, transformers, rectifiers.
 - Circuit protection.
 - External / Ground power.
- ◆ Able to understand the equipment and furnishings (ATA 25)
 - Emergency equipment requirements.
 - Seats, harnesses and belts.
- ◆ Able to understand the fire protection (ATA 26)
 - Fire and smoke detection and warning systems.
 - Fire extinguishing systems.
 - System tests.
- ◆ Able to understand the flight controls (ATA 27)

- Primary controls: aileron, elevator, rudder, spoiler.
- Trim control.
- Active load control.
- High lift devices.
- Lift dump, speed brakes.
- System operation: manual, hydraulic, pneumatic, electrical, fly-by-wire.
- Artificial feel, Yaw damper, Mach trim, rudder limiter, gust locks.
- Balancing and rigging.
- Stall protection system.
- ◆ Able to understand the fuel systems (ATA 28)
 - System lay-out.
 - Fuel tanks.
 - Supply systems.
 - Dumping, venting and draining.
 - Cross-feed and transfer, Indications and warnings.
 - Refuelling and defuelling.
 - Longitudinal balance fuel systems.
- ◆ Able to understand the hydraulic power (ATA 29)
 - System lay-out.
 - Hydraulic fluids.
 - Hydraulic reservoirs and accumulators.
 - Pressure generation: electric, mechanical, pneumatic.
 - Emergency pressure generation.
 - Pressure Control.
 - Power distribution.
 - Indication and warning systems.
 - Interface with other systems.

	<ul style="list-style-type: none"> ◆ Able to understand the ice and rain protection (ATA 30) <ul style="list-style-type: none"> • Ice formation, classification and detection. • Anti-icing systems: electrical, hot air and chemical. • De-icing systems: electrical, pneumatic and chemical. • Rain repellent and removal. • Probe and drain heating. ◆ Able to understand the landing gear (ATA 32) <ul style="list-style-type: none"> • Construction, shock absorbing. • Extension and retraction systems: normal and emergency. • Indications and warning. • Wheels, brakes, antiskid and autobraking. • Tyres. • Steering. ◆ Able to understand the lights system (ATA 33) <ul style="list-style-type: none"> • External: navigation, anti-collision, landing, taxiing, ice. • Internal: cabin, cockpit, cargo. • Emergency. <p>6.2 Theoretical and practical aspects</p> <ul style="list-style-type: none"> ◆ Able to apply the following knowledge in the aircraft maintenance. <ul style="list-style-type: none"> • General concepts of airframe structures • Aeroplanes airframe structures • Instrument systems (ATA 31) • Electrical power (ATA 24) • Equipment and furnishings (ATA 25) • Emergency equipment requirements • Fire protection (ATA 26)
--	---

	<ul style="list-style-type: none"> • Flight controls (ATA 27) • Fuel systems (ATA 28) • Hydraulic power (ATA 29). • Ice and rain protection (ATA 30). • Landing gear (ATA 32). • Lights (ATA 33). <p>6.3 Professional approach</p> <ul style="list-style-type: none"> ◆ 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. <ul style="list-style-type: none"> • General concepts of airframe structures • Aeroplanes airframe structures • Instrument systems (ATA 31). • Electrical power (ATA 24). • Emergency equipment requirements • Fire protection (ATA 26). ◆ 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 subjects. <ul style="list-style-type: none"> • Flight controls (ATA 27). • Fuel systems (ATA 28). • Hydraulic power (ATA 29). • Ice and rain protection (ATA 30). • Landing gear (ATA 32). • Lights (ATA 33). ◆ 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 simple light aeroplane 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 11: Aeroplane aerodynamics, structures and systems</p>