SKILLEDTRADESBC

PROGRAM OUTLINE

Aircraft Maintenance Technician

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AIRCRAFT MAINTENANCE TECHNICIAN

PROGRAM OUTLINE

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Province of British Columbia

TABLE OF CONTENTS

Section 1 INTRODUCTION 4

Foreword 5
Acknowledgements 6
How to Use this Document 7

Section 2 PROGRAM OVERVIEW 9

Program Credentialing Model 10
Program Assessment 11
Occupational Analysis Chart 12
Training Topics and Suggested Time Allocation Level 1 18
Training Topics and Suggested Time Allocation Level 2 19
Training Topics and Suggested Time Allocation Level 3 20
Training Topics and Suggested Time Allocation Level 4 21

Section 3 PROGRAM CONTENT 23

Level 1 Aircraft Maintenance Technician 24
Level 2 Aircraft Maintenance Technician 100
Level 3 Aircraft Maintenance Technician 175
Level 4 Aircraft Maintenance Technician 227

Section 4 TRAINING PROVIDER STANDARDS 309

Facility Requirements 310
Tools and Equipment 311
Reference Materials 313
Instructor Requirements 314

Section 1

INTRODUCTION

Aircraft Maintenance Technician

Foreword

This Program Outline is issued by the Industry Training and Apprenticeship Commission for use in apprenticeship training classes sponsored by the Industry Training and Apprenticeship Commission. Indentured apprentices will be directed to the Apprenticeship Training classes in accordance with the General Regulations made pursuant to the Industry Training and Apprenticeship Act of British Columbia.

It is intended as a guide for instructors of apprenticeship. Practical instruction by demonstration, and student participation should be integrated with classroom sessions. Safe working practices, even though not always specified in each operation or topic, are an implied part of the program and should be stressed throughout the apprenticeship.

The Program Outline was prepared with the advice and assistance of Aircraft Maintenance Trade Advisory Committee comprised of representatives of management and labour and in cooperation with the Colleges and Institutes and the Industry Training and Apprenticeships Commission.

SAFETY ADVISORY

Be advised that references to the WorkSafe BC safety regulations contained within these materials do not/may not reflect the most recent Occupational Health and Safety Regulation (the current Standards and Regulation in BC can be obtained on the following website: http://www.worksafebc.com). Please note that it is always the responsibility of any person using these materials to inform him/herself about the Occupational Health and Safety Regulation pertaining to his/her work.

Acknowledgements

The Program Outline was prepared with the advice and direction of the Canadian Aviation Maintenance Council (http://www.avaerocouncil.ca/) and the Government of Manitoba - Entrepreneurship, Training and Trade (www.gov.mb.ca).

SkilledTradesBC would like to acknowledge the dedication and hard work of all the industry representatives involved in identifying the training requirements of the Aircraft Maintenance Technician occupation.

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How to Use this Document

This Program Outline has been developed for the use of individuals from several different audiences. The table below describes how each section can be used by each intended audience.

Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
Program Credentialing Model	Communicate program length and structure, and all pathways to completion	Understand the length and structure of the program	Understand the length and structure of the program, and pathway to completion	Understand challenger pathway to Certificate of Qualification
Program Assessment	Communicate program completion requirements and assessment methods	Understand the various assessment requirements for the program	Understand the various assessment requirements for the program	Understand the assessment requirements they would have to fulfill in order to challenge the program
OAC	Communicate the competencies that industry has defined as representing the scope of the occupation	Understand the competencies that an apprentice is expected to demonstrate in order to achieve certification	View the competencies they will achieve as a result of program completion	Understand the competencies they must demonstrate in order to challenge the program
Training Topics and Suggested Time Allocation	Shows proportionate representation of general areas of competency (GACs) at each program level, the suggested proportion of time spent on each GAC, and percentage of time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the relative weightings of various competencies of the occupation on which assessment is based
Program Content	Defines the objectives, learning tasks, high level content that must be covered for each competency, as well as defining observable, measureable achievement criteria for objectives with a practical component	Identifies detailed program content and performance expectations for competencies with a practical component; may be used as a checklist prior to signing a recommendation for certification (RFC) for an apprentice	Provides detailed information on program content and performance expectations for demonstrating competency	Allows individual to check program content areas against their own knowledge and performance expectations against their own skill levels

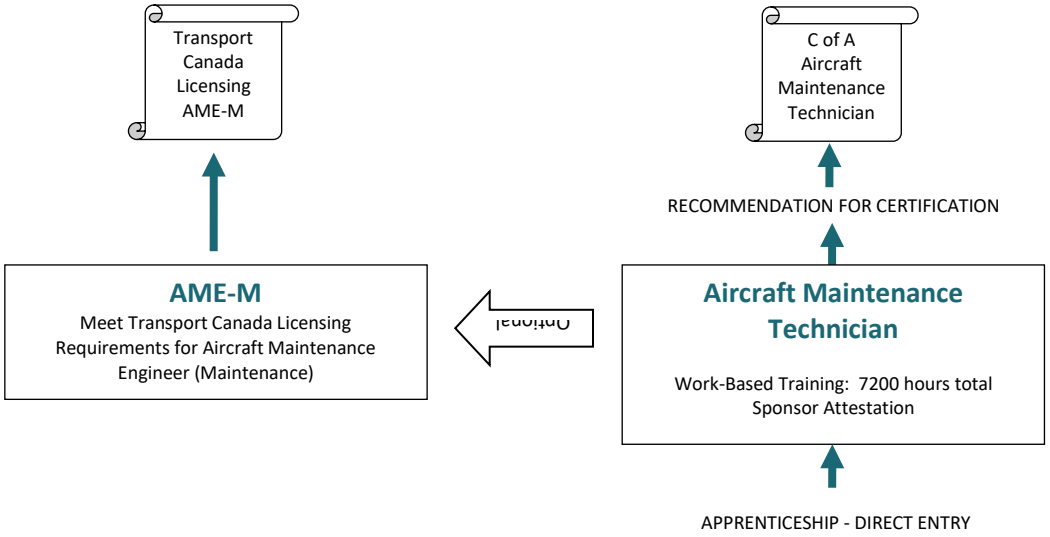
Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
Training Provider Standards	Defines the facility requirements, tools and equipment, reference materials (if any) and instructor requirements for the program	Identifies the tools and equipment an apprentice is expected to have access to; which are supplied by the training provider and which the student is expected to own	Provides information on the training facility, tools and equipment provided by the school and the student, reference materials they may be expected to acquire, and minimum qualification levels of program instructors	Identifies the tools and equipment a tradesperson is expected to be competent in using or operating; which may be used or provided in a practical assessment

Section 2

PROGRAM OVERVIEW

Aircraft Maintenance Technician

Program Credentialing Model



Suggested duration based on 30-hour week

Certificate of Qualification (C of Q)
Certificate of Apprenticeship (C of A)
Certificate of Completion (C of C)
Work-Based Training (WBT)

CROSS-PROGRAM CREDITS

None

Program Assessment

Apprentices will be assessed fairly and accurately throughout the program on the various skills required to be a professional tradesperson. Assessment activities are designed to provide feedback and allow for further development of skills that have been identified as essential for on the job performance.

The forms of assessment used in this program are described below.

Completion Requirement	Evidence of Achievement	Level of Achievement Required
Level 1 Technical Training	In-school testing and practical assessment	Minimum 70%
Level 2 Technical Training	In-school testing and practical assessment	Minimum 70%
Level 3 Technical Training	In-school testing and practical assessment	Minimum 70%
Level 4 Technical Training	In-school testing and practical assessment	Minimum 70%
Recommendation for Certificate of Apprenticeship	Hours and sponsor sign-off	Declared competent

Occupational Analysis Chart

AIRCRAFT MAINTENANCE TECHNICIAN

Occupation Description: "Aircraft Maintenance Technician" means a person who performs inspections and troubleshooting of an aircraft, including airframe structures, engines and aircraft systems, disassembles and removes defective parts, assembles and installs replacement parts, interprets technical manuals, drawings and blueprints, tests aircraft systems, records problems and actions taken to rectify them, and maintains and accurate statement of the maintenance history of the aircraft.

Block	Competencies			
GROUND HANDLING 1	Fire Protection and Detection 1.01 (1)	Equipment and Furnishings 1.02 (1)	WHMIS 1.03 (1)	Aircraft Handling 1.04 (1)
AVIATION MATH AND PHYSICS 2	Aviation Math and Physics 2.01 (1)			
TOOLS AND EQUIPMENT 3	Hand and Machine Tools 3.01 (1)	Precision Measuring Instruments 3.02 (1)		
AIRFRAME FUEL SYSTEMS 4	Fuel and Fuel Systems 4.01 (1)			
AIRCRAFT HARDWARE 5	Aircraft Hardware 5.01 (1)			

HYDRAULIC AND PNEUMATIC SYSTEMS 6	Environmental Systems 6.01	Hydraulic Systems 6.02	Controls and Rigging 6.03	Basic Hydraulics and Pneumatics 6.04		
	1	1	1	1		
LANDING GEAR 7	Landing Gear, Wheels, Tires and brakes 7.01					
	1					
STRUCTURES, ASSEMBLY, RIGGING 8	Controls and Rigging 8.01	Metallic Structures 8.2	Theory of Flight-Fixed Wing 8.03			
	1	1	1			
ROTARY-WING CONTROL SYSTEMS 9	Controls and Rigging 9.01	Theory of Flight-Rotary Wing 9.02				
	1	1				
COMPOSITES 10	Non-Metallic Structures 10.01	Materials and Processes 10.02				
	2	2				
RECIPROCATING ENGINES 11	Bearings and Seals 11.01	Reciprocating Engine Principles 11.02	Reciprocating Engine Maintenance 11.03	Carburation and Engine Fuel Systems 11.04	Introduction Fuel Systems 11.05	Fuel Injections Systems 11.06
	2	2	2	2	2	2

	Induction, Supercharging, Exhaust 11.07	Engine Starting Systems 11.08	Lubricants and Lubrication 11.09	Aircraft Engine: Operation and Installation 11.10	
	2	2	2	2	
PROPELLERS 12	Propellers 12.01				
	2				
AIRCRAFT STRUCTURAL MATERIALS 13	Non-Metallic Structures 13.01	Materials and Processes 13.02	Corrosion Control 13.03		
	2	2	2		
WOOD AND FABRIC 14	Non-Metallic Structures 14.01	Materials and Processes 14.02			
	2	2			
HUMAN FACTORS 15	Human Factors in Aircraft Maintenance 15.01				
	1				
DYNAMIC DRIVE SYSTEMS 16	Dynamic Drivetrains 16.01				
	2				

VIBRATION ANALYSIS 17	Vibration Analysis and Rectification 17.01				
		2			

WEIGHT AND BALANCE 19	Weight and Balance 19.01				
	1				

DRAWINGS 20	Aircraft Drawings 20.01				
			3		

METALLIC STRUCTURES 21	Metallic Structures 21.01					Hand and Machine Tools 21.02				
			3					3		

MAINTENANCE PROCEDURES 22	Principles of Aircraft Maintenance Management 22.01				
			3		

TURBINE ENGINES 23	Fire Protection and Detection 23.01					Ignition Systems 23.02					Engine Indicating and Warning Systems 23.03					Gas Turbine Engine Theory 23.04					Turbine Engine Maintenance 23.05					Gas Turbine Engine Fuel Systems 23.06				
			3					3					3					3					3					3		

	Engine Starting Systems 23.07	Lubricants and Lubrication-Turbine 23.08	Lubricants and Lubrications-Function 23.09	Aircraft Engine: Operation and Installation 23.10	Aircraft Engine: Operation and Installation 23.11
	3	3	3	3	3
ENVIRONMENTAL SYSTEMS 24	Environmental Systems 24.01				
	3				
CANADIAN AVIATION REGULATIONS 25	Introduction to CARS 25.01	CAR Part 1-General Provisions 25.02	CAR Part 2- Identification and Registration 25.03	CAR Part 4 Subpart 3 & AWM Chapter 566 25.04	CAR 501,AWM 501-Annual Airworthiness Information Report 25.05
	4	4	4	4	4
	CAR 507,AWM 507 Flight Authority 25.06	CAR 509,AWM 509- Export Airworthiness Certificates 25.07	CAR 251 Division 2 Type Certificates 25.08	CAR 521 Division 4 Changes to a Type Design 25.09	AWM 561-Manufacture of Aeronautical Products 25.10
	4	4	4	4	4
	AWM 563-Distribution of Aeronautical Products 25.11	CAR 571,AWM 571-Aircraft Maintenance Requirements 25.12	CAR 573,AWM 573-Approved Maintenance Organizations 25.13	CAR 521 Division IX Service Difficulty Reporting 25.14	CAR 521 Division X Airworthiness Directives 25.15
	4	4	4	4	4
	CAR 604- Private Operator Passenger Transportation 25.16	CAR 605-Aircraft Requirements and CAR 625 25.17	CAR 625-Appendix A-Elementary Work 25.18	CAR 625-Appendix C-Out of Phase Tasks 25.19	CAR 625-Appendix I Specification Tables-Schedule I 25.20
	4	4	4	4	4
	CAR 706-Maintenance Requirements for Commercial Air Operators and Car 726 25.21	CAR on the Internet 25.22	AME Publications 25.23		
	4	4	4		

INSTRUMENTS **27**	Engine Indicating and Warning Systems 27.01			4	
	Aircraft Instrumentation 27.02			4	
AVIONICS **28**	Controls and Rigging 28.01			4	
	Avionics 28.02			4	
	Data Bus and Logic 28.02			4	
ICE AND RAIN PROTECTION **29**	Ice and Rain Protection Systems 29.01			4	
ELECTRICAL **30**	Basic Electricity -DC 30.01			4	
	Basic Electricity-AC 30.02			4	
	Electrical Systems 30.03			4	
NON- DESTRUCTIVE TESTING **31**	Non-Destructive Inspection 31.01			4	

Training Topics and Suggested Time Allocation Level 1

		% of Time
Line 1	**GROUND HANDLING**	**8 %**
1.01	Fire Protection and Detection	
1.02	Equipment and Furnishings	
1.03	WHMIS	
1.04	Aircraft Handling	
Line 2	**AVIATION MATH AND PHYSICS**	**15 %**
2.01	Aviation Math and Physics	
Line 3	**TOOLS AND EQUIPMENT**	**11 %**
3.01	Hand and Machine Tools	
3.02	Precision Measuring Instruments	
Line 4	**AIRFRAME FUEL SYSTEMS**	**3 %**
4.01	Fuel and Fuel Systems	
Line 5	**AIRCRAFT HARDWARE**	**9 %**
5.01	Aircraft Hardware	
Line 6	**HYDRAULIC AND PNEUMATIC SYSTEMS**	**9 %**
6.01	Environmental Systems	
6.02	Hydraulic Systems	
6.03	Controls and Rigging	
6.04	Basic Hydraulic and Pneumatic	
Line 7	**LANDING GEAR**	**11 %**
7.01	Landing Gear, Wheels, Tires and Brakes	
Line 8	**STRUCTURES,ASSEMBLY,RIGGING**	**16 %**
8.01	Controls and Rigging	
8.02	Metallic Structures	
8.03	Theory of Flight-Fixed Wing	
Line 9	**ROTARY WING CONTROL SYSTEMS**	**7 %**
9.01	Controls and Rigging	
9.02	Theory of Flight-Rotary Wing	
Line 15	**HUMAN FACTORS**	**4 %**
15.01	Human Factors in Aircraft Maintenance	
Line 19	**WEIGHT AND BALANCE**	**7 %**
19.01	Weight and Balance	
	Total Percentage for Aircraft Maintenance Technician Level 1	**100 %**

Training Topics and Suggested Time Allocation Level 2

		% of Time
Line 10	**COMPOSITES**	**11 %**
10.01	Non-Metallic Structures	
10.02	Materials and Processes	
Line 11	**RECIPROCATING ENGINES**	**53 %**
11.01	Bearings and Seals	
11.02	Reciprocating Engine Principles	
11.03	Reciprocating Engine Maintenance	
11.04	Carburation and Engine Fuel Systems	
11.05	Introduction to Fuel Systems	
11.06	Fuel Injection Systems	
11.07	Induction, Supercharging, Exhaust	
11.08	Engine Starting Systems	
11.09	Lubricants and Lubrication	
11.10	Aircraft Engine: Operation and Installation	
Line 12	**PROPELLERS**	**9 %**
12.01	Propellers	
Line 13	**AIRCRAFT STRUCTURAL MATERIALS**	**9 %**
13.01	Non-Metallic Structures	
13.02	Materials and Processes	
13.03	Corrosion Control	
Line 14	**WOOD AND FABRIC**	**5 %**
14.01	Non-Metallic Structures	
14.02	Materials and Processes	
Line 16	**DYNAMIC DRIVE SYSTEMS**	**7 %**
16.01	Dynamic Drivetrains	
Line 17	**VIBRATION ANALYSIS**	**6 %**
17.01	Vibration Analysis and Rectification	
	Total Percentage for Aircraft Maintenance Technician Level 2	**100 %**

Training Topics and Suggested Time Allocation Level 3

		% of Time
Line 20	**DRAWINGS**	**5 %**
20.01	Aircraft Drawings	
Line 21	**METALLIC STRUCTURES**	**34 %**
21.01	Metallic Structures	
21.02	Hand and Machine Tools	
Line 22	**MAINTENANCE PROCEDURES**	**7 %**
22.01	Principles of Aircraft Maintenance Management	
Line 23	**TURBINE ENGINES**	**43 %**
23.01	Fire Protection and Detection	
23.02	Ignition Systems	
23.03	Engine Indicating and Warning Systems	
23.04	Gas Turbine Engine Theory	
23.05	Turbine Engine Maintenance	
23.06	Gas Turbine Engine Fuel Systems	
23.07	Engine Starting Systems	
23.08	Lubricants and Lubrication-Turbine	
23.09	Lubricants and Lubrication-Function	
23.10	Aircraft Engine: Operation and Installation	
23.11	Aircraft Engine: Operation and Installation	
Line 24	**ENVIROMENTAL SYSTEMS**	**11 %**
24.01	Environmental Systems	
	Total Percentage for Aircraft Maintenance Technician Level 3	**100 %**

Training Topics and Suggested Time Allocation Level 4

		% of Time
Line 25	**CANADIAN AVIATION REGULATIONS**	**19 %**
25.01	Introduction to CAR	
25.02	CAR Part 1-General Provisions	
25.03	CAR Part 2-Identification and Registration	
25.04	CAR Part 4 Subpart 3 &AWM Chapter 566	
25.05	CAR 501,AWM 501-Annual Airworthiness Information Report	
25.06	CAR 507,AWN 507-Flight Authority	
25.07	CAR 509,AWM 509-Export Airworthiness Certificates	
25.08	CAR 521 Division 2 Type Certificates	
25.09	CAR 521 Division 4 Changes to a Type Design	
25.10	AWM 561-Manufacture of Aeronautical Products	
25.11	AWM 563-Distribution of Aeronautical Products	
25.12	CAR 571,AWM 571-Aircraft Maintenance Requirements	
25.13	CAR 573,AWM 573- Approved Maintenance Organizations	
25.14	CAR 521 Division IX-Service Difficulty Reporting	
25.15	CAR 521 Division X-Airworthiness Directives	
25.16	CAR 604- Private Operator Passenger Transportation	
25.17	CAR 605- Aircraft Requirements and CAR 625	
25.18	CAR 625-Appendix A- Elementary Work	
25.19	CAR 625-Appendix C-Out of Phase Tasks	
25.20	CAR 625-Appendix I-Specification Tables-Schedule 1	
25.21	CAR 706-Maintenance Requirements for Commercial Air Operators and CAR 726	
25.22	CAR on the Internet	
25.23	AME Publications	
Line 27	**INSTRUMENTS**	**14 %**
27.01	Engine Indicating and Warning Systems	
27.02	Aircraft Instrumentation	
Line 28	**AVIONICS**	**11 %**
28.01	Controls and Rigging	
28.02	Avionics	
28.03	Data Bus and Logic	
Line 29	**ICE AND RAIN PROTECTION**	**11 %**
29.01	Ice and Rain Protection Systems	

		% of Time
Line 30	**ELECTRICAL**	**5 %**
30.01	Basic Electricity- DC	
30.02	Basic Electricity- AC	
30.03	Electrical Systems	
Line 31	**NON-DESTRUCTIVE TESTING**	**40 %**
31.01	Non-Destructive Inspection	
	Total Percentage for Aircraft Maintenance Technician Level 4	**100 %**

Section 3

PROGRAM CONTENT

Aircraft Maintenance Technician

Level 1

Aircraft Maintenance Technician

Line (GAC): 1 Ground Handling

Competency: 1.01 Fire Protection and Detection

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS	CONTENT
A.2.1 Causes, Prevention, Extinguishing of Fires	
A2.1.1 Classify fires	• Class A • Class B • Class C • Class D
A2.1.2 Explain requirements for fires	• Fire triangle • Extinguishing fires
A2.1.3 Describe dangers of fire in aircraft	• Flammable materials • Fuels and refuelling • Fire exits and escape routes
A2.1.4 Describe fire safety in workshops	• Safety precautions • Handling of flammable products • Fire exits • Welding
A2.1.5 Locate fire extinguishers (Practical)	
A2.2 Fire Extinguisher Agents	
A2.2.1 Describe fire-extinguishing agents by class of fire	• Water • Halogen and its various forms – Halon 1301 – CTC (Carbon Tetrachloride) – Halon 1401 – Freon – BCF (Bromochlorodifluoromethane) – CO (carbon dioxide) • Dry powder • Methyl Bromide • Properties

		• Advantages • Disadvantages • Precautions
A2.2.2	Identify types of extinguishers	• Color coding • Markings
A2.2.3	Describe use of various fire extinguishers	• Handling • Safety checks • Discharging • Dangers of using wrong type
A2.2.4	Identify fire extinguishers from selection provided and state purpose including class of fire for which it is used (Practical)	

Line (GAC): 1 Ground Handling

Competency: 1.02 Equipment and Furnishings

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
A9.4	Aircraft Emergency and Life Saving Equipment	
A9.4.1	Describe types of emergency and lifesaving equipment:	• Life jackets • Liferafts • Airframe Flotation Devices

Line (GAC): 1 Ground Handling

Competency: 1.03 WHMIS

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS	CONTENT
G15.1 WHMIS	
G15.1.1 Explain WHMIS	• Purpose • Background – Right to know about health and safety • Hazardous materials – Controlled products – Definition • Three main components – Labels – MSDSs – Training
G15.1.2 Discuss WHMIS legislation	• Federal • Provincial • Canada Labor Code • Hazardous Products Act – Prohibited products – Restricted products – Controlled products • Penalties
G15.1.3 Explain WHMIS hazard classes	• Compressed gas • Flammable and combustible materials • Oxidizing materials • Poisonous • Corrosive materials • Reactive materials • Biohazards
G15.1.4 List exempted products	• Partially exempt: – Consumer goods – Cosmetics

- Pesticides
- Radioactive substances

- Completely exempt:
  - Wood and wood products
  - Manufactured articles
  - Tobacco
  - Products related to Transport of Dangerous Goods Act

G15.2 Supplier and Workplace Labels

G15.2.1 Describe hazardous product labeling

- Purpose
- Types of WHMIS labels
  - Supplier label
  - Workplace label
- Responsibilities for labeling
  - Suppliers
  - Employers
  - Workers

G15.2.2 Describe supplier label

- Seven categories that must appear on a typical WHMIS supplier label
  - Identifier
  - Material Safety Data Sheet reference
  - Hazard symbols
  - Risk phrases
  - Precautionary measures
  - First-aid measures
- Single-container labeling
  - Label applied
- Multi-container labeling
  - Label inner and outer containers
- Bulk shipments
  - Send label to employer
  - Refer to Transportation of Dangerous Goods Act and Regulations
- Design

G15.2.3 Describe employer's role in labeling materials used in workplace

- Check that supplier labels are provided and applied
- Procedure for improperly labeled products
- Post or apply labels for bulk shipments
- Develop workplace label system
- Provide training on workplace labels and labeling

G15.2.4 Describe workplace labels

- Content
  - Product identifier

  - Safe handling information
  - MSDS available (if applicable)
- Workplace labels must be used on:
  - Storage containers of controlled products used on site
  - Storage containers to receive bulk shipments
  - Portable containers for use longer than a shift
  - Supplier containers with illegible labels
- Design
- Symbols used
- Other means of identification:
  - When used?
  - Where used?

G15.3 MSDS

G15.3.1 Explain purpose of MSDS

- Technical bulletin providing detailed hazard, precautionary, and emergency information about a controlled product
- Supplements alert information provided on labels

G15.3.2 Explain MSDS responsibilities

- Suppliers
  - Provide employers with current MSDS before product sale or importation. Review every three years.
- Employers
  - Ensure up-to-date MSDS obtained first time controlled product is received in the workplace
  - Produce data sheets if producing controlled products for workplace use
  - Must make MSDS available to workers
  - Must provide instruction to workers on information important to health and safety
- Workers
  - Must learn information provided and apply it to the job

G15.3.3 Describe design of MSDS

- Any design may be used subject to basic rules
- MSDS must display nine sections of content covering approximately 60 items of information
- No blank areas

G15.3.4	Describe type of information found in MSDS's	• Product information • Hazardous ingredients • Physical data • Fire and explosion hazard • Reactivity data • Toxicological properties • Preventive measures • First-aid measures • Preparation information
G15.3.5	Locate specified information on MSDSs (Practical)	
G15.4	Implementation and Training	
G15.4.1	Explain requirement for training in WHMIS	• How WHMIS works • Hazards of products • Procedures for safe storage, handling and disposal • Emergency procedures • Training provided by employer – Health and safety committees
G15.5	WHMIS in the Workplace	
G15.5.1	List persons responsible for WHMIS, health and safety and, first aid	
G15.5.2	List hazardous materials used in workplace/learning environment	
G15.5.3	Locate and describe storage areas for hazardous materials	
G15.5.4	Explain requirements associated with MSDSs	• Where data sheets are kept • How to use data sheets • Updating • Accuracy of information
G15.5.5	Describe process for decanting materials used on the shop floor	

G15.5.6 Describe process for disposing of unused and/or contaminated decanted materials

Line (GAC): 1 Ground Handling

Competency: 1.04 Aircraft Handling

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
G18.1	Housekeeping and Safety Precautions	
G18.1.1	Stress importance of keeping hangar/shop clean and organized	• Proper storage of compressed gas cylinders • Air hoses and electrical wires • Tools and tool carts • Stands, hoists and ladders • Batteries and battery carts • Oils and volatile fluids stored in correct locations • Oil/fuel spills attended to immediately • Paint and paint products
G18.1.2	Discuss use of personal safety equipment	• Eye glasses and ear defenders • Location and maintenance of eyewash stations • Acid-proof aprons and gloves • Particle masks and air makeup units • Correct footwear and clothing
G18.1.3	Recall workplace hazardous materials (WHMIS) information system	
G18.1.4	Explain dangers of compressed gas and explain correct handling	• Explosive dangers • Identification of contents • Correct caps • Regulators • Cleanliness • Restraint and storage • Spinning of bearings

G18.1.5	Recall fire safety	• Nature and classification of fires • Identification of markings on fire extinguishers • Inspections of fire extinguishers • Extinguishing agents and correct use of fire extinguishers
G18.1.6	Discuss flight line safety	• Ignition switches and propellers • Correct chocking • Cleanliness of ground run area especially with turbine engines • Cockpit checks • Use of control locks • Dangers around inlet and exhaust areas • Rotor blade clearances • Open driveshafts • Loose clothing, rags and other FOD • Ground support equipment hookup • Signals and communication with other crew members
G18.1.7	Describe system lockout and placarding procedures	• Tagging • Safetying of systems • Manufacturers' procedures (maintenance manual) • Documentation
G18.2	Ground Handling, Towing, Marshalling	
G18.2.1	Discuss procedures for moving aircraft on ground	• Pushing small aircraft – Removal of control locks – Allowable handling areas – Correct inflation of wheels and oleos • Towing large aircraft – Installation of towbars and ropes – Installation of steering lockout pins – Nose gear – Removal of linkages if required – Extra personnel requirements e.g., brakeman and wingman • Hand signaling, day and night • Procedures for moving aircraft around airports • Installation and use of ground power

		equipment • Steering limits • Tow angle limits
G18.3	Hoisting, Jacking, Tying down and Mooring	
G18.3.1	Discuss jacking procedures	• Placarding aircraft • Single wheel tire or brake servicing • Retraction tests and landing gear servicing, e.g. weighting tail so aircraft doesn't fall on its nose • Leveling and weighing aircraft • Tail support when servicing in tail boom or tail cone • Bladder cell lifting
G18.3.2	Discuss lifting procedures	• Changing of undercarriage from floats to wheels to skis • Changing helicopter landing gear types • Salvaging – Precautions – Damages
G18.3.3	Discuss lowering procedures	
G18.3.4	Discuss tie-down procedures	• Selection of ropes • Landplanes – covering, disruption of lift surfaces in high winds, gustlocks , proper knots • Seaplanes-mooring to buoys, jettys, sinking of floats for high winds, proper knots • Skiplanes – covering, heating, distribution of power sources, prevention of freezing into ice surface for high winds • Helicopters – covering and tying down of blades, covering of bubbles, heating, prevention of freezing into ice, purposely freezing into ice, prevention of torque spins on icy surfaces • Discuss ground crew responsibilities and precautions applicable to helicopters slinging external loads

Line (GAC): 2 Aviation Math and Physics

Competency: 2.01 Aviation Math and Physics

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
I.2	Use Different Numbering Systems	
I.2.1.1	Utilize different numbering systems	• The decimal numbering system • The binary number system • Scientific notation
I2.1.2	Perform calculations using the various numbering systems	• Performing calculations with whole numbers • Describe the use of exponents • Perform multiplication with scientific notation
I2.2	Use Fractions in Aviation Related Math	
I2.2.1	Identify terms used with fractions	• Numerator • Denominator • Mixed numbers • Improper fractions
I2.2.2	Perform calculations using fractions	• Reducing fractions to lowest terms • Changing mixed numbers to improper fractions and improper fractions to mixed numbers • Perform addition and subtraction • Perform multiplication and division • Convert fractions to decimals • Convert decimals to fractions
I2.3	Use of Percentages in Aviation Math	
I2.3.1	Identify the use of percentage in aviation	

I2.3.2	Perform calculations for percentage conversions	• Decimal/percentage conversions • Fraction /percentage conversions • Ratio/percentage problems
I2.4	Use of Ratios and Proportion in Aircraft Maintenance	
I2.4.1	Solve ratio and proportion problems	• Express two quantities in the form of a ratio • Express two ration in the form of a proportion • Solve mechanical lever problems • Solve hydraulic piston/actuator problems • Identify and determine different gear ratios
I2.5	Use Area and Volume Calculations in Aircraft Maintenance	
I2.5.1	Perform area calculations	• Rectangles • Squares • Triangles • Quadrilaterals • Circles
I2.5.2	Solve for the total area of aircraft related layout patterns	Using: • Triangles • Quadrilaterals • Circles
I2.5.3	Perform volume calculations	• Rectangular solids • Cubes • Cylinders • Spheres
I2.5.4	Calculate total volume in aviation-related problems	
I2.6	Measuring Systems and Conversions	

I2.6.1	Calculate total volume in aviation-related problems	Perform imperial/S.I. conversions of: • Speed • Length • Mass • Temperature • Pressure • Volumes
I2.6.2	Solve aviation-related problems in Imperial Units for length, velocity, and weight.	
I2.7	Angular Measurement and Trigonometric Functions.	
I2.7.1	Solve problems involving addition and subtraction	• Degrees • Minutes • Seconds
I2.7.2	Calculate unknown quantities in right angle triangles, using trigonometric functions.	
I2.8	The Physical States of Matter	
I2.8.1	Identify the three physical states of matter	• Solid • Liquid • Gas
I2.8.2	Compare the difference between weight and mass	
I2.8.3	Define density of a substance	
I2.8.4	Define specific gravity of a substance	
I2.9	The Basic Types of Energy	
I2.9.1	Identify the difference between potential and kinetic energy	
I2.9.2	Compute the quantity of potential energy of an elevated weight	
I2.10	The Use of Simple Machines in Aviation Maintenance	
I2.10.1	Define and express work, power, and force	
I2.10.2	Calculate mechanical advantages of simple machines, and explain their function	• Levers

		• Inclined planes • Pulley systems • Gears
I2.11	Stress and Strain	
I2.11.1	Describe the five different types of stress, and the ways in which they act upon aircraft structures	• Tension • Torsion • Compression • Bending • Shear
I2.11.2	Explain the difference between stress and strain	
I2.12	Motion and Laws of Motion	
I2.12.1	Explain the effect of force on matter using Newton's first, second and third laws	
I2.12.2	Differentiate between speed and velocity	
I2.12.3	Compare centrifugal and centripetal force	
I2.13	Heat and Pressure	
I2.13.1	Identify three methods of heat transfer	• Conduction • Convection • Radiation
I2.13.2	Differentiate between specific heat and latent heat	
12.13.3	Identify the parameters defining standard day conditions	
12.13.4	State the difference between the various types of pressures	• Absolute pressure • Gage pressure • Differential pressure
I2.14	Gas and Fluid Laws	
I2.14.1	Identify the different gas laws	• Charles law • Boyle's law • Dalton's law
I2.14.2	Use gas laws to determine the results of changing parameters	
I2.14.3	Compare the compressibility of gasses and fluids	
I2.14.4	Determine the pressure exerted by a column of	

fluid

I2.14.5 Use Pascal's law to explain the mechanical advantage of a simple hydraulic system

I2.14.6 Explain, using Bernoulli's principle, the pressure changes that take place in a venturi

I2.15 Sounds and its Effects

I2.15.1 Explain the propagation of sound and it's speed variations through different mediums

I2.15.2 Identify the effects of temperature and pressure on the speed of sound

I2.15.3 Explain the concept of Mach number as a measurement of the speed of sound, and how it varies with different atmosphere conditions affecting the flight of an aircraft

Line (GAC): 3 Tools and Equipment

Competency: 3.01 Hand and Machine Tools

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
G6.1	Safety Consideration and Procedures	
G6.1.1	Discuss safety regulations (provincial and other governing safe operation of hand and machine tools	• Eye protection • Ear protection • Respiratory protection • Clothing – Coveralls – Apron – Gloves – Footwear • Jewelry
G6.1.4	Demonstrate awareness of safety procedures and regulations related to operation of hand and machine tools (Practical)	
G6.2	Cutting Tools	
G6.2.1	Describe correct and safe use of cutting tools	• Diagonal cutters • Chisels – Types – Cutting angles • Hacksaws – Frames – Blades – Two-teeth rule • Files – Nomenclature – Types – Cuts – File cards • Twist drills – Nomenclature – Index sizes – Point angle – Cutting speeds – Feed speed

- Lubricants
- Countersinks
  - Angles
  - Plain
  - Automatic
- Counterbores
  - Spot facing
- Reamers
  - Straight
  - Adjustable
  - Taper
- Taps and dies
  - Types
  - Thread forms (introduction), UNF and UNC internal and external
  - Tap drills
  - Body drills
  - Thread repairing devices
- Snips and scissors
  - Straight, left and right hand metal snips
- Hole cutters

G6.2.2 Demonstrate correct and safe use of a variety of cutting tools including items listed in G5.2.1

G6.3 Mechanical and Electrical Assembly Tools

G6.3.1 Discuss application and safe use of wrenches

- Open-end, box-end, combination and offset
- Six and twelve point
- Ratcheting box-end
- Flare nut
- Adjustable
- Allen wrenches

G6.3.2 Discuss application and safe use of socket wrenches and accessories

- Drive handles and sizes
- Shallow and deep sockets
- Six, eight and twelve point
- Crowsfoot wrenches
- Extensions
- Specialty attachments such as flex sockets, universal joints, Allen and screwdriver heads

G6.3.3.	Discuss application and safe use of torque wrenches	• Use of toque and torque values • Types (e.g., click, bar, gauge) • Proper care/calibration • Calculations of torque corrections for length length adapters
G6.3.4	Discuss special wrenches and precautions in their use	• Screw extractors • Strap wrench • Spanner wrenches
G6.3.5	Discuss screwdrivers and their applications	• Types: – Slotted (plain) – Phillips – Reed and prince – Clutch head, torx, hex and tri-wing – Stubbies, offsets and ratchets
G6.3.6	Discuss pliers and their applications	• Combination slip joints • Adjustable slip joints • Channellocks • Vice grips (adjustable lever wrench) • Needle nose • Duckbills • Safety-wire twisters • Circlip pliers
G6.3.10	Calculate and demonstrate torque correction required for several situations requiring torque wrench extensions and crows-feet extensions	
G6.4	Power and Abrasive Tools	
G6.4.1	Explain safe use of power tools	• Saws • Drill presses • Routers
G6.4.2	Explain safe use of abrasive tools	• Belt and disc sander – Parts (nomenclature) – Operation and maintenance – Safety • Pedestal and valve grinders – Parts (nomenclature)

  - Operation and maintenance
  - Safety
  - Abrasive wheels
- Media blasters

Line (GAC): 3 Tools and Equipment

Competency: 3.02 Precision Measuring Instruments

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
G8.1	Micrometers	
G8.1.1.	Describe micrometers	• Types – Caliper – Vernier – Inside and outside micrometer – Depth gauge • Different sizes • Nomenclature • Principle of operation • Master gauge block
G8.1.2	Read micrometers	• Imperial outside micrometer (.001”) • Imperial outside with vernier scale (.0001”) • Imperial depth micrometer • Imperial inside micrometer • Metric outside micrometer • Metric inside micrometer
G8.1.3	Describe care and handling of micrometers	• Cleaning • Oiling • Storage • Check for accuracy • Make adjustments
G8.1.4	Measure components, and record correct reading, using micrometers (Practical)	• 0 to 1” outside micrometer • Over 1” (25mm) outside micrometer • Inside micrometer • Depth micrometer
G8.2	Precision Measuring Calipers	
G8.2.1	Describe precision measuring calipers	• Types: – Vernier

		– Dial – Digital • Nomenclature • Principle of operation
G8.2.2	Explain how to use and check for accuracy	• Vernier • Dial • Digital
G8.2.3	Explain use of precision measuring calipers for inside/outside and depth measurement	
G8.2.4	Describe care and handling of precision measuring calipers	• Cleaning • Oiling • Storing • Adjusting
G8.2.5	Demonstrate use of precision measuring calipers. Measure components and record readings (Practical)	
G8.3	Bore and Dial Gauges	
G8.3.1	Describe bore and dial gauges	• Nomenclature • Principles of operation • Correct use and limitations – Small-bore gauge – Telescoping gauge – Cylinder gauge (dial) – “Go no-go” gauges – Pin gauges – Feeler gauges – Universal dial indicators – Air – Electronic • Surface plate
G8.3.2	Describe care and handling of bore and dial gauges	• Oiling • Cleaning • Storing • Adjusting

G8.4 Comparators and Miscellaneous Instruments

G8.4.2	Explain use of miscellaneous measuring instruments	• Protractors – Bevel – Bubble – Propeller – Digital – Inclinometer • Combination set • Gauges – Height – Depth – Radius – Thread – Thickness • Rules – Machinist – Steel – Flexible
G8.4.3	Explain tools used to transfer measurements	• Calipers • Dividers
G8.4.4	Describe care and maintenance of gauges, rules and calipers	• Cleaning • Oiling • Storing

Line (GAC): 4 Airframe Fuel Systems

Competency: 4.01 Fuel and Fuel Systems

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS	CONTENT
A3.1 Aircraft Fuels	
A3.1.1 Describe fuels	• Production – Sources – Process – Types of aircraft fuel • Characteristics of aviation gasoline (AVGAS) – Volatility – Detonation – Octane and performance rating – Specific gravity – Flash point • Characteristics of turbine fuel – Low viscosity – Quick start – Complete combustion – High calorific action – Non-corrosive – Fire hazard – Provide lubrication – Specific gravity – Flash point
A3.1.2 Identify fuels	• Turbine fuels – Jet A – Jet A1 – Jet B • Aviation gasoline – AVGAS 80 – AVGAS100 – AVGAAS 100LL – MOGAS

- Fuel lines (color codes)
- Filler cap markings
- Refueling vehicle markings

A3.1.3 Describe fuel handling

- Fire hazards
  - Static electricity
  - Volatility
  - Contamination control:
    - Water
    - Solids
    - Microbial
    - Incorrect grade
- Fueling procedures
  - Water contamination check:
    - Water detection tablets and paste
  - Filters for hand pumps and electric pumps
  - Spill and disposal procedures
  - Grounding
  - Static electricity
- De-fueling procedures
- Care and storage
  - Packed fuel
  - Fuel bowsers
  - Pumps
  - Filter units
  - Drums/plastic jerry cans
- Additives
  - Anti-icing
  - Microbial

A3.2 Aircraft Fuel Systems and components

A3.2.1 Describe fuel systems

- Types of fuel systems
- Gravity –feed
- Pressure-feed
- Requirements for fuel systems

A3.2.2 Describe fuel tanks

- Integral
  - Materials
  - Construction
- Removable
  - Rigid

		• Materials
		• Construction
		• Bladder
		  – Materials
		  – Construction
		  – Attachment methods

A3.2.3	Describe fuel tank filler caps	• Types
		• Purpose
		• Safety considerations
		  – Venting
		  – Preventing of incorrect grade
		• Locking

A3.2.5	Describe fuel pumps	• Purpose
		• Classification
		  – Boost
		  – Scavenge
		  – Cross-feed
		  – Main
		  – Emergency
		• Types
		  – Vane
		  – Variable-volume
		  – Centrifugal: electrically operated and used to start engines, may be submerged
		  – Ejector (used as a scavenge, take over when centrifugal switched off)
		  – Wobble pump
		  – Gear pump
		  – Piston pump
		  – Diaphragm pump

A3.2.6	Describe filters and strainers	• Reasons for filtering • Warning system • Location of filters • Maintenance practices • Drains • Location purpose

A3.2.7	Describe fuel valves	• Selector
		  – Purpose select
		  – Shut-off

		– Flexible – Rigid – Integral • Hand operated – Cone type – Poppet-type • Motor-operated • Solenoid-operated
A3.2.8	Describe fuel heaters	• Types • Purpose • Position on aircraft
A3.2.9	Describe fuel system indicators	• Quantity indicating – Low level warning system • Flowmeters • Temperature gauges • Pressure gauges • Discharge indicators
A3.3	Aircraft Fuel System Operation	
A3.3.1	Describe fuel system operation	• Priming • Venting • Fuel jettisoning • Oil dilution • Cross-feed • Indicating components • Warning lights
A3.3.2	Describe single-engine aircraft fuel systems	• Gravity-feed – Components – Operation • Pump-feed – Low-wing aircraft – Components – Operation – High-wing aircraft ○ Components ○ Operation
A3.3.3.	Describe multi-engine aircraft fuel systems	• Small aircraft – Components – Operation • Large reciprocating engine aircraft – Components – Operation

- Large gas turbine engine aircraft
  - Components
  - Operation

A3.4 Aircraft Fuel System Maintenance

A3.4.1 Explain importance of system grounding

A3.4.2 Describe re-fuelling and de-fueling of aircraft

- Safety aspects
  - System bonding
  - Fire precautions
  - Clothing
  - Tools
  - Venting and tank (purging)
- Procedures
- Gravity fuelling
- Pressure fuelling
- De-fuelling
- Hot fuelling

A3.4.3 Discuss leak detection and classification

A3.4.4 Describe water and sediment checks

A3.4.6 Describe fuel tank repair, installation and testing

Line (GAC): 5 Aircraft Handling

Competency: 5.01 Aircraft Handling

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
G7.1.	Standards and Specifications	
G7.1.1.	Explain differences between approved and non-approved aircraft hardware	
G7.1.2	Explain "standards" as used in aircraft industry	• Abbreviations – Army/Navy (AN) – Air Force/Navy/Aeronautical Design (AND) – Military Standard (MS) – National Aircraft Standard (NAS) – Naval Aircraft Factory (NAF) – Aeronautical Standard (AS) – Aeronautical Materials – Specifications (AMS) • Industry standards – American Society for Testing and Materials (ASTM) – American National Standards Institute (ANSI) – American Iron and Steel Institute (AISI) – Society of Automotive Engineers (SAE) – Alloy Casting Institute (ACI) – Investment Casting Inst. (ICI) – Gray Iron Founders' Society (GIFS) – Steel Founders' Society of America (SFSA) – CGSB
G7.1.3	Explain "specifications" as used in aircraft industry	• Military specifications(MIL) • FAA/JAA/Transport Canada specs
G7.2	Threaded Fasteners and Related Safetying Devices	
G7.2.1	Describe characteristics of thread forms	• Terms: – Pitch – Lead – Crest – Root – Major diameter

		– Minor diameter • Forms and series: – AN – Whitworth – SI – Unified – Acme – American and British standard – Pipe – BA – Buttress – Metric taper
G7.2.2	Describe unified thread series	• UNF/UNC – Thread call-out and sizes – Class of fit – Internal and external thread – Designation (A/B)
G7.2.3	Describe characteristics and application of aircraft bolts	• Define – Grip – Length – Diameter • Bolt size (diameter and length) • Determine grip length with reference to tables • Identify bolts by: – Head shape – Markings • Application • Aircraft bolts: – AN part number system – Close tolerance – Drilled head – Clevis • MS and NAS bolts: – MS and NAS part number system – Use tables for correct size bolt, grip
G7.2.4	Describe aircraft screws	• Review: method of identifying screws and determining part numbers – Size – Length – Thread – Shape of head – Material – Grip length – Special features • Difference between bolts and screws • Structural and non-structural screws • Head style

		• AN screw part number system • Self-tapping screws and their uses: – Type A – Type B • MS standard screws
G7.2.5	Describe aircraft nuts	• Use of nuts • Various types of nuts • Use designation codes to identify: – AN310 castle nut – AN320 shear nut – AN315 plain nut (L/R thread) – AN316 check nut – Self-locking nuts (NC/NF): – AN364 shear – AN365 fibre – An363 metallic – Plate nuts – AN350 wing nuts – Sheet spring nuts • AN nut part number system • MS nuts
G7.2.6	Describe relationship of wrench size to bolt or nut size:	• Review “torque” and use of torque tables • Metric • SAE • BSF/BSW
G7.2.7	Describe aircraft washers	• Use • Types – AN960 flat – AN970 large-area flat – AN935 split-ring lock – AN936 shake proof (type A/B) – Thin series • Washer sizes (to fit screw or bolt) – AN935, AN936 lock – AN950, AN955 Ball socket, seat washers – AN975 taper pin washers – NAS143 countersunk washers • Installation
G7.2.8	Describe procedures for securing hardware	• Cotter pins – Uses – Sizes – Part numbers – Demonstrate – Installation/removal • Safety wire – Uses – Sizes – Part numbers – Demonstrate

		– Installation/removal • Witness wire • Witness marking • Specialty locking devices • Other methods for securing hardware – Peening – Staking – Lock/tab washers – "Loctite" – circlips – snap rings
G7.2.9	Describe various types of threaded insert devices and their installation	• Rivnut
G7.2.10	Using acceptable standard practices, complete exercises (Practical)	• Identify differences between approved and non-approved aircraft hardware • Determine thread size and call-out from physical examination and measurement of hardware: • Use AN/MS/NAS tables, and aircraft publications to identify correct hardware: • Install and remove hardware: • Demonstrate safety procedures.
G7.3	Non-Threaded Fasteners	
G7.3.1	Describe types and uses of pins	Types: • Clevis MS20392 • Taper AN385-386 • Roll • Spring Uses: • Locking • Securing
G7.3.2	Describe rivets	• Identification by: – Material – Head shape – Markings – Length – Diameter • Rivet materials and identifying marks: – Aluminum and aluminum alloy rivets; discuss "ice-box" rivets – Magnesium – Copper – Steel – Monel – Titanium • Part numbers

G7.3.3	Describe fasteners	• MS20600 – MS20603 series and NAS1398, 1399, 1738 and 1739 series • Uses and limitations • Cherrylock • Cherrymax • Huck • Pop rivets
G7.3.4	Describe uses of special fasteners	• K-bolts • Hi-lock • Hi-shear • Jo-bolts • Anchor nuts
G7.3.5	Describe quick release fasteners	• Dzus • Camlock • Airlock fasteners
G7.4	Fluid Lines and Fittings	
G7.4.1	Describe piping and tubing as used in aircraft systems	
G7.4.2	Describe flared tubing and connections	
G7.4.3	Describe use of tapered pipe threads	
G7.4.4	Describe various threaded fittings	• Universal and bulkhead fittings • Universal fittings • Nipples • Reducers
G7.4.5	Describe flared fitting designations	• AN/MS no. indicates function of fitting • Sizing • Materials identification
G7.4.6	Describe flare less tube connections	
G7.4.7	Describe swaged tube fittings	
G7.4.8	Describe quick-disconnect fittings	
G7.4.9	Describe installation procedures for flexible connectors	• Proper clamping procedures

G7.4.10	Identify materials and demonstrate installation techniques of fluid lines and fittings	• Identify various materials used in manufacture of tubing • Identify various materials used on manufacture of hose • Identify different categories of hose – Low pressure – Medium pressure – High pressure • Identify different types of tube fittings – MS flare-less – AN flared – Pipe fittings • Demonstrate installation procedures for different types of tube fittings • Identify typical aircraft hose fittings • Demonstrate installation procedures for aircraft hose fittings • Explain AN numbering systems for aircraft tubing, hose, and fittings • Identify “allowable damage tolerances for tubing and hose” • Demonstrate proper installation procedures for tubing and hose • Identify “allowable repair practices for tubing and hose” • Identify quick-disconnect couplings in systems • Identify aircraft fluid lines according to their colour coding • Demonstrate safety procedures for high-pressure fluids • Identify shelf and service life of aircraft flexible hose • Demonstrate installation of flexible connectors

Line (GAC): 6 Hydraulic and Pneumatic Systems

Competency: 6.01 Environmental Systems

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
A4.5	Aircraft Pneumatic Systems	
A4.5.1	Explain the principles of operation of the pneumatic system	• Temperature regulation • Pressure control • Flow control • Sources • Common application
A4.5.2	Explain the maintenance and servicing of pneumatic system components	• Relief valves • Control valves • Filters • Air bottles • Lines and tubing

Line (GAC): 6 Hydraulic and Pneumatic Systems

Competency: 6.02 Hydraulic Systems

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS	CONTENT
A5.1 Hydraulic Components	
A5.1.1 Explain function of hydraulic components	• Reservoirs – Non-pressurized – Pressurized • Pressure control devices – Relief valves – Pressure regulator – Unloading valves – Thermal relief valve – Debooster valve • Selector valves – Rotary – Poppet – Open center • Automatic operating valves – Restrictor/orifice – Sequence value – Check – Metering – Hydraulic fuse – Shuttle – Priority • Accumulators – Diaphragm – Bladder – Piston • Filters – Paper – Metallic mesh – Sintered metal – Cuno filter • Pumps – Hand pumps

		– Gear type – Vane type – Gerotor – Piston – Variable delivery • Switches – Pressure – Thermal – Position – Limit • Actuators – Single acting – Double acting – Servo actuators – Hydraulic motors • Quill shaft
A5.2	Hydraulic Back-up Systems	
A5.2.2	Explain operation of manual pump	• How it fits into hydraulic system to operate essential aircraft sub systems
A5.2.4	Explain operation of auxiliary electric pump	• How auxiliary electric pump can be used to operate essential aircraft systems
A5.2.5	Explain purpose of brake accumulator in aircraft hydraulic system	
A5.3	Simple Hydraulic Systems	
A5.3.1	Explain path of fluid flow required to	• Actuate flaps in simple closed-center hydraulic system • Retract and extend landing gear
A5.3.2	Identify and describe purpose of components in system, using simple closed-center hydraulic system schematic	
A5.3.3	Explain operational differences between open and closed-center systems, using schematic diagrams	
A5.3.4	Explain hydraulic power pack	• Small aircraft hydraulic system

A5.4	Multiple, Independent Hydraulic Systems	
A5.4.1	Explain sub-system operations using schematic diagrams	• Interconnection between systems A, B, and standby system • Sub-systems operated by power systems • Reservoir and pump configuration for power systems • Operation of components: – Supply shutoff valves – Ground interconnect valve – Brake interconnect valve – Manual bypass valve – Heat exchanger – Accumulators
A5.4.2	Explain schematic diagram	• Explain method used for pressurization of reservoir • Explain operation of engine-driven pressure pumps
A5.4.3	Explain function of ram air turbine in aircraft hydraulic system	
A5.4.4	Explain hydraulic module or modular unit	
A5.5	Helicopter Hydraulic Systems	
A5.5.1	Explain purpose of using multi hydraulic systems in large helicopter.	
A5.5.2	Discuss hydraulic system warning devices	
A5.5.3	Explain operation of pulsation dampener	
A5.6	Hydraulic System Maintenance	
A5.6.1	Discuss safety and servicing practices	• Replenishing fluids • Fluid types • Handling of fluids • Pressurization of reservoirs • Accumulators

- Use of ground hydraulic test equipment

A5.6.2	Describe procedures for purging air from hydraulic system
A5.6.3	Describe procedures for flushing contaminants from hydraulic system.
A5.6.5	List items and inspection methods of a scheduled hydraulic system inspection.
A5.6.6	Inspect, service, operate, and test a hydraulic system (Practical)
A5.6.7	Service a high pressure accumulator (Practical)
A5.7	Hydraulic System Troubleshooting
A5.7.1	Identify best source of reference for troubleshooting hydraulic problems
A5.7.2	Given aircraft troubleshooting chart, discuss recommended steps in the troubleshooting process
A5.7.3	Given list of common hydraulic system malfunctions, formulate logical step-by-step troubleshooting process

Line (GAC): 6 Hydraulic and Pneumatic Systems

Competency: 6.03 Control and Rigging

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
A7.6	Hydraulic Control Systems	
A7.6.2	Describe hydraulic powered flying controls	• Reasons for powered flying controls • Requirements of powered flying control systems – Performance – Response – Stability – Irreversibility – Safety and reliability • Components • Advantages/disadvantages • Duplicate systems • Manual reversion systems
A7.6.3	Describe artificial “feel”	• Reasons for • Requirements • Stall warning • Force gradient • Magnetic brakes
A7.6.4	Explain rotary-wing hydraulic boosted controls	• Components • System description • System function • Component location

Line (GAC): 6 Hydraulic and Pneumatic Systems

Competency: 6.04 Basic Hydraulic and Pneumatics

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
G13.1	Fluids in Motion and under pressure	
G13.1.1	Explain laws concerning behavior of fluids	• Law of conservation of energy • Static laws • Pascal's law • Hydrostatic paradox • Mechanical advantage • Dynamic laws • Bernoulli's principle • Fluid friction • Boyles (Marriott Law)
G13.2	Work and Power calculations	
G13.2.1	Explain work and power calculations	• Define and discuss force, pressure, distance, area, volume, work, • Discuss area of circle and volume of cylinder • Apply appropriate units of measurement to force, pressure, work, power, etc. • Explain relationships: • For example • Force = area x pressure • Volume = area x distance • Work = force x distance
G13.3	Hydraulic Fluids	
G13.3.1	Describe properties of hydraulic fluids	• Requirements and purposes of hydraulic fluid • Three different types of hydraulic fluids – Vegetable base – Mineral based – Synthetic – Incompatibilities • Safety concerns, handling techniques and compatibility of hydraulic fluids

G13.4	Simple Hydraulic systems	
G13.4.1	Define and discuss a simple, closed hydraulic system	• Difference between open and closed systems • Definition of closed system • Operation of simple hydraulic brake systems • Components of simple, closed system: – Reservoir – Pump – Selector valve – Actuator
G13.5	Open and closed-centre systems	
G13.5.1	Define and discuss difference between open- and closed-centre systems	• Open-centre system schematic vs. Closed-centre system • Path of fluid flow through an open centre system • Major operational differences between two systems – Selectors return to neutral – Only one subsystem can be fully operational at a time • Advantages and disadvantages of two types of systems
G13.7	Pneumatics	
G13.7.1	Explain function and operation of pneumatic system components	• Pressure source – Compressors – Storage bottles • Pressure-control devices – Bleed valve – Relief valve – Unloading valve – Pressure-reducing valve • Actuating Devices • Flow control valves – Shuttle – Isolation • Moisture control • Filters • Ground charging valve • Monitoring devices • Identify pneumatic lines according to their colour coding

		• Discuss safety procedures for handling high-pressure air bottles
G13.8	Hydraulic Seals	
G13.8.1	Discuss different types of seals	• O-rings • Chevron seals • U-ring seals • Gaskets • Crush washers • Backup rings • Uses • Importance of fluid compatibility • Installation of different types of seals
G13.8.2	Discuss pressure testing procedures of components	

Line (GAC): 7 Landing Gear

Competency: 7.01 Landing Gear, Wheels, Tires, Brakes

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
A6.1	Landing Gear, Types and Configurations	
A6.1.1	Discuss purpose of landing gear	
A6.1.2	Describe landing gear types	• Configurations – Tricycle ○ Main wheels ○ Nose wheels • Conventional – Main wheels – Tail wheels • Large transport aircraft – Main wheel layout • Centre line • Skis • Floatplanes – Floats – Hulls – Amphibians Fixed Retractable – Mechanical – Electrical – Hydraulic – Emergency Helicopter – Skids – Floats – Pop out (emergency floats)
A6.1.3	Describe non-shock-absorbing landing gear	• Rigid • Shock-cord • Spring-type
A6.1.4	Describe shock-absorbing landing gear	• Rubber block • Spring shock struts • Air/oil shock struts

A6.1.5	Identify landing gear components.	
A6.1.6	Describe maintenance and servicing of air/oil shock struts	• Filling – Types of oil • Bleeding • Removal – Safety precautions • Dismantling • Components
A6.1.7	Describe shimmy dampers	• Purpose • Types – Piston-type – Vane-type • Servicing
A6.1.8	Describe nose-tail-wheel steering systems	• Small aircraft • Large aircraft
A6.1.11	Disassemble, inspect, service and reassemble air/oil shock struts (Practical)	
A6.2	Aircraft Floats and Skis	
A6.2.1	Describe construction of aircraft floats and hulls	
A6.2.2	Describe construction of aircraft skis	
A6.2.3	Describe maintenance and installation of floats and skis	• Boxing of floats (symmetry) • Alignment of skis • Ski retraction system
A6.2.5	Perform installation and rigging check (Practical)	• Floats or Skis
A6.3	Aircraft Wheels	
A6.3.1	Describe wheels	• Construction – Divided hubs – Detachable flange – Nose wheels – Main wheels • Components

A6.3.2	Describe wheel maintenance	• Removal of wheels from aircraft • Disassembly – Safety • Cleaning – Wheel – Bearings • Inspection – Typical defects – Wheels – Bearings • Lubrication of bearings • Assembly • Inflation (see Tires) – Safety
A6.3.3	Describe wheel balancing (requires knowledge of tires to complete – see Tires).	
A6.3.4	Describe wheel alignment	• Purpose • Terminology – Toe-in – Toe-out – Camber • Adjustments – Use of grease plates
A6.4	Aircraft Tires	
A6.4.1	Describe tires	• Construction – Tubed – Tubeless – High pressure • Markings – Size – Ply – Colour codes – Identification • Rating • Mounting • Storage
A6.4.2	Describe inner tubes	• Construction • Inflation

A6.4.3	Describe tire maintenance	• Disassembly – Safety • Cleaning • Inspection – Typical defects – Tires: cuts, scores, overheating, bulges, wear, creep, flat spots, sponginess, rejected take-off – Tubes • Assembly – different wheel/tube types • Inflation – Safety – Tire pressures ○ Air or nitrogen ○ Cold/hot tires ○ Differential pressures (bogies)
A6.4.4	Describe repair of tires and tubes	• Recap
A6.4.6	Inspect, service, and inflate aircraft tire (Practical)	
A6.5	Aircraft Brakes	
A6.5.1	Describe aircraft brakes	• Disk – Single – Multiple – Segmented rotor-disk • Construction – Components • Internal expanding-shoe • Expander-tube • Carbon brakes • Linings – Material
A6.5.2	Explain function of aircraft braking systems	• Review hydraulics fundamentals • Braking heat energy • Brake limitation charts • Independent brake systems (light aircraft) – Purpose • Power boost systems – Purpose

		• Power brakes – Control valves – De-boosters • Emergency braking systems
A6.5.3	Describe procedures for braking system maintenance	• Lining wear – Indicators – Measuring methods • Bleeding brakes – Types of fluid – Master cylinders – Power brakes – Gravity bleeding – Pressure bleeding • System leak checks • Bolt torque check • Bolt condition • Disc condition • Seal condition • Replacement of brake linings – Safety (asbestos linings) – Brake burn-in
A6.5.4	Describe brake system faults	• Overheating • Dragging • Uneven wear • Rapid wear • Squealing and chattering • Ineffective braking • Uneven braking (aircraft pulls to one side) • Excessive pedal travel
A6.5.5	Describe procedures for testing brakes after maintenance	
A6.5.6	Disassemble and identify parts of brakes; reassemble (Practical)	
A6.5.7	Check condition of brake linings; change linings (Practical)	
A6.5.8	Bleed aircraft brakes (Practical)	
A6.6.	Anti-Skid Systems	

A6.6.1	Describe operation of anti-skid systems	• Mechanical system • Electrical system • Electronic system
A6.6.2	Identify components of anti-skid systems	• Wheel-speed sensors • Control valves • Control box • Circuitry • Indicating system
A6.6.3	Describe maintenance and testing of anti-skid systems	
A6.7	Gear Retraction Systems	
A6.7.1	Review types of retraction systems	
A6.7.2	Review landing gear systems	
A6.7.3	Explain function of retractable gear systems	• Purpose • Components – Gear-selector mechanism – Gear-centering system – Over-centre links – Locks ○ Up ○ Down ○ Ground – Door actuation ○ Sequencing valves ○ Proximity switches • Squat switches • Fail-safe systems – Auto gear-down – Anti-retraction • Emergency gear-down systems – Free-fall – Hand pump – Compressed air • Warning devices – Lights – Audible warning devices
A6.7.4	Describe maintenance of retractable landing gear	• Rigging and adjustment • Door clearance checks • Retraction check

		• Inspection
A6.7.5	Research and explain (Practical)	• Undercarriage retraction and extension system on aircraft
A6.7.6	Under supervision (Practical)	• Prepare aircraft for jacking up • Jack-up aircraft • Retract gear • Extend gear • Confirm correct operation (IAW) maintenance manual • Jack-down aircraft

Line (GAC): 8 Structures, Assembly, Rigging

Competency: 8.01 Control and Rigging

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
A7.1	Types of Controls	
A7.1.4	Describe control surface balance	• Static balance • Aerodynamic balance
A7.1.5	Identify (Practical)	• Various control surfaces • Types of control surface balance devices installed
A7.2	Cable and Wire Control Systems	
A7.2.1	Describe cable control system	• System operation • Components – Cables: trim, balance, main – Terminals – Horns and arms – Bell cranks – Stops – Pulleys – Fairleads – Turnbuckles – Quadrants – Walking beams
A7.2.2	Describe control cables and fittings	• Cable construction and materials – Manufacture – Cleaning – Corrosion prevention methods • Sizes • Swaging • Splicing
A7.2.3	Describe adjustment procedures for cables	• Tensioning • Tensiometer • Temperature allowance – Automatic

		– Use of charts – Effect of temperature change on cable tensions • Safetying of turnbuckles
A7.2.4	Describe range of movement	
A7.2.5	Describe other types cable control systems	• Bowden' • 'Teleflex'
A7.2.6	Locate and identify components of aircraft or helicopter cable control system (Practical)	
A7.2.7	Tension and secure aircraft control cable(s) (Practical)	
A7.2.8	Swage steel-wire cable (Practical)	
A7.3	Rod and Tube Control Systems	
A7.3.1	Describe rod and tube control systems	• System operation • Advantages/disadvantages • Identify components – Push-pull rods – Torque tubes – Bell cranks – Friction controls
A7.3.2	Describe adjustment procedures for push-pull control rods	• Non-adjustable • Adjustable
A7.3.3	Describe control stops	• Primary • Secondary • Adjustable/non-adjustable • Location • Adjustment
A7.3.4	Describe range of movement limitations of aircraft control systems	• Full left/full right • Full up/full down • Full forward/full aft • Artificial Feel/Feedback Systems • Systems which may modify flight control travel

- Altitude
- Velocity

A7.3.5	Locate and identify control system of aircraft and/or helicopter (Practical)	
A7.7	Aircraft Fixed Surfaces Rigging	
A7.7.1	Explain reasons for rigging	• Scheduled inspection • Heavy landings • Flight through turbulence • Improper loading
A7.7.2	Describe aircraft leveling	• Reasons • Procedures
A7.7.3	Describe fixed surface alignment checks	• Symmetry • Dihedral/Anhedral • Incidence • Wing/fuselage alignment • Empennage alignment • Engine alignment • Wires and struts • Tools and equipment
A7.7.4	Describe float installation, boxing and rigging	
A7.8	Flying Control Surfaces Rigging	
A7.8.1	Describe safety procedures to be followed when rigging aircraft	• Jacking and leveling • Moving controls • Tagging controls • Use of stands and ladders • Done indoors, out of wind • Tool control
A7.8.2	Describe installation and assembly of control surfaces	

A7.8.3	Describe interlock and safety systems	
A7.8.5	Describe control system rigging	• Tools and equipment required – Pins and jigs • Rigging data reference material • Control surface balancing • Correct assembly and locking checks • Independent inspections • Loose article checks
A7.8.6	Explain rigging of control surfaces	• Trim tab • Elevator • Aileron • Rudder • Stabilator • Flaps
A7.8.7	Describe problems associated with installation and/or rigging of interconnected controls	• Flaps and aileron • Rudder/aileron (PA31) • Controls incorporating autopilot control bridles
A7.8.8	Describe internal and external control and gust locks	• Importance of flagging

A7.8.9	Explain inspection procedures for controls	• Importance of little, or no, wear in control runs
		• Problem areas
		• Cleanliness
		• Correct assembly
		• Correct locking
		  – Turnbuckles
		  – Control rods
		  – Stops
		• Loose article checks
		• Cable inspection
		  – Condition
		  – Crossed cables
		• Control sense and direction
		• Range of movement
		• Checks with power on/off
		• Checks with panels removed/refitted
		• Use of manuals

- Check Ads

Line (GAC): 8 Structures, Assembly, Rigging

Competency: 8.02 Metallic Structures

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
A11.1.	Aircraft Construction	
A11.1.1	Define parts of aircraft	• Nomenclature • Terminology
A11.1.2	Describe airframe forms	• Wire-braced structures • Skin: – Unstressed – Stressed • Girder or truss structures: – Pratt – Warren • Semi-monocoque: • Skin – Bulkheads – Longerons – Stringers – Formers – Gussets – Advantages/disadvantages • Monocoque – Advantages/disadvantages • Sandwich construction
A11.1.3	Describe wing forms	• Truss • Semi Monocoque • Cantilever • Semi-contilever • Spars – Fail safe – Mono-spar – Two-spar – Multi-spar

		– Box spar – Composite spar – Chemically milled • Ribs • Drag and anti-drag wires • Stressed skin • Small aircraft wings – Construction • Large aircraft wings – Construction
A11.1.4	Describe wing control surfaces	• Construction
A11.1.5	Describe tail structure	• Construction • Horizontal stabiliser • Vertical stabiliser (fin) • Construction • Control surfaces
A11.1.6	Describe cabins, cockpit and compartments	
A11.1.7	Describe aircraft doors	• Cargo • Pressurized • Non-pressurized • Emergency
A11.1.8	Discuss types of landing gear attachment structure	• Wheel type • Hulls and floats, amphibian • Skis • Skids
A11.1.9	Describe powerplant structures	• Nacelles • Struts • Pylons • Firewalls • Engine mounts • QEC • Design features – Reciprocating engine – Turbine engine • Vibration mounts

		• Dynafocal Mounts • Cowlings and fairings
A11.1.10	Discuss terms associated with aircraft shape and dimensions	• Aircraft Station Numbers – Fuselage stations – Datum line – Wing stations – Water line – Butt line – Component stations – Zones

Line (GAC): 8 Structures, Assembly, Rigging

Competency: 8.03 Theory of Flight-Fixed Wing

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
G9.1	Properties of Atmosphere	
G9.1.1	Describe composition of atmosphere	• Distribution of gases • Divisions and extent: stratosphere and troposphere
G9.1.2	Explain static pressure	• Definition • Units of measurement • Torricelli • Absolute pressure • Gauge pressure
G9.1.3	Explain temperature	• Units of measurement - °F; °C; • Decrease in temperature with altitude • Lapse rate • Inversion
G9.1.4	Explain density	• Review • Gas laws: – Boyle's – Charles – Dalton's • Effects of density on performance
G9.1.5	Explain humidity	• Definition and conditions • Weight of humid air • Effect of humidity on performance
G9.1.6	Explain the term "Standard Day"	• Definition • Importance and use • ICAO Standard Day • ISA Standard
G9.2	Elementary Aerodynamics	

G9.2.1	Review Bernoulli's Principle	• Relationship of pressure and velocity • Flow in venturi • Flow over airfoil
G9.2.2	Review Newton's Third law of Motion	• Definition • Effect on airfoil
G9.2.3	Describe airfoils	• Definition • Terminology – Chord – Chord line – Camber – Thickness • Profiles • NACA • Characteristics – Coefficient of lift – Coefficient of drag – Lift/drag ratio • Centre of pressure • Centre of gravity • Lift • Drag • Thrust • Weight
G9.2.4	Explain factors affecting lift	• Air Flow types • Definition of lift • Fundamental equation for lift • Spanwise Flow • Skin friction/viscosity • Laminar flow – Boundary layer – Turbulence • Angle of attack – Relative wind – Critical angle • Stall • Area and lift • Velocity and lift • Density and lift
G9.2.5	Explain factors affecting drag	• Definition of drag • Fundamental equation for drag

		– D= CD • Classification – Parasite drag – Induced drag • Parasite drag – Definitions ○ Form drag ○ Skin friction ○ Interference drag – Streamlining – Air density – Speed squared rule • Induced drag – Definition
G9.2.6	Explain aspect ratio	• Wing Area • Definitions of aspect ratio – A = span/chord – $A = b^2/S$ • Effects of A/R • Wing-tip vortices/Induced drags – Airflow over wing – Winglets
G9.2.7	Explain reasons for wing tapers and sweep angle	• Wing taper in plan form • Wing taper in thickness • Sweep angle
G9.2.8	Calculate lift using formulas when variables are changed (Practical)	
G9.2.9	Calculate aspect ratio (Practical)	
G9.3	Control and Stability	
G9.3.1	Discuss aircraft axes	• Vertical or normal • Longitudinal • Lateral
G9.3.2	Discuss movement around (or about) and along axes and how it is achieved	• Roll/ailerons • Pitch/elevators • Yaw/rudder
G9.3.3	Describe flight controls	• Primary • Ailerons – Adverse yaw – Friese – Differential

  - Aileron droop
  - Elevators
  - Rudder
- Compound
  - Elevons
  - Flaperons
  - Stabilator
  - Ruddervator
- Secondary
  - Trim devices
  - Balance tabs
  - Trim tabs
  - Servo tab
  - Spring tabs
  - Anti-servo tabs
- Auxiliary/Lift modifying devices
- Flaps: various types
- Leading edge flaps
- Slots
- Slats
- Spoilers and air brakes
- Vortex Generator
- Strakes
- Stall Strips
- Wing LETS
- Wing femes
- Delta Wing
- Balance of control surfaces
  - Static
  - Dynamic

G9.3.4 Discuss stability

- Definition
  - Static
  - Dynamic

G9.3.5 Explain factors affecting stability

- Angle of incidence
  - Wash-in/wash-out
- Lateral stability
  - Dihedral/anhedral
  - Sweepback
- Longitudinal stability
  - Center of gravity position
  - Neutral

  - Negative
  - Positive
  - Tail plane position
  - Longitudinal dihedral (incidence of tail)
- Directional stability
  - Vertical stabilizer/tail fin
  - Propeller slipstream effect
  - Sweepback
- Limits of control and stability
  - Excessive stability
  - Controllability
  - Lower and upper limits

G9.3.7 Describe canards

- Definition
- Purpose

G9.3.8 Describe purpose of forward swept wings

G9.3.9 Describe purpose of T-tail arrangement

G9.3.10 Explain loads and load factors

- Loads acting on fuselage
  - G forces
  - Pressurization
  - Landing
- Loads acting on wings
  - Normal Category
  - Utility Category
  - Acrobatic Category
  - Mainplane in a turn
  - Aerodynamic forces
- Wing loading
  - Ratio of a/c total gross wt over total wing area

G9.4 High-Speed Flight

G9.4.1 Discuss nature of compressibility

- Compare air to water
- Compare behavior of air at low speed to high speed
- Convergence/divergence effects

G9.4.2 Explain speed of sound

- Pressure warning
- Mach number
- Effects of temperature on speed of sound

G9.4.3	Discuss subsonic flight	• Define <M 0.75 • Local speed of air over airfoil higher than M 0.75
G9.4.4	Discuss properties of sound related to high speed flight	• Vibration • Wave motion • Sound transmission • Intensity
G9.4.5	Discuss transonic flight	• Define M O. 75-M 1, 20 • Formation of shock wave • Loss of lift, control • Mach trim • Mach feel
G9.4.6	Discuss supersonic and hypersonic flight	• High-speed airfoil sections: – Low thickness ratio – Low camber – Sweepback – Aspect ratio and tip shape – Delta wing • Critical Mach number – Area Rule – Weighting Function ○ C/D Duct ○ Bi convex

Line (GAC): 9 Rotary Wing Control Systems

Competency: 9.01 Controls and Rigging

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
A7.9	Rotary-Wing Control Systems	
A7.9.1	Describe differences in fixed-wing and rotary wing flight controls and rigging.	
A7.9.2	Describe rotary-wing controls	• Collective • Cyclic • Tail rotor • Engine controls • Interlinks – Collective/tail rotor – Collective/throttle – Collective/cyclic • Stabilizer bars – Dampeners • Mixer box units • Elevator
A7.9.3	Describe control system components	• Masts • Stabilizer bar • Swashplate • Push-pull tubes, bell cranks • Actuators • Pitch change rods • Stops
A7.9.4	Describe main/tail rotor static balancing	
A7.9.5	Describe main rotor blade alignment	
A7.9.6	Describe flying control rigging procedures	• Tools and equipment • Neutral checks • Range of movement • Stops • Adjustments

		• Friction off • Power on/power-off
A7.9.7	Explain inspection procedures for rotary wing controls	• Importance of little, or no, wear in control runs • Problem areas • Cleanliness • Correct assembly • Correct locking – Turnbuckles – Control rods – Stops • Loose article checks • Cable inspection – Condition – Crossed cables • Control sense and direction • Range of movement • Checks with power (hydraulics) on/off • Checks with panels removed/refitted • Use of manuals • Check Ads
A7.9.10	Identify control system components	• Flying controls – Rotating – Non-rotating
A7.9.11	Identify non-flying control system(s)	• Throttle • Governor

Line (GAC): 9 Rotary Wing Control Systems

Competency: 9.02 Theory of Flight-Rotary Wing

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
G10.1	Aerodynamic Terminology	
G10.1.1	Recall fixed wing theory of flight terminology	• Chord • Span • Angle of incidence • Relative wind • Angle of attack • Lift, drag, thrust and weight • Stall • Centre of pressure • Airfoil shapes
G10.1.2	Define terminology related to rotary wing flight theory	• Relative wind • Pitch angle • Angle of attack • Tip path plane • Track/balance – Related vibrations • Lift, thrust • Drag, weight • Blade stalls • Centre of pressure • Airfoil shapes
G10.2	Rotor Designs	
G10.2.1	Explain various rotor designs and terminology applicable to various rotor designs	• Flapping • Feathering (pitching) • Lead/lag (sweep, hunting) • Rigid • Semi-rigid • Fully articulated • Coning

- Axes

Explain various rotor blades:

- Design
- Construction
- Types

10.3 Forces Acting on Rotor

10.3.1 Describe forces acting on helicopter rotor systems

- Lift
- Drag
- Weight
- Thrust
- Centrifugal force
- Centrepital force
- Newton's Three Law's
- Torque
  - Power
  - Collective pitch
  - Anti-torque tail rotor input
- Gyroscopic forces
  - Precession
- Coriolis forces
- Translating tendency
- Ground effect
- Dissymmetry of lift
- Transverse flow effect
- Translational lift
- Retreating blade stall
- Settling with power

G10.4 Autorotation, Ground Resonance, and Stability

G10.4.1 Describe autorotation

- Definition and requirements
- Freewheel units
- Factors affecting autorotation RPM
  - Airspeed
  - Weight
  - Density altitude
  - Collective position
  - Rigging
- Autorotative charts and adjustments

		– Altitude vs. forward speed – Performance curves • Rotor system designs – Mass – Speed
G10.4.2	Describe ground resonance	• Definition • Susceptible rotor systems • Recognition and prevention • Prevention devices • Actions
G10.4.3	Describe stability	• Definition – Static – Dynamic • Causes • Compensation – Stab bar – Paddles – Offset hinge (‘delta’) – Stability systems
G10.4.4	Given an autorotative chart and performance figures, determine correct autorotative rpm.	
G10.5	Rotary Wing Controls	
G10.5.1	Describe rotary wing flight control systems	• Swashplate control system – Collective – Cyclic • Anti-torque • Synchronised elevators • Boosted controls • Mixing units • Droop compensator

Line (GAC): 15 Human Factors

Competency: 15.01 Human Factors in Aviation Maintenance

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
G4.1	Introduction to Human Factors in Aircraft Maintenance	
G4.1.1	Describe the impact of human error in aircraft maintenance on air carrier accidents	• The number of accidents caused by maintenance error is increasing significantly
G4.1.2	Explain why the number of accidents caused by maintenance errors is increasing	• Maintaining fleets that are increasing in age • Increasing pressure for meeting schedule departure times • New aircraft and advanced technology • Increasing complexity of new aircraft
G4.1.3	Explain the term *human factors*	
G4.2	The relationship between physical factors and needs and aircraft maintenance errors	
G4.2.1	Explain the legal and moral responsibilities of aircraft maintenance technicians and AME'S	
G4.2.2	Explain the relationship between physical factors and aircraft maintenance errors	• Physical size • Working in cramped or confined spaces • Physical conditioning and health • Climbing over wings and horizontal stabilizers • Lack of conditioning or health might cause work to be skipped, improperly performed, or uncompleted • Sensory systems • Good vision required for many jobs (gradually decreasing vision may not be noticed by an individual) • Normal color recognition required for some jobs

G4.2.3	Explain the relationship between physiological needs and aircraft maintenance errors	• Lack of Communication • Complacency • Lack of Knowledge • Distraction • Lack of Teamwork • Fatigue • Lack of Resources • Pressure • Lack of Assertiveness • Stress • Lack of Awareness • Norms of the workplace
G4.3.2	Defend the need to adhere to established maintenance procedures	
G4.3.3	Describe the relationship between maintenance errors and the chains of events leading to errors.	
G4.3.4	Analyze case studies to determine causes of maintenance errors.	

Line (GAC): 19 Weight and Balance

Competency: 19.01 Weight and Balance

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
G17.1	Terminology	

G17.1.1	Define applicable terminology	• Centre of gravity
		  – Limits
		  – Range
		• Empty weight
		  – Centre of gravity
		  – Centre of gravity range
		• Ballast
		• Basic weight
		• Arm
		• Datum
		• Mean aerodynamic chord include lemac and temac
		• Maximum weight
		  – Landing weight
		  – Ramp weight
		  – Takeoff weight
		• Moment
		• Stations
		  – Longitudinal
		  – Lateral
		  – Water line
		  – Butt line
		• Tare

G17.3	Weight and Balance Requirements	
G17.3.1	Explain applicable documentation	• Aircraft weight and balance control • Weight and balance reports • Amendments to weight and balance reports • Alternative configurations (addendums)

G17.3.2	Describe empty weight configurations	• Fuels • Oils • Hydraulics • Water
G17.3.3	Explain purpose of re-weighing and balancing aircraft	
G17.4	Weighing Procedures	
G17.4.1	Explain requirements for weighing	
G17.4.2	Review documents	• Flight manual • Operations manual • Aircraft specifications • Type approval/certificate • Maintenance manual
G17.4.3	Describe preparation of aircraft for weighing	• Cleanliness • Equipment list • Fluid levels • Fuel tanks (drained) • Oil tanks (as applicable) • Position of flight controls, seats, rotors
G17.4.4	Describe environment for weighing aircraft	• Fans • Traffic • Building doors and windows
G17.4.5	Explain importance of weight and balance with regard to safe operation of aircraft	• Differences between fixed wing and rotory wing weight and balance (lateral centre of gravity)
G17.4.6	Describe jacking and levelling of aircraft for weighing	• Safety • Methods of levelling – Spirit levels – Plumb bobs – Longitudinal – Lateral – Laser (level 1 only)
G17.4.7	Describe use of various weighing equipment	• Calibration of scales – Platform – Electronic

G17.4.8	Describe recording of data	• Arms with reference to datum – Longitudinal – Lateral • Weight – Aircraft weighing points – Tare
G17.4.9	Describe computing centre of gravity	• Compare data to previous reports for realistic data
G17.4.10	Describe ballast	• Location • Calculation of weight
G17.5	Weight and Balance Report	
G17.5.1	Describe information required in report	• Aircraft make, model, serial number, and registration • Date of weighing • Weighing data • Empty weight – Including all items required by the basis of type approval • Empty weight centre of gravity • Equipment list • Certification • Ballast calculations • Adverse load checks • Centre of gravity limits
G17.5.2	Review various examples of weight and balance reports and equipment lists.	
G17.5.3	Prepare weight and balance report with equipment list for samples provided (Practical)	
G17.6	Weight and Balance Amendments	
G17.6.1	Describe requirements of amendments to weight and balance reports	• Explanation of the change • Identify the weight and balance document requiring amendment • Identify the affected aircraft • Date of the change

		• Amendment number • Replacement equipment list – Items affected – Revised weights – Revised moments arms • New empty weight • New empty weight centre of gravity • Maintenance release certification
G17.6.2	Describe addenda to weight and balance reports	• Passenger/cargo configurations • Seasonal equipment changes
G17.6.3	Amend weight and balance report and equipment list (Practical)	

Level 2

Aircraft Maintenance Technician

Line (GAC): 10 Composites

Competency: 10.01 Non-Metallic Structures

Objectives

To be competent in this are the individual must be able to:

LEARNING TASKS		CONTENT
A12.3	Composite Structures	
A12.3.1	Emphasis, at all points during this course, the importance of health and safety concerns when using composite materials	• WHMIS • OHS
A12.3.2	Describe fibre weaves and weights and their uses	• Satin • Crowfoot • Plain • Unidirectional
A12.3.3	Describe common reinforcement materials used for laminates and compare their qualities	• Fibreglass • Aramid fibres (*Kevlar) • Carbon fibers • Ceramic • Boron
A12.3.4	Describe importance of warp fibre direction	
A12.3.5	Describe handling of materials in ”prepreg” form	• Emphasis is on “out time” from refrigerated storage and, upon removal from cold storage, thawing it in moisture proof bag to prevent condensation
A12.3.6	Explain matrixes in composites	• Epoxies • Polyesters • Microballoons
A12.3.7	Describe use and preparation of adhesives	• Paste adhesives • Film adhesives
A12.3.8	Describe handling of composite materials	• Safety • Preparation • Mixing of resins • Cleanliness • Storage

A12.3.9	Explain foam core materials	• Styrofoam • Urethane • PVC
A12.3.10	Identify honeycomb core materials and core configuration	• Cell shapes • Strength characteristic • Dimension
A12.3.11	Describe care and handling of composites	• Protection • Storage
A12.4	Fabrication and Repair of Composite Structures	
A12.4.1	Describe fabrication of non-metallic composite structures	• Solid laminates • Honeycomb sandwich • Solid core sandwich • Filament winding
A12.4.2	Explain manufacturers' methods of lay-up, applying pressures, and	
A12.4.3	State methods of machining cured and non-cured reinforcement materials (use of tools covered in G3)	• Hand and power tools for: – Cutting – Drilling – Sanding
A12.4.4	Describe workplace ventilation and vacuum requirements during machining.	
A12.4.5	Describe methods of inspection and their application:	• Visual and tap testing • NDI
A12.4.6	Classify damage	• Cosmetic • Impact and delamination • Cracks and hole damage
A12.4.7	Explain use of curing and heating equipment	
A12.4.8	Explain composite repair techniques	• Removal of damage and surface preparation • Surface and flush patch

- Core potting and replacement
- Patch preparation
- Delamination repairs
- Applying pressures
- Release fabrics and films
- Heat curing
- Finishes-paint
  - Gelcoat

A12.4.9 Explain electrical bonding of composite components

- Lightning protection
- Continuity testing

A12.4.10 Describe personal safety equipment

- During machining
- While using resins

A12.4.11 Describe quality control processes

A12.4.12 Inspect composite panel (Practical)

- Tap test
- Visual
-

A12.4.13 Repair composite panel (Practical)

- Classify damage
- Remove damage and prepare surface
- Repair damaged sandwich panel
- Core potting and replacement
- Prepare patch
- Apply pressure using vacuum bag procedures
- Use controlled heat curing for patch repair

Line (GAC): 10 Composites

Competency: 10.02 Materials and Processes

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
G12.9	Composite Materials	
G12.9.1	List applications of composite materials in aircraft	• Primary structures • Dynamic components • Secondary structures • Fairings, cowlings
G12.9.2	Explain advantages and disadvantages of composite materials	
G12.9.3	Define “composite materials”	
G12.9.4	Describe types of composite construction	• Solid laminates • Honeycomb sandwich • Solid-core sandwich
G12.9.5	Describe reinforcing materials	• Terms – Warp – Weave patterns ○ Plain ○ Crowfoot ○ Bidirectional ○ Unidirectional – Fibers ○ Fiberglass E glass • Fiberglass S glass • Aramide • Carbon graphite • Ceramic cloth • Boron fiber patch • Safety Precautions
G12.9.6	Describe inspection and testing methods	

G12.9.7 Describe safety precautions and handling procedures

G12.9.8 Perform a composite repair (Practical)

Line (GAC): 11 Reciprocating Engines

Competency: 11.01 Bearings and Seals

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
G16.1	Types and Purposes of Bearings	
G16.1.1	Describe different forces on bearings	• Friction – Sliding – Rolling • Loads – Radial – Axial – Combination – Varying direction (misalignment) – Speed
G16.1.2	Discuss bearing types and their nomenclature	• Ball bearings – Balls – Inner race – Outer race – Face – Separator – Outside diameter – Bore – • Roller bearings – Rollers – Outer ring – Inner ring – Separator – Face – Barrel rollers • Concave rollers • Tapered roller bearings – Roll – Cup – Cone – Cage • Elastomeric bearings

		• Spherical rod-end bearings – Lubricated and non-lubricated
G16.1.3	Discuss plain bearings (bushing)	• Loading • Uses • Material, for example – Bronze – Silver – Lead – Babbitt
G16.2	Lubrication and Sealing	
G16.2.1	Describe different types of seals and their Function in sealing bearing areas	• Dust seals – Cap – Felt • Labyrinth seals • Lip seals • "O" ring seals • Carbon face seals • Magnetic seals • Chevron seals • Gaskets • Back-up rings
G16.3	Bearing Removal Inspection and Installation Techniques	
G16.3.1	Discuss bearing inspection and handling techniques	• Cleaning bearings • Storing bearings • Inspecting defects – Pitting – Denting – Scratches – Corrosion – Spalling – Retainer (cage) elongation – Charring and cracks – Brinelling – Discolouration – Play – Inspection tools – New bearings

Line (GAC): 11 Reciprocating Engines

Competency: 11.02 Reciprocating Engine Principles

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
P1.1	History and Development	

P1.1.1	Discuss early development of heat engines	• Inventors
		• Types of engines
		• Users
		• Limitations
		  – Efficiency
		  – Materials
		  – Fuels

P1.1.2	Discuss factors affecting development of engines	• Needs of the industry • Requirements for an aircraft engine • Certification costs

P1.1.3	Describe types of engines developed for aviation use	• Rotary-radial engines
		  – Static radial
		  – Multiple row radial
		  – Wankel rotary
		• In-line
		  – Inverted
		• V-type
		• Opposed
		• Water-cooled
		• Air-cooled

P1.1.4	Explain differences and advantages of different types of engines	
P1.1.5	Describe engine development and application	• Two-stoke for home-built, lightweight aircraft use • Wankel rotary • Automobile engines adapted for aircraft
P1.1.6	Describe limitations of piston engines	

P1.2	Engine Components and Accessories	
P1.2.1	Describe internal engine components	• Pistons • Piston rings • Camshaft • Crankshaft • Connecting rods • Drive shafts • Valves • Cam ring
P1.2.2	Describe external engine components	• Cylinders • Crankcase • Oil sump • Exhaust • Induction system
P1.2.3	Describe engine accessories	• Magnetos • Starter motor • Alternator/generator • Propeller governor • Propeller synchronizer • Vacuum pump • Hydraulic pump • Fuel system components
P1.2.4	Explain the function of engine components	
P1.2.5	Identify major engine components, state their purpose (Practical)	
P1.3	Types of reciprocating engines	
P1.3.1	Explain terms, identify by symbols, used in aircraft engine identification classification	• E.G., GTSIO-520-E1B4D
P1.3.2	Classify engines by cylinder arrangement or displacement	• Letters to indicate type and characteristics • Letters to indicate displacement • Suffix letters for additional information

P1.3.3	Explain purpose of engine data plates	• Location • Data • Applicable regulations
P1.3.4	List and identify types of engines used in school (installed in aircraft and on shop floor) (Practical)	
P1.3.5	Referencing engine data plates, determine characteristics of each engine type identified (Practical)	
P1.4	Engine Theory	
P1.4.1	Explain principles of energy transformation	• Chemical energy to heat transformation • Heat energy to mechanical energy • Kinetic energy • Potential energy
P1.4.2	Explain Gas Laws, and how they apply to engine operation	• Charles' law • Boyle's law • General gas laws
P1.4.3	Explain piston displacement	
P1.4.4	Explain power calculations	• Define power • Horsepower (hp) – Brake (hp) – Friction (hp) – Indicated (hp) – Shaft (hp) – Plank formula • Watts • Torque – Prony brake – Dynamometer – Brake mean effective pressure (bmep) • Specific fuel consumption (sfc) – Brake (bsfc)
P1.4.5	Explain engine efficiency	• Mechanical • Thermal • Volumetric
P1.4.6	Explain factors affecting performance, including	• Manifold pressure • RPM (revolutions per minute) • Air volume

		• Air density • Weight-to-power ratio • Detonation • Pre-ignition • Fuel octane
P1.4.7	Explain Otto cycle (constant volume cycle)	
P1.4.8	Explain power curves	
P1.4.9	Draw graph to represent indicator diagram for Otto Cycle (Practical)	
P1.4.10	Compute horsepower using PLANK formula	
P1.4.11	Calculate piston displacement	
P1.4.12	Calculate compression ratio	
P1.5	Operation Fundamentals	
P1.5.1	Explain engine operation terminology	• Internal combustion engine • Cycle • Stroke • Top dead centre • Bottom dead centre • Square engine – Over- – Under- • Conversion of reciprocating motion to rotating motion • Relationship of piston travel to crankshaft travel • Ineffective crack angle
P1.5.2	Explain two-stroke cycle	• Uses • Advantages • Disadvantages • Five events occur in each operating cycle – Intake

		– Compression – Ignition – Power – Exhaust • Valve arrangement • Fuel/induction system
P1.5.3	Explain four-stroke cycle	• Otto cycle • Intake • Compression • Ignition • Power • Exhaust • Valve timing – Lead – Lag – Overlap • Compare with two-stroke cycle
P1.5.4	Explain cylinder-pressure indicating diagram	
P1.5.6	Explain engine timing	• Valve operation and mechanisms • Cylinder firing-order for different types of engines – Lycoming horizontally opposed – Continental horizontally opposed – Single bank radial – Multi-bank radial – Timing for engine balance • "Formula" for determining firing order of large radial engines • Valve operating components – Camshaft – Valve lifters/tappets – Cam – Cam plate/ring – Rocker arm • Radial engine cam ring table (to determine speed and direction of rotation)
P1.5.7	Describe engine cooling	• Fins on cylinders • Baffles on engine • Sodium filled exhaust valves • Air flow through engine • Oil system • Liquid cooling

P1.5.8 Determine firing order of various reciprocating engines (Practical)

P1.5.9 Identify combustion and valve timing components (Practical)

P1.5.10 Identify engine cylinder positions (e.g., No. 1 on the Continental) (Practical)

Line (GAC): 11 Reciprocating Engines

Competency: 11.03 Reciprocating Engine Maintenance

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
P2.3	Engine overhaul procedures	
P2.3.3	Describe disassembly procedures:	• Use of check sheets • Use of manufactures' technical publication manuals – Use of index marks
P2.3.4	Describe cleaning procedures	• Types of cleaning materials • Degreasing • Decarbonizing • Stripping • Abrasive blasting • Vapor bath
P2.3.5	Describe inspection procedures	• Visual • NDT
P2.3.6	Describe dimensional inspection procedures	• Typical wear items • Equipment
P2.3.7	Describe repair and replacement procedures	• Repairable items – Crankcase – Crankshaft (not usual) – Cylinders – Bushings – Valve seats – Valve (reconditioning) • Replacement items – Items that are not repairable – Pistons and rings – Cylinder heads – Cylinders – Bushings – Studs and fasteners

		– Valve guides and seats – Rocker arms, shafts, and bearings – Camshafts – Crankshafts
P2.3.8	Describe assembly procedures	• Assemblies • Sub-assemblies • Installation of engine onto test stand
P2.3.9	Describe testing procedures	• Recommended procedures • Pre-oiling • Engine running • Operating parameters – Temperatures – Pressures • Record keeping
P2.3.10	Describe preservation and packing procedures	• Interior preservation • Exterior preservation • Short term storage • Long tem storage
P2.3.11	Describe documentation and certification	• Engine and component logs • Parts documentation
P2.3.12	Disassemble, clean, and inspect engine or component for overhaul (Practical)	
P2.3.13	Determine parts serviceability with reference to manufactures' technical publications (Practical)	
P2.3.14	Reassemble engine and install component (Practical)	
P2.3.15	Test engine during run up (Practical)	
P2.4	Maintenance Procedures	
P2.4.1	Define "maintenance" and "service"	• Types of maintenance (include inspections) • Scope of servicing Limitations

P2.4.2	Describe servicing of aero engines	• Cleaning • Lubricating • Replenishing of fluids
P2.4.3	Describe maintenance of ignition systems	• Spark plug, inspection, cleaning, and replacement • Magneto timing, inspection, repair, and replacement • Harness testing and replacement
P2.4.4	Describe maintenance of fuel systems	• Leak checks • Float adjustments • Fuel flow and pressure adjustments • Nozzle cleaning • Carburetor/fuel injection, inspection, adjustment and replacement • Fuel pump inspection and replacement
P2.4.5	Describe maintenance of lubricating systems	• Oil system component, inspection, replacement and adjustment – Oil pump – Oil cooler – Fluid lines – Leak checks – Filters
P2.4.6	Describe maintenance of induction and exhaust systems	• Induction system inspection, repair and replacement • Exhaust system inspection, repair and replacement • Turbo-and super-charging systems inspection, adjustment and replacement
P2.4.7	Describe cylinder differential pressure testing	• Purpose • Equipment • Procedure • Frequency • Documentation
P2.4.8	Describe ground running and operational testing of reciprocating engines and components	• Starting procedures • Operating procedures • Oil consumption check • Engine run-in procedures • Instrument monitoring – Parameters

		• Shut down procedures
P2.4.9	Describe engine trouble shooting	
P2.4.10	Describe certification of maintenance work	
P2.4.11	Carry out reciprocating engine maintenance (Practical)	• Inspect engine • Remove/install components • Test and adjust engine systems • Start and operate engine • Carry out cylinder pressure differential test
P2.4.12	Service reciprocating engine and its systems	• Check fluid levels • Replenish fluids • Clean components • Check pressures • Check for leaks

Line (GAC): 11 Reciprocating Engines

Competency: 11.04 Carburation and Engine Fuel Systems

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
P3.1	Requirements of Engine Fuel Systems	
P3.1.1	Explain requirements for carburation	• Fuel metering • Vaporization of fuel • Control of engine power • Control of fuel/air mixture
P3.1.2	Identify types of fuel carburation devices	• Float carburetor • Pressure carburetor • Fuel injection
P3.2	Related Physics	
P3.2.3	Explain how Bernoulli's Principle relates to operation of simple carburetor	
P3.2.4	Explain movement and metering of fuel in simple carburetor.	
P3.2.6	Explain function of air bleed in simple carburetor	
P3.3	Characteristics of Gasoline	
P3.3.3	Identify range of fuel/air mixture ratios within which gasoline will burn	
P3.3.4	Define "stoichiometric mixture"	
P3.3.5	Differentiate between mixture ranges	• Best power • Lean best power • Rich best power • Best economy

P3.3.6	Explain effect of fuel/air mixture	• Exhaust gas temperature • Flame propagation • Detonation • Afterfiring • Backfiring • Specific fuel consumption – Effects of altitude
P3.4	Carburetors	
P3.4.1	Differentiate between types of carburetor floats	
P3.4.2	Identify fuel strainer	
P3.4.3	List components which make up main metering system	
P3.4.4	Identify components of idle system	
P3.4.5	Describe different types of accelerating systems	• Accelerating well • Accelerating pumps
P3.4.6	Identify types of main mixture controls	• Needle type • Disc type • Backsuction type • Variable orifice • AMC
P3.4.7	Identify types of economizer systems	• Needle valve • Air bleed • Manifold pressure
P3.4.8	Explain function of components in float carburetor	• Venturi • Metering jets • Discharge nozzle • Idle circuit • Main metering circuit • Float • Needle valve • Accelerator pump

- Accelerator well
- Main mixture controls
- Idle mixture control
- Economizers

P3.5 Pressure Injection Carburetors

P3.5.1 State advantages of pressure injection carburetors over float carburetors

P3.5.2 Explain operation of fuel pressure regulator

P3.5.3 Identify major components in pressure injection carburetor

P3.5.4 Define “air metering force” and “fuel metering force”.

P3.5.5 Explain operation of sub-systems

- Mixture control system
  - Automatic mixture control system
- Idle system
- Acceleration system
- Manual power enrichment valve
- Airflow power enrichment valve

P3.6 Anti-detonation Injection (ADI)

P3.6.1 State purpose of anti-detonation injection (ADI)

P3.6.2 Describe components in ADI system

P3.6.3 Describe principles of operation of ADI system.

P3.7.3 Describe adjustments of idle speed

P3.7.4 List items to be inspected, on carburetor, during routine inspection

P3.7.5	Describe removal and installation procedures of aircraft carburetor	

P3.7.6	Describe possible causes and corrective action for carburetor problems	• Carburetor leaks when engine stopped
		• Mixture too lean at idle
		• Mixture too lean at cruise
		• Mixture too lean at full power
		• Mixture too rich at idle
		• Mixture too rich at high power
		• Poor acceleration
		• Poor idling
		• Engine stalls during
		  – Acceleration
		  – Idle
		• Engine “hunting”

P3.7.7	Describe independent check for carburetor controls	

Line (GAC): 11 Reciprocating Engines

Competency: 11.05 Introduction to Fuel Systems

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
P4.1	Introduction to Fuel Injection	
P4.1.1	Review disadvantages of carburation	• Uneven fuel/air distribution • Carburetor icing • Incomplete vaporization • Loss of fuel in abrupt, or prolonged
P4.1.2	Describe basic concepts of continuous flow fuel injection system	• Positive delivery • Delivers it to intake port of each cylinder • Continuous flow
P4.2	Introduction to Fuel Injection	
P4.2.1	Describe fuel control unit	• Fuel inlet strainer • Mixture control valve – Idle cut-off – Manual mixture control – Cockpit linkage • Main metering jet • Throttle fuel valve – Idle valve lever connection to throttle lever linkage
P4.2.2	Describe regulator unit	• Fuel regulator – Air diaphragm ○ Inlet air pressure ○ Venturi air pressure – Fuel diaphragm ○ Metered fuel pressure ○ Unmetered fuel pressure ○ Ball valve • Throttle valve – Cockpit linkage

P4.2.3	Explain interaction of air metering force and fuel metering force to regulate fuel flow	
P4.2.4	Describe function of flow divider	• Divides fuel flow • Idle downstream fuel pressure • Positive fuel cutoff • Fuel flow indication
P4.2.5	Describe function of fuel injection nozzles	• Calibration • Air bleed system • Installation
P4.2.6	Describe idle system	• Constant head spring • Constant effort spring
P4.2.7	Describe manual mixture control system	
P4.2.8	Describe automatic mixture control	• Bellows • Bleed across air diaphragm
P4.2.9	Describe starting procedures	• Cold engine • Hot engine
P4.2.10	Describe system maintenance	• Nozzle cleaning • Injector body
P4.2.11	Describe system adjustments	• Idle mixture • Idle speed
P4.2.12	Discuss typical problems that occur and troubleshooting techniques to pinpoint fault and determine corrective action.	
P4.2.13	Describe typical repairs and/or refractions for these faults	
P4.2.14	Trace a Bendix fuel injection system flow diagram.	
P4.3	Teledyne Continental System	
P4.3.1	Describe function of fuel pump	• Vapor chamber • Vane pump • Adjustable orifice

		• Relief valve • Jet pump/venturi • Bypass check valve • Variable restrictor controlled by aneroid valve for turbocharging
P4.3.2	Describe fuel control unit	• Manual mixture control valve – Linkage to cockpit • Throttle fuel valve – Air valve linkage – Cockpit linkage
P4.3.3	Describe function of fuel manifold valve	• Distribution of fuel • Positive shut-off at fuel cutoff
P4.3.4	Describe function of injector lines	
P4.3.5	Describe function of fuel injection nozzles	• Calibration • Air bleed system • Nozzle length • Turbocharged application
P4.3.6	Describe starting procedures	• Cold engine • Hot engine
P4.3.7	Describe system maintenance	• Nozzle cleaning • Inspection
P4.3.8	Describe system adjustments	• Low unmetered fuel pressure • High unmetered fuel pressure • Idle mixture • Idle speed
P4.3.9	Describe typical problems that occur and troubleshooting techniques to pinpoint fault and determine corrective action	
P4.3.10	Describe typical repairs and/or rectifications for these faults	
P4.3.11	Trace a Continental fuel injection flow diagram	

Line (GAC): 11 Reciprocating Engines

Competency: 11.06 Fuel Injection Systems

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS	CONTENT
P5.1 Reciprocating Engine Ignition Systems	
P5.1.1 Explain battery ignition systems	• Components and their function – Coil – Battery – Distributor ○ Points ○ Capacitor ○ Distributor cap – Ignition harness – Spark plugs – Ignition switch • Advantages of battery ignition system over magneto system
P5.1.2 Explain low tension magneto ignition systems	• Components and their function – Magneto ○ Coil ○ Distributor ○ Points ○ Capacitor – Ignition harness – Spark plugs – Ignition switch • Advantages and disadvantages of low tension magneto system
P5.1.3 Explain high tension magneto ignition systems	• Single and dual magnetos • Components and their function – Magneto mechanical system ○ Rotating magnets ➢ Bearing ➢ Seal – Methods of mounting

- Base mount
- Vernier coupling
- Flange mount

– Magneto magnetic circuit
- Two pole magnet
- Pole shoes
- Core of coil
- Flux flow
  - Full register
  - Null

– Primary circuit
- Windings
- Points
- Cam
- Capacitor
  - Feed through
  - Axial capacitor
  - Radio noise suppression

– Collapsing of primary field
- E-gap

– Secondary circuit
- Windings
- Carbon brush contact
- Distributor gear
- Distributor block

P5.1.4 Describe electronic ignition systems

P5.1.5 Describe magneto maintenance procedures

P5.1.6 Inspect, service, and test magneto ignition system components (Practical)

P5.2 Ignition Harnesses

P5.2.1 Explain purpose of ignition harnesses

- Carry high voltage
- Noise shielding

P5.2.2 Describe construction of ignition harnesses

- Centre conductor
  – ‘Slick/Electro’
  – ‘Bendix’
- Insulator

- Shield
  - Outer covering
- Terminal ends
  - 5/8”-24 shielded
  - ¾”-20 all weather
  - Angled leads
  - Insulators

P5.2.3 Describe installation of ignition harnesses

- ‘Bendix’ type
  - Crimp style
  - Distributor block end
  - Spark plug end
- ‘Slick’
  - Pin style
  - Distributor block end
  - Spark plug end

P5.2.4 Describe testing of ignition harnesses

- Continuity test
- Insulation test
- Resistance test

P5.2.5 Install and test ignition harness

P5.3 Spark Plugs

P5.3.1 Describe spark plugs

- Size of plugs
  - Shell thread
  - Terminal thread
- Electrode types
  - Massive
  - Fine wire
- Reach
  - Short
  - Long
  - Gasket
- Part number information
- Heat range
  - Selectable range as per Type
  - Certificate
- Resistor type

P5.3.2	Describe maintenance of spark plugs	• Inspection intervals
		• Removal
		• Visual inspection
		  – Types of fouling
		  – Wear limits
		• Cleaning
		  – Electrode
		  ○ Abrasive blast
		  ○ Vibrator type
		  ○ Terminal end
		  ○ Threads
		• Gapping
		  – Fine wire
		  – Massive
		• Testing
		• Installation
		  – Rotation
		  – Lubrication
		  – Torque
		  – Spark plug
		  – Terminal end
		• Care and handling

P5.3.3	Remove, clean, inspect, test, and install spark plugs	
P5.4	Ignition Systems for Engine Starting	
P5.4.1	Explain reasons for ignition systems for engine starting	

P5.4.2	Explain booster magneto	• Theory of operation
		• Booster coil
		  – Power source
		• Trailing finger
		  – Firing order

P5.4.3	Explain induction vibrators	• Theory of operation

P5.4.4	Explain 'Shower of Sparks' ignition	• Theory of operation
		• Starting vibrator
		• Ignition switch
		• Magnetos condition on start
		  – Left
		  – Right
		• Left magneto breaker points
		  – Retard
		  – Advance

P5.4.5	Explain impulse couplings	• Theory of operation • Lag angle • Spring loaded coupling • Coming in speed
P5.4.6	Describe maintenance of ignition systems for engine starting	
P5.4.7	Inspect and test ignition systems for engine starting (Practical)	
P5.5	Magneto Timing	
P5.5.1	Explain conditions that must occur for proper ignition timing	

P5.5.2	Describe internal timing of magnetos	• Locating E-gap
		• Adjusting point opening
		  – Advance points
		  – Retard points (if applicable)
		  – Gear meshing

P5.5.3	Describe magneto-to-engine timing (external timing)	• Locate advance firing location on compression stroke of #1 cylinder
		  – Timing hat
		  – Time-rite
		  – Engine markings
		• Set magneto to fire#1 ignition lead (Explain various methods)
		• Engage magneto to engine (Explain various methods)
		• Do final adjustment using magneto timer

P5.5.4	Internally time magnetos	• Single • Dual • Radial engine
P5.5.5	Install magnetos on any of the following	• Single • Dual • Radial engine
P5.6	Ignition Systems Maintenance	
P5.6.1	Describe field-inspection of installed ignition-system.	
P5.6.2	Explain testing of magneto system	• Magneto RPM drop test • Live magneto test
P5.6.3	Explain drift of magneto timing	• Cam follower wear • Breaker point wear
P5.6.4	Describe use of engine ignition analyzer	

Line (GAC): 11 Reciprocating Engines

Competency: 11.07 Induction, Supercharging, Exhaust

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
P10.1	Related Physics	
P10.1.2	Define	• Manifold pressure • Induction • Boost • Supercharging • Turbocharging • ISA (International Standard Atmosphere) • Critical altitude • Absolute altitude • Engine rated power
P10.1.3	Explain effect of density-altitude on engine performance	
P10.1.4	Explain how Gas Laws relate to engine performance	
P10.2		
P10.2.1	Describe reciprocating engine induction system components	• Air intakes • System filtering • Dust removal • Ice control • Intake manifold • Alternate air intake • Fuel metering systems
P10.2.2	Explain purpose of supercharging	• Relationship between manifold pressure and horsepower • Density altitude • Supercharging limitations

P10.2.3	Compare induction systems of opposed engines with that of radial engines	
P10.2.4	Perform inspection of aircraft engine induction system (Practical)	
P10.3	Classification of Superchargers	
P10.3.1	Describe aircraft superchargers	• Internally driven superchargers • Single stage, one speed • Single stage, two speed • Externally driven superchargers (turbochargers) • Discuss turbocompound engines
P10.3.2	Describe sea level supercharger and altitude supercharger	
P10.4	Internally driven Superchargers	
P10.4.1	Describe internal supercharger system	• Impeller • Diffuser • Carburetor • Single speed/two speed
P10.4.2	Explain operation of two-speed supercharger	
P10.4.3	Explain Changes in temperature and pressure within internal supercharger	
P10.5	Turbocharger Systems	
P10.5.1	Describe configurations and operation of turbocharger systems	
P10.5.2	Describe components of turbocharger system	• Ground adjustable waste gate • Automatic waste gate • Absolute pressure controller • Ratio controller • Rate controller • Variable absolute pressure controller

		• Pressure relief valve • Alternate air door • Density controller • Differential pressure controller • Heat exchanger
P10.5.3	Describe turbocharger oil system	• Lubrication • Cooling • Turbocharging control
P10.5.4	Describe adjustments	• Density controller • Absolute pressure controller • Ratio controller • Variable absolute pressure controller • Waste gate
P10.5.5	Describe typical turbocharger faults	
P10.5.6	Describe turbocharging systems troubleshooting methods	
P10.6	Exhaust Systems	
P10.6.1	Describe types of exhaust systems	• Short stack • Collector ring • Opposed type exhaust manifold
P10.6.2	Explain purpose of mufflers and heat exchangers	• Cabin heat • Carburetor heat
P10.6.4	Describe exhaust system maintenance	• Inspection and repair critical areas – Welds – Expansion joints – Bends – Internal baffles – Heat muffs • Pressure testing – Vacuum cleaner – Soap and water
P10.6.5	Describe turbocharged exhaust system	• Gaskets and seals • “V” band couplings

- Heat shrouds and shields
- Expansion joints

P10.7 Turbocharged Engines

P10.7.1 Describe operation of turbocharged engines

- Warm up procedures
- Limitations
- Cool down procedures
- Safety procedures

Line (GAC): 11 Reciprocating Engines

Competency: 11.08 Engine Starting Systems

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS	CONTENT
P12.1 Reciprocating Engines Starting Systems	
P12.1.1 Discuss starting systems	• Hand propping (Hand Cranking) – Hazards and safety • Bungee cord • Direct hand cranking • Inertia starters – Hand inertia – Combination inertia • Cartridge • Direct cranking electric
P12.1.2 Describe starting systems operation	• Sources of energy – Mechanical – Combustion – Electrical • Methods of engagement and disengagement – Clutches – Over running – Torque overload release – Helical spline – Spring clutch • Drive configurations – 90 degree drive – Planetary gear drive – Direct drive – Pinion and starter gear
P12.1.3 Describe starting systems operating procedures	

Line (GAC): 11 Reciprocating Engines

Competency: 11.09 Lubricants and Lubrication

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
P13.1	Function and Characteristics of Lubricants	
P13.1.1	Describe functions of lubricants	• Friction • Cooling • Corrosion • Cleaning • Cushioning • Sealing
P13.1.2	Describe characteristics of engine lubricants	• Viscosity and Index • Specific Gravity • Colour • Cloud and pour point • Flash and fire point • Carbon residue • Ant-forming quality • Operating range • Resistance to oxidation • Non-corrosive
P13.2	Types and Classifications of Lubricants	
P13.2.1	Describe common standards and specification for lubricants	• SAE system • Commercial aviation grade number • Military specifications
P13.2.2	Explain advantages and disadvantages of	• Mineral oils • Ashless dispersant oils • Synthetic oils • Greases
P13.2.3	Explain precautions when inter-mixing oil types	

P13.3 Reciprocating Engine Lubricating Systems

P13.3.1 Describe types of lubrication systems

- Dry-sump
- Wet-sump

P13.3.2 Describe external components of reciprocating engine oil lubrication system

- Tanks
  - Capacity
- Pumps
  - Scavange
- Filters
  - Types of filters
    - Pressure and scavange
    - Full-flow and partial-flow
    - Edge
    - Depth
    - Surface
    - Semi-depth
- Pressure relief valve
- Pressure indication
- Temperature regulator
- Temperature indication
- Quantity indication
- Temperature switches
- Cooler
- Flow control valves
- Surge protection valves
- Air flow control valves
- Oil/Air separators
- Oil dilution

P13.3.3 Describe methods for internal lubrication of reciprocating engines

- Pressure
- Splash
- Pressure/splash combination

P13.3.4 Describe maintenance practices for reciprocating engine oil lubrication systems

- Analysis
  - Magnetic plugs
  - Filter inspection
  - Spectrometric
- Maintenance
  - Tanks
  - Coolers
  - Screens and strainers

- Filters
- Bypass valves
- Relief valve
  - Adjustment
- Frequency of servicing

P13.3.5 Service reciprocating engine lubricating system (Practical)

P13.3.6 Inspect engine oil-system

Line (GAC): 11 Reciprocating Engines

Competency: 11.10 Aircraft Engine: Operation and Installation

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
P14.1	Removal and Installation – Reciprocating Engines	
P14.1.1	Discuss reasons for removal of reciprocating engines	• Defects requiring removal – Cracked crankcase – Defective mounts – Access to firewall • Engine has reached Time Between Overhaul (TBO) – Engine fails to meet standards ○ Excessive internal wear ○ High oil consumption ○ High operating temperatures ○ Poor performance ○ Sudden stoppage – Sudden speed reduction (engine detuned) – Overspeed – Foreign Object Damage (FOD) ingestion – Metal particles in oil – Immersion in water (cold engine, hot engine, salt water) – When run using incorrect fuel – Excessive vibration – Exposure to volcanic ash – Lack of pre-oiling

P14.1.2	Describe procedures for preparation of engine removal/installation	• Magneto “off” or grounded • Fuel shut-off • Battery disconnected • Wheels chocked • Tail supported • Human resources required • Fire safety procedures • Hoisting requirements and safety
P14.1.3	Describe disconnection/reconnection of	• Engine controls • Electrical components • Fuel, oil, hydraulic, air, and other lines (Note: stress importance of capping lines) • Engine mounts
P14.1.4	Describe removal of other components necessary to facilitate engine removal	• Cowlings • Baffles
P14.1.5	Describe procedure for hoisting and removing/installing engine	• Use of slings and hooks • Use of hoists • Placement of engine receiving stands
P14.1.6	Describe transfer of components to replacement engine (as necessary)	• Starter motor • Propeller governor • Fuel pumps • Magnetos • Vacuum pump • Engine mounts
P14.1.7	Describe engine installation procedures	• Inspections required – Pre-installation – Functional – Independent inspections – Leak checks • De-preservation • Pre-oiling
P14.1.8	Describe required log book entries, maintenance certifications, and records	
P14.1.9	Describe preservation and crating procedures for storage/transportation of engines.	

P14.3 Reciprocating Engines Operation

P14.3.1 Describe preparation of engines for ground running

- Pre-run inspection
  - Points to look for
- Pre-oiling
  - Reasons
  - Equipment
  - Procedure
- Fuel system bleeding
- Propeller checks
- Cowlings in position
- Check the operation of engine and propeller controls
- Fire precautions
- F.O.D.
- Operating area clear of personnel and equipment
- Pre-heat
  - Heat blanket
  - Oil heat
  - Herman Nelson
- Radial engine propeller pull-through

P14.3.2 Describe run-up procedures

- Starting using external power sources
- Starting using aircraft battery
- Hand starting
- Starting procedure
  - Position of controls
  - Idle rpm
  - Mixture position
- Check engine rpm
- Check fuel flow
- Check temperatures and pressures
- Observance of other indication and warning systems
- Magneto checks
- Avoidance of critical rpm range

P14.3.3 Describe factors that affect engine starting

- Starter systems
- Ignition faults
- Fuel system faults

P14.3.4	Describe engine shut-down procedures	• Idle mixture shut-off • Danger of shut-down using magneto switch • Cool down period
P14.3.5	Describe typical engine adjustments for reciprocating engines	• Carburetor • Fuel injection system • Oil pressure • Fuel pressure and flow • Magneto • Timing • Turbocharger • Propeller governor • Propeller synchronizer • Generator/alternator
P14.3.6	Describe emergency procedures:	• Oil leak • Fuel leak • Fire • Over-speed
P14.3.7	Ground run reciprocating engine (Practical)	
P14.5	Troubleshooting Reciprocating Engines	
P14.5.1	Review troubleshooting techniques and principles	
P14.5.2	Describe operating problems and their probable causes	• Backfiring • Engine fails to start • Low power/uneven running • Failure to develop full power • Rough running • Failure to shut down • Low/high operating temperatures • Low/high operating pressures • Low/high fuel flow • Vibration
P14.5.3	Describe probable remedial action for the above problems	• Manufacturers' recommended procedures

P14.5.4 Review log book entries and maintenance records required prior to and following remedial action.

Line (GAC): 12 Propellers

Competency: 12.01 Propellers

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
P11.1	Basic Applications	
P11.1.1	Describe sources of power to drive propellers	• Piston engines • Turbine engines
P11.2	Nomenclature	
P11.2.1	Identify areas of propeller blade	
P11.2.2	Identify components of propeller	
P11.3	Propeller Theory	
P11.3.1	Explain propeller operating variables	• Blade element theory • Blade stations • Blade angle • Pitch distribution • Propeller angle of attack with respect to change in relative wind at different airspeeds and aircraft attitudes (fixed pitch prop) • P-factor or propeller factor • Geometric pitch • Slip • Effective pitch • Changeable pitch props – Two-position – Multiposition – Automatic – Constant speed • Forces acting on a propeller in flight • Relationship of propeller tip speed to speed

		of sound • Ratio of forward velocity to rotational velocity • Propeller load • Propeller efficiency • Propeller feathering • Reverse thrust • Newton's laws • Airfoil design • Angle of attack • Airspeed • Density
P11.4	Propeller Classifications and Types	
P11.4.1	Describe classifications of propellers	• Tractor • Pusher
P11.4.2	Describe types of propellers	• Fixed pitch • Ground-adjustable • Controllable-pitch • Two-position pitch • Constant speed • Automatic pitch
P11.4.3	Describe feathering capability of controllable pitch propeller	
P11.4.4	Describe reverse pitch capability of controllable pitch propeller	
P11.5	Fixed Pitch and Variable Pitch Propellers	
P11.5.1	Describe construction of wooden propellers	• Materials used • Fabrication techniques • Shielding to prevent abrasion • Mounting assemblies • Identification
P11.5.2	Describe construction of metal propellers	• Materials used • Fabrication techniques • Mounting

		• Identification
P11.5.3	Describe construction of composite propellers	• Materials used • Fabrication techniques • Mounting • Identification
P11.5.4	State advantages and disadvantages of different types of propellers	• Wood • Metal • Composite
P11.5.5	Describe construction of ground adjustable propellers	• Blade design • Hub design • Method of changing pitch
P11.5.6	State advantages of being able to adjust blade pitch on ground	
P11.6	Propellers Governors	
P11.6.1	Explain advantages of being able to change and control propeller pitch in flight.	
P11.6.2	Discuss two-position propeller system	• Basic pitch-change mechanism of propeller (oil pressure and counterweights) • Valve system for selecting high or low pitch
P11.6.3	Discuss constant-speed propeller system	• Review concept of constant speeding • State mechanisms that may be used for pitch change • Describe basic concept of how oil flows through governor to control blade angle of propeller
P11.6.4	Describe propeller governors	• Internal parts • Oil flow through governor and crankshaft • Relationship between speeder spring pressure and flyweight forces due to engine rpm • On-speed condition and resultant oil flow • Under-speed condition and resultant oil flow • Over-speed condition and resultant oil flow

		• Linkage between propeller control in cockpit and governor speeder spring adjustment • Feathering capability of governor
P11.7	Constant-Speed and Feathering Propellers	
P11.7.1	Describe construction and internal operation	• Non-feathering • Feathering • Counterweight • Reversible
P11.7.2	Describe operation of feathering propeller installation	• Cockpit controls • Cockpit instrumentation
P11.7.3	Explain	• Shaft horsepower (SHP) • Equivalent shaft horspower (ESHP) • Torquemeter readings compared to horsepower output
P11.7.4	Describe construction and internal operation of reversing propeller	
P11.7.5	Describe operation of turbo-prop (PT-6 System) control systems	• Cockpit controls • Engine reversing linkage • Propeller governor during – On-speed – Under-speed – Over-speed – Feathering – Reversing • Propeller over-speed governor • Topping governor
P11.7.8	Disassemble and Reassemble Propeller (Practical)	
P11.8	Synchronizing and Synchrophasing Systems	
P11.8.1	Explain	• Synchronized propeller operation • Synchrophased propeller operation
P11.8.2	Define terminology for systems	• Master engine • Slave engine

P11.8.3	Describe components and operation	• Synchronizing system • Synchrophasing system
P11.9	Autofeather Systems	
P11.9.1	Explain autofeather system	
P11.10	Propellers Installation and Removal	
P11.10.1	Describe basic types and components of propeller mounting configurations	• Tapered shaft • Splined shaft • Flanged shaft
P11.10.2	Describe basic steps for removal and installation for each shaft configuration	• How puller part of hub works • How to check and improve interference fit • Inspection of crankshaft • Installation and making safe
P11.10.3	Describe steps for removal and installation on splined shaft	• Removal procedure • Master spline • Spline inspection • Installation procedure • Front-cone bottoming and how to fix the problem • Rear cone bottoming and how to fix the problem • Torqing and making safe
P11.10.4	Describe parts of flanged hub	
P11.10.5	Describe basic steps for removal and installation on a flanged hub	• Removal procedure • Replacing bushings • Mating surface inspection • Dowel position • Propeller positioning in absence of dowels • Installation and making safe
P11.10.6	Remove, inspect reinstall and adjust propeller on piston or turbine engine (Practical)	

P11.11 Inspection, Maintenance and Repair

P.11.11.1 Discuss propeller vibrations

- Correctable vibrations
- Uncorrectable vibrations
- Purpose for checking propeller track and balance
- Method for checking track and balance
- Static balance
  - Horizontal imbalance
  - Vertical imbalance
  - Method for correcting
- Dynamic imbalance

P11.11.2 Discuss propeller repairs

- General causes of propeller damage
- Results of not repairing damage
- General inspection or maintenance operations
- Repairs that AME is authorised to accomplish
- Repairs that must be done by specialized shops

P11.11.3 Discuss wooden propeller inspection

- Defects that may occur on all parts of propeller
- Defects that are cause for rejection
- Basic repairs of minor damage
- Major damage

P11.11.4 Discuss hollow and solid metal propellers

- Major damage
- Techniques used for inspection
- Basic repairs allowed for minor damage

P11.11.5 Discuss aluminum-alloy propellers

- Major damage
  - Bent in face alignment
  - Bent in edge alignment
  - Fatigue failure
- Prevention and treatment of minor surface defects
- Repair of pitted leading edges
- Inspection and treatment of scratches and suspected cracks
  - Local etching
  - Purpose
  - Procedure

		• Shortening of blades to remove defects • Causes for rejection of aluminum blades
P11.11.6	Discuss composite propeller blades	• Terms used for blade damage • Minor damage of – Erosion shield – Blade cuff – Blade • Major damage • Methods of recording repairs (major or minor)
P11.11.7	Describe special inspections	• Check blade angles using propeller protractor • Scheduled inspection • Dynamic balance • Static RPM check • Constant speed propeller adjustments • Prop-strike inspection • Typical inspections for responding to troubleshooting problems • Five year inspection
P11.11.8	Inspect minor damage to propeller blade (Practical)	
P11.12	Troubleshooting	
P11.12.1	Identify	• Common faults • Probable causes • Proper corrective actions

Line (GAC): 13 Aircraft Structural Materials

Competency: 13.01 Non-Metallic Materials

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
A12.5	Plastics and Glass	
A12.5.2	Describe methods for storing and protecting plastics	
A12.5.3	Describe procedures for cleaning machining and cementing plastics	
A12.5.4	Explain installation and repair of plastic transparencies	
A12.5.5	Explain procedures for inspection and installation of glass windows.	

Line (GAC): 13 Aircraft Structural Materials

Competency: 13.02 Materials and Processes

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS	CONTENT
G12.1 Aircraft Development and Materials	
G12.1.2 Discuss materials used in aircraft construction	• Steel • Aluminum • Magnesium • Titanium • Plastic/rubber • Glass • Composite materials
G12.2 Properties of Materials	

G12.2.1 Define metallurgical terms	• Force
	• Load
	• Stress
	• Strain
	  – Forms of stress
	  – Tension
	  – Torsion
	  – Compression
	  – Shear
	  – Bending
	• Deformation
	• Elasticity
	• Plasticity
	  – Malleability
	  – Ductility
	• Hardness
	• Tensile strength
	• Brittleness

G12.2.2 Explain Common metallurgical expressions	• Strength to weight ratio • Ultimate tensile strength

- Proof stress
- Design limits
- Service life
- Fail-safe
- Cyclic stresses

G12.2.3 Describe general properties of metals

- Crystalline structures
- Slip planes
- Grain size
- Alloys

G12.3 Ferrous Metals

G12.3.1 Describe iron

- Characteristics
- Production process
- Properties
- Forms
- Advantages/disadvantages/limitations

G12.3.2 Describe steel

- Characteristics
- Production process
- Forming
- Alloys and properties
  - For example
    - Reasons for alloying
    - Carbon
    - Chromium
    - Aluminum
    - Lead
    - Manganese
    - Vanadium
    - Silicon
    - Nickel
    - Molybdenum
    - Tungsten
    - Titanium
- Control of impurities
  - Sulphur
  - Phosphorous

G12.3.3 Explain steel alloy identification systems

- SAE identification system
- AISI system
- Colour coding

- Spark characteristics

G12.3.4 Describe steel heat treatment

- Reasons for heat treatment
  - Softening
  - Hardening
  - Surface hardening
- Heat treatment process
  - Austenite
  - Ferrite
  - Cementite
  - Pearlite
  - Martensite
- Types of heat treatment
  - Annealing
  - Case-hardening
  - Cyaniding
  - Nitriding
  - Normalizing
  - Tempering

G12.3.5 Describe stainless steels

- Characteristics
- Identification by AISI number
- Uses
- Advantages and disadvantages

G12.4 Non-ferrous metals

G12.4.1 Describe aluminum

- Characteristics
- Production and manufacturing processes
- Forms
  - Cast
  - Wrought
- Properties
- Advantages/disadvantages
- Methods of strengthening aluminum
  - Alloying
  - Cold working
  - Heat treatment

G12.4.2 Describe aluminum alloys

- Reasons for alloying
- Alloying elements ant their properties

  - Non (99.5% pure aluminum)
  - Copper
  - Manganese
  - Silicon
  - Magnesium
  - Zinc

G12.4.3 Explain aluminum and alloy identification systems

- Aluminum association designation system for wrought alloys
  - 1st digit: - main alloy element
  - 2nd digit: - modification of alloy
  - 3rd and 4th digit - alloy designator (%of alloy)
- Temper designation system
  - F: - as fabricated
  - O: - annealed
  - H: - strain hardened (for NHT alloys)
  - W: - unstable condition (temporary while material ages after SHT)
  - T: - thermally heat treated
- Heat treatable and non-heat treatable alloys
- Forms of wrought metal
  - Sheet
  - Plate
  - Extrusions
  - Bar and rod stock
- Federal Specifications (QQ#)
- Identification markings for sheet
  - Manufacturer
  - Alloy temper
  - Thickness
  - Production lot #

G12.4.4 Describe heat treatment

- Reasons for heat treatment
- Annealing
  - Reasons
  - Process
  - Natural aging
  - Retarding aging – icebox rivets
- Precipitation heat treatment (artificial aging)
  - Reasons

		– Process – Heat treatment safety precautions
G12.4.5	Describe magnesium	• Properties and uses • Heat treatment • Identification • Safety
G12.4.6	Describe titanium	• Properties and uses • Heat treatment • Identification
G12.4.7	Describe copper and its alloys	• Properties and uses
G12.4.8	Describe monel and its alloys	• Properties and uses
G12.4.9	Describe high-temperature alloys	• Hastelloy • Haynes • Inconel
G12.5	Material Testing	
G12.5.1	Recall hardness and strength characteristics	
G12.5.2	Explain purpose of hardness testing	• To determine hardness of material • To identify metals and alloy
G12.5.3	Describe various hardness testing processes	• Brinell – For ferrous, non-ferrous and soft metals before machining – Steel ball, pressure, measure depression, 15s press for ferrous, 30spresee for others • Rockwell – For depth of penetration – Steel ball or diamond spheroconical penetrator
G12.6	Glass and Plastics	

G12.6.1	Define “plastics”	
G12.6.2	Describe	• Thermosetting plastics • Thermoplastics resins
G12.6.3	Describe aircraft transparencies	• Materials • Construction • Care and handling • Cleaning • Repair • Inspection • Installation • Damage Assessment
G12.6.4	Describe storing, protecting, and handling of plastic and glass materials, windows and lenses	
G12.6.5	Describe types and uses of glass in aircraft	
G12.6.6	Describe windshields	• Types • Construction • Coatings
G12.6.7	Handle plastics: clean a transparency (Practical)	

Line (GAC): 13 Aircraft Structural Materials

Competency: 13.03 Corrosion Control

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
G14.1	Formation and Types of Corrosion	
G14.1.1	Describe elements of corrosion	• Definition of corrosion • Chemistry – Requirements for corrosion – Potential difference table
G14.1.2	Classify corrosion	• Direct chemical attack • Electrochemical attack • Uniform • Localized
G14.1.3	Describe types of corrosion	• Galvanic • Oxidation • Uniform surface • Pitting • Intergranular • Exfoliation • Fatigue • Oxygen cell • Metallic ion cell concentration • Internal stress • Crevice • Fretting • Microbiological • Filiform
G14.1.4	Recall corrosion-prone materials used in aircraft construction	• Magnesium • Certain aluminium alloys • Ferrous and non-ferrous
G14.1.5	Describe corrosive elements and their effects	• Metals in contract • Water • Air

- Salts
- Organic growths
- Acids
- Alkalis
- Mercury
- Paint strippers
- Toilet and galley contaminants
- Blood
- Chemicals
- Rain

G14.1.6 Identify types of corrosion on samples (Practical)

G14.2 Corrosion Detection

G14.2.1 Describe corrosion-prone areas

- Exhaust areas
- Battery compartments and vents
- Lavatories and galleys
- Wheel wells and landing gear
- Skin seams and lap joints
- Engine inlet areas
- Fuel tanks
- Piano hinges
- Control surface recesses
- Bilges
- Landing-gear boxes
- Engine mount/structure
- Control cables
- Welded areas
- Avionics equipment
- Rotating components (helicopter)
- Leading edge of wings and rotors erosion leading to corrosion

G14.3 Corrosion Removal and Control

G14.3.1 Explain mechanical removal of corrosion in aluminum alloys

- Abrasive materials
- Removal limits
- Safety precautions
- Procedure cautions

		– Do not use steel-wire brush
G14.3.2	Explain chemical control of corrosion in aluminum alloys	• Alodine • Alachrom
G14.3.3	Explain mechanical removal of corrosion in magnesium alloys	• Abrasive materials • Removal limits • Safety precautions
G14.3.4	Explain chemical control of corrosion in magnesium alloys	• Chromic acid + sulphuric • Pickling
G14.3.5	Explain mechanical removal of corrosion in ferrous metals	• Abrasive materials • Removal limits • Safety precautions
G14.3.6	Explain chemical treatment of corrosion in ferrous metals	• Safety precautions
G14.4	Corrosion Prevention and Protection	
G14.4.1	Describe corrosion protection measures	• Seam sealing • Aircraft cleaning • Anodizing and related processes • Plating • Chrome-pickling • Dichromate treatment • Stannate immersion • Galvanizing • Cladding • Metal spraying • Sacrificial node • Organic coatings • Dope proofing • Internal treatments • Painting
G14.4.2	Describe methods of constructing corrosion-resistant structure	• Use of close galvanic metals in proximity • Insulation of dissimilar metals • Treating and painting of cut edges • Alodining • Sealing methods

- Use of drain holes
- Use of water dispersant

Line (GAC): 14 Wood and Fabric

Competency: 14.01 Non-Metallic Structures

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
A12.1	Wood Structures	
A12.1.1	Review use of wood in aircraft structures	• Classification of wood • Acceptability and considerations when selecting or ordering wood.
A12.1.3	Describe types of glues	
A12.1.4	Describe procedures for wood preparation	
A12.1.5	Describe inspection and repair procedures	
A12.2	Fabric Coverings	
A12.2.1	Describe materials and nomenclature used for fabric covering	• Types • Tape • Threads and cords • Grommets • Inspection rings • Miscellaneous
A12.2.2	Describe nitrate and butyrate dopes and dope additives	• Rejuvenators • Solvents • Retarders
A12.2.3	Discuss facilities and equipment required for doing fabric work	• Tools • Safety • Environment

A12.2.4	Discuss application process for fabric covering	• Structure preparation • Fabric seams • Covering methods • Installation of fabric • Rib lacing and attachment • Surface tape application • Finishing process
A12.2.5	Discuss fabric inspection	• Examine Seybolt and Maule “punch” tester • Determine criteria for serviceability of fabric material
A12.2.6	Discuss methods of repairing fabric covering	• Sewing and doping tears • Doped repair • Sewn-in panels • Doped-in panels • Application of rejuvenators

Line (GAC): 14 Wood and Fabric

Competency: 14.02 Materials and Processes

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
G12.7	Wood	
G12.7.1	Describe the uses of wood in aircraft construction	• Advantages • Disadvantages • Examples of aircraft using wood • Types of structures using wood
G12.7.2	List three forms of wood commonly used in aircraft	• Solid wood • Plywood • Laminated wood
G12.7.3	Describe solid wood	• Types of approved species • Spring wood • Grain pattern • Density • Defects – Checks – Shakes – Splits – Knots – Decay
G12.7.4	Describe laminated wood	
G12.7.5	Describe plywood	
G12.7.6	Describe testing procedures for wood and adhesives	
G12.8	Fabric Coverings	

G12.8.1	Describe uses of fabric coverings and materials	• Covering of wings, control surfaces and fuselage • Reinforcing tape • Surface tape • Lacing cord • Machine thread • Hand-sewn thread • Rib stitching
G12.8.2	Describe fabric coverings	• Nomenclature – Bias – Bleaching – Calenderizing – Fill/woof – Mercerizing – Selvedge – Sizing – Thread count – Weight • Organic fabrics – Cotton fabrics – Linen – Thread count – Grades • Discuss SAE numbers • Inorganic fabrics – Polyesters – Fiberglass • List advantages and disadvantages of each material
G12.8.3	Describe tapes and their uses	• Surface • Reinforcing • Chaffing
G12.8.4	Describe sewing threads and lacing cords	• Machine thread • Hand-sewn thread • Lacing cord
G12.8.5	Describe use of fabric covering accessories and hardware	• Grommets • Inspection rings • Special fasteners • Tacks

- Beeswax

G12.8.6 Describe testing of fabric

Line (GAC): 16 Dynamic Drive Systems

Competency: 16.01 Dynamic Drivetrains

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS	CONTENT
A1.1. Driveshafts and Transmission Accessories	
A1.1.1 Describe aircraft power transmission	• Driveshafts – Reasons for use – Types ○ Solid ○ Hollow ○ Flexible • Materials – Steel – Aluminum – Combination • Belts and pulleys – Types of belts ○ Flat vee ○ Cogged • Types of pulleys – Flat – Vee •
A1.1.2 Describe types of driveshaft couplings	• Grease lubricated – Internal/External crown tooth gear and splined housing • Laminated flex • Curvic • Elastomeric – Combination rubber and steel • Splined
A1.1.3 Describe driveshaft support systems	• Hangers and bearings • Floating supports • Dampeners

A1.1.4	Describe maintenance of driveshafts	• Lubrication and servicing • Removal and installation • Balance • Temperature indicators
A1.1.6	Remove, inspect and install helicopter tail rotor driveshaft (Practical)	
A1.2	Freewheel Units	
A1.2.1	Explain purpose of freewheel units on helicopter drive systems	
A1.2.2	Describe different types of freewheel units	• Sprag – Components – Operating principle
A1.2.3	Describe location of freewheel units	• Engine output-Bell 206 • Output driveshafts-AS 350 • Combining gearboxes-Bell 212 • Main transmission inputs-Bell 204 • Planetary system-Bell 47
A1.3	Clutches	
A1.3.1	Describe clutches and their operation	• Unloading engine during start sequence • Difference between clutches and freewheel units
A1.3.2	Identify types of clutches	• Centrifugal • Mercury • Shoe • Maintenance and adjustments • Belt tensioners • Manual • Electric • Maintenance and adjustments
A1.4	Gear Systems	

A1.4.1	Describe gear nomenclature	• Tooth description – Heel – Toe – Face – Profiles ○ Gear (crown) ○ Pinion
A1.4.2	Describe types of gears	• Straight cut • Helical • Bevel • Spiral bevel • Worm
A1.4.3	Describe types of gear sets and their uses	• Types – Spur gears – Gear (crown) and pinion – Planetary – Worm and wheel • Uses – Transmitting motion – Changing speed – Changing direction
A1.4.4	Describe methods for determining gear mesh relationships	• Lash measurement • Checking visual pattern • Lubrication – Tooth loading – Shimming – Positioning of bearings and housings
A1.4.5	Describe methods for determining gear wear	• Visual pattern • Gauge pins • Straight edge and feeler gauge • Backlash measurements
A1.5	Aircraft Gearboxes	
A1.5.1	Describe gearbox construction	• Material – Aluminum

- Magnesium
- Steel

- Support structure
  - Webbing
  - Mounts
- Liners
- Protection
  - Paints
  - Sealers

1.5.2 Describe gearbox components

- Seals
- Packings
- Bearings
- Oil system components
  - Pumps
  - Pressure regulators
  - Filters
    - Cartridge
    - Element
    - Bypass valves
  - Chip detectors
  - Temperature transmitters
    - Switches
  - Pressure transmitters
    - Switches
- Quantity indicators
  - Sight glasses
  - Dip sticks
  - Floats
- Filler caps
  - Vents
- Coolers
  - Thermobypass valves

A1.5.3 Describe gearbox accessories

- Mounts
  - Torsional loads
  - Lift loads
  - Vibration isolation
- Accessory drives
  - Hydraulic pumps
  - Tachometer

		– Clutches – Drive adapters – Rotor brakes – Motor generators – Blowers – Tail rotor
A1.5.4	Describe types of gearboxes and their applications	• Helicopter main transmissions • Intermediate • Tail rotor • Accessory • Flap extension • Engine • Propeller reduction
A1.5.5	Maintain aircraft gearboxes	• Replace/clean filters • Check chip detectors • Determine type quantity of lubrication • Adjust oil pressure regulator • Determine security and condition of fasteners and mounts • Inspect for corrosion • Check gear backlash

Line (GAC): 17 Vibration Analysis

Competency: 17.01 Vibration Analysis and Rectification

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
A10.1	Transmission of Sound	
A10.1.1	Explain and discuss transmission of sound	• Frequency, amplitude and displacement • Wave motion • Transmission of sound in different mediums • Measurement of intensity against time (inches per sec.) • Resonance • Doppler effect
A10.2	Vibrations in Rotating and Non-Rotating Devices	
A10.2.1	Explain vibrations	• Amplitude • Frequency • Centre of mass • Centre of gravity • Centre of rotation • Direction of vibration (vertical and lateral)
A10.2.2	Demonstrate low and medium frequency vibration (Practical)	
A10.3	Nodes, Anti-Nodes, Inherent Vibrations, Masking and Harmonics	
A10.3.1	Explain vibration characteristics and properties	• Nodes and anti-nodes • Harmonics and inherent vibrations • Nodamatic suspensions • Pendulum absorbers • Bifilars • Mass weight and springs • Isolation mounts • Noise canceling systems

A10.4 Detection and Isolation

A10.4.1 Explain vibration troubleshooting techniques

- Low-, medium-, and high- frequency vibrations and their sources
- Vertical and lateral vibrations and their causes
- Blade phase angles
- Acquisition of information
- Seat of the pants track and balance
- Importance of communication with pilot
- Equipment used
- Frequency
- Direction
- Differences of track in a hover versus speed-sensitive track
- How track affects phase
- Proper sequence of adjustments

A10.4.2 Balance vibration simulator (Practical)

A10.4.3 Identify direction of vibration

A10.4.4 Determine source of vibration

A10.5 Test Equipment

A10.5.1 Explain function of and demonstrate use of test equipment

- Accelerometers, piezio electric, velocimeters and veiocimeters
- Pickups
  - Magnetic
- Interrupters
- Phasors
- Strobe lights
- IPS meters
- Charts
- Vibration analysers

A10.5.2 Install test equipment on vibration simulator or helicopter (Practical)

A10.6 Static Balance

A10.6.1 Explain static balance

- Alignment and phasing of rotors and blades
- Telescope gunsight alignment
- Knife-edge balancer
- Marvel balancer
- Bullseye and bubble levels
- Methods of weight change

A10.7 Dynamic Balance

A10.7.1 Explain dynamic balance

- Reading charts
- Chart correction
- Interpretation of results
- Building chart from scratch
- Predicting move line directions

A10.7.2 Perform dynamic balance (Practical)

- Equipment installation
- Tuning
- Sequence of corrections
- Chart building and use
- Adjustments to track
- Adjustments to balance
- Fine-tuning

Level 3

Aircraft Maintenance Technician

Line (GAC): 20 Drawings

Competency: 20.01 Aircraft Drawings

Objectives

To be competent in this are the individual must be able to:

LEARNING TASKS		CONTENT
G5.1	Types of Drawings	
G5.1.1	Explain Drawings and Sketches	• Production drawings – Detail – Assembly – Pictorial – Installation • Block diagrams • Schematic diagrams • Shop sketches • Electrical/electronic drawings – Wiring diagrams – Schematic diagrams – Logic circuit diagrams
G5.1.2	Explain drawing production processes.	
G5.2	Drawing Techniques	
G5.2.1	Explain Projections	• Perspective view • Oblique view • Isometric projection • Orthographic projection
G5.2.2	Explain Lines	• Widths – Wide – Medium – Narrow • Object • Hidden

- Phantom
- Dimension
- Extension
- Cutting-plane
- Break
- Adjacent part
- Short
- Long

G5.2.3	Recognize and explain machining and finishing symbols	• Countersinking • Boring • Surface finish

G5.2.4	Explain Views	• Single
		• Two
		• Three
		• Multiple
		• Phantom
		• Sectional
		  – Full section
		  – Half section
		• Detail

G5.2.5	Explain Dimensions	• Basic dimensions
		  – Limits
		  – Permissible dimensions
		  – Tolerance
		  – Allowance
		  – Tight fit
		  – Loose fit

G5.2.6	Explain numbering and lettering format	• Block • Upper case • Gothic • Zoning
G5.2.7	Explain basic sketching techniques	

G5.2.8	Explain title block layout and purpose	• Drawing number • Materials list – Quantity – Part number – Description – Material – Size – Specifications • Left-hand and right-hand parts – Scale – Title – Revisions – Dimensions and limits
G5.2.9	Explain drawing revisions/changes/modifications	• Engineering orders • Production changes • Ballooning
G.5.2.10	Explain care and storage of drawings	
G5.2.11	Using a variety of line types, views, and levels of complexity, draw/sketch examples of each of the projections. (Practical)	
G5.2.12	Given a damage scenario, produce sketch/drawing to evaluate repair (Practical)	
G5.3	Interpretation of Aircraft Drawings	
G5.3.1	Explain Station numbers	• Datum • Fuselage stations • Wing stations • Water line • Butt line • Component stations
G5.3.2	Explain zoning	• ATA 100 zoning system • Major zoning areas

G5.3.3	Explain symbols and abbreviations	• Materials symbols • Process codes • Flag notes • Caution tags
G5.3.4	Locate specific information from a variety of aircraft drawings and blueprints (Practical)	• Serial numbers • Aircraft applicability • Location on aircraft • Scale
G5.3.5	While performing various tasks interpret blueprints and drawings (Practical)	• Locating components on aircraft • Wiring components on aircraft • Configuring aircraft from floats, skis or wheels

Line (GAC): 21 Metallic Structures

Competency: 21.01 Metallic Structures

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
A11.3	Aircraft Sheet Metal	
A11.3.1	Describe handling procedures and storage of sheet metal	• Safety • Documentation and identification
A11.3.2	Review identification of sheet Aluminum alloy	• Markings • Thickness • Aluminum Association Identification system
A11.3.3	Describe sheet metal documentation	
A11.3.4	Obtain sheet of specified aluminum alloy from sheet metal rack. Handle and move it. Replace it in rack (practical)	
A11.4	Lay Out, Cutting and Drilling of Sheet Metal	
A11.4.1	Describe layout procedures	• Constructing a – Square – Triangle – Circle • Bisect above constructions
A11.4.2	Describe use of lay-out tools and instruments	
A11.4.3	Describe process for marking and drilling holes in sheet metal	
A11.5	Installation of Rivets	
A11.5.1	Describe solid rivets	• Rivet codes (AN and MS) – Head shape

  - Material
  - Shank diameter
  - Shank length
- Head styles
- Ice box rivets

A11.5.2 Describe riveting process

- Lay out
  - Pitch
  - Min and max
  - Edge distance
  - Single row
  - Staggered row
  - Grip length
- Riveting tools
  - Rivet guns
  - Bucking bars
  - Clecos and clamps
  - Set-up and “drawing” tools
  - Countersinking and dimpling tools
  - Rivet cutting tools
  - Rivet gauges
- Rivet sizing
  - Length
  - Diameter
  - Tail length
  - Formed head size
- Forming upset heads (bucking)
- “Wet “ installation
- Prepare faying surfaces
- Safety precautions

A11.5.3 Describe inspection of formed rivets

- Rivet replacement rules
- Shear strength
- Bearing failure
- Riveting faults
  - Manufactured head damage
  - Formed head under/oversized
  - Cracks
  - Offset head
  - Loose rivet
  - Clearance under heads
  - Marked skin

		• Use of oversize rivets
A11.5.4	Describe removal of rivets (Practical)	• Tools • Procedure – Centre punch head – Drill size – Depth of drilling – Head removal – Use of pin punch • Safety precautions
A11.5.5	Lay out pieces of metal, cut to size using both hand shears and mechanical shears. Note safety	
A11.5.6	Lay out and drill rivet pattern on two pieces of metal	• Single row • Double row • Staggered row • One row for countersunk rivets
A11.5.7	Rivet together two pieces of metal using both hand-riveting and pneumatic-riveting procedures	• Lap joint • Butt joint
A11.5.8	Inspect rivets for correct installation, mark poor or damaged rivets	
A11.5.9	Remove poor or damaged rivets or select several rivets for removal	
A11.6	Forming and Bending Sheet Metal	
A11.6.1	Describe calculation of bend allowance	• Definition – Bend radius – Metal thickness – Degrees of bend – Hardness of metal • Bend allowance formula • Bend allowance chart • Sight line • Bend line • Bends smaller than 90° • K-factor

A11.6.2	Describe bend allowance	• 90° bend • Bends less than 90° (open angle) – Use K-factor • Bends greater than 90° – Use K-factor – Without K-factor
A11.6.3	Describe formation of joggle	• Manual method • Brake method
A11.6.4	Form a bend (Practical)	• Brake • Bars • Radius
A11.6.5	Calculate bend allowance and lay out selection of one or more forms	• Simple 90° bend • Bend greater than 90° • Bend less than 90° • U channel • Hat section • V section • Z section
A11.6.6	Produce selection of one or more of following forms	• Simple 90° bend • Bend greater than 90° • Bend less than 90° • U channel • Hat section • V section • Z section
A11.6.7	Form joggle	
A11.6.8	Fabricate joggled joint (join two joggled pieces)	
A11.7	Sheet Metal Repairs	
A11.7.1	Explain damaged area inspection	• Scratch inspection • Assess type and extent of damage • Draw or make rubbing of damaged area • Write up damage report • Plan repair

A11.7.2	Explain damage removal process	• Support damaged area • Remove rivets • Dress out damage • Inspect for further damage
A11.7.3	Explain fabrication of surface and flush patches	• Blind hole finding
A11.7.4	Explain rivet formulas	
A11.7.5	Describe repair to pressurized structure	
A11.7.6	Explain use of sealants in structural repair	• Types of sealant • Application and curing
A11.7.7	Practice dimpling and countersinking	
A11.7.8	Perform sheet metal repair in accordance approved data	• Stressed skin
A11.8	Installation of Special Fasteners	

A11.8.1	Describe sheet metal fasteners	• Hi-Shear rivets
		• Blind Hi-Shear rivets
		• Hi-Lok Hi-Tigue fasteners
		• Hi-Lites
		• Lockbolts
		• Blind Lockbolts
		• Huckbolt
		• Taperlocks
		• Blind Rivets:
		  – Pop rivets
		  – Rivnuts
		  – Cherrylock rivets
		  – Cherrymax rivets
		  – Huck

A11.8.2	Describe special fasteners for panels and cowlings	• Dzus • Camloc • Airloc

A11.8.3	Install special fasteners (practical)	
A11.9	Inspection of Tubular Structures	
A11.9.1	Review types of tubular construction	

A11.9.2	Discuss inspection of tubular structures for damage	• Visual
		• NDT
		• Areas of likely damage
		  – Primary
		  – Secondary
		• Hazardous incidents such as:
		  – Heavy/overweight landings
		  – Flight through severe turbulence
		  – Lightning strikes
		  – Immersion in water

A11.9.3	Discuss type of repairs	• Weld alignment
		• Cluster repairs
		• Dent repairs
		• Welded sleeve
		• Bolted sleeve
		• Welded patch
		  – Dents
		  – Punctures
		• Splicing
		  – Inner sleeve
		  – Outer sleeve
		  – Larger diameter replacement tubes

A11.9.4	Discuss inspection of welds	• Appearance of good weld • Weld faults

A11.9.5	Explain regulatory requirements for repairs to tubular structures	• Qualifications
		• Regulations
		  – Transport Canada
		  – FAA
		• Documentation
		  – Logbooks

- Tags

A11.9.6	Discuss process of preparing aircraft for repair	• Survey damage • Support structure • Jury braces • Alignment and geometry checks • Cleaning • Internal inspection
A11.9.7	Inspect and assess welded areas on tubular construction samples	
A11.10	Inspection and Repair of Bonded Structures	
A11.10.1	Describe inspection techniques	• Tap test • Obvious damage • NDI
A11.10.2	Describe metal-bonding materials	
A11.10.3	Describe repair techniques	• Remove bonding material • Re-bond • Cut away damaged area • Splice in and rivet repair

Line (GAC): 21 Metallic Structures

Competency: 21.02 Hand and Machine Tools

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
G6.5	Sheet Metal Tools	
G6.5.1	Discuss hand tools employed for sheet metal work	• Hammers and mallets • Hand snips and shears • Nibblers • Rivet squeezers • Punches • Wire and sheet metal gauge • Rivet guns and sets • Bucking bars • Sheeet fasteners (clecos) and pliers • Hole finder • Rivet cutter • Rivet mandrel grinder • Dimpling tool • Flanging tools • Hand drills • Rivet shavers • Die grinders • Blind fastener installing tools • Air tools • Battery powered tools
G6.5.2	Discuss safe use of floor and bench tools employed in sheet metal work	• Shears • Brakes • Forming machines

Line (GAC): 22 Maintenance Procedures

Competency: 22.01 Principles of Aircraft Maintenance Management

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
G1.1	Quality Assurance within the workplace	
G1.1.1	Define quality assurance as it relates to aircraft maintenance	• A program for systematically monitoring and evaluating all elements of a maintenance operation to ensure that standards for quality are being met. • Finding and permanently eliminating the source of failures in quality

Line (GAC): 23 Turbine Engines

Competency: 23.01 Fire Protection and Detection

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
A2.3	Fire-Detection Systems	
A2.3.1	List design requirements for fire-detection systems	
A2.3.2	Explain fire zone classification	• Class A • Class B • Class C • Class D • Class X
A2.3.3	Discuss types of detection systems available	• Fire • Overheat • Smoke
A2.3.4	Discuss types of detectors	• Fire/overheat detectors – Thermocouples – Pneumatic system – Systron-Donner gas filled tube • Bi-metallic thermal switches • Smoke detectors • Toxic gas detectors
A2.3.5	Explain function of thermal switches	• Principles of operation • Description of system – Materials • Spot detectors (Fenwell)
A2.3.6	Explain function of thermocouples	• Principles of operation • Description of system – Materials • Three circuits – Detector – Alarm – Test

		• Numbers used in typical systems – Size of fire zone
A2.3.7	Explain function of continuous loop fire-detection systems (fire wire)	• Principles of operation – Materials • Description of systems – Fenwell system – Kiddie system
A2.3.8	Explain function of pressure type fire-detection systems	• Principles of operation – Materials – Overheat function – Discrete function • Description of systems – Lindberg – Systron-Donner
A2.3.9	Describe types of smoke and toxic gas detectors	• Principles of operation • Toxic gas detection – Carbon monoxide detectors • Smoke detectors – Light refraction type – Ionization type – Solid state type
A2.3.10		
A2.3.11	Discuss flame detectors	• Principles of operation • Types of detectors
A2.3.12	Describe routing, installation and inspection of sensors	
A2.4	Fire-Suppression Systems	
A2.4.1	Discuss types of fire-suppression systems	• Installed systems • Portable extinguishers • Where installed on aircraft
A2.4.2	Describe fire-suppression systems	• Principles of operation • Requirements of systems

- Extinguishant containers
  - Cylinders under px
  - Types of bottles
  - How fired
- Explosive cartridges
  - Electrically operated
  - Safety/dangers
  - Installing
  - Testing
- Conventional system
  - Gradual release
- High rate of discharge (HRD)
- One-shot
- Two-shot
- Cross feed
- Process (warning to extinguishing)
  - Operator's actions
  - Automatic functions
  - Follow up
  - Clean up
  - Inspection

A2.4.3 Describe aircraft fire extinguishers

- Spherical
- Cylindrical
- Bottle
- Hand-held

A2.4.5 Describe spray pipe and spray nozzle installation

A2.4.6 Describe inspection and maintenance of fire suppression systems

- Inspection
  - Hydrostatic life
- Safety
- Container pressure checks
- Discharge indication
  - Blow-out discs
  - Pressure gauges
  - Crew-initiated discharge indication
  - Automatic or thermal discharge indication
- Fitting and testing of discharge cartridges
- Identification of system pipelines and markings

A2.4.7	Describe typical fire protection and detection equipment installations	• Light aircraft • Large aircraft • Helicopters • Powerplant installations

Line (GAC): 23 Turbine Engines

Competency: 23.02 Ignition Systems

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS	CONTENT
P5.7 Turbine Ignition Systems	
P5.7.1 Explain types of turbine ignition systems	• Igniters • Low tension – DC input • High tension – AC input • Glow plug
P5.7.2 Explain maintenance of turbine ignition systems	• Igniter plugs and units – Low voltage ○ Semiconductor ○ Inspection ○ Cleaning and servicing ○ Testing ○ Safety – High voltage ○ Inspection ○ Cleaning and servicing ○ Testing ○ Safety • Glow plugs and ballast tubes – Inspection – Cleaning and servicing – Testing – Safety • Ignition leads – Inspection – Cleaning and servicing – Testing
P5.7.3 Describe continuous, auto and manual ignition control systems	

P5.7.4 Perform ignition systems servicing and inspection procedures (practical)

Line (GAC): 23 Turbine Engines

Competency: 23.03 Engine Indicating and Warning Systems

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
P6.2	Gas Turbine Engine Instrumentation	
P6.2.1	Discuss instrumentation that is common to both reciprocating and gas turbine engine installations	
P6.2.2	Describe engine power measurement	• Description • Uses • Operating principles • Engine Pressure Ratio (EPR)
P6.2.3	Describe engine speed indicating systems	• Terminology • Description • Uses • Types • Operating principles
P6.2.4	Describe gas temperature indicating systems and terminology	• Types • Description • Uses • Operating principles
P6.2.5	Describe torquemeter indicator	• Description • Types • Uses • Operating principles
P6.2.6	Describe fault indicating and isolating systems	• Chip lights • Temperature monitors

Line (GAC): 23 Turbine Engines

Competency: 23.04 Gas Turbine Engine Theory

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
P7.1	History and Development	
P7.1.1	Describe jet propulsion	
P7.1.2	Describe examples of natural jet propulsion	• Water creatures – Squid
P7.1.3	Describe common examples of jet propulsion	• Water hose, balloon releasing air, air hose
P7.1.4	Describe early jet propulsion inventions	• Hero's Aelopile • Chinese Rocket • Branca's Turbine Stamping Mill • Da Vinci's "chimney jack" • Newton's Horseless Carriage
P7.1.5	Describe gas turbine development	• Moss Turbo-supercharger • Whittle's Cranwell gas turbine thesis – Description – Development – Problems – Successes – Aircraft in which flown
P7.1.6	Describe gas turbine applications	• Large engines • Helicopter (turbo-shaft) • Turbo-prop • Ducted fan • Unducted fan • Auxiliary Power Units (APU)
P7.2	Types of Gas Turbine Engines	

P7.2.1	Describe types of reaction engines	• Rockets • Ram jet engines • Pulse jet engines
P7.2.2	Describe types of gas turbine engines	• Turbofan • Turboprop • Turbo-shaft • Turbo-Jet
P7.2.3	Describe advantages and disadvantages of each type of gas turbine engine	
P7.3	Basic Science	
P7.3.1	Review temperature scales and temperature conversion	• Celsius • Kelvin • Fahrenheit • Rankine
P7.3.2	Review effects of atmospheric conditions	• Standard Day – Temperature – Pressure – Density – Humidity – Altitude
P7.3.3	Review Gas Laws	
P7.3.4	Explain thrust formula	
P7.3.5	Define the following physics terms	• Force • Work • Power • Thrust • Speed • Velocity • Acceleration • Mass • Momentum • Kinetic energy

		• Potential energy
P7.3.6	Review Newton's Laws of Motion	
P7.3.7	Review Bernoulli's Theorem	
P7.4	Propulsion Principles	
P7.4.1	Describe jet propulsion	
P7.4.2	Describe gas turbine engine operation	• Main sections of engine – Compressor – Combustor – Turbine
P7.4.3	Describe Brayton Cycle (constant-pressure engine)	
P7.4.4	Compare Brayton Cycle to Otto Cycle	
P7.4.5	Describe flow of air through an engine (pressure and temperature changes)	
P7.4.6	Describe behavior of air at varying velocities	• Low speed • High speed • How to vary air velocity • Effects of compressibility • Mach number • Shock waves
P7.4.7	Describe gas turbine engine performance	• Effects of – Velocity – Altitude – Ram – Rpm – Temperature – Humidity

P7.4.8	Describe gas turbine engine efficiencies	• Thrust specific fuel consumption (tsfc) • Propulsive efficiency • Combustion efficiency • Thermal efficiency
P7.4.9	Interpret engine performance graph (practical)	
P7.5	Engine Inlet Construction and Design	
P7.5.1	Describe function of engine air inlet	• Deliver airflow to compressor • Convert kinetic energy of airstream into ram pressure • Control air velocity
P7.5.2	Describe types of air inlet ducts, and state their function	• Subsonic • Supersonic
P7.5.3	Describe airflow through air duct	• Subsonic • Supersonic • Variable geometry
P7.5.4	Explain purpose of inlet guide vanes	
P7.5.5	Describe air inlet icing and icing control	• Anti-icing
P7.5.6	Describe	• Converging duct • Diverging duct • Subsonic diffuser • Supersonic diffuser
P7.5.7	Define duct pressure efficiency and ram recovery point	
P7.6	Compressor Construction and Design	
P7.6.1	Explain purpose of compressors	
P7.6.2	Describe centrifugal flow compressor	• Components – Impeller – Diffuser

		– Compressor casing – Compressor stages – Bearings – Seals • Principles of operation • Materials
P7.6.3	Describe axial flow compressors	• Components – Guide vanes, fixed, variable – Compressor blades – Stators – Diffuser – Compressor casing – Compressor stages – Bearings – Seals – Low pressure (l.P.) compressor (N1) – High pressure (h.p) compressor (N2) • Principles of operation • Materials
P7.6.4	Compare two types of compressors	• Advantages • Disadvantages • Engines using both types
P7.6.5	Explain compressor theory	• Temperature change • Pressure change • Velocity change • Compressor efficiency • Compressor stall – Causes – Indications – Effects – How corrected
P7.6.6	Describe air flow through compressor stages	• Vector diagrams
P7.6.7	Describe air-bleed and air supply systems	• Ice prevention • Air conditioning • Heating • Pressurization

- Winch operation
- Other air driven services
- Turbine cooling

P7.7 Combustion Chamber Construction and Design

P7.7.1 Explain function of combustors

- Combustion process
- Air supply/flow
- Fuel supply
- Ignition

P7.7.2 Describe types of combustors

- Can type
- Annular type
- Can-annular type
- Reverse flow
- Advantages/disadvantages
- Materials

P7.7.3 Describe combustion chamber efficiency and performance

- Performance requirements
- Combustion efficiency
- Temperature distribution
- Combustion stability
- Emission control

P7.7.4 Describe fuel nozzle/igniter locations

P7.8 Turbine Construction and Design

P7.8.1 Explain function of turbine

P7.8.2 Describe types of turbine blades

- Impulse
- Reaction
- Reaction-impulse

P7.8.3 Describe nozzle guide vanes

- Construction
- Function

P7.8.4 Describe turbine construction

- Turbine disks
- Turbine blades
- Materials
- Balancing

P7.8.5	Discuss turbine blade cooling	
P7.8.6		
P7.8.7	Explain various turbine configurations	
P7.8.8	Explain gas-flow through turbine stages	
P7.9	Exhaust System Construction and Design	
P7.9.1	Describe exhaust ducts	• Function • Construction
P7.9.2	Describe gas-flow through exhaust system	
P7.9.3	Describe exhaust nozzles	• Function • Convergent nozzle • Divergent nozzle • Convergent-divergent nozzle • Variable-area nozzle for afterburners. • Materials • Thrust vectoring
P7.9.4	Describe thrust augmentation	• Water injection • Afterburning
P7.9.5	Describe thrust reversers	• Purpose • Types – Hot – Cold
P7.9.6	Discuss methods of noise suppression on gas turbines	• Hush kits • Noise categories • Reason for
P7.10.	Internal Air Systems	

P7.10.1	Describe gas turbine internal air systems	• Cooling • Seals • Hot air control • Control of tip clearance
P7.10.3	Describe airflow through engine	
P7.10.4	Describe cooling	• Turbine • Bearing chamber • Accessory • Case
P7.11	Components and Accessories	
P7.11.1	Describe gear trains	• Internal gearbox • Drive shafts • Intermediate gearbox • External gearboxes • Auxiliary gearbox • Direct drive
P7.11.2	Identify components driven by gear trains	• Oil pumps • Fuel pumps • Hydraulic pumps • Starter/generators • Fuel control units • Governor • Constant speed drive (CSD) • Tach generators
P7.11.3	Discuss accessory drive configurations	
P7.11.4	Discuss torque systems	
P7.11.5	Discuss ignition systems	• Automatic ignition systems

Line (GAC): 23 Turbine Engines

Competency: 23.05 Turbine Engine Maintenance

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS	CONTENT
P8.1 Inspection	

P8.1.1 Describe turbine engine scheduled inspection requirements	• Lubrication
	  – Spectrometric oil analysis program
	• Oil filters
	• Fuel filters
	• Air filters
	• Chip detectors
	• Cleaning of gas pathways, e.g.;
	  – Compressor wash
	  – Desalination wash
	• Thermocouple
	• Vibration analysis
	• Trend monitoring
	  – Power checks
	  – Internal inspection
	• Rigging
	• Inspection after storage

P8.1.2 Explain inspection of turbine engines after an unusual occurrence	• Sudden stoppage
	  – Stalls
	• Foreign object damage (FOD)
	• Over limit
	  – Temp
	  – Rpm
	  – Torque
	• Immersion
	• Lightning strike

P8.1.3 Explain why turbine engine inspection must comply with special inspection requirements due to engine operating environment	

P8.1.4	Perform procedures for calculating engine cycle counts (practical)	
P8.2	Modules and Parts Replacement	

P8.2.1	Describe turbine engine module replacement	• Compressor section
		• Bypass fans
		• Gearbox section
		  – Accessory
		  – Reduction
		• Combustion section
		• Turbine section
		• Fuel metering system components
		  – Main fuel control units
		  – Governors
		  – Fuel pumps
		  – Nozzles
		• Generators
		  – Tach
		  – Starter generators
		• Bleed valves
		• Use of special tools

P8.2.2	Describe engine removal and replacement	• Engine mounts • Disconnecting fuel lines and electrical harness • Engine alignment • Control rigging • Use of special tools
P8.3	Hot Section Inspection	
P8.3.1	Explain inspection procedures for turbine engine hot section components	• Engine parameter checks • Determine inspection periodicity • Combustion cans • Combustion liners • Heat shields • Nozzle vanes • Turbine discs and blades • Tip clearances • Exhaust diffusers and ducts

- Fuel nozzles
- Igniters
- Glow plugs
- Thermocouples
- Burner can drain valves
  - Bearings
  - Oilways
  - Use of borescopes and guides

P8.3.2 Describe types of damage

- Burning
- Blistering
- Cracks
- Discolouration
- Erosion
- Corrosion
- Stretching
- Rubbing

P8.3.3 Discuss manufacturers' tolerances/limits

P8.3.4 Describe disassembly and reassembly procedures

- Use of special tools
- Markings of parts
  - Approved means of marking
- Leak checks

P8.3.5 Perform hot section inspection (practical)

P8.4 Cold Section Inspection and Repair

P8.4.1 Explain inspection procedures for turbine engine cold section components

- Compressor inlet guide vanes
- Fan blades
- Compressor case halves
  - Abradable coatings
- Rotor blades and stator vanes
- Rotors
- Impellers
- Bleed valves
- Anti-ice valves
- Diffusers and vanes
- Scrolls

- Ducts
- Use of borescopes and guides

P8.4.2 Describe types of damage

- Nicks
- Dents
- Curls
- Erosion
- Corrosion
- Cracks
- Dirt, oil and contaminants

P8.4.3 Discuss manufacturers 'tolerance/limits

P8.4.4 Discuss field repairs

- Fan blade replacement
- Blade repair
- Fan blade balancing

P8.4.5 Perform cold section inspection

Line (GAC): 23 Turbine Engines

Competency: 23.06 Gas Turbine Engine Fuel Systems

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
P9.1	Turbine Fuel	
P9.1.1	State gas turbine fuel properties	• BTUs • Lubricity • Specifications
P9.1.2	Describe characteristics of turbine fuel	• Calorific value • Freezing range • Combustion characteristics • Volatility • Specific gravity
P9.1.3	Describe types of turbine fuels	• Kerosene • Wide cut gasolines • Advantages of each type
P9.1.4	Describe entrained water in fuels, and methods used to prevent or limit its occurrence	• Tendency to absorb moisture • Water dispersants
P9.1.5	Describe problems of fuel icing and methods used to prevent or limit its occurrence	• Additives • Fuel heating
P9.1.6	Describe problems of micro-organisms and other contaminants in fuel	• Conditions for occurrence • Additives • Corrosion problems
P9.1.7	Determine correct fuel and grade, and types of additives for certain conditions	
P9.1.8	Describe problem of intermixed fuel, and danger of fuelling with incorrect fuel grade	• Type Certificates • Journey log • Flight Manual • Maintenance Manual
P9.2	Fuel System Components	

P9.2.1	Describe fuel system components	• Fuel pumps • Filters – By-pass indicators • Fuel control units • Fuel nozzles • Fuel control • Governors • Fuel –oil heat exchanger • Fuel pressurizing valve • Fuel manifolds • Manifold drain valve and purge systems • Fuel heater • Fuel flow meter • Fuel system instruments • Pressure switch
P9.2.2	State purpose of fuel system	
P9.2.3	Explain the purpose and operation of water methanol injection systems	
P9.2.4	Describe fuel control systems	• General operation • Hydro-mechanical • Electronic • Speed control • Full authority digital engine control system (FADEC)
P9.2.5	Perform fuel nozzle inspection	• Inspection • Servicing • Safety
P9.3	Fuel Control Units	
P9.3.1	Explain operation of fuel control	• Purpose • Components • Terminology
P9.3.2	Explain fuel control systems	• Hydro-mechanical • Electro-mechanical • Hydro-pneumatic • Electronic

P9.3.3	Explain function and maintenance of fuel nozzles	• Description
		• Components
		• Types
		  – Simplex
		  – Duplex
		  – Vapourizing
		  – Atomizing
		• Maintenance of nozzles
		  – Handling and storage
		  – Cleaning
		  – Spray pattern checks
		  – Inspection and testing

P9.3.4	Describe fuel system operation problems	
P9.3.5	Describe maintenance of fuel control units	• Inspection • Rigging of controls • Troubleshooting • Adjustments. Including but not limited to: – Trimming
P9.3.6	Inspect fuel control system (practical)	
P9.3.7	Remove and install fuel system component	
P9.3.8	Locate and identify components of gas turbine fuel system	

Line (GAC): 23 Turbine Engines

Competency: 23.07 Engine Starting Systems

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
P12.2	Gas Turbine Engines Starting Systems	
P12.2.1	Identify types of starting systems for turbine engines	• Direct electric • Starter-generator • Air turbine starter • Cartridge starter • Gas turbine starter • Air-impingement starter
P12.2.2	Describe various starting systems for turbine engines	• Sources of energy – Mechanical – Combustion – Electrical – Bleed air • Starter duty cycle • Start-up sequence of events • Methods of engagement and disengagement – Clutches – Ratchet and pawl over running clutch – Overload release clutch
P12.2.3	Describe supporting components for starters in turbine engines	• Dual voltage starting systems • Various engagement and disengagement speed sensors • Bleed air systems • Pressure regulating and shut off valve • Starter/generator internal circuit
P12.2.4	Describe turbine engine starting procedures	
P12.3	Inspection and Maintenance	

P12.3.1	Describe inspection and maintenance of starting systems	• Security and condition – Magnetic chip plugs – Air ducts – Various attaching hardware ○ Clamps ○ QAD flange – Splines – Various drive couplings – Lubricants – Cooling fans – Electrical conductors ○ Brushes • Installation and removal of starters
P12.3.2	Perform the inspection and servicing of an electrical turbine engine starter (practical)	• Remove • Inspect • Install

Line (GAC): 23 Turbine Engines

Competency: 23.08 Lubricants and Lubrications - Turbine

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
P13.4	Turbine Engine Lubricating Systems	
P13.4.1	Describe turbine engine lubrication systems	• Dry sump
P13.4.2	Describe turbine engine oil lubrication system components	• Tanks • Pumps – Vane – Gerotor – Gear • Filters – Ratings – Types • Air-oil separator • Pressure relief valves • Thermal relief valves • Coolers – Heat exchangers • Internal system components – Jets, vents – Seals – Labyrinth – Check valves • Pressure and temperature indicating
P13.4.3	Explain turbine engine oil lubrication system maintenance	• Servicing and oil changes – Intervals – Consumption rates – Flow checks • Pressure adjustment • Filters – Cleaning – Inspection

- Scavenge systems
  - Chip plugs
- Oil analysis

Line (GAC): 23 Turbine Engines

Competency: 23.09 Lubricants and Lubrications - Function

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
P13.1	Function and Characteristics of Lubricants	
P13.1.1	Review functions of lubricants	• Friction • Cooling • Corrosion • Cleaning • Cushioning • Sealing
P13.1.2	Review characteristics of engine lubricants	• Viscosity and Index • Specific Gravity • Colour • Cloud and pour point • Flash and fire point • Carbon residue • Ant-forming quality • Operating range • Resistance to oxidation • Non-corrosive
P13.2	Types and Classifications of Lubricants	
P13.2.1	Review common standards and specification for lubricants	• SAE system • Commercial aviation grade number • Military specifications
P13.2.2	Review advantages and disadvantages	• Synthetic oils
P13.2.3	Explain precautions when inter-mixing oil types	
P13.2.4	Explain the types and requirements of turbine engine oil	

Line (GAC): 23 Turbine Engines

Competency: 23.10 Aircraft Engine: Operation and Installation

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
P14.6	Troubleshooting Gas Turbine Engines	
P14.6.1.	Review troubleshooting techniques and principles	
P14.6.2	Describe operating problems and their probable causes	• Engine fails to turn over • Engine fails to start • Hung start • Wet start • Compressor stall • Failure to develop full power • Engine vibration • Acceleration temperature too high • High rpm • Low/high operating temperatures • Low/high operating pressures • Low/high fuel flow • Over-torque
P14.6.3	Describe probable remedial action for the above problems	

Line (GAC): 23 Turbine Engines

Competency: 23.11 Aircraft Engine: Operation and Installation

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
P14.2	Removal and Installation – Gas Turbine Engines	
P14.2.1	Explain reasons for removal of gas turbine engines	• Defects requiring removal, e.g.; • Engine has reached Time Between Overhaul (TBO), or component has reached finite life • Engine fails to meet standards by exhibiting – Excessive internal wear – High oil consumption – High operating temperatures – Poor performance – Failed "hot-end' inspection – Failed "cold-end" inspection – Other • Sudden stoppage • Over-speed • Over-torque • Fire damage • Foreign Object Damage (FOD) ingestion • Metal particles in oil • Immersion in water (when cold, hot, running) • When run using incorrect fuel • Excessive vibration • Exposure to volcanic ash
P14.2.2	Describe procedures for preparation of engine removal/installations	• Load monitoring • Fuel shut-off • Battery disconnected • Wheels chocked • Tail supported • Manpower requirements • Fire safety procedures

		• Hoisting requirements and safety
P14.2.3	Describe disconnection/reconnection	• Engine controls • Electrical components • Fuel, oil, hydraulic, air, and other lines (Note: stress importance of capping lines) • Torquing, alignment and proper clamping of pipe lines • Engine mounts • Tail pipe
P14.2.4	Describe removal of other components necessary to facilitate engine removal	• Cowlings • Particle separators
P14.2.5	Describe procedure for hoisting and removing/installing engine	• Use of slings and hooks • Use of hoists • Placement of engine receiving stands • Use of engine dolly • Safety procedures
P14.2.6	Discuss transfer of components to the replacement engine (as necessary):	• Starter/generator • Propeller governor • Fuel pumps • Vacuum pump • Engine mounts
P14.2.7	Describe gas turbine Quick Engine Change (QEC) installation	
P14.2.8	Describe engine installation procedures	• Inspections – Pre-installation – Functional – Independent inspections – Leak checks
P14.2.9	Describe preservation and crating procedures for storage/transportation of an engine	
P14.4	Gas Turbine Engines Operation	
P14.4.1	Describe preparation of engines for ground running	• Pre-run inspection – Points to look for

		• Propeller checks • Cowlings in position • Check operation of engine and propeller controls • Fire precautions • F.O.D. • Operating area clear of personnel and equipment

P14.4.2	Describe typical run-up procedures	• Starting using external power source
		• Starting using aircraft battery
		• APU starting
		• Air starting
		• Starting procedure
		  – Position of controls
		  – Idle rpm
		• Check engine RPM
		• Check fuel flow
		• Check temperatures and pressures
		• Observance of other indication and warning systems
		• Avoidance of critical rpm range

P14.4.3	Describe types of engine runs	• Dry run (motoring) check
		• Wet run check
		• Idle check
		• Trimming check
		• Power assurance check
		  – Use of power check charts
		  – Trend monitoring
		  – Parameters to be monitored
		  – OAT
		  – Pressure Altitude
		  – EGT, TOT, ITT etc
		  – Fuel flow, pressure
		• Engine control lever positions
		• Acceleration check
		• Deceleration check

P14.4.4	Describe factors that affect engine starting	• Starting systems • Hung start • Hot start • Ignition faults

		• Fuel system faults • Compressor stall • Wind direction/aircraft position • Atmospheric conditions
P14.4.5	Describe engine running adjustments for gas turbine engine	• Fuel control system trimming • Power turbine governor • Exhaust temperature • Inlet temperature • Variable inlet guide vanes • Turboprop governor
P14.4.6	Describe engine shut-down procedures	• Cool down period • Fuel shut-off
P14.4.7	Describe emergency procedures	• Oil leak • Fuel leak • Fire • Over-speed • Over temperature
P14.4.8	Perform engine ground run (practical)	
P14.4.9	Calculate engine performance from manufacturer's charts and interpret data (practical)	
P14.6	Troubleshooting Gas Turbine Engines	
P14.6.1	Review troubleshooting techniques and principles	
P14.6.2	Describe operating problems and their probable causes	• Engine fails to turn over • Hung start • Compressor stall • Failure to develop full power • Engine vibration • Acceleration temperature too high • High rpm • Low/high operating temperatures • Low/high operating pressures • Low/high fuel flow • Over-torque

Line (GAC): 24 Environmental Systems

Competency: 24.01 Environmental Systems

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS	CONTENT
A4.1 Aircraft Air Conditioning Systems	
A4.1.1 Outline need for conditioned air in aircraft	
A4.1.2 Describe vapour-cycle air conditioning	• Refrigeration theory – Heat transfer – Vapour cycle • System components – Refrigerant – Refrigeration oil – Receiver – dryer – Thermal expansion valve ○ Internally equalized ○ Externally equalized – Evaporator – Compressor – Condenser – Service valves – Schrader type – Compressor isolation valve
A4.1.3 Describe vapour-cycle servicing procedures	• Servicing equipment – Manifold set – Charging hoses – Refrigerant source – Vacuum pump – Leak detector • Servicing tasks – Visual inspection – Leak test – Performance test – Feel test

		– System purge – Compressor oil level – System evacuation – System charging – Environmental considerations – Safety
A4.1.4	Describe air-cycle air conditioning	• Operating principle • Components – Primary heat exchanger and by-pass valve – Air conditioning shut-off valve – Refrigeration bypass valve – Secondary heat exchanger – Expansion turbine – Water separator – Ram air valve • Cabin temperature control – Sensor – Selector – Regulator
A4.1.5	Describe air-cycle servicing procedures	
A4.2	Aircraft Heating and Ventilation	
A4.2.1	Identify aircraft heating systems	• Exhaust type cabin heaters • Electric heaters • Combustion heaters • Compressor bleed air
A4.2.2	Describe operating principles of heating systems	• Exhaust type cabin heaters – Advantages – Disadvantages • Combustions heaters – 'Janitrol' type – 'South Wind' type • Bleed air
A4.2.3	Describe components of combustion heater systems	• Combustion air system • Fuel system

		• Ventilation air system • Controls • Safety features – Switches ○ Duct limit ○ Overheat ○ Etc. • Combustion air pressure, cycling, purge • Carbon monoxide detector
A4.2.4	Discuss basic system inspection and troubleshooting	• Pressure decay test
A4.2.5	Describe aircraft ventilation systems	• Components – Blowers – Vents
A4.2.6	Inspect exhaust type cabin heater components(practical)	
A4.2.7	Examine, handle, and identify components of combustion heater systems(practical)	
A4.2.8	Perform pressure decay test (practical)	
A4.3	Aircraft Pressurization Systems and Components	
A4.3.1	Identify need for aircraft pressurization systems	• Review of atmosphere – Pressure – Temperature – Altitude – Aircraft – Cabin • Review encountered with flight at altitude – Aircraft construction – Passenger requirements – Engine performances
A4.3.2	Identify sources for pressurizing air	• Source – Roots type compressor – Turbocharging

- Superchargers
- Centrifugal cabin compressor
- Compressor bleed air

- Advantages and disadvantages of each source

A4.3.3 Describe maintenance of pressurization systems

A4.3.4 Describe pressurization theory

- Controlled air leakage
  - Components
    - Orifice theory
- Uncontrolled air leakage
  - Factors affecting
    - Penetration through pressurized structure

A4.3.5 Describe operation and control of pressurization system components

- Outflow and safety valves
- Negative pressure relief valves
- Pressure controllers
  - Manual
  - Automatic
- Altitude limiting devices

A4.3.6 Describe operation of small aircraft/turboprop/airliner/business jet pressurization system operation

A4.3.7 Identify and handle pressurization system components (practical)

A4.4 Aircraft Oxygen Systems

A4.4.1 Review physiology of flight

- Atmosphere
- Human respiration and circulation
- Medical conditions
  - Hypoxia/anoxia
  - Hyperventalation
  - Carbon monoxide poisoning

A4.4.2 Identify properties of oxygen

- Forms
  - Gaseous oxygen
  - Liquid oxygen

		– Chemical
A4.4.3	Identify oxygen system components	• Gaseous oxygen systems – Storage bottles – Low/high pressure – Regulators ○ Continous flow ○ Diluter demand ○ Pressure demand • Masks – Continous flow – Demand type – Liquid oxygen-Military – Chemical oxygen systems
A4.4.4	Describe operation and servicing of oxygen systems	• Gaseous oxygen systems – Leak testing – Hydrostatic test – Draining the system – Replenishing the system – Purging the system – Mask and tubing inspection • Chemical oxygen systems – Mask extraction system ○ Manual ○ Automatic
A4.4.5	State safety precautions when working with oxygen systems	• Prevention of oxygen fires and explosions • Cleanliness • Tools • Transportation & storage of components
A4.4.6	Examine oxygen systems (practical)	

Level 4

Aircraft Maintenance Technician

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.01 Introductions to CAR

Objectives

To be competent in this are the individual must be able to:

LEARNING TASKS		CONTENT
25.1	Introduction to CARs	
25.1.1	Explain the function of the Aeronautics Act	
25.1.2	Briefly summarize the basic regulatory structure from the manufacture of an aircraft to a Certificate of Airworthiness	• Aircraft Manufacturer • Transport Canada Type Certification • Aircraft owner • Aircraft Maintenance Engineers • Approved Maintenance Organizations
25.1.3	Explain the CARs numbering system, including the differences in numbering for CARs Part V	
25.1.4	Explain the difference between regulations, standards, and advisory material	

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25. 02 CAR Part 1- General Provisions

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS	CONTENT
25.2 CAR Part I - General Provisions	
25.2.1 Define Specific terminology from CAR 101	• Aeronautical Product • Aeroplane • Air Time • Airworthiness Limitation • Airworthy • Elementary Work • Flight Authority • Flight Time • Hard Time • Large Aeroplane • Life-Limited Part • Owner • Maintenance • Maintenance Release • Major Modification • Major Repair • Serviceable • Small Aircraft •
25.2.2 Explain the application of CAR, (who CARs apply to) according to CAR 102	
25.2.3 Discuss regulations in CAR 103, Administration and Compliance	• 103.02 Inspection of Aircraft, Requests for Production of Documents and Prohibitions • 103.03 Return of Canadian Aviation Documents
25.2.4 Explain the function of CAR 104 Charges	

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.03 CAR Part 2- Identification and Registration

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.3	CARs Part II Identification and Registration	
25.3.1	Discuss the regulations and standards for aircraft identification plates in CAR 201 and 221	• Location • Required information • Modification of an aircraft resulting in the alteration of aircraft identification plates • data • Alterations to information • Removal and replacement of aircraft identification plates
25.3.2	Discuss the regulations and standards in CAR 201 and 221 for identification plates on aeronautical products other than aircraft	• Engines • Propellers • Appliances • Balloon basket and burner assemblies
25.3.3	Discuss the regulations and standards for aircraft nationality and registration marks in CAR 202 and 222	• Requirement for marks • Display of marks, including, size, style, and location for fixed and rotary wing aircraft. • Removal or change of marks
25.3.4	Discuss regulations and standards for aircraft registration in CAR 202 and 222	• Application • Qualifications to be a registered owner • Types of registration – Private – State – Commercial • Registration status – Provisional – Interim – Temporary – Continuing •

25.3.5 Explain the requirements for carrying a certificate of registration on board the aircraft

25.3.6 Explain the requirements for removing the marks of an aircraft being exported

25.3.7 Describe the Canadian Civil Aircraft Register

25.3.8 Search the Canadian Civil Aircraft Register through the transport Canada internet site for a specific aircraft or aircraft type (practical)

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.04 CAR Part IV Subpart 3 Chapter 566- AME Licences and Ratings

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.4	CAR Part IV Subpart 3 and AWM Chapter 566 – AME Licenses and Ratings	
25.4.1	Explain the regulations and standards related to the issuance and endorsement of an AME license	• Citizenship • Age • Training – Approved training – Acceptable training – Basic training – Type training • Knowledge • Experience • Skill
25.4.2	Explain the categories of AME licences	
25.4.3	State the validity period of an AME licence	
25.4.4	Explain AME licence recent requirements	
25.4.5	Explain how currency is regained	
25.4.6	Explain the application process for an AME licence	
25.4.7	Define an Approved Training Organization from CAR 403.08 and explain their purpose	

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.05 CAR 501, AWM 501-Annual Airworthiness Information Report (AAIR)

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.5	CAR 501, AWM 501-Annual Airworthiness Information Report (AAIR)	
25.5.1	Discuss the requirements of an AAIR, including	• Requirement to report • Consolidated fleet reports • Out of service exemption • Reporting schedule and alternate dates • Reportable information

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.06 CAR 507, AWM 507 - Flight Authority

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.6	CAR 507, AWM 507 - Flight Authority	
25.6.1	Explain the application of flight authority	• Exemption for ultralights
25.6.2	Explain Certificates of Airworthiness (C of A)	• Eligibility of aircraft • Transfer of a C of A
25.6.3	Explain Special Certificates of Airworthiness	• Provisional • Restricted • Amateur-built • Limited
25.6.4	Explain Flight Permits	• Experimental • Specific purpose
25.6.5	Discuss the validation of a foreign flight authority	
25.6.6	Explain the application for a flight authority	• Application for a C of A • Application for a special C of A • Application for a flight permit • Validation of a foreign flight authority • Application in respect of an imported aircraft • Persons who may attest to condition and conformity
25.6.7	Explain the issuance of additional flight authorities	
25.6.8	Explain Operating Conditions	

25.6.9	Explain the duration of flight authorities	• C of A • Special C of A • Flight Permits
25.6.10	Explain the requirements for the alteration of a flight authority	

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.07 CAR 509, AWM 509 - Export Airworthiness Certificates

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.7	CAR 509, AWM 509 - Export Airworthiness Certificates	
25.7.1	Describe Export Airworthiness Certificates (EAC)	• Application (eligibility for an EAC) • Application procedures for an EAC • Authority for export • Persons who may attest to condition and conformity • Responsibilities of the exporter

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.08 CAR 521 Division II Type Certificates

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.8	CAR 521 Division II Type Certificates	
25.8.1	State the categories of type certificates	• Normal, utility, aerobatic • Transport category aeroplane • Transport category rotorcraft • Normal category rotorcraft • Glider • Powered glider • Airship • Manned free balloon • Delete • Restricted
25.8.2	Explain restricted category special purpose operations	• Agricultural • Fire prevention and suppression • Aerial surveying • Patrolling • Weather control • Aerial advertising • Wildlife conservation • Other specialized roles
25.8.3	Describe conditions for the issuance of a type certificate	
25.8.4	Describe the types of information found in a type certificate data sheet	
25.8.5	Discuss the aeronautical products requiring a type certificate	
25.8.6	Using the Transport Canada Internet Site, find the type certificate data sheet for a specified aircraft (Practical)	

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.09 CAR 521 Division IV Changes to a Type Design

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.9	CAR 521 Division IV Changes to a Type Design	
25.9.1	Discuss means of creating approved data for modifications and repairs to aeronautical products	• Supplemental Type Certificates • Repair Design Certificates

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.10 AWM 561 - Manufacture of Aeronautical Products

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.10	AWM 561 - Manufacture of Aeronautical Products	
25.10.1	Discuss the requirements to be eligible for a manufacturing approval	• Right to manufacture • Facilities • Quality program • Inspectors
25.10.2	Discuss the responsibilities of the manufacturer	• Product conformity • Subcontract activity • Record retention • Airworthiness certification

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.11 AWM 563 - Distribution of Aeronautical Products

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.11	AWM 563 - Distribution of Aeronautical Products	
25.11.1	Discuss the requirements to be eligible for a distributor approval	• Product sources • Facilities • Product control system
25.11.2	Discuss the responsibilities of the distributor	• Product proof of conformity • Record retention

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.12 CAR 571, AWM 571 - Aircraft Maintenance Requirements

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.12	CAR 571, AWM 571 - Aircraft Maintenance Requirements	
25.12.1	Explain the application of CAR 571	• Exemption to hang gliders • Exemption to ultralights
25.12.2	Explain the requirements of maintenance performance rules	
25.12.3	Explain the requirements for the recording of maintenance and elementary work	
25.12.4	Explain specialized maintenance, including Schedule II, CAR 571	
25.12.5	Explain the maintenance requirements of aeroplanes or helicopters operated under Part IV and aircraft operated under Part VII	
25.12.6	Explain the requirements of major modification and major repairs	• Requirements for reporting by the completion of a 24-004 conformity certificate • Types of data required for carrying out major modifications and major repairs • Criteria for the classification of modifications and repairs
25.12.7	Explain the requirements for the installation of new parts	
25.12.8	Explain the requirements for the installation of used parts	
25.12.9	Explain the requirements for the installation of life-limited parts	
25.12.10	Explain the requirements for a maintenance release	• Information required • Suggested wording

		• Conditional maintenance release
25.12.11	Explain who may sign a maintenance release for different types of maintenance	• Specialized maintenance • Maintenance on aircraft • Maintenance on aeronautical products other than aircraft • Maintenance on amateur-built aircraft • Maintenance on flight training aircraft and commercial aircraft, and for parts used on either
25.12.12	Explain the general requirements for the installation of parts	
25.12.13	Discuss personnel certification for non-destructive testing (NDT) from Schedule I CAR 571	
25.12.14	Discuss additional maintenance standards, including standards	• Work that disturbs engine or flight controls • Work affecting the pitot-static system • Work affecting pitot static ports, pitot tubes, and flight control surfaces • When ELT's may be tested • Changes to the empty weight or centre of gravity of an aircraft

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.13 CAR 573, AWM 573 - Approved Maintenance Organizations (AMO)

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.13	Car 573, AWM 573 - Approved Maintenance Organizations (AMO)	
25.13.1	Discuss the requirements for application for an Approved Maintenance Organization	
25.13.2	Discuss the categories and ratings for AMOs	
25.13.3	Explain the requirements for the Person Responsible for Maintenance	• Qualifications • Responsibilities
25.13.4	Discuss the options and requirements for assignment of management functions	• Responsibility for quality assurance • Responsibility for production
25.13.5	Explain the authorization to sign a maintenance release	• Aircraft Certification Authority (ACA) • Shop Certification Authority
25.13.6	Explain the requirements for a training program	• Initial training • Additional training • Update training
25.13.7	Discuss the requirements for the keeping of personnel records	
25.13.8	Discuss the requirements for facilities, equipment, standards, and procedures	
25.13.9	Explain the function and requirements of the Quality Assurance Program	
25.13.10	Discuss the requirements for the Maintenance Policy Manual	• Content • Amendments

25.13.11 Discuss the requirements for maintenance arrangements

25.13.12 Explain the requirement for the filing of service difficulty reports

25.13.13 Discuss the requirements for foreign AMO approvals

25.13.14 Discuss the requirements for AMO identification

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.14 CAR 521 Division IX Service Difficulty Reporting

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.14	Car 521 Division IX Service Difficulty Reporting	
25.14.1	Define a reportable service difficulty	
25.14.2	State the purpose of the SDR system	
25.14.3	State the requirement to report	
25.14.4	Discuss the organizations required to report SDRs	
25.14.5	State the time limits for reporting SDRs	

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.15 CAR 521 Division X Airworthiness Directives (AD)

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.15	CAR 521 Division X Airworthiness Directives (AD)	
25.15.1	Explain the purpose of Airworthiness Directives	
25.15.2	Explain the conditions under which an AD may be issued	
25.15.3	State the application of ADs	• Compliance with ADs • The consequences of non-compliance • Alternative means of compliance
25.15.4	Discuss who is responsible for ensuring that all applicable ADs are carried out	
25.15.5	Discuss the applicability of foreign ADs or equivalent notices	
25.15.6	Using the Transport Canada Internet Site, carry out a search for applicable ADs on a specified aircraft (practical)	

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.16 CAR 604 – Private Operator Passenger Transportation

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.16	Car 604 – Private Operator Passenger Transportation	
25.16.1	Define a Private Operator involved in passenger transportation	
25.16.2	State the function of the maintenance control system	
25.16.3	Discuss the information in the operations manual that forms the maintenance control system	
25.16.4	Discuss the requirements for a person responsible for the maintenance control system	
25.16.5	Discuss the requirements for maintenance personnel and facilities	
25.16.6	Discuss the requirements for the reporting and rectification of defects	• Recording defects • Defect rectification • Recurring defects
25.16.7	Discuss the requirements for service difficulty reporting	
25.16.8	Discuss the requirements for technical dispatch instructions	
25.16.9	Discuss the requirements for service information reviews	
25.16.10	Discuss the requirements for maintenance agreements	
25.16.11	Discuss the requirements for maintenance training	

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.17 Car 605 – Aircraft requirements and CARs 625 – Aircraft Equipment and Maintenance Standard

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.17	Car 605 – Aircraft requirements and CARs 625 – Aircraft Equipment and Maintenance Standard	
25.17.1	Explain the applicability of CAR 605	
25.17.2	State the requirements for carrying a flight authority on board the aircraft	• Operating conditions • Exemptions
25.17.3	State the requirement for making the flight manual available to crew members at their stations	
25.17.4	State the requirement for aircraft to display all required markings and placards	
25.17.5	State the requirements for aircraft equipment to meet the standards of airworthiness	
25.17.6	Define Minimum equipment lists and state their purpose	
25.17.7	Explain the requirements and criteria for operating an aircraft with unserviceable and removed equipment	• General requirements • Aircraft with a minimum equipment list • Aircraft without a minimum equipment list
25.17.8	Explain the requirement for having the appropriate maintenance performed before operating an aircraft	
25.17.9	Explain the requirements for the certification of maintenance before an aircraft takes off	• The signing of a maintenance release • Conditional maintenance releases and test flights • No requirement for a maintenance release in the case of elementary work
25.17.10	Explain the requirement for aircraft to be maintained according to an approved maintenance schedule	• Applicability of the appropriate schedule for the type of aircraft and the type of operation • Locate and interpret approved

		maintenance schedules for: – Private piston powered small aeroplanes – Commercial aircraft – Large aircraft – Turbine powered pressurized aircraft •
25.17.11	Discuss the requirements for the transfer of aeronautical products between maintenance schedules	
25.17.12	Explain the requirement for inspection after abnormal occurrences	• Identify abnormal occurrences • Locate inspection standards in Appendix G, CAR 625 • Specify who may carry out the inspection • Explain entries into the technical record after an abnormal inspection
25.17.13	Discuss the requirements to keep technical records	• General requirements for making entries • Requirements for journey logs, including – Identification – Required maintenance entries – Retention – Transfer of entries to the technical logs – Carrying on board – New volumes • Requirements for separate technical records for airframes, engines, variable pitch props – Identification – Required maintenance entries – Retention – Transcribing of entries from the journey log – New volumes – Transfer of technical records • Requirements for the component technical records • Empty weight and balance reports

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.18 CAR 625 – Appendix A – Elementary Work

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.18	Car 625 – Appendix A – Elementary Work	
25.18.1	Define Elementary work	
25.18.2	Locate and interpret elementary work tasks in CAR 625, Appendix A	
25.18.3	Explain the requirements for persons performing elementary work	• Private aircraft • Commercial and flight training unit aircraft
25.18.4	Explain the requirements for recording elementary work	

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.19 CAR 625 – Appendix C – Out of Phase Tasks

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.19	Car 625 – Appendix C – Out of Phase Tasks	
25.19.1	Locate and interpret hard time intervals for aircraft equipment from CAR 625, Appendix C, including requirements	• Rotorcraft Dynamic Components • Engines • Variable pitch propellers • Fixed pitch and ground adjustable propellers • Tachometers • Weight and balance • Magnetic compasses • Emergency locator transmitters • Altimetry devices • Transponders • Survival and emergency equipment • Cockpit voice recorders • Flight data recorders • Underwater locating devices

Line (GAC): 25 Canadian Aviation Regulations

Competency: **25.20 CAR 625 - Appendix I Specification Tables – Schedule 1 Position and Anti-Collision Light Systems**

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.20	Car 625 - Appendix I Specification Tables – Schedule 1 Position and Anti-Collision Light Systems	
25.20.1	Explain the requirements for position and anti-collision light systems	• Location of lights • Required colours and fields of visibility • Use of lights

Line (GAC): 25 Canadian Aviation Regulations

Competency: **25.21 CAR 706 - Maintenance Requirements for Commercial Air Operators and CAR 726 – Commercial Air Service Standards**

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.21	CAR 706 - Maintenance Requirements for Commercial Air Operators and CAR 726 – Commercial Air Service Standards	
25.21.1	Explain the application of CARs Part VII	
25.21.2	Explain the purpose of the Maintenance Control System	
25.21.3	Discuss the Person Responsible for the Maintenance Control System	• Qualifications • Authorization to remove aircraft from service • Combined AMO/ Air Operator • Assignment of management functions
25.21.4	Discuss the responsibilities of maintenance personnel	
25.21.5	Describe the standards that the maintenance facility must meet	
25.21.6	State the purpose of defect rectification and control procedures	• Recording aircraft defects • Ensuring that defects are rectified in accordance with regulations • Detecting recurring defects • Scheduling the rectification of deferred defects
25.21.7	State the purpose of technical dispatch procedures	
25.21.8	Describe the function of the evaluation program	• Purpose • Updating of maintenance schedules • Compliance with regulations • Record keeping

25.21.9	Describe the requirements for the Maintenance Control Manual	• Purpose • Incorporation by reference • Compliance with MCM policies and procedures • Approval and amendments • Availability to staff • Content
25.21.10	Explain Maintenance Arrangements	
25.21.11	Explain the training requirements for persons performing elementary work	
25.21.12	Discuss the training requirements for aircraft servicing	
25.21.13	Discuss the requirements for training personnel	• Initial training • Update training • Additional training • Combined Air Operator/ AMO training • Records of training
25.21.14	Discuss the requirements for keeping personnel records	
25.21.15	State the requirement for reporting service difficulties	

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.22 CAR on the Internet

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.22	CARs on the Internet	
25.22.1	Answer specific CARs questions by searching the Transport Canada internet website	

Line (GAC): 25 Canadian Aviation Regulations

Competency: 25.23 AME Publications

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
25.23	AME publications	
25.23.1	Describe the purpose and content Transport Canada Publications sent to AMEs	• Service difficulty alerts • Service difficulty advisories • Feedback • Maintainer • Airworthiness notices

Line (GAC): 27 Instruments

Competency: 27.01 Engine Indicating and Warning Systems

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
P6.3	Engine Indicating and Warning Systems	
P6.3.1	Describe types of displays	• Direct • Servo • Electronic (CAT)
P6.3.2	Describe handling and installation of instruments	
P6.3.3	Describe serviceability checks	
P6.3.4	Describe testing and calibration of instruments	• Test equipment – 'Barfield' – 'Jetcal' – Deadweight

Line (GAC): 27 Instruments

Competency: 27.02 Aircraft Instrumentation

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
E4.1	Aircraft Instruments and Instruments	
E4.1.1	Explain reasons for using instrumentation	• Monitoring systems • Diagnostic purposes • Navigation • Allows IFR flight
E4.1.2	Categorize instruments according to function	• Powerplant • Flight and navigation • Systems monitoring
E4.1.3	Identify applications of mechanically and electrically/electronically operated instruments (practical)	
E4.2	Pressure Measuring Instruments	
E4.2.1	Explain principles of absolute pressure measurement	• Atmospheric pressure • Standard day • Mercury barometer • Aneroid barometer
E4.2.2	Explain principles of gauge pressure measurement	• Bellows/diaphragms for low pressure – Types of instrument ○ Altimeter ○ Air speed indicator (ASI) ○ Manifold pressure – Description and operation • Bourdon tubes for high pressure – Types of instrument ○ Hydraulic pressure

		○ Engine oil pressure ○ Oxygen pressure ○ Other high pressure – Description and operation • Solid state
E4.2.3	Explain principles of differential pressure measurement	• Differential bellows type – Types of instrument – Pitot/static • Rate of climb indicator – Engine pressure ratio indicator – Pressure switches • Description and operation
E4.2.4	Explain altimeters	• Purpose – Types of altitude measurement ○ Indicated altitude ○ Pressure altitude – Effects of density changes • Description of instrument – Face/scale – Pointers – Digital scale • Operation – Temperature compensation – Components • Encoding altimeter
E4.2.5	Explain airspeed indicators	• Differential pressure gauge • Compares pitot-static pressures • Purpose – Determine airspeed – Compute ground speed – Indicate to pilot warning speeds For example: ○ Flap extension speed ○ Gear extension speed

		○ Stall speed ○ Take-off/landing speed ○ Other – Indicated airspeed vs true airspeed • Mechanism and operation
E4.2.6	Describe vertical-.and instantaneous- vertical speed indicators	• Purpose • Mechanism
E4.2.7	Explain air data computers	
E4.2.8	Explain electrically driven instruments	• Servoed altimeters
E4.3	Temperature Measuring Instruments	
E4.3.1	Explain temperature measuring instruments	• Principles of operation – Liquid expansion – Solid expansion – Gas expansion – Electrical • Types of: – A.S.I. and altimeter temperature correction function – Outside air temperature gauges (OAT) – Engine temperature – Oil temperature •
E4.4	Gyroscopic Instruments	
E4.4.1	Explain gyroscopic principles	• Laser gyros principles • Description of gyroscope • Rigidity in space – Increases as mass at rim increases – Increases as speed of rotation – Increases

		– Effects of friction • Precession – Definition – Advantages – Disadvantages • Why used in aircraft instrumentation • Instruments using gyroscopes for example: – Direction indicator – Artificial horizon indicator – Attitude director indicator – Turn and slip indicator – Turn coordinator – Horizontal situation indicator – Slaved gyro compass
E4.4.2	Explain sources of power for gyroscopes	• Electrical – Built-in motor • Pressure – Vacuum pump discharge air – Reasons for use • Vacuum – Vacuum pump – Venturi – Principles of operation
E4.4.3	Describe vacuum pump system	
E4.4.4	Explain gyro attitude instruments	• Directional gyro indicator – Compare to magnetic compass, and reason why used – Relationship to HIS/RMI – Description – Purpose – Principles of operation – Mechanism – Flux valves – Compass amplifier – Compensators • Artificial horizon indicator – Description – Purpose

		– Principles of operation – Mechanism • Attitude director indicator – Description – Purpose – Principles of operation – Mechanism • Slave Gyro Compass system – Description – Purpose – Principles of operation – Mechanism – Flux valves – Compass amplifier – Compensators • Laser Gyros • Strap down gyros
E4.4.5	Explain rate gyro instruments	• Slip turn and indicator (turn and bank) – Description – Purpose – Principles of operation – Mechanism • Turn coordinator – Description – Purpose – Principles of operation – Mechanism
E4.4.6	Explain safety and handling of gyro instruments	• Precautions – Recently powered down
E4.5	Direct Linkage and Drive systems	
E4.5.1	Describe types of instruments using direct linkage and drives	• Mechanical tachometer • Flap position indicator • Cowl flap position indicator • Fuel level indicator (on some older aircraft) • Trim tab position indicator
E4.5.2	Describe installation of direct linkage and drive mechanisms	• Installation, lubrication and cleaning
E4.6	Magnetic Compasses	

E4.6.1	Describe magnetic compasses	• Construction – Case – Compass fluid – Pivot bearings – Face markings – Corrector card – Illumination • Position • Purpose • Operation
E4.6.2	Explain principles of navigation	• Meridians – Longitude – Latitude • Poles – Magnetic north – True north • Magnetic variation – Isogonic lines – Accounting for • Magnetic deviation – Causes
E4.6.3	Explain procedures for correcting errors (compass swing)	• When required • The compass rose • Equipment required • Taxiing and swinging procedures • Compass adjustments • Documentation – Log book – Correction card • Compass swing – Magnetic – Slaved
E4.6.4	Conduct compass swing (real or simulated)(practical)	
E4.7	Electronic Display and Indication Instruments	
E4.7.1	Describe various display types	• Cathode-ray tubes – EFIS – ECAM – EICAS

		• Light emitting diodes • Liquid crystal displays • Gas discharge
E4.7.2	Describe various methods of display	• Dial type • Vertical type • Numerical • Analogue • Digital • Heads up displays (HUD)
E4.8	Electrical Flight Instruments	
E4.8.1	Describe electrical flight instruments	• Angle of attack detection • Control indication – Flaps – Rudder – Aileron – Elevator – Trim systems • EADI • Stall warning systems
E4.9	Engine Electrical Instruments	
E4.9.1	Describe engine electrical indicating instruments	• Meter movements – D'Arsonval or Weston – Galvanometer – Dynamometer • Types of instruments – Ammeter – Voltmeter – Magnesyn – Autosyn – Tachometers – Selsyn
E4.9.2	Describe engine instrument installation and marking	• Panel layout • Instrument mounting • Power requirements • Range markings

E4.9.3	Describe testing of engine electrical indicating instrument systems	• Barfield EGT tester • Multimeter
E4.10	Systems Instruments	
E4.10.1	Describe systems that employ electrical indicating instruments	• Landing gear – Position indication • Fuel systems – Quantity – Flow • Environmental control – Pressurization – Air conditioning • Flight controls
E4.10.2	Describe maintenance of systems electrical indicating instruments	
E4.11	Instrument Installation and Maintenance	
E4.11.1	Describe location of instruments in instrument panel	
E4.11.2	Describe maintenance of flight instruments	• Handling and storage • Types of mount • Hardware • Size of openings • Capping of open lines • Marking of lines • Instrument face markings • Witness marks • Installation • Removal • Shipping – Caging of gyros
E4.11.3	Explain procedures for testing	• When to test – After installation – On defect – Periodically

- Types of test
  - Pitot/static tests for pressurized and non-pressurized aircraft
  - Compass swing
  - Dead weight checks
  - Functional tests
- Test equipment
  - Pitot/static
  - Vacuum/pressure test kit (air pressure/vacuum)
  - Land compass (compass swing)
  - Dead weight test kit (oil pressure)
- Calibration of fuel quantity indicating systems

E4.11.4 Describe servicing of pitot/static systems

E4.11.5 Carry out instrument section of periodic inspection (practical)

E4.11.6 Carry out pitot/static check(practical)

E4.11.7 Drain pitot/static system(practical)

E4.11.8 Inspect instruments for correct installation and markings(practical)

E4.11.9 Carry out check on liquid pressure instrument system(practical)

E4.11.10 Check aircraft instruments for correct function(practical)

E4.11.11 Test exhaust gas temperature system employing suitable testing instrument(practical)

E4.11.12 Package instrument for shipping(practical)

Line (GAC): 28 Avionics

Competency: 28.01 Controls and Rigging

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
A7.4	Electrical/Electronic Flight Control Systems	
A7.4.1	Describe electrically operated controls	• Flaps
A7.4.2	Describe electrically controlled trim systems	• Fixed-wing • Rotary-wing
A7.4.3	Trace electrically operated control systems by reference to circuit diagrams (practical)	
A7.4.4	Locate electrically operated control system components (practical)	
A7.4.5	Operate electrical control systems (practical)	
A7.5	Automatic Flight Control Systems [Refer to E5 Avionics]	
A7.5.1	List purposes of automatic flight control systems	
A7.5.2	Explain autopilot operation	• Stabilization • Full flight control
A7.5.3	Describe features of autopilot system	• Basic autopilot • Directed autopilot
A7.5.4	Describe autopilot flight control system	• List of components
A7.5.5	Describe automatic flight and landing systems	• Purpose • Types of systems

A7.5.6	Describe Stabilization Augmentation Systems (SAS)	• Purpose • Components – Sensors – Processing units
A7.5.7	Describe electronic flight control systems	
A7.5.8	Describe other forms of electronic flight control	• Fly-by-wire • Fly-by-light

Line (GAC): 28 Avionics

Competency: 28.02 Avionics

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
E5.1	Introduction to Avionics	
E5.1.1	Explain Frequency spectrum	• Frequency ranges • Use in avionics systems
E5.1.2	Explain IFR versus VFR	
E5.2	Communications	
E5.2.1	Explain audio and communication systems	
E5.2.2	Explain maximum power transfer theorem	• Definition • MPT theory
E5.2.3	Describe audio components	• Headsets – Noise cancelling – Stere/mono • Carbon microphone • Dynamic microphone • Electret microphone • Aircraft microphone interconnects • Speakers • Impedance – Maximum power transfer
E5.2.4	Explain functions of audio control panels	
E5.2.5	Explain functions of communication controls	• Flight interphone • Service interphone • Crew call • Passenger address system

- General audio control
- Passenger entertainment system

E5.3 Antennas, Transmission Lines and Basic Radio

E5.3.1 Explain antenna fundamentals

- Wavelengths
- Frequency relationships
- Polarization
- Ground planes

E5.3.2 Describe transmission lines

- Coaxial cable
- Shielding
- Impedance line
- Diplex-triplex splitters

E5.3.3 Explain aircraft communications

- Wave propagation
- Information transfer
- RF Communication
- Amplitude modulation
- Frequency modulation
- Radio Theory
  - Transmitters
  - Superheterodyne receivers
  - Oscillators
  - Amplifiers

E5.4 Very High Frequency (VHF) Communication Systems

E5.4.1 Explain VHF communication systems

- Receivers
- Transmitters
- Controls
- Antenna and location
- Speakers
- Integrated system
- Aircraft components
- Location
- Frequency usage

E5.5 High Frequency (HF) Communication Systems

E5.5.1	Explain HF communication systems	• Propagation • Short-wave • Transmission modes • Single sideband • Advantages • Components • Antenna types and tuning • Use of HF systems • Safety
E5.6	Selective Calling	
E5.6.1	Explain selective calling	• VHF system • HF system • Frequency • Designation
E5.7	Cockpit Voice Recorders (CVR)	
E5.7.1	Describe cockpit voice recorders	• Voice recorder • Activation circuit • G switch • Recorder control head • Acoustic Beacon • Component location • Testing procedures
E5.8	Flight Data Recorders and Health Usage Monitoring System (HUMS)	
E5.8.1	Explain flight data recorders	• Typical recording parameters • G switch • Activation circuit • Acoustic beacon – ULB/ULD • Component location

E5.8.2 Explain Health and Usage Monitoring System (HUMS).

E5.9 Emergency Locator Transmitter (ELT)

E5.9.1 Explain ELTs

- ELT usage
- Characteristics
- Test procedures
- Operational test considerations
- Battery replacement
- Types of ELTs
- ELT installation
  - Antenna installation
  - Coax length
  - TSO C91A
- Frequencies
  - 121.5 Mhz
  - 406.025 Mhz
  - 243 Mhz

E5.10 Satellite Communications (SAT/COM)

E5.10.1 Satellite Communications (SAT/COM)

- Advantages
- Use
- Basic principles
- System operation
- Components

E5.11 Automatic Direction Finding (ADF)

E5.11.1 Explain ADF

- Purpose
- Theory of operation
- Components
- Indication

E5.12 Global Positioning Systems (GPS)

E5.12.1 Explain GPS

- Purpose
- Theory of operation
- Components
- Indication

E5.13 VHF Omni-Range Navigator (VOR)

E5.13.1 Explain VHF omni-range

- Purpose
- Theory of operation
- Components
- Indication
  - HSI
  - CDI
  - RMI

E5.14 Instrument Landing System (ILS)

E5.14.1 Explain instrument landing systems

- Purpose
- Theory of operation
- Components
- Indication

E5.14.2 Explain localizer

- Purpose
- Theory of operation
- Components
- Indication

E5.14.3 Explain glide slope

- Purpose
- Theory of operation
- Components
- Indication

E5.14.4 Explain marker beacon

- Purpose
- Theory of operation
- Components

- Indication

E5.15 Distance Measuring Equipment (DME)

E5.15.1 Explain DME

- Purpose
- Theory of operation
- Components
- Indication

E5.16 Secondary Surveillance Radar Transponder

E5.16.1 Explain transponder

- Purpose
- Theory of operation
- Components
- Indication
- Emergency codes and precautions
- Operational test precautions
- Altitude encoding systems

E5.17 Traffic Collision Avoidance Systems (TCAS)

E5.17.1 Explain TCAS

- Purpose
- Theory of operation
- Components
- Indication
- Operational test precautions

E5.18 Radio Altimeter

E5.18.1 Explain radio altimeters

- Purpose
- Theory of operation
- Components
- Indication

E5.19 Weather Radar

E5.19.1 Explain weather radar

- Purpose
- Theory of operation
- Components
- Indication
- Operational test precautions
- Radome
- Wave guide

E5.20 Autopilot

E5.20.1 Explain auto-pilot

- Purpose
- Theory of operation
- Components
- Indication
- Operational test precautions
- Yaw damper
- Mach trim

E5.20.2 Explain flight director system

E5.20.3 Explain auto throttle/auto thrust

E5.21 Flight Management Systems (FMS)

E5.21.1 Describe flight management systems (FMS)

- Relationship to autopilot
- Database
- Inputs
  - V.O.R.
  - D.M.E.
  - G.P.S.

E5.22 Ground Proximity Warning System (GPWS)

E5.22.1	Explain GPWS	• Purpose • Theory • Components • Indication
E5.23	Electronic Display Systems	
E5.23.1	Explain EICAS	• Purpose • Theory of operation • Components • Indication • Operational test precautions • BITE functions
E5.23.2	Explain EFIS	• Purpose • Theory of operation • Components – Cathod-ray tube • Indication • Operational test precautions • BITE functions
E5.24	E5.24 Avionics Systems Installation	

E5.24.1	Explain avionics systems installation	• Cooling
		• Contamination
		  – Moisture
		  – Swarf
		• Vibration
		• Noise reduction
		• Bonding
		• Antenna installation
		• EMI
		• RFI
		• Documentation

E5.25 Avionics Maintenance Inspections

E5.25.1 Explain avionics maintenance inspections

- Visual
- Security
- Environment
- Ramp test equipment

E5.26 System Troubleshooting

E5.26.1 Explain Troubleshooting

- Cost of poor fault analysis
- Logic approach
- Planning
- Visual
- Components
- Interconnect
- Resources and references

E5.27 Systems Interconnection

E5.27.1 Discuss interconnection of avionics systems

- GPS
- Autopilot
- ILS
- Flight director
- Transponder
- FMS

E5.28 System Troubleshooting

E5.28.1 Explain System Troubleshooting

- Cost of poor fault analysis
- Logic approach
- Planning
- Visual
- Components
- Interconnect
- Resources and references

Line (GAC): 28 Avionics

Competency: 28.03 Data Bus and Logic

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
E6.1	Number Systems	
E6.1.1	Describe number systems	• BCD • Decimal • Binary • Octal • Hexadecimal
E6.1.2	Explain analogue and digital systems	• Advantages and disadvantages
E6.1.3	Given several decimal numbers convert to binary and octal notations (practical)	
E6.1.4	Convert between various number systems	• BCD • Decimal • Binary • Octal Hexadecimal
E6.2	Logic Gates Functions	
E6.2.1	Explain logic gates using truth tables	• AND • OR • NOT (Inverter) • Buffer • NAND • NOR • EXCLUSIVE OR • Logic switch

E6.2.2	Use electrical circuit representations to explain logic gates	• AND • OR • NOT (Inverter) • Buffer • NAND • NOR • EXCLUSIVE OR
E6.2.3	BRIEFLY discuss boolean equations	
E6.2.4	Describe display of digital data	• Voltage waveforms and levels
E6.3	Integrated Circuits	
E6.3.1	Describe characteristics of integrated circuits	• IC connection arrangement • DIP – IC – Switch • OP AMPS (briefly discuss)
E6.3.2	Describe some applications of integrated circuits	
E6.3.3	Given logic diagram with digital inputs, determine correct digital output (practical)	
E6.4	Systems, Controls and Displays	
E6.4.1	Describe functions of computer operations	• Central processing unit • Central control unit • Memory – RAM – ROM • Arithmetic logic unit • Data transmission – Serial ○ Multiplexers ○ Demultiplexers – Parallel – Data bus types including ARINC 429

E6.4.2	Describe flight management systems	
E6.4.3	Describe air data computers	
E6.4.4	Describe thrust management systems	
E6.4.5	Describe aircraft digital systems	• Line replaceable units (LRU) • Built in test equipment (BITE) • Electronic flight instrument systems (EFIS) • Engine indicating and crew alerting system (EICAS)
E6.5	Digital Systems	
E6.5.1	Describe systems testing and troubleshooting	• Logic diagrams • Flow charts • Built in test equipment (BITE)
E6.5.2	Describe safety procedures	• Static – Static dischargers – Electrostatic discharge system

Line (GAC): 29 Ice and Rain Protection

Competency: 29.01 Ice and Rain Protection Systems

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
A8.1	Ice Formation and Effects on Aircraft Operation	
A8.1.1	Explain conditions leading to ice formation	
A8.1.2	Describe types of ice and icing	• Rime ice • (Opague or glaze) ice/Clear ice • Frost • Packed snow • Induction icing/Carburetor icing • Impact icing
A8.1.3	Explain dangers of airframe icing	• Loss of lift • Control surfaces • Loss of control • Weight • Linkages • Drains • Windshields (visibility) • Pitot tubes • Fuel system • Antennae
A8.1.4	Explain dangers of powerplant icing	• Props • Intake • Carbs • Oil system • Linkages • Vent blockages • Loss of power • Ice throw-off damage • Engine indicating

A8.1.5	Explain dangers of rotary-wing airframe and powerplant icing	• Main and tail rotor • Powerplant intakes
A8.2	Ice Detection Systems	
A8.2.1	Explain electronic ice-detection	• Leading edge build-up • Wiper ice • Wing lights • Externally mounted indicators-ice accretion meters
A8.2.2		• O.A.T. gauge • Probes
A8.2.3	Explain electro-mechanical ice-detection.	
A8.3	Airframe and Powerplant De-icing	
A8.3.1	Discuss differences in ground and airborne de-icing/anti-icing	
A8.3.2	Describe ground de-icing of aircraft	• Anti-icing fluids • Physical removal – Heated mixture of ethylene glycol, isopropyl alcohol, and water – Importance of time factor – Safety precautions • Type I and Type II de-ice fluids
A8.3.3	Explain airframe anti-icing systems and components	• Thermal types – Heated air ducted to leading edges and control surfaces and antenna – Windshield hot air anti-ice – Sources of heat ○ Engine bleed air ○ Combustion heaters ○ Exhaust augmenters • Electric anti-icing – Pitot heads – static ports – Windshields and view panels ○ Externally mounted – Pressurization outflow valves

		– toilets • Chemical anti-icing – Windshields – Airfoil leading edge • Fuel system anti-icing – Additives – Oil cooler system
A8.3.4	Explain airframe de-icing systems and component	• Inflatable boots – Materials and components – System operation – Source of air • Maintenance of de-icer boots
A8.3.5	Explain powerplant anti-icing	• Intake ice screens • Hot air system – Source of heat • Electric system • Hot oil use (fuel heating) • Areas to be heated – IGV – Nose cone – Intake
A8.3.6	Explain propeller ice control systems and components	• Fluid systems – Fluids used – System description • Electric heating systems – System description – Operation • Maintenance
A8.3.7	Locate and identify components of ice control systems (practical)	
A8.3.8	Operate ice control system (practical)	
A8.3.9	Troubleshoot ice control system (practical)	
A8.3.10	Clean and carry out basic maintenance of ice control systems (practical)	

A8.4 Rain Removal

A8.4.1	Discuss rain control methods	• Waxed and cleaned windshields • Windshield wipers • Rain repellant • Pneumatic systems
A8.4.2	Describe windshield wiper systems	• Electrically operated – System operation – Components • Hydraulically operated – System operation – Components • Pneumatically operated systems – System operation – Components • Installation and rigging – Range of movement – Park – Tension – Speed control – Precautions, e.g., do not operate when windshield is dry • Operating limitations, e.g., aircraft speed
A8.4.3	Describe rain repellant systems	• Types of chemicals – Environmental concerns • Application methods – Ground applied – Pilot operated • System operation – Components
A8.4.4	Describe pneumatic rain removal systems	• System operation – Components – Sources of air
A8.4.5	Describe inspection and maintenance of rain removal system	

Line (GAC): 30 Electrical

Competency: 30.01 Basic Electrical - DC

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
E1.1	Atomic Theory and Static Electricity	
E1.1.1	Explain electron theory	• Molecules and atoms • Elements and compounds • Electrons, protons and neutrons – Positive and negative ions – Free electrons, valence electrons – Conductors, insulators – Semiconductors • Direction of current flow
E1.1.2	Explain electrostatics	• Electric series • Electrostatic force
E1.1.3	Explain voltage sources	• Chemical • Magnetism • Friction • Pressure • Light • Thermal
E1.2	Electrical Circuits	
E1.2.1	Explain units of electricity	• Current – Ampere (A) • Voltage – Volt (V) • Resistance – Ohm (Ω)

E1.2.2	Explain Ohm's Law	• Electrical power and work – Watts – Horsepower • Voltage drop • Series circuits • Parallel circuits • Series-parallel circuits • Kirchhoff's laws • Resistance bridge
E1.2.3	Discuss resistors	• Types of resistors – Fixed – Variable • Construction Materials
E1.2.4	Use Ohm's Law to solve a variety of series and parallel circuit problems. Use examples both taken from the text and provided by the instructor (Practical)	
E1.3	Electrical Measuring Devices	
E1.3.1	Explain meter movements	• Galvanometer
E1.3.2	Explain measuring devices	• Ammeter – Shunts • Voltmeter DC – Multiplier (series) resistor • Voltmeter AC • Ohmmeter
E1.3.3	Explain meter types and uses	• Multimeter – Analogue meter – Digital meter • Oscilloscope
E1.3.4	Use a variety of multimeters to measure current, voltage, and resistance	

E1.3.5	Construct circuits from components that are the same as those previously solved mathematically. Components will be provided	
E1.3.6	Measure values to substantiate theories of Ohm's Law and Kirchhoff's Law	
E1.4	Batteries	
E1.4.1	Explain voltaic cells	• Primary cells and secondary cells • Dry cells and wet cells
E1.4.2	Explain cell types	• Alkaline, mercury • Lead-acid • Nickel-cadmium • Gel cell
E1.4.3	Explain batteries	• Capacity (rating) – Volts – Ampere-hours • Rate • Open-circuit and closed-circuit voltage • Internal resistance
E1.4.4	Explain lead-acid batteries	• Theory • Construction of – Plates – Cell container – Vent caps – Case and paints – Maintenance free • Voltage and capacity • Testing – Hydrometer/specific gravity – Temperature effects – High-rate discharge test and load testers • Charging lead-acid batteries – Constant-current charging

		– Constant-voltage charging – New batteries – Safety precautions
E1.4.5	Explain nickel-cadmium batteries	• Theory and construction of: – Plates and cell case – Thermal runaway – Vents – Outer case and paints • Capacity of nickel-cadmium batteries – Constant voltage charging – Constant voltage charging – Foaming of electrolyte • Maintenance of ni-cad batteries – Inspection – Deep cycling (reconditioning) – Discharge – Disassembly and cleaning – Reassembled – Recharged – Electrical lead check • Battery storage • Battery installation • Temperature monitor • Safety – Thermal runaway • Segregation of lead acid and ni-cad operation • Personal safety (WHMIS)
E1.4.6	Describe installation procedures for aircraft batteries	• Temperature of location • Venting of gasses/overflow of electrolyte • Battery connections and leads
E1.4.7	Describe maintenance of lead acid batteries	• Battery box • Neutralizing electrolyte spillage

E1.4.8	Describe temperature effects on battery performance.	
E1.4.9	Measure different battery types under load and no-load conditions (Practical)	
E1.5	Electromagnetic Induction	
E1.5.1	Explain magnetism	• Magnets – Residual magnetism – Permeability • Properties of magnetism – Magnetic field – Lines of flux – Magnetic circuit – Reluctance
E1.5.2	Explain magnetic devices	• Electromagnets • Solenoids and relays – Coils – Contact points
E1.5.3	Explain electromagnetic induction	• Generator action • Explain the three requirements to make electricity – Magnetic field – Conductor – Relative motion
E1.6	DC Generators and Controls	
E1.6.1	Explain DC generator theory	• DC generator – Commutator – Ripple – Residual magnetism – Armature reaction ○ Cross magnetism ○ Interpoles ○ Compensating winding • Starter-generators
E1.6.2	Explain DC generator construction	• Armature assembly • Field-frame assembly • Brush assembly • End frame • Cooling

E1.6.3	Explain DC generator maintenance	• Inspection – Terminals – Flange mount – Brushes and holders – Commutator and windings o Growler – Aircraft mounting structure – Installation in aircraft – Drive spline inspection and lubrication
E1.6.4	Explain voltage regulation	• Vibrating type • Solid state • Carbon pile
E1.7	DC Motor Principles	
E1.7.1	Explain magnetic attraction and repulsion	• Counter EMF and net EMF • Types and characteristics of DC motors – Series – Shunt – Compound – Continuous duty – Intermittent duty – Reversible
E1.8	Aircraft Alternator	
E1.8.1	Explain DC generation, using alternators	• Identify components – Stator o Wye-wound o Delta wound – Rotor – Slip rings – Rectifiers • Aircraft alternators
E1.8.2	Service a DC alternator (Practical)	

E1.8.3	Inspect and test rectifier assembly (Practical)	
E1.9	Electrical Control Devices and Semiconductors	
E1.9.1	Explain switches	• De-rating factors • Manually operated • Electrically operated – Solenoids
E1.9.2	Explain circuit protection	• Fuses • Current limiters • Circuit breakers • Remote control circuit breakers
E1.9.3	Briefly describe electron tubes including cathod-ray tubes	
E1.9.4	Explain semiconductors	• Construction – Materials ○ Germanium & silicon ○ P & N type – Doping – Junction ○ Potential barrier • Diodes – Anode and cathode – Biasing – Rectifiers ○ Halfwave ○ Fullwave – Heat sinks – Testing • Transistors – Base, collector, emitter – Npn, pnp – Uses ○ Switching ○ Amplification – Characteristics – Testing • Other semiconductor devices – Thyristor family – Zener diode ○ Avalanche effect – LEDs – Photodiodes

E1.9.5	Operate and test switches, relays, circuit breakers, and	
E1.9.6	Forward bias and reverse bias a diode	
E1.9.7	Test diodes for serviceability	
E1.9.8	Operate a transistor	• Switch • Amplifier
E1.9.9	Test a transistor for serviceability	
E1.10	Electrical Devices Safety	
E1.10.1	Explain safe operation of	• Measuring devices – – Ohmmeter – Voltmeter – Ammeter (See *Measuring Devices)* • Batteries – Ni-cad – Lead-acid (See *Batteries)* • Electrical generation devices – Generators – Alternators (See *Principles of Generation,* and *DC Alternator Principles)* • Electrical motor (See *DC Motor Principles)*
E1.10.2	Demonstrate (Practical)	• Safe use of a multimeter

Line (GAC): 30 Electrical

Competency: 30.02 Basic Electrical - AC

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS	CONTENT
E2.1 Principles of Alternating Current (AC)	
E2.1.1 Define alternating current	• Sine curve/wave • Other wave forms
E2.1.2 Explain “root mean square (RMS)” values	
E2.1.3 Explain frequency	• Hertz • Domestic and aircraft industrial frequencies • Effect of frequency on electrical equipment
E2.1.4 Explain phase	• Phase angle • Three-phase • Current/voltage; out of phase
E2.1.5 Explain use of oscilloscope	
E2.2 AC Measuring Devices	
E2.2.1 Explain AC measuring devices	
E2.2.2 Describe inductive pickups	
E2.2.3 Explain use of multimeters and oscilloscopes	
E2.2.4 Perform the following	• Identify required lab equipment • Measure AC voltages – Oscilloscope – AC voltmeter

E2.3 Capacitance

E2.3.1 Define capacitance

E2.3.2 Explain capacitors

- Types of capacitors
  - Fixed
  - Variable
- Materials
- Multiple capacitor circuits
  - Parallel
  - Series
- Time constant

E2.3.3 Describe effects of capacitors in electrical circuits

E2.3.4 Describe uses for capacitors

- Purpose
- In parallel in DC circuit-eliminate voltage pulsations
- Reduce arcing at points
- Reduce radio interference

E2.3.5 Explain capacitance in AC circuits

- Farads/micro-farads/pico farads
- Reactance
- Measured in ohms
- Formula
- Phase shift

E2.3.6 Explain polyphase AC circuits

- Description
- Uses
- Advantages
- Three-phase
- Single-phase

E2.3.7 Explain uses of AC electricity in aircraft

E2.3.8 Measure capacitance (Practical)

E2.4	Inductance	
E2.4.1	Explain inductance	• Definition • Measured in henries (h)
E2.4.2	Explain inductance coil	
E2.4.3	Explain inductance in AC circuits	• Inductive reactance – Formula • Phase shift
E2.4.4	Explain transformers	• Purpose • Components • Theory • Step-up • Step-down • Phasing
E2.5	Resonance and Impedance	
E2.5.1	Briefly explain resonance	• RLC circuits
E2.5.2	Define impedance	
E2.5.3	Explain phase angle and power factor	• Phase angle (Ø) – True power – Apparent power • Power factor – Definition •
E2.6	AC Generators	
E2.6.1	Describe use of AC generators in aircraft	

E2.6.2	Explain AC generator theory	• AC generator – Sine wave generators – Parts of a generator ○ Field poles ○ Armature/rotor ○ Slip rings ○ Brushes
E2.6.3	Explain aircraft generators	• Construction – Wye configuration – Delta configuration – Regulator • Differences between alternator and generator – Advantages/disadvantages – Rotor – Stator • Principles • High power brushless alternator
E2.6.4	Explain transformer rectifiers	• Purpose • Function
E2.7	Generator and Alternator Control	
E2.7.1	Explain voltage regulation	• Purpose • Generator and alternator voltage regulators in generators (DC)
E2.7.2	Describe generator control units	• AC
E2.8	Power Conversion	
E2.8.1	Discuss conversion methods	• DC to AC • AC to DC and • AC to AC (voltage change)
E2.8.2	Explain inverters	• Function • Cooling • Input voltage • Output voltage • Single-phase • Three-phase • Rotary • Static

E2.8.3	Explain variable-speed, constant-frequency power systems	• Purpose • Description • Advantages • Types – CSD – IDG • Servicing
E2.8.4	Describe transformer characteristics	
E2.8.5	Describe semi-conductor diode	
E2.8.6	Convert AC to DC (Practical)	
E2.9	AC Motors	
E2.9.1	Compare AC and DC motors	
E2.9.2	Explain AC motors	• Theory • Types – Universal – Induction – Synchronous – Combinations • Components – Rotors – Stators • Function
E2.9.3	Explain improvement of starting qualities	
E2.9.4	Explain repulsion motors	
E2.9.5	Explain synchronous motors	• Uses

E2.9.6	Explain motor losses	• Friction loss • Resistance or copper loss • Hysteresis loss
E2.9.7	Describe single-phase AC actuator motors	• Limit switches
E2.9.8	Describe three-phase AC motors	
E2.9.9	Describe inspection and servicing of motors	

Line (GAC): 30 Electrical

Competency: 30.03 Electrical Systems

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
E3.1	Circuit Installation and Wiring Practices	
E3.1.1	Describe types of wiring diagrams	• Block diagrams • Pictorial diagrams • Schematic diagrams
E3.1.2	Describe basic circuit components	• Wire types and gauges – Continuous/intermittent • Clamping, lacing and support devices • Terminal strips including matrix blocks • Connectors – BNC – Plugs and receptacles, for example: ○ AN ○ MS ○ MIL specs • Junction boxes
E3.1.3	Describe maintenance of electrical wiring systems	• Wiring and cable integrity • Protection from fluids • Wiring cable clamps and supports • Conduits • Plastic wire sleeving • Crimping, stripping and splicing tools e.g. Daniels Manufacturing (deutch connectors, cannon plugs) • Soldering • Wire marking • Heat shrink

E3.1.4 Identify proper crimping tools for pins and lugs

E3.1.5 Construct basic wiring harness using acceptable methods, techniques and practices (practical)

E3.2 Circuit Control and Protection Devices

E3.2.1 Describe types of electrical control devices

- Switches
  - Toggle and rocker
  - Rotary (wafer)
  - Micro
  - Transistor
  - Pushbutton
  - Slide type
  - Thermal
  - Inertia
  - Proximity
  - Frangible
  - Mercury
  - Specifications
    - Current capacity
    - Voltage and power
    - Derating
- Relays and solenoids
  - Specifications
    - Current capacity
    - Voltage and power
    - Derating

E3.2.2 Describe types of electrical circuit protection devices

- Fuses
- Circuit breakers
- Currect limiters
- RCCB

E3.2.3 Identify electrical diagram symbols for control and protection devices

- Switches
- Relays
- Circuit breakers

- Fuses
- Transistors
- Warning lamps (press to test)

E3.2.4 Troubleshoot various control and protection devices using schematic diagrams (practical)

E3.3 Power Supply and Generation Systems

E3.3.1 Describe electrical supply and generation components

- Batteries
  - Lead acid
  - Nickel-cadmium
- Alternators
- Generators
- Starter generators
- External power
- Voltage regulators
  - Vibrator
  - Carbon pile
  - Solid state
  - Paralleling
- Reverse current relays
- Current limiters

E3.3.2 Read electrical supply and power generation systems' wiring diagrams

- Alternator and battery bus supply
- Generator bus supply
- Starter generator bus supply
- External power supply
- Control devices
  - Voltage regulators
  - Paralleling
  - Reverse current relays
  - Current limiters
-

E3.3.3 Describe maintenance of electrical power supply and generation systems

- Battery systems
  - Cooling and venting
- Alternator systems
  - Cooling
  - Bearings
  - Belts and alignment
  - Drive
- Generator systems
  - Cooling
  - Bearings
  - Drive

- Starter generator systems
- External power supply systems
- Control devices
  - Voltage regulators
  - Paralleling
  - Reverse current relays
  - Current limiters

E3.3.4 Service and test

- Alternator
- Generator

E3.3.5 Connect and test components to simulate aircraft generation system (practical)

E3.4 Monitoring and Troubleshooting Warning and Lighting Circuits

E3.4.1 Describe aircraft indication, monitoring and lighting circuits

- Components
  - Sockets
  - Bulbs
- Diagram symbols
- Relationships of components in circuits
- Functions of circuits

E3.4.2 Describe troubleshooting techniques

- Observation of circuit functions
- Use of multimeters
- Circuit and schematic analysis

E3.4.3 Students will determine causes of defect in electrical system using circuit diagram and appropriate test equipment (practical)

E3.5 Electrical Motor Systems

E3.5.1 Describe electrical motor theory

- DC motors
  - Series
  - Shunt
  - Compound
  - Reversing
- Brakes and clutches for motors

E3.5.2	Describe components which make up aircraft electrical motor circuits	• Diagram symbols • Motors – AC – DC • Control devices – Limit switches – Thermal switches – Relays – Rheostats – Field polarity resistors – Proximity switches
E3.5.3	Describe maintenance and repair of aircraft electrical motor systems	• AC • DC
E3.5.4	Inspect and test aircraft motor system (practical)	
E3.6	Landing Gear Electrical Systems	
E3.6.1	Describe electrical components of landing gear system	• Diagram symbols • Switches – – Limit – Pressure – Squat – Weight on wheel – Various manufacturers 'terminology – Throttle • Warning horn – Proximity – Reed • Lighting/indication • Motors – Hydraulic – Geared – Electric
E3.6.2	Describe servicing and inspection of electrical landing gear system components	• Rigging and adjustment of switches • Lighting/indication functions • Motors
E3.7	Distribution Systems	

E3.7.1 Describe light aircraft distribution systems:

- DC alternator
  - Single/multi engine
    - Paralleling
    - Buses
- DC generator
  - Single/multi engine
    - Paralleling
    - Buses
    - RCR
    - Over-voltage control
- GPU
- APU

E3.7.2 Describe large aircraft distribution systems

- Generation systems
  -
  - GCU
  - TRUs
  - Inverters
- Bus
  - Split
  - Parallel
  - Control
  - Transfer bus
  - Load shed
- GPU
- APU
- ATM

E3.8 Safety

E3.8.1 Describe safety procedures for maintenance of electrical systems

- Connecting and disconnecting power supplies
- Correct meter connections
  - Voltage
  - Polarity
- Clothing
- Jewelry and tools
- Eye protection
- Circuit lockout and tagging

E3.8.2 Connect/disconnect power supply (practical)

Line (GAC): 31 Non Destructive Testing

Competency: 31.01 Non-Destructive Inspection

Objectives

To be competent in this area the individual must be able to:

LEARNING TASKS		CONTENT
G11.1	Inspection Procedures	
G11.1.1	Explain purpose of and type of information found in Standard Practices manuals related to NDI processes	• Contains maintenance information and procedures common to manufacture's aircraft, engine or components. • Typical information in cleaning, nondestructive inspection materials and procedures. • A standard practice is a single process that is required for maintenance of numerous parts included in product. • Each process has a defined area of application for accomplishing a specific task.
G11.1.2	Describe types of inspection procedures and standards required as per CGSB, MIL-410 and AECL	• Visual • Tap test • Prism check • Liquid Penetrant Inspection • Magnetic Particle Inspection • Eddy Current • Ultrasonic • Radiography
G11.1.4	Describe documentation requirements for NDI	• Recording log entries for defects and rectification
G11.2	Visual Inspection	
G11.2.1	Describe visual inspection techniques	
G11.2.2	Explain equipment used in visual inspection	

G11.2.3	Describe cleaning processes and equipment for visual inspection	
G11.2.4	Carry out visual inspection using related equipment	• Boroscope • Prism check
G11.2.5	Demonstrate visual inspection using the following procedures	• Cleaning parts • Looking for defects • Confirming cracks with magnifying glass • Confirming cracks using NDI methods • Cleaning after inspection • Reference to records (logs) • Reference to manuals • Recording log entries for defects and rectification – Track defects using maintenance records
G11.3	Tap Test	
G11.3.1	Explain Tap Test	• Sound/tone changes • Tool • Mapping • Precautions
G11.4	Prism Check	
G11.4.1	Explain Prism Check	• Light refraction • Prism material
G11.5	Liquid Penetrant	
G11.5.1	Describe LPI	• Procedure • Materials • Limitations
G11.5.2	Explain application of dye penetrant	• Preparation • Methods • Interpretation of defects • Final cleaning and precautions

G11.5.3	Explain use of florescent penetrant	• Process • Safety precautions
G11.5.4	Demonstrate both procedures on sample components with and without known defects and, list advantages and disadvantages of dye penetrant and florescent penetrant (practical)	
G11.6	Magnetic Particle	
G11.6.1	Describe magnetic particle inspection (MPI)	• Description of process • Principle of magnetic flaw detection • Methods of magnetization • Limitations
G11.6.2	Explain magnetic particle inspection procedure	• Prepare • Magnetize • Apply magnetic ink or powder • Interpret indications • Record defects • Demagnetize after test • Clean • Field applications • Precautions
G11.6.3	List advantages and disadvantages of magnetic particle inspection	
G11.7	Ultrasonic Inspection	
G11.7.1	Describe ultrasonic inspection	• Principles • Types of sound waves • Limitations
G11.7.2	Explain ultrasonic inspection procedures:	• Aircraft or part preparation • Processes
G11.7.3	List advantages and disadvantages of UT	
G11.8	Eddy Current	

G11.8.1	Describe eddy current inspection	
G11.8.2	Describe eddy current inspection procedures for fastener holes	
G11.8.3	Describe eddy current inspection procedures for surface applications	
G11.8.4	List advantages and disadvantages of eddy current inspection	
G11.9	Radiography	
G11.9.1	Describe radiography inspection procedures	• Principles of radiography • Hazards and safety procedures • Aircraft preparation • Limitations
G11.9.2	List advantages and disadvantages of radiography inspection.	
G11.10	Advanced Inspection Methods	
G11.10.1	Describe advanced forms of NDI	• Acoustic emission • Ultrasound • Holographic imagery • Shearography • Thermography

Section 4

TRAINING PROVIDER STANDARDS

Facility Requirements

Classroom Area

- Recommended 2.5 Sq. meters per student
- Projection screen, multimedia projector, whiteboard or similar
- Seating and tables suitable for lecturing
- Compliance with all safety codes

Shop Area

- Recommended 25 Sq. meters per student
- Meet all safety and fire, and environmental codes
- Good lighting
- Appropriate lifting cranes as required to move industry equipment
- Approved ventilation systems

Lab Requirements

- Recommended 10 Sq. meters per student
- Computer labs on-site

Student Facilities

- 1 locker per student, study areas, computer labs, food facility, hand wash facility, washroom facility.

Instructor's Office Space

- Recommended 3.5 Sq. Meters

Other

- Storage space for classroom and shop props.

Tools and Equipment

Shop (Facility) Tools

Standard Tools

- Abrasives
- Air blowers
- Air drills
- Air ratchets
- Air regulators
- Aircraft snips
- Alignment tools
- Bevel protractors
- Blades
- Block sanders
- Bucking bars
- Buffing pads
- Burnishing tools
- Burnishing wheels
- Calipers
- Centre punches
- Chalk lines
- Chassis punches
- Chisels
- Clamps
- Cleco pliers
- Combination sets
- Compasses
- Countersinks
- Cutters
- Cutting bits
- Cutting blades
- Cutting discs
- Cutting shears
- Cutting tools
- Cutting wheels
- Deburring tools
- Depth gauges
- Dial indicators
- Die grinders
- Dimpling dies
- Disc sanders
- Discs
- Dividers
- Drift punches
- Drill jigs
- Drill motors
- Drill presses
- Drill size charts
- Extractor fans
- File cards
- Files
- Grip-length gauges
- Gun applicators
- Hacksaws
- Hammers
- Hand applicators
- Hand presses
- Hand punches
- Hand saws
- Hand shears
- Hand squeezers
- Heat guns
- Heat lamps
- Height gauges
- Hex keys
- Irons
- Jigsaws
- Knives
- Layout tools
- Levelling equipment
- Lights
- Line-up punches
- Magnets
- Mallets
- Mandrills
- Markers
- Measuring scales
- Measuring tape
- Mechanical files
- Microstop countersinks
- Micrometers
- Mirrors
- Needles
- Nibblers
- Pliers
- Plumb bobs
- Pneumatic applicators
- Pop riveters
- Portable circular saws
- Protractors
- Pry bars
- Punches
- Putty knives
- Rasps
- Ratchets
- Razors
- Reamers
- Rivet guns
- Rivet sets (snaps)
- Rollers
- Rotary files
- Rotary knives
- Rotary shears
- Router bits
- Routers
- Routing equipment
- Routing templates
- Scissors
- Scrapers
- Screwdrivers
- Scribes
- Socket ratchets
- Socket wrenches
- Sockets
- Spatulas
- Spot facers
- Squares
- Squeegees
- Squeeze riveters
- Straight edges
- Stretching tools
- Tap hammers
- Tape measures
- Temporary fasteners
- Thermometers
- Twist drills
- Vacuum cleaners
- Ventilation fans
- Vices
- Weights
- Wrenches

Specialty Tools

- 10X magnifying glass
- Air compressors
- Air extractors
- Aircraft levelling equipment
- Applicator guns
- Arbour presses
- Autoclaves
- Band saws
- Bead blasters
- Beading equipment
- Bending brakes
- Blind fastener pulling heads
- Blind riveters
- Blind riveting equipment
- Borescopes
- Coin dimplers
- Cold working tools
- Contour blocks
- Contour gauges
- Cooling baths/tanks
- Cranes
- Crown rollers
- Curing equipment
- Curing ovens
- Dust removal equipment
- Explosion proof lighting
- Fixtures
- Flanging dies
- Flanging machines
- Flap-peening equipment
- Flaring tools
- Form blocks
- Forming dies
- Grinders
- Hardness testers
- Heat blankets
- Heat-teat ovens
- Hot bonders
- Hot bonding control unit
- Hot dimplers
- Hydraulic brakes
- Hydraulic presses
- Hydroform presses
- Ice boxes
- Injection filling equipment
- Jacks
- Jigs
- Joggling rollers
- Machine mixers
- Maule testers
- Mechanical polishers
- Mechanical presses
- Mechanical shears
- Media blasting equipement
- Mixing equipment
- Optical micrometers
- Painting equipment
- Pinking shears
- Planers
- Planes
- Planishing hammers
- Plastic weld guns
- Pneumatic squeezers
- Power shears
- Precision measuring devices
- Press brakes
- Press punches
- Pressure gauges
- Prisms
- Pyrometers
- Reciprocating saws
- Recording equipment
- Salt baths
- Sandbags
- Sewing machines
- Sewing needles
- Seyboth testers
- Sheet metal rollers
- Shoring and lifting tools
- Skin peeling tools
- Slip rollers
- Spot welders
- Spray booths
- Spray equipment
- Spray guns
- Stirring/agitating equipment
- Swagers
- Swaging tools
- Table saws
- Tack hammers
- Telescoping gauges
- Thimbles
- Timers
- Torque wrenches
- Trammels
- Transits
- Tube benders
- Tube bending tools
- Tube cutters
- Vacuum gauges
- Vacuum sniffers
- Vacuum sources
- Valve-stem cutters
- Vernier scale
- Verniers
- Weigh scales
- Wire twisters

Reference Materials

Required Reference Materials

- https://www.avaerocouncil.ca/en

Recommended Resources

- https://www.avaerocouncil.ca/en

Suggested Texts

- Aircraft Basic Science, 7th Edition by Kroes and Radon, Glencoe Publishing
- Aircraft Maintenance & Repair, 6th Edition by Kroes and Watkins & Delp, Glencoe Publishing
- Standard Aircraft Handbook, 6th Edition, edited by Larry Keithmaier, Division of McGraw Hill

Instructor Requirements

Occupation Qualification

The instructor must possess:

- AME-M licence

Work Experience

A minimum of 10 years' experience working in the industry as a journeyperson.

Instructional Experience and Education

It is preferred that the instructor also possesses:

- Instructor Diploma