SKILLEDTRADESBC

PROGRAM OUTLINE

Aircraft Structural Technician

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AIRCRAFT STRUCTURAL TECHNICIAN

PROGRAM OUTLINE

APPROVED

DECEMBER 2000

Document Revised 2011

Developed by
SkilledTradesBC
Province of British Columbia

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Section 1

INTRODUCTION

Aircraft Structural 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 Structures 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 an industry steering committee convened initially by the Industry Training and Apprenticeship Commission. Members include:

- R. Malcolm Sterling- Aviation Programs BCIT
- Tim Eaton- IAM & AW District Lodge No. 721
- Tony Stacey- Canadian Aircraft Products/AVCORP

SkilledTradesBC would like to acknowledge the dedication and hard work of all the industry representatives appointed to identify the training requirements of the Aircraft Structural Technician occupation.

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

Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
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
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

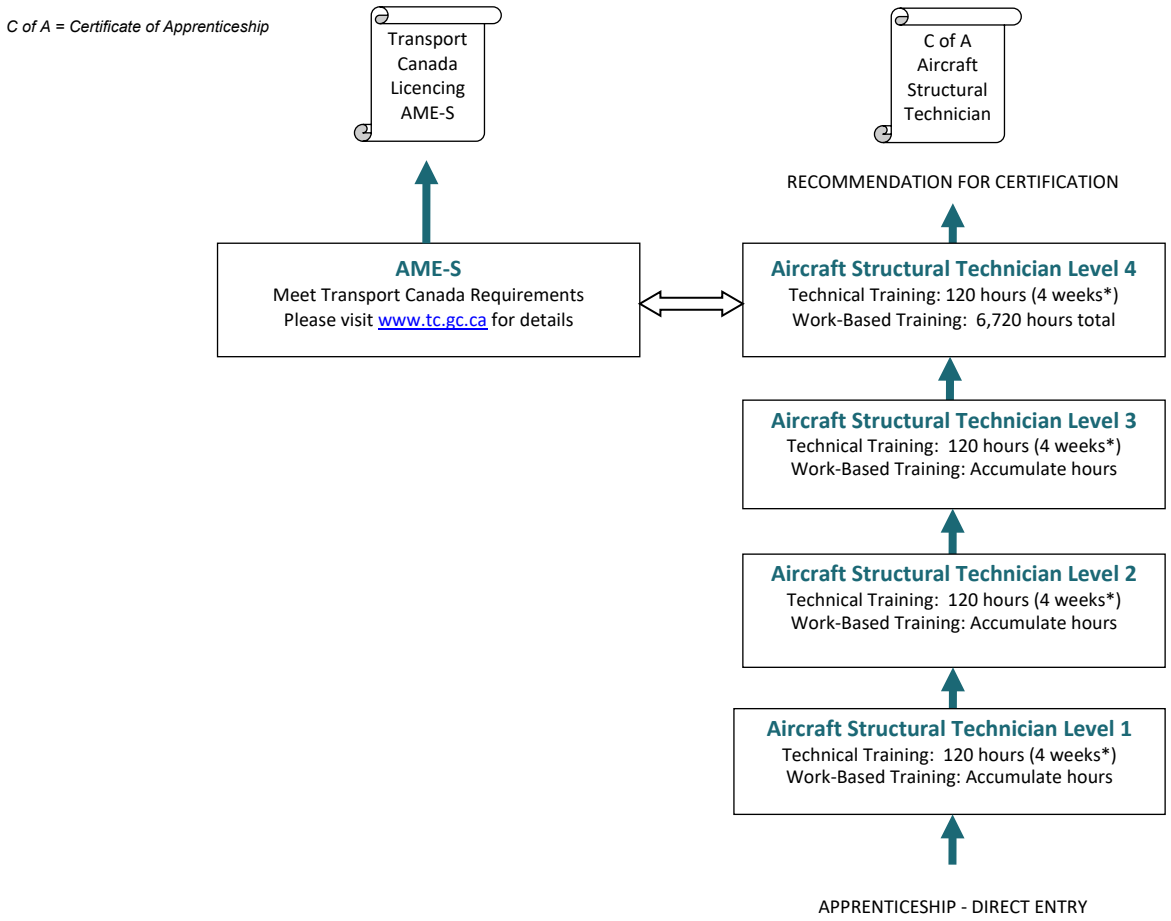
PROGRAM OVERVIEW

Aircraft Structural Technician

Program Credentialing Model

Apprenticeship Pathway

This graphic provides an overview of the Aircraft Structural Technician apprenticeship pathway.



**Suggested duration based on 30-hour week*

CROSS-PROGRAM CREDITS

Individuals who hold the credentials listed below are entitled to receive partial credit toward the completion requirements of this program

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 skill development of skills that have been identified as essential for on the job performance.

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 STRUCTURAL TECHNICIAN

Occupation Description: "Aircraft Structural Technicians" means a person who selects, measures, shears, cuts, bends, forms, heat treats, seals, fabricates, fits, inspects, paints and refinishes parts and components to drawing specifications. Drills, countersinks, dimples, reams and taps holes for bolting, screws, riveting, and installation of special fasteners. Assembles parts and components and sub-assemblies using special jigs and fixtures. Uses special tools and tooling for installation of bolts, rivets, screws and special fasteners. Installs completed components in aircraft and inspects and verifies the installation and operation of the components using test and measuring equipment as required. Reworks and/or replaces components to rectify damaged or malfunctioning components.

INTRODUCTION TO APPRENTICSHIP 1	Describe the Training Program 1.1	Discuss Provincial Accreditation 1.2	Discuss the Transport Canada "S" License 1.3
SHOP SAFETY 2	Identify Potential Health and Safety Hazards 2.1	Comply with Safety Regulations 2.2	Use Personal Protective Equipment 2.3
TOOLS & EQUIPMENT 3	Use and Maintain Tools and Equipment in a Safe Manner 3.1	Select and Operate Hand Tools 3.2	Select and Operate Power Tools 3.3
	Select and Operate Shop Equipment 3.4	Select and Operate Measuring Tools 3.5	
TECHNICAL DRAWINGS 4	Refer to Applicable Drawings and Manuals 4.1	Read and Interpret Technical Drawings 4.2	Draw Shop Sketches 4.3

Line	Competencies					
TECHNICAL INFORMATION 5	Read Technical Drawings and Manuals 5.1 (1)	Comply with Regulations and Directives 5.2 (1)				
APPLIED MATH/PHYSICS 6	Review Using the Imperial System of Measurement 6.1 (1)	Review Conversion Between Decimals and Fractions (both ways) 6.2 (1)	Review and Perform Area Calculations 6.3 (1)	Review and Perform Volume Calculations 6.4 (1)	Review Ratio and Proportions Problems 6.5 (1)	Review Layout and Cutting Calculation Procedures 6.6 (1)
	Review Degree, Minute and Second (DMS) Angular Measurement 6.7 (1)	Review Calculations, Unknown Quantities in Right Angle Triangles Using Trigonometry Function 6.8 (1)	Review Chemical Nature of Matter 6.9 (1)	Review Physical Nature of Matter 6.10 (1)	Review Computed Weight and Balances 6.11 (1)	Review Simple Machines 6.12 (1)
	Review Forces, Stress and Strain 6.13 (1)	Describe Newton's Laws 6.14 (1)				
BASIC METALLURGY 7	Describe Ferrous Metals 7.1 (1)	Describe Non-ferrous Metals 7.2 (1)				
AERO DYNAMICS 8	Explain Why an Aircraft Can Fly 8.1 (1)	Explain Lift, Thrust, Weight and Drag 8.2 (1)	Explain Axes of Flight 8.3 (1)	Explain Aircraft Control 8.4 (1)	Describe the Consequences of Atmospheric Pressure on Flight 8.5 (1)	

AIRCRAFT STRUCTURE COMPONENT & FUNCTIONS **9**	Describe the Salient Features of Fixed Wing Aircraft 9.1	Describe the Salient Features of a Rotary Wing Aircraft 9.2	Describe Primary Flight Controls 9.3	Describe the Secondary Flight Controls 9.4	Describe Controls Systems and Methods 9.5	Describe Aircraft Engines and Propulsion Systems 9.6
SHEET METAL FABRICATION **10**	Layout Pattern/Template 10.1	Select Approved Materials 10.2	Cut Materials to Size and Deburr 10.3	Saw and Rout Sheet Metal 10.4	Form Sheet Metal with Hand and Machine Tools 10.5	Select Fasteners 10.6
	Layout Hole Pattern 10.7	Drill, Ream and Countersink Holes 10.8	Treat Fastener Holes with Anti-corrosion Compounds 10.9	Use Temporary Fasteners 10.10	Set and Buck Rivets 10.11	Assemble Parts with Structural Fasteners 10.12
	Punch and Drill Sheet Metal 10.13	Dimple/Countersink Sheet Metal 10.14	Heat Treat Rivets 10.15	Trim and Fill Parts 10.16	Disassemble Components and Parts 10.17	Apply Corrosion Protection 10.18
CORROSION CONTROL **11**	Identify Conditions for Corrosion 11.1	Describe Types of Corrosion 11.2	Describe Treatment of Aluminum Alloys 11.3	Describe Treatment of Steel Alloys 11.4	Describe Treatment of Magnesium Alloys 11.5	Describe Water Displacing Compounds 11.6
	Describe Levelling Compounds 11.7	Apply Corrosion Protection 11.8				

SEALING **12**	Refer to Technical Information 12.1					Prepare Surfaces and Mask off Sealing Areas 12.2					Select Sealants 12.3					Demonstrate Mixing Sealants 12.4					Demonstrate Applications of Sealants to Seams and Joints and Fasteners 12.5					Review the Sealing Process 12.6				
	1					1					1					1					1							3		
	Explain Preparation Processes 12.7					Demonstrate Sealing Processes 12.8					Review Sealing Safety 12.9																			
			3			1		3			1		3																	
HEAT TREATMENT **13**	Explain Heat Treatment of Sheet Aluminum 13.1					Describe Heat Treatment of Steel 13.2					Explain Heat Treatment of Rivets 13.3					Review Heat Treatment of Aluminum Alloys 13.4					Demonstrate Air Furnace 13.5					Demonstrate Salt Bath 13.6				
	1					1					1							3					3					3		
	Review Safety Requirements 13.7																													
			3																											
SPECIAL FASTNER INSTALLATION & PROCESSES **14**	Install Standard and Special Fasteners 14.1					Install Panel and Cowling Fasteners 14.2					Install Blind Nuts 14.3					Install Blind Bolts and Rivets 14.4					Cold-work Fastener Holes 14.5					Flap Peen Large Holes 14.6				
	1					1					1					1					1					1				
	Bond/Spot Weld Parts 14.7					Assemble Parts with Structural 14.8					Fasten Sheet Metal by Bonding 14.9																			
	1					1					1																			

COIN DIMPLING 15	Describe Work Order Procedures and Specifications 15.1	Describe Materials to be Dimpled 15.2	Explain Dimpling Equipment 15.3	Describe Quality Control 15.4
	2	2	2	2
COLD WORKING HOLES 16	Describe Split Sleeve Method 16.1	Demonstrate Tools and Equipment 16.2		
	2	2		
SPOT FACING 17	Explain Reason for Spot Facing 17.1	Demonstrate Spot Facing Tools and Equipment 17.2	Describe Quality Control 17.3	
	2	2	2	
REAMING 18	Explains Reasons for Reaming 18.1	Demonstrate Reaming Tools and Equipment 18.2	Describe Quality Control 18.3	
	2	2	2	
TEMPORARY & PERMANENT FASTNER INSTALLATION 19	Describe Temporary Fastener 19.1	Demonstrate Temporary Fastener Installation 19.2	Describe Permanent Fasteners 19.3	Demonstrate Permanent Fastener Installation 19.4
	2	2	2	2
TORQUING 20	Review Torquing Principles 20.1	Describe Torque Wrench 20.2	Install and Torque Fasteners 20.3	
	2	2	2	

SAFETY DEVICES 21	Describe Safety Devices 21.1		Demonstrate Safety Practices and Procedures 21.2	
	2		2	
MANUFACTURER SPECIFIC FASTENERS 22	Describe Manufacturer's Specific Fasteners 22.1		Demonstrate the Installation of Fasteners 22.2	
	2		2	
PERMASWAGE 23	Describe Permaswage Fasteners 23.1		Demonstrate Permaswage Installation 23.2	
	2		2	
ELECTRICAL BONDING OF A/C 24	Discuss Reasons for Electrical Bonding of A/C 24.1	Describe Electrical Bonding of A/C 24.2	Demonstrate Electrical Bonding of A/C 24.3	
	2	2	2	
ALODINING 25	Review the Alodining Process 25.1	Explain Preparation Process 25.2	Explain Alodining and Unracking 25.3	Review Alodining Safety 25.4
	3	3	3	3
PRIMING & PAINTING 26	Review the Painting Process 26.1	Explain Preparation Processes 26.2	Demonstrate Painting Techniques 26.3	Review Painting Safety 26.4
	3	3	3	3

WINDOW & LENSES 27	Inspect Windows and Lenses	27.1			3		
	Demonstrate Sand Buff and Polish Windows/Lenses	27.2			3		
	Demonstrate Patching Windows/Lenses	27.3			3		
	Demonstrate Installing Windows/Lenses	27.4			3		
	Demonstrate a Fabric Lens	27.5			3		
NON-DESTRUCTIVE INSPECTIONS (NDI) 28	Discuss Inspection Procedures	28.1			3		
	Describe Visual Inspection	28.2			3		
	Demonstrate Liquid Penetrant	28.3			3		
	Demonstrate Eddy Current Inspection	28.4			3		
	Demonstrate Ultrasonic Inspection	28.5			3		
	Discuss Radiographic Inspection	28.6			3		
	Review Safety Issues	28.1			3		
PRESS BRAKE 29	Review Bend Allowance	29.1	1				
	Explain Press Brake Operation	29.2	1				
	Demonstrate Press Brake Operation	29.3	1				
FLUID LINES & CONDUIT 30	Refer to Technical Information	30.1			3		
	Identify/Label Lines and Fittings	30.2			3		
	Demonstrate Disassembling of Aircraft Systems	30.3			3		
	Select Materials and Fittings	30.4			3		
	Attach/Replace Fittings	30.5			3		
	Band Tubing as per Drawings/Sample	30.6			3		
	Demonstrate Fabrication of Flexible Hose Assemblies	30.7			3		
	Demonstrate Testing Assembly for Leakage	30.8			3		
COMPOSITE CONSTRUCTION 31	Discuss Principles of Composite Construction	31.1					
	Demonstrate Composite Construction	31.2					

Line	Competencies					
ADVANCED BLUEPRINT READING 32	Discuss Advanced Blueprint Details 32.1 (4)	Discuss and Compare Company Blueprint Standards 32.2 (4)	Discuss and Compare Manufacturers Blueprint Standards 32.3 (4)	Interpret Detailed Blueprints 32.4 (4)	Work with Manufacturers Drawings 32.5 (4)	
INTRO TO SHOP COMPUTER USE 33	Demonstrate Computer Access to Work Orders 33.1 (4)	Discuss Computers for Shop Control 33.2 (4)	Explain Shop Computers Regarding Latest Drawing and Revisions Latest E.O's and R.E.S.'s 33.3 (4)	Explain Specifications and Process Control and Q.A.S.P. 33.4 (4)		
MOULD MAKING 34	Discuss Principles of Mould Making 34.1 (4)	Fabricate Master Mould 34.2 (4)	Pull-off Mould From Master Model 34.3 (4)	Fabricate Cutting Pattern for Lay-up Piles 34.4 (4)	Prepare Piles for Wet/Pre-peg Lay-up 34.5 (4)	Demonstrate Mould Surface Preparation 34.6 (4)
AUTO CLAVE OPERATION 35	Discuss Operational Requirements 35.1 (4)	Demonstrate Equipment 35.2 (4)	Demonstrate Operating Procedures 35.3 (4)	Discuss Maintenance Requirements 35.4 (4)	Review Safety 35.5 (4)	
TEMPER INSPECTION 36	Review Temper Designations 36.1 (4)	Discuss Standards and Specifications 36.2 (4)	Review Hardness Testing 36.3 (4)	Review Conductivity Testing 36.4 (4)	Discuss Inspection Procedures 36.5 (4)	
GEOMETRIC TOLERANCING 37	Discuss Geometric Dimensioning and Tolerance 37.1 (4)	Explains Geometric Symbols 37.2 (4)				

PHOSPHORIC CHROMIC ACID ANODIZING **38**	Discuss Preparation Processes 38.1	Discuss the Anodizing Process 38.2		
	4	4		
PASSIVATION **39**	Discuss Reasons for Passivation 39.1	Demonstrate Process and Equipment 39.2	Describe IQC and Maintenance 39.3	Review Safety Requirement 39.4
	4	4	4	4
HYDRO-PRESS **40**	Explain Metal Forming Requirements 40.1	Demonstrate Hydro-press 40.2	Discuss Safety Precautions 40.3	
	4	4	4	
METAL BONDING **41**	Describe Metal Bonding 41.1	Discuss Metal Bonding Preparation 41.2	Demonstrate Metal Bonding Steps 41.3	Discuss Safety Precautions 41.4
	4	4	4	4
SHOT PEENING **42**	Describe Shot Peening Process 42.1			
	4			
QUALITY CONTROL **43**	Explain Quality Assurance 43.1	Discuss ISO 9000 43.2	Explain Quality Control Procedures 43.3	Explain Statistical Process Control 43.4
	4	4	4	4

METAL ROUTING 44	Describe Routing Principles 44.1	Demonstrate Hand Routing 44.2	Demonstrate Computer Controlled Router 44.3
	4	4	4

Training Topics and Suggested Time Allocation Level 1

Level 1		% of Time
Line 1	**INTRODUCTION TO APPRENTICSHIP**	**1%**
1.1	Describe the Training Program	
1.2	Discuss Provincial Accreditation	
1.3	Discuss the Transport Canada "S" License	
Line 2	**SHOP SAFETY**	**3%**
2.1	Identify Potential Health and Safety Hazards	
2.2	Comply with Safety Regulations	
2.3	Use Personal Protective Equipment	
Line 3	**TOOLS AND EQUIPMENT**	**9%**
3.1	Use and Maintain Tools and Equipment in a Safe Manner	
3.2	Select and Operate Hand Tools	
3.3	Select and Operate Power Tools	
3.4	Select and Operate Shop Equipment	
3.5	Select and Operate Measuring Tools	
Line 4	**TECHNICAL DRAWINGS**	**7%**
4.1	Refer to Applicable Drawings and Manuals	
4.2	Read and Interpret Technical Drawings	
4.3	Draw Shop Sketches	
Line 5	**TECHNICAL INFORMATION**	**2%**
5.1	Read Technical Drawings and Manuals	
5.2	Comply with Regulations and Directives	
Line 6	**APPLIED MATH/PHYSICS**	**9%**
6.1	Review Using the Imperial system of Measurement	
6.2	Review Conversion Between Decimals and Fractions (both ways)	
6.3	Review and Perform Area Calculations	
6.4	Review and Perform Volume Calculations	
6.5	Review Ratio and Proportions Problems	
6.6	Review Lay-out and Cutting Calculation Procedures	
6.7	Review Degree, Minute and Second (DMS) Angular Measurement	
6.8	Review Calculations, Unknown Quantities in Right Angle Triangles Using Trigonometry Function	
6.9	Review Chemical Nature of Matter	
6.10	Review Physical Nature of Matter	
6.11	Review Computed Weight and Balances	
6.12	Review Simple Machines	
6.13	Review Force, Stress and Strain	
6.14	Describe Newton's Laws	
Line 7	**BASIC METALLURGY**	**4%**
7.1	Describe Ferrous Metals	
7.2	Describe Non-ferrous Metals	

Level 1		% of Time
Line 8	**AERO DYNAMICS**	**5%**
8.1	Explain Why an Aircraft Can Fly	
8.2	Explain Lift, Thrust, Weight and Drag	
8.3	Explain Axes of Flight	
8.4	Explain Aircraft Control	
8.5	Describe the Consequences of Atmospheric Pressure on Flight	
Line 9	**AIRCRAFT STRUCTURE COMPONENTS AND FUNCTION**	**11%**
9.1	Describe the Salient Features of a Fixed Wing Aircraft	
9.2	Describe the Salient Features of a Rotary Wing Aircraft	
9.3	Describe Primary Flight Controls	
9.4	Describe the Secondary Flight Controls	
9.5	Describe Control Systems and Methods	
9.6	Describe Aircraft Engines and Propulsion Systems	
Line 10	**SHEET METAL FABRICATION**	**25%**
10.1	Lay Out Patterns/Templates	
10.2	Select Approve Materials	
10.3	Cut Materials to Size and Deburr	
10.4	Saw and Rout Sheet Metal	
10.5	Form Sheet Metal with Hand and Machine Tools	
10.6	Select Fasteners	
10.7	Lay Out Hole Patterns	
10.8	Drill, Ream and Countersink Holes	
10.9	Treat Fastener Holes with Anti-corrosion Compounds	
10.10	Use Temporary Fasteners	
10.11	Set and Buck Rivets	
10.12	Assemble Parts with Structural Fasteners	
10.13	Punch and Drill Sheet Metal	
10.14	Dimple/Countersink Sheet Metal	
10.15	Heat Treat Rivets	
10.16	Trim and Fit Parts	
10.17	Disassemble Components and Parts	
10.18	Apply Corrosion Protection	
Line 11	**CORROSION CONTROL**	**8%**
11.1	Identify Condition for Corrosion	
11.2	Describe Types of Corrosion	
11.3	Describe Treatment for Aluminum Alloys	
11.4	Describe Treatment for Steel Alloys	
11.5	Describe Treatment of Magnesium Alloys	
11.6	Describe Water Displacing Compounds	
11.7	Describe Leveling Compounds	
11.8	Apply Corrosion Protection	
Line 12	**SEALING**	**3%**
12.1	Refer to Technical Information	
12.2	Prepare Surfaces and Mask of Sealing Areas	
12.3	Select Sealants	
12.4	Demonstrate Mixing Sealants	
12.5	Demonstrate Applications of Sealants to Seams and Joints and Fasteners	

Level 1		% of Time
Line 13	**HEAT TREATMENT**	**4%**
13.1	Explain Heat Treatment of Sheet Aluminum	
13.2	Describe Heat Treatment of Steel	
13.3	Explain Heat Treatment of Rivets	
Line 14	**SPECIAL FASTENER INSTALLATION AND PROCESSES**	**9%**
14.1	Install Standard and Special Fasteners	
14.2	Install Panel and Cowling Fasteners	
14.3	Install Blind Nuts	
14.4	Install Blind Nuts and Rivets	
14.5	Cold-work Fastener Holes	
14.6	Flap Peen Large Holes	
14.7	Bond/Spot Weld Parts	
14.8	Assemble Parts with Structural Fasteners	
14.9	Fasten Sheet Metal by Bonding	
	Total Percentage for Aircraft Structural Technician Level 1	**100%**

Training Topics and Suggested Time Allocation Level 2

Level 2		% of Time
Line 15	**COIN DIMPLING**	**15%**
15.1	Describe Work Order Procedures and Specifications	
15.2	Describe Materials to be Dimpled	
15.3	Explain Dimpling Equipment	
15.4	Describe Quality Control	
Line 16	**COLD WORKING HOLES**	**6%**
16.1	Describe Split Sleeve Method	
16.2	Demonstrate Tools and Equipment	
Line 17	**SPOT FACING**	**4%**
17.1	Explain Reason for Spot Facing	
17.2	Demonstrate Spot Facing Tools and Equipment	
17.3	Describe Quality Control	
Line 18	**REAMING**	**13%**
18.1	Explain Reason for Reaming	
18.2	Demonstrate Reaming Tools and Equipment	
18.3	Describe Quality Control	
Line 19	**TEMPORARY AND PERMANENT FASTENER INSTALLATION**	**29%**
19.1	Describe Temporary Fastener	
19.2	Demonstrate Temporary Fasteners Installation	
19.3	Describe Permanent Fasteners	
19.4	Demonstrate Permanent Fasteners Installation	
Line 20	**TORQUING**	**6%**
20.1	Review Torqueing Principles	
20.2	Describe Torque Wrench	
20.3	Install and Torque Fasteners	
Line 21	**SAFETY DEVICES**	**6%**
21.1	Describe Safety Devices	
21.2	Demonstrate Safety Practices and Procedures	
Line 22	**MANUFACTURER'S SPECIFIC FASTENERS**	**1%**
22.1	Describe Manufacturer's Specific Fasteners	
22.2	Demonstrate the Installation of Fasteners	
Line 23	**PERMASWAGE**	**9%**
23.1	Describe Permaswage Fasteners	
23.2	Demonstrate Permaswage Installation	

Level 2		% of Time	
Line 24	**ELECTRICAL BONDING OF A/C**	**11%**	
24.1	Discuss Reasons for Electrical Bonding of A/C		
24.2	Describe Electrical Bonding of A/C		
24.3	Demonstrate Electrical Bonding of A/C		
	Total Percentage for Aircraft Structural Technician Level 2	**100%**	

Training Topics and Suggested Time Allocation Level 3

Level 3		% of Time
Line 25	**ALODINING**	**11%**
25.1	Review the Alodining Process	
25.2	Explain Preparation Process	
25.3	Explain Alodining and Un-racking	
25.4	Review of Alodining Safety	
Line 26	**PRIMING AND PAINTING**	**8%**
26.1	Review the Painting Process	
26.2	Explain Preparation Process	
26.3	Demonstrate Painting Technique	
26.4	Review Painting Safety	
Line 12	**SEALANTS**	**7%**
12.6	Review the Sealing Process	
12.7	Explain Preparation Process	
12.8	Demonstrate Sealing Processes	
12.9	Review Sealing Safety	
Line 27	**WINDOWS AND LENSES**	**19%**
27.1	Inspect Windows and Lenses	
27.2	Demonstrate Sand, Buff and Polish Windows/Lenses	
27.3	Demonstrate Patching Windows/Lenses	
27.4	Demonstrate Installing Windows/Lenses	
27.5	Fabricating a Plastic Lens	
Line 28	**NONDESTRUCTIVE INSPECTION (NDI)**	**16%**
28.1	Discuss Inspection Procedures	
28.2	Describe Visual Inspection	
28.3	Demonstrate Liquid Penetrant	
28.4	Demonstrate Eddy Current Inspection	
28.5	Demonstrate Ultrasonic Inspection	
28.6	Discuss Radiographic Inspection	
28.7	Review Safety Issues	
Line 29	**PRESS BRAKE**	**12%**
29.1	Review Bend Allowance	
29.2	Explain Press Brake Operation	
29.3	Demonstrate Press Brake Operation	
Line 13	**HEAT TREATMENT**	**6%**
13.4	Review Heat Treatment Aluminum Alloys	
13.5	Demonstrate Air Furnace	
13.6	Demonstrate Salt Bath	
13.7	Review Safety Requirements	
Line 30	**FLUID LINES AND CONDUITS**	**21%**
30.1	Refer to Technical Information	

Level 3		% of Time	
30.2	Identify/Label Lines and Fittings		
30.3	Demonstrate Disassembling of Aircraft Systems		
30.4	Select Materials and Fittings		
30.5	Attach/Replace Fittings		
30.6	Band Tubing as Per Drawing/Sample		
30.7	Demonstrate Fabrication of Flexible Hose Assemblies		
30.8	Demonstrate Testing Assembly for Leakage		
	Total Percentage for Aircraft Structural Technician Level 3	**100%**	

Training Topics and Suggested Time Allocation Level 4

Level 4		% of Time
Line 31	**COMPOSITE CONSTRUCTION**	**10%**
31.1	Discuss Principles of Composite Construction	
31.2	Demonstrate Composite Construction	
Line 32	**ADVANCED BLUEPRINT READING**	**14%**
32.1	Discuss Advanced Blueprint Details	
32.2	Discuss and Compare Company Blueprint Standards	
32.3	Discuss and Compare Manufacturers Blueprint Standards	
32.4	Interpret Detailed Blueprints	
32.5	Work with Manufacturer's Drawings	
Line 33	**INTRO TO SHOP COMPUTER USE**	**7%**
33.1	Demonstrate Computer Access to Work Orders	
33.2	Discuss Computers for Shop Control	
33.3	Explain Shop Computers Regarding Latest Drawings and Revisions Latest Eos and RESs	
33.4	Explain Specifications and Process Control and QASP	
Line 34	**MOULD MAKING**	**6%**
34.1	Discuss Principles of Mould Making	
34.2	Fabricate Master Model	
34.3	Pull off Mould From Master Model	
34.4	Fabricate Cutting Pattern for Lay-up Piles	
34.5	Prepare Piles for Wet/Pre-preg Lay-up	
34.6	Demonstrate Mould Surface Preparation	
Line 35	**AUTO CLAVE OPERATION**	**11%**
35.1	Discuss Operational Requirements	
35.2	Demonstrate Equipment	
35.3	Demonstrate Operating Procedures	
35.4	Discuss Maintenance Requirements	
35.5	Review Safety	
Line 36	**TEMPER INSPECTION**	**7%**
36.1	Review Temper Designations	
36.2	Discuss Standards and Specifications	
36.3	Review Hardness Testing	
36.4	Review Conductivity Testing	
36.5	Discuss Inspection Procedures	
Line 37	**DEOMETRIC TOLERANCING**	**10%**
37.1	Discuss Geometric Dimensioning and Tolerancing	
37.2	Explain Geometric Symbols	
Line 38	**PHOSPHORIC CHROMIC ACID ANODIZING**	**6%**
38.1	Discuss Preparation Process	
38.2	Discuss the Anodizing Process	

Level 4		% of Time
Line 39	**PASSIVATION**	**4%**
39.1	Discuss Reasons for Passivation	
39.2	Demonstrate Process and Equipment	
39.3	Discuss IQC and Maintenance	
39.4	Review Safety Requirements	
Line 40	**HYDRO PRESS**	**3%**
40.1	Explain Metal Forming Requirements	
40.2	Demonstrate Hydro-press	
40.3	Discuss Safety Precautions	
Line 41	**METAL BONDING**	**6%**
41.1	Describe Metal Bonding	
41.2	Discuss Metal Bonding Preparation	
41.3	Demonstrate Metal Bonding Steps	
41.4	Discuss Safety Precautions	
Line 42	**SHOT PEENING**	**5%**
42.1	Describe shot peening process	
Line 43	**QUALITY CONTROL**	**6%**
43.1	Explain Quality Assurance	
43.2	Discuss ISO 9000	
43.3	Explain Quality Control (QC) Inspection Procedures	
43.4	Explain Statistical Process Control	
Line 44	**METAL ROUTING**	**5%**
44.1	Describe Routing Principles	
44.2	Demonstrate Hand Routing	
44.3	Demonstrate Computer Controlled Router	
	Total Percentage for Aircraft Structural Technician Level 4	**100%**

Section 3

PROGRAM CONTENT

Aircraft Structural Technician

Level 1

Aircraft Structural Technician

Line (GAC): 1 INTRODUCTION TO APPRENTICSHIP

Competency: 1.1 Describe the Training Program

Objectives

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

LEARNING TASKS	CONTENT

1. Explain the format of the course	• Length of the course
	  ○ main topics
	  ○ block system
	  ○ tests
	  ○ attendance
	  ○ punctuality
	  ○ policies, rules and regulations
	  ○ tour the facility

2. Aviation Industry careers	• Occupation list • Employers

3. Describe the different aspects of the aviation industry	• Industry requirements
	• Manufacturing
	• Re-manufacturing
	• Repair and overhaul facilities
	• Maintencance facilities
	  ○ airlines
	  ○ general aviation
	  ○ helicopters

Line (GAC): 1 INTRODUCTION TO APPRENTICESHIP

Competency: 1.2 Discuss Provincial Accreditation

Objectives

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

LEARNING TASKS	CONTENT
1. Apprenticeship	• Length • Technical training • Training record book
2. Certificate of Qualification	• Time spent in trade • Mandatory tasks • Log book • TQ examination

Line (GAC): 1 INTRODUCTION TO APPRENTICESHIP

Competency: 1.3 Discuss the Transport Canada "S" License

Objectives

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

LEARNING TASKS	CONTENT
1. Describe Transport Canada	• Government regulatory body • Authority • A/C documents • Work requirements • Licenses
2. Describe T.C. licenses	• AME S • AME M • AME E • AME P
3. Describe AME 'S' License categories	• S31 • S32 • S33 • S34
4 Discuss CARS and the new licensing	• Licenses

Line (GAC): 2 SHOP SAFETY

Competency: 2.1 Identify Potential Health and Safety Hazards

Objectives

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

LEARNING TASKS	CONTENT
1. Identify potential hazards	• Toxic and corrosive substances/fumes • Skin and eye irritation • Dermatitis • Explosive substances/fumes • Compressed air • Dust • Excessive noise level • Electrical/mechanical hazards
2. Describe potential work hazards when using hand, power and machine tools	• Wrenches • Torches • Power tools • Cutting tools • Grinding tools • Hydraulic presses
3. Explain purpose of WHMIS	• "What's WHMIS?" Manual • WHMIS Participant Workbook
4. Describe types of hazardous materials and their compositions	• Compressed gases • Flammable/toxic fluids • Flammable solids
5. Describe proper storing and disposal of hazardous materials	• Workplace Hazardous Materials • Information System (WHMIS) • Storage facilities • Disposal requirement • Material Safety Data Sheets (MSDS) • Labelling

Line (GAC): 2 SHOP SAFETY

Competency: 2.2 Comply With Safety Regulations

Objectives

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

LEARNING TASKS	CONTENT
1. Describe provisions for reporting accidents and fires	• WHMIS • WCB regulations • First Aid Station recording log • Local fire regulations • In-house fire alarm systems • Report to supervisor
2. Canada Labour Code	• Regulations
3. Local Shop Safety Rules	• Safe Work Practices • Jurisdiction having authority

Line (GAC): 2 SHOP SAFETY

Competency: 2.3 Use Personal Protective Equipment

Objectives

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

LEARNING TASKS	CONTENT
1. Describe types and applications of personal protective equipment	• Safety glasses/goggles • Face shield • Respirator • Gas mask • Ear muffs • Gloves • Safety apron • Coveralls • Safety shoes/boots
2. Describe types and application of safety equipment	• Air evaculation system • Saw blade guards • Switch guards • Emergency exits/fire doors • Life preservers/vests • Workstand • Guardrails • Safety belts/lines • Lockout procedure
3. Select required safety equipment to suit job assignment	• Evaluation of potential hazards • Effects of prolonged high noise levels
4. Describe confined space entry procedures	• WHMIS regulations • Canada Labour Code

5. Describe emergency safety equipment	• Fire extinguishers • Fire blankets • Fire hoses • Stretchers • First aid box/station • Emergency shower • Eye wash station/fountain • Repirator/oxygen

Line (GAC): 3 TOOLS AND EQUIPMENT

Competency: 3.1 Use and Maintain Tools and Equipment in a Safe Manner

Objectives

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

LEARNING TASKS	CONTENT
1. Identify defective and damaged tools	• Mushroomed hammer peens • Mushroomed chisel heads • Mushroomed punches • Broken/split handles • Frayed cables • Bulged hoses • Electrical plugs • Grounding cables/plugs
2. Identify hazards associated with power tools	• Torque • Kickback • Vibration • Electrical shorts • Air exhaust • Sparks
3. Describe types and applications of hand tools	• Hammers • Chisels • Punches • Saws • Wrenches • Screwdrivers • Awls • Clamps • Vise

Line (GAC): 3 TOOLS AND EQUIPMENT

Competency: 3.2 Select and Operate Hand Tools

Objectives

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

LEARNING TASKS	CONTENT

1. Describe difference North American, British and Metric hand and cutting tools sizing	• WRENCH OPENING CHARTS
	  ○ North American
	  ○ British
	  ○ Metric
	• DRILL CHARTS
	  ○ Imperial (inches)

2. Describe types of applications of hand tools	• Hammer • Chisel • Punches • Pliers • Hacksaw • Files/Rasps • Wrenches • Screwdriver • Awl • Metal Snips • Clamps • Vise

Line (GAC): 3 TOOLS AND EQUIPMENT

Competency: 3.2 Select and Operate Hand Tools (cont'd)

Objectives

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

LEARNING TASKS	CONTENT
3. Use hand tools	• Shop demonstration of proper use of hand tools ○ Hammer ○ Chisel ○ Punches ○ Pliers ○ Hacksaw ○ Files/Rasps ○ Wrenches ○ Screwdrivers ○ Awls ○ Metal ○ Clamps ○ Vise
4. Describe types of cutting tools required to repair aircraft structures	• CHISEL TOOTH COMMON TO ALL CUTTING TOOLS ○ Saw ○ Files/Rasps ○ Twist drill ○ Router bit ○ Burr ○ Reamer
5. Use cutting tools	• Shop demonstration of proper use of cutting tools

Line (GAC): 3 TOOLS AND EQUIPMENT

Competency: 3.3 Select and Operate Power Tools

Objectives

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

LEARNING TASKS	CONTENT
1. Describe types and purpose of power tools used to repair aircraft structures	• Portable electric/pneumatic drills • Portable grinders/sanders • Portable riveter • Router
2. Use power tools	• Shop demonstration of proper use of power tools

Line (GAC): 3 TOOLS AND EQUIPMENT

Competency: 3.4 Select and Operate Shop Equipment

Objectives

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

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LEARNING TASKS	CONTENT
1. Describe types and purpose of machine tools	• Bench drill • Band/Circular saw • Bench riveter • Squaring shear • Throttles shear • Slip roller • Bending brake • Stretcher/Shrinker • Dimpler (Radius and Coin)
2. Use shop equipment	• Shop demonstration of proper use of shop equipment

Line (GAC): 3 TOOLS AND EQUIPMENT

Competency: 3.5 Select and Operate Measuring Tools

Objectives

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

LEARNING TASKS	CONTENT
1. Select and demonstrate proper operation of measuring devices used for repairing aircraft structures	• Rigid/Flexible scale • Straight edge • Square • Tape measure • Vernier calliper • Outside micrometer • Inside micrometer • Optical micrometer • Depth gauge • Thermometer • Pyrometer • Protractor • Vacuum gauge • Pressure gauge • Dividers • Trammel points • Weighing scales • Torque wrench

Line (GAC): 4 TECHNICAL DRAWINGS

Competency: 4.1 Refer to Applicable Drawings and Manuals

Objectives

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

LEARNING TASKS	CONTENT
1. Describe information on technical drawings	• Title block on drawing for various information • Flag notes • Tolerances • Finishing standards • Fasteners codes
2. Identify location of information in manufacturer's/vendor's publications	• Manufacturer/vendor publications
3. Locate information in manufacturer's/vendor's publications	• Sample technical drawings
4. Locate information in manufacturer's/vendor's publications	• Manufacturer/vendor publications
5. Draw and orthographic projection	• First angle projection • Third angle projection

Line (GAC): 4 TECHNICAL DRAWINGS

Competency: 4.2 Read and Interpret Technical Drawings

Objectives

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

LEARNING TASKS	CONTENT
1. Describe types of technical drawings required for sheet metal fabrication	• Orthographic drawing • Production drawing • Detail drawing • Assembly drawing • Installation drawing • Sectional drawing • Exploded-View drawing
2. Describe methods of illustration used to assist in visualizing three dimensional objects	• Isometric projection • Oblique view • Perspective
3. Identify minimum and maximum metal removal standards	• Tolerance standards • Structural Repair Manual • Overhaul Manual • Service/Maintenance Manual • Engineering Orders • Production Orders

Line (GAC): 4 TECHNICAL DRAWINGS

Competency: 4.3 Draw Shop Sketches

Objectives

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

LEARNING TASKS	CONTENT
1. Describe information that must be included in shop sketch	• All information required to fabricate a part • All information required to make a repair • Name of part • Material specifications • Grain direction • Personal identification • Date • Work Order/Job Card number
2. Use utensils required to make accurate shop sketches	• Graph paper • Measuring scale • Ruler • Compass • Pencil
3. List projections to make shop sketches	• Orthographic • Isometric

Line (GAC): 5 TECHNICAL INFORMATION

Competency: 5.1 Read Technical Drawings and Manuals

Objectives

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

LEARNING TASKS	CONTENT
1. List sources of information to fastener installation	• Vendors' instructions • SRM's • Manufacturing process controls • Standard practices
2. Describe where information for fastener installation is located on technical drawings	• National Aerospace Standard – 523 • Material list • Flag notes

Line (GAC): 5 TECHNICAL INFORMATION

Competency: 5.2 Comply with Regulations and Directives

Objectives

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

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LEARNING TASKS	CONTENT
1. List sources of regulations and directives applicable to assembly of parts and components	• Manufacturers' process controls • Maintenance manuals • SRM's
2. Explain why certification is necessary for the completed assemblies and components	• Materials Tracing from component to source by way of suppliers • All materials used in component manufacture and repair must be traceable • Liability

Line (GAC): 6 APPLIED MATH/PHYSICS

Competency: 6.1 Review Using the Imperial System of Measurement

Objectives

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

LEARNING TASKS	CONTENT
1. Explain the Imperial System of Measurement	• Inches, feet, yards, miles • Fractions, decimals and decimal equivalents • History • Countries that use it • Aviation problems in Imperial units for length, velocity and weight

Line (GAC): 6 APPLIED MATH/PHYSICS

Competency: 6.1 Review Conversion Between Decimals and Fractions (Both Ways)

Objectives

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

LEARNING TASKS	CONTENT
1. Solve decimal/fraction conversion problems related to hardware components	• A/C hardware call outs • Fractional hardware • Decimal equivalents
2. Solve decimal/fraction conversion problems related to machine tools	• Fractional drill bits • Thread call outs • Clearance drills • Interference fit

Line (GAC): 6 APPLIED MATH/PHYSICS

Competency: 6.3 Review and Perform Area Calculations

Objectives

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

LEARNING TASKS	CONTENT
1. Solve for the total area	• Circles • Quadrilaterals • Triangles
2. Solve for the total area of aircraft-related layout patterns, using triangles, quadrilaterals and circles	• Material requirements • Wing area • Rectangular • Tapered • Delta • Curved • Rotor disc area of helicopter given rotor blade length • Control surfaces

Line (GAC): 6 APPLIED MATH/PHYSICS

Competency: 6.4 Review and Perform Volume Calculations

Objectives

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

LEARNING TASKS	CONTENT
1. Solve the total volume	• Cube • Cylinder

Line (GAC): 6 APPLIED MATH/PHYSICS

Competency: 6.5 Review Ratio and Proportions Problems

Objectives

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

LEARNING TASKS	CONTENT
1. Review math mathematical procedure	• Addition and subtraction • Factors • Parentheses • Multiplication and division • Order of operations
2. Solve hydraulic piston/actuator problems	• Hydraulic system ○ Piston and acuator diameters • Aspect ratio • Mean chord
3. Solve mechanical level problems	• See single machines section

Line (GAC): 6 APPLIED MATH/PHYSICS

Competency: 6.6 Review Layout and Cutting Calculation Procedures

Objectives

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

LEARNING TASKS	CONTENT
1. Design a cutting template with minimum wastage	• Edge clamping • Nesting • Cutting capabilities • Material requirements • Wastage by weight • Cost by weight

Line (GAC): 6 APPLIED MATH/PHYSICS

Competency: 6.7 Review Degree, Minute and Second (DMS) Angular Measure

Objectives

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

LEARNING TASKS	CONTENT
1. Solve problems involving addition and subtraction of degrees, minutes and seconds	• Angle of incidence • Flight control ranges of motion • Bend calculations

Line (GAC): 6 APPLIED MATH/PHYSICS

Competency: 6.8 Review Calculations, Unknown Quantities in Right Angle Triangles Using Trigonometry Function

Objectives

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

LEARNING TASKS	CONTENT
1. Solve actuator movement problems	• Flight control actuator movement
2. Solve for unknowns in right triangle using trigonometric functions	• Two sides given • Angles and side given • Bend allowance K chart

Line (GAC): 6 APPLIED MATH/PHYSICS

Competency: 6.9 Review Chemical Nature of Matter

Objectives

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

LEARNING TASKS	CONTENT

1. Describe the chemical nature of matter	• Basic theory of atomic structure
	  ○ Electrons
	  ○ Protons
	  ○ Neutrons
	• Elements and compounds
	• Pure metals and alloys

Line (GAC): 6 APPLIED MATH/PHYSICS

Competency: 6.10 Review Physical Nature of Matter

Objectives

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

LEARNING TASKS	CONTENT
1. Describe the relationship between heat and energy	• Energy • Heat
2. Describe the effects of heat on matter	• Solids • Liquids • Gases
3. Describe the effects of heat on phase change	• Phase change • Latent heat

Line (GAC): 6 APPLIED MATH/PHYSICS

Competency: 6.11 Review Computed Weight and Balances

Objectives

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

LEARNING TASKS	CONTENT
1. Perform weight and balance calculations	• Weight • Mass • Arm • Movement • Weight and arm • Torque • Longitudinal centre of gravity of an aircraft given weight and arms from three scale locations • Lateral C of G of an aircraft given weight and arms from three scale locations

Line (GAC): 6 APPLIED MATH/PHYSICS

Competency: 6.12 Review Simple Machines

Objectives

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

LEARNING TASKS	CONTENT
1. Describe the lever	• Fulcrum location and mechanical advantage • Relationship between arm, force and torque • Mechanized advantage of various level configuarations
2. Describe pulleys	• Pulley uses • Mechanical advantage of single and multi-pulley systems
3. Describe the inclined plane	• Advantage of inclined planes • Thread of worm gear as inclined plane

Line (GAC): 6 APPLIED MATH/PHYSICS

Competency: 6.13 Review Force, Stress and Strain

Objectives

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

LEARNING TASKS	CONTENT

1. Describe the five basic forces	• Compression
	  ○ Compressive strength
	• Tension
	  ○ Tensile strength
	• Bending
	• Shear
	• Torsion

2. Contrast stress and strain	• Stress (internal force that resists deformation) • Strain (the deformation of the material caused by external load)

Line (GAC): 6 APPLIED MATH/PHYSICS

Competency: 6.14 Describe Newton's Laws

Objectives

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

LEARNING TASKS	CONTENT
1. State Newton's 1st Law	• A body at reast tends to stay at rest • A body in motion tends to stay in motion in a straight line unless forced to changed by an external force • A/C stability
2. State Newton's 2nd Law	• The acceleration of a body is directly proportional to the mass of the body
3. State Newton's 3rd Law	• For every action there is an equal and opposite. There is an equal and opposite reaction. • 3rd Law as it applies to the thrust of an aircraft

Line (GAC): 7 BASIC METALLURGY

Competency: 7.1 Describe Ferrous Metals

Objectives

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

LEARNING TASKS	CONTENT
1. Review terms used to describe metal characteristics	• Hardness • Tensile strength • Ductility • Malleability • Elasticity • Toughness
2. Describe ferrous metals	• Characteristics and properties • Grain structure • Steel production • SAE/AISI identification system • Aircraft specific ferrous metals • Changing properties • Shop methods of identifying steels • Steel coating

Line (GAC): 7 BASIC METALLURGY

Competency: 7.2 Describe Non-Ferrous Metals

Objectives

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

LEARNING TASKS	CONTENT
1. Describe non-ferrous metals	• Aluminum • Titanium • Magnesium • Cadmium • Copper • Zinc
2. Describe aluminum and its alloys	• Aluminum and its alloys • Characteristics and properties • Grain structure • Aluminum production • Identification codes with emphasis on aluminum association • Aircraft specific aluminum alloys • Cladding • Changing properties
3. Compare ferrous and non-ferrous metals in A/C construction	• Strength • Weight • Corrosion resistance • Fabrication considerations • Cost
4. Identify ferrous and non-ferrous metals, aluminum alloys, mild steel, galvanized steels, hicarbon steels, SAW 4130, copper, brass, stainless steel, titanium	• Surface appearance • Bend test • Magnetism test • Acid test • Typical identification markings • Spark test
5. Reference technical information regarding materials	• Weight • Strength • Corrosion resistance

- Cost

Line (GAC): 8 AERO DYNAMICS

Competency: 8.1 Explain Why an Aircraft Can Fly

Objectives

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

LEARNING TASKS	CONTENT
1. Explain how an aircraft wing creates lift	• Bernoulli's principle • Newton's third law • Pressure differential • Airfoils
2. Explain how a helicopter rotor blade creates lift and forward motion	• Blade airfoils • Rotor system terminology • Types of rotor systems • Forces acting on the rotor

Line (GAC): 8 AERO DYNAMICS

Competency: 8.2 Explain Lift, Thrust, Weight and Drag

Objectives

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

LEARNING TASKS	CONTENT
1. Explain the forces acting on an aircraft in flight	• Lift • Thrust • Weight • Drag

Line (GAC): 8 AERO DYNAMICS

Competency: 8.3 Explain Axes of Flight

Objectives

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

LEARNING TASKS	CONTENT
1. Describe the 3 axes of flight	• Pitch • Roll • Yaw

Line (GAC): 8 AERO DYNAMICS

Competency: 8.4 Explain Aircraft Control

Objectives

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

LEARNING TASKS	CONTENT
1. Describe the main control system for each axis of flight	• Aileron • Elevator • Rudder
2. Describe the effect of tabs on flight controls	• Trim tabs • Balance tabs • Servo tabs • Antiservo tabs • Spring tabs • Adjustable stabilizer

Line (GAC): 8 AERO DYNAMICS

Competency: 8.5 Describe the Consequences of Atmospheric Pressure on Flight

Objectives

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

LEARNING TASKS	CONTENT
1. Explain atmospheric characteristics	• Earth's atmosphere • Pressure • Density • Temperature • Compressibility
2. Explain consequences of altitude change	• Jet efficiency • Pressurized A/C • A/C heating • Reciprocating engines • ICAO standard atmosphere chart

Line (GAC): 9 AIRCRAFT STRUCTURE COMPONENTS AND FUNCTIONS

Competency: 9.1 Describe the Salient Features of a Fixed Wing Aircraft

Objectives

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

LEARNING TASKS	CONTENT

1. Describe the five major features of an airplane and their functions	• Lifting structures
	  ○ Types of airfoils
	  ○ Types of wing construction
	  ○ Types of wing attachment
	  ○ Types of wing control configuration
	• Fuselage structures
	  ○ Construction
	  ○ Parts and layout
	  ○ Types of configurations
	• Control devices
	  ○ Aileron and construction
	  ○ Elevators
	  ○ Rudders
	  ○ Flaps
	  ○ Control surface construction
	  ○ Control configurations
	  ○ Secondary control devices
	• Ground support structure
	  ○ Wheels
	  ○ Float structures
	• Power plant supports
	  ○ Power plant configuration
	  ○ Engine mounts
	  ○ Pylons, firewalls, cowling

Line (GAC): 9 AIRCRAFT STRUCTURE COMPONENTS AND FUNCTIONS

Competency: 9.2 Describe the Salient Features of a Rotary Wing Aircraft

Objectives

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

LEARNING TASKS	CONTENT
1. Describe the major features of a rotary wing and their functions	• Types of construction • Engine placement • Reason for construction of tail booms • Fuselage construction for tranmission mount • Main rotor • Types of systems • Types of construction • Forces acting on a system • Flight characteristics of rotor craft • Anti torque systems need types components and constructions
2. Rotorcraft controls	• Describe and discuss controls • Cyclic • Collective • Swashplate linear to rotary action • Stabilizers • Antivibration devices etc.

Line (GAC): 9 AIRCRAFT STRUCTURE COMPONENTS AND FUNCTIONS

Competency: 9.3 Describe Primary Flight Controls

Objectives

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

LEARNING TASKS	CONTENT
1. Describe three primary control systems as to location, construction, movement, effect on control, configurations	• Ailerons • Elevators • Rudder

Line (GAC): 9 AIRCRAFT STRUCTURE COMPONENTS AND FUNCTIONS

Competency: 9.4 Describe the Secondary Flight Controls

Objectives

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

LEARNING TASKS	CONTENT
1. Describe secondary flight controls as to location on different A/C, operation, effect on flight, construction	• Flaps • Trim tabs • Air brakes • Spoilers • Vortex generators

Line (GAC): 9 AIRCRAFT STRUCTURE COMPONENTS AND FUNCTIONS

Competency: 9.5 Describe Controls Systems and Methods

Objectives

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

LEARNING TASKS	CONTENT
1. Describe cable control systems	• Various systems • Components • Advantages and disadvantages
2. Describe push rod systems	• Various systems • Components • Advantages and disadvantages
3. Describe hydraulic-assisted systems	• Types of power assisted controls • Components • Advantages and disadvantages
4. Describe artificial feel systems	• Control feel explanation • Methods • Reasons for adding artificial feel

Line (GAC): 9 AIRCRAFT STRUCTURE COMPONENTS AND FUCTIONS

Competency: 9.6 Describe Aircraft Engines and Propulsion Systems

Objectives

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

LEARNING TASKS	CONTENT
1. Describe A/C reciprocating engines	• Classified by cylinder arrangement • Liquid cooled • Air cooled • 2 stroke • 4 stroke • Simplified design, construction operation
2. Describe A/C turbine engines	• Types of turbine • Turbo shaft • Turbo prop • Turbo jet • Turbo fan • Simplified design, construction, operation
3. Describe A/C propellers	• Nomenclature • Theory • Types
4. Describe engine controls and instrumentation	• Throttle • Prop pitch • Mixture • Tach • Cylinder temp • Oil pressure • Oil temperature • Manifold pressure • Exhaust gas temperature

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.1 Lay Out Patterns/Templates

Objectives

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

LEARNING TASKS	CONTENT
1. Describe the advantages of making a template for new parts	• Serves as a guide or model for layout • Time savings when making more than one part • Can be made from cheaper materials • Can be stored for future uses
2. List materials from which templates can be fabricated	• Mylar • Sheet aluminum • Sheet steel • Sheet plastic • Cardboard • Pressboard • Plywood • Stiff paper
3. Determine the developed length of bend or curved sheet metal parts	• Material thickness plus side plus bend allowance • Repeat for each bend or, • Roll over formed sample part onto flat patter and transfer dimensions and holes etc.
4. Transfer dimensions from drawings to templates	• Measuring devices • Lay-out tools • Marking tools
5. Label complete template	• Name of part • Material specifications • Grain direction • Work Order/Job Card number

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.2 Select Approved Materials

Objectives

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

LEARNING TASKS	CONTENT
1. Select material for fabricating sheet metal parts	• Same material as in sample part or approved substitution • Must have certification or release note/tag • Temper condition according to severity of forming • Appropriate grain direction
2. Verify thickness indicated on sheet metal	• Sample measurement along sheet edges with micrometer • Material specification verification

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.3 Cut Materials to Size and Deburr

Objectives

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

LEARNING TASKS	CONTENT
1. List hand tools used for cutting and shearing sheet metal to size	• Tin snip • Aviation snip • Hand nibbler • Hacksaw • Jigsaw • Cold chisel • Chassis punches
2. List portable power tools used for cutting and shearing sheet metal to size	• Slitting shear • Nibbler • Circular saw (Ketts saw) • Reciprocating saw • Router
3. List shop equipment used for cutting and shearing sheet metal to size	• Squaring shear • Throatless shear • Scroll shear • Fly cutter • Hole saw • Punches presses (single and rotary)
4. List tools and abrasives used to deburr and smooth cut sheet metal edges	• Files • Deburring scrapers • Aluminum wool • Abrasive nylon pads • Abrasive rubber compounds (Cratex)
5. Cut and deburr sheet metal	• Mark outline of part with template • Cut along outline • Leave marking lines on part • Shear with appropriate tool or equipment • Deburr and smooth cut edges

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.3 Cut Materials to Size and Deburr (cont'd)

Objectives

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

LEARNING TASKS	CONTENT
6. List materials which are sensitive to shearing	• Titanium • Stainless steel • Plastic laminates • Acrylics
7. Identify minimum and maximum metal removal standard	• Tolerance standards • Structural Repair Manual • Overhaul Manual • Service/Maintenance Manual • Engineering Orders • Productions Orders

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.4 Saw and Rout Sheet Metal

Objectives

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

LEARNING TASKS	CONTENT
1. Describe hand and machine tools used for sawing sheet metal	• Hacksaw • Circular saw (Ketts saw) • Reciprocating saw • Band saw • Hole saw/Fly-cutter
2. Describe hand and machine routers	• High-speed electric or air motor • Hand guided or machine mounted • Router bit has cutting teeth on side • Depth of cut controlled by adjustable base or table • Freehand or template routing

3. Saw sheet metal	• Mark cutting line on metal
	• Select fine tooth saw blade
	• Determine cutting speed
	• Back-up sheet metal to keep from clattering
	• Saw beside marked line on cut-off side
	• Hacksaw:
	  ○ Keep as many teeth as possible engaged by angling saw and press in forward stroke only
	• Circular Saw (Keets saw):
	  ○ Mark cutting line on metal
	  ○ Select fine tooth saw blade
	  ○ Secure sheet metal by clamping to work table
	  ○ Use straight edge as guide
	  ○ Cut in forward direction only
	  ○ Lubricate/cool saw blade periodically

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.4 Saw and Rout Sheet Metal (cont'd)

Objectives

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

LEARNING TASKS	CONTENT

3. Saw sheet metal (cont'd)	• Reciprocating saw:
	  ○ Mark cutting line on metal
	  ○ Select fine tooth saw blade
	  ○ Back-up sheet metal to keep from chattering
	  ○ Saw beside marked line on cut-off side
	• Band saw
	  ○ Mark cutting line on metal
	  ○ Select fine tooth saw blade
	  ○ Saw beside marked line on cut-off side
	  ○ Use straight edge as guide
	  ○ Cut in forward direction only
	  ○ Lubricate/cool saw blade periodically
	• Hole saw/Fly cutter
	  ○ Mark hole centre on sheet metal
	  ○ Centre punch
	  ○ Protect drill table with plywood pad
	  ○ Clamp sheet metal and plywood pad securely to drill table
	  ○ Drill pilot hole
	  ○ Select appropriate hole saw/fly cutter diameter
	  ○ Select slowest speed possible
	  ○ Start drill press

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.4 Saw and Rout Sheet Metal (cont'd)

Objectives

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

LEARNING TASKS	CONTENT
4. Route sheet metal	• Mark cutting line on sheet metal • Support sheet metal so that the cutting line is clear of table • Clamp sheet metal and support to table • Use straight edge as guide • Select appropriate router bit • Hold router firmly • Start router motor • Start form sheet metal edge or plunge cut • Lubricate/cool router bit periodically (sheet metal only!) • Stop router motor

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.5 Form Sheet Metal with Hand and Machine Tools

Objectives

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

LEARNING TASKS	CONTENT
1. Describe methods of forming sheet metal	• Beading • Bending • Crimping • Dimpling • Flanging • Joggling • Pressing • Rolling • Shrinking • Stamping • Stretching • Stretch forming
2. Describe shop equipment that produce straight bends in sheet metal	• Press brake • Cornice brake • Bar folding machine • Box/Pan/Finger brake • Slip roll former
3. Describe tools and shop equipment that produce compound curves in sheet metal	• Wood mallet • Plastic mallet • Rawhide hammer • Sandbag • Bumping hammer • Drop hammer • Hydro press • Shrinker • Stretcher • Stamping press • Stretch forming press • Crown roller (english wheel)

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.5 Form Sheet Metal with Hand and Machine Tools (cont'd)

Objectives

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

LEARNING TASKS	CONTENT
4. Explain terminology used in bending sheet metal	• Grain direction • Bend radius • Neutral axis • Mould line • Mould point • Bend tangent line • Setback • K-factor • Flat • Bend allowance
5. Determine from chart minimum bend radius for aircraft aluminum sheet metal	• Minimum Bend Radius Chart for various aircraft aluminum alloys • Locate alloy and temper line • Locate thickness row • Determine minimum bend radius at junction • Correction minimum bend radius according to grain direction
6. Determine setback for straight bends	• Calculate 90 degree bend setback ○ Bend radius plus sheet thickness (T) • Locate K-factor in K-chart for other than 90 degree bends
7. Determine bend allowance (BA) for straight bend	• Empirical formula ○ 90 degree bend allowance (B.A.) + (0.0078T + 0.01743R) • Bend Allowance Chart for other than 90 degree bends
8. Calculate sight line location	• Add bend radius to bend tangent line bend allowance side

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.5 Form Sheet Metal with Hand and Machine Tools (cont'd)

Objectives

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

LEARNING TASKS	CONTENT
9. Bend sheet metal part in cornice or box brake	• Mark slight line on sheet metal • Smooth edges of metal where bend is to occur • Select and install nose bar with appropriate radius • Adjust nose bar for material thickness • Insert sheet metal between nose bar and brake bed • Adjust depth of insertion so that forward end of nose bar and sight line are even • Clamp down nose bar with adequate pressure to hold sheet metal • Raise bending leaf to desired angle • Lower bending leaf • Check for bend angle • Overbend for spring back as required • Release nose bar
10. Form compound curves in sheet metal with sandbag	• Make depression in sandbag to approximate desired shape • Use round faced plastic hammer to bump sheet metal into depression • Periodically check formed metal against template • Anneal metal as required • Use planishing hammer to finish • Trim off surplus metal

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.5 Form Sheet Metal with Hand and Machine Tools (cont'd)

Objectives

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

LEARNING TASKS	CONTENT
11. Roll sheet metal in slip roller	• Wipe rollers clean • Adjust upper and lower rollers for material thickness • Start feeding sheet metal into rollers • Let sheet metal ride up on rear roller • Adjust rear roller to form sheet metal round • Repeat adjustment until proper dimension is formed
12. Joggle sheet metal and extruded angles	• Mark position of joggle • Clamp material into joggling dies • Apply pressure to joggling die • Measure difference of offset • Adjust as required

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.6 Select Fasteners

Objectives

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

LEARNING TASKS	CONTENT
1. List aircraft hardware specification standards	• AN • MS • NAS
2. Identify materials and/or type of aircraft fasteners by head markings	• SAE2330 • AA2024 • CRES
3. List thread standards used for aircraft fasteners	• NF • NC • Special threads • Metric
4. Describe classes of fit for fastener threads	• Class 1 – Loose fit • Class 2 – Free fit • Class 3 – Medium fit • Class 4 – Close fit
5. Identify fastener diameter and length from alphanumeric hardware specification number	• As required
6. Describe type and uses of aircraft fastener nuts	• Plain nuts • Check lock nuts • Castle nuts • Self-locking nuts • Shear tension nuts • Wing nuts
7. Classify common solid aircraft rivets by presence or absence of head markings	• Dimpled • Raised dot • Double dash • Raised cross • Plain head

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.6 Select Fasteners (cont'd)

Objectives

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

LEARNING TASKS	CONTENT
8 Select solid rivet head style, material composition, diameter and length from alphanumeric identification system	• First letter group – Hardware standard • First number group – Head style • Second letter group – Alloy composition • Second number group – Diameter • Third number group - Length

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.7 Layout Hole Patterns

Objectives

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

LEARNING TASKS	CONTENT
1. Describe layout and marking tools	• Scales (flexible and rigid) • Squares (combination and mechanics) • Dividers • Compass with non-graphite pencil • Trammel points • Scriber • Felt marking pen • Centre/Prick punch • Transfer punch • Hold finders
2. Explain reasons for minimum and maximum edge distance	• Minimum: bearing strength of material • Maximum: possible lifting of material edges
3. Select location of hole centre for minimum and maximum edge distance	• Minimum: not less than 2 hole diameters • Normal: 2 ½ times hole diameter • Maximum: not more than 4 hole diameters
4. Explain reasons for minimum and maximum pitch	• Minimum: weakening of material strength • Maximum: buckling of sheets
5. Explain the terms “Gauge” and “Transverse pitch”	• Gauge: distance of holes parallel in multi-row layout • Transverse pitch: distance of holes staggered in multi-row layout (should be 75% of fastener pitch)
6. Select location of hold centres for minimum and maximum pitch and gauge	• Minimum: typically not less than 3 hold diameters • Maximum: typically not more than 12 hold diameters • Special pitch specified by manufacturer

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.8 Drill, Ream and Countersink Holes

Objectives

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

LEARNING TASKS	CONTENT
1. List twist drill size standards	• Fractional sizes • Letter sizes • Number sizes • Metric (millimetres)
2. Check drills for correct diameter, proper sharpening and straightness	• Drill gauge • Drill point gauge • Surface plate
3. Apply suitable lubricant to twist drills and reamers	• Friction reduction and cooling with: • Water • Cutting oil • Cetyl alcohol (solid, paste and liquid) • Lard • Turpentine • Wax
4. Ream fastener holes to required clearance	• Clearance drill sizes for bolts/screws • Clearance drill sizes for rivets • Solid body and adjustable reamers
5. Deburr fastener holes with hand tools	• Larger size twist drill bit • Countersink • Special deburring tools
6. Countersink metal to accommodate the head of flush fasteners	• Check for correct countersink angle • Solid body countersinkers (with or without pilots) • Adjustable countersink (Microstop) • Slow cutting speed to avoid chatter • Original Equipment Manuals flushness requirements • National Advisory Committee for Aeronautics Fluid tight rivet installation

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.8 Drill, Ream and Countersink Holes (cont'd)

Objectives

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

LEARNING TASKS	CONTENT
7. Spotface uneven material surfaces to accommodate the head of protruding fasteners	• Spotface with drill press if possible • Spotface prior to final finishing of fastener hole • Use proper pilot • Use slow cutting speed to avoid chatter • Use radiusesd spotface tool

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.9 Treat Fastener Holes with Anti-Corrosion Compounds

Objectives

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

LEARNING TASKS	CONTENT
1. Explain purpose of treating fastener holes	• Increases corrosion resistance of material surface in the fastener holes
2. Give examples of conversion coatings	• Chromic acid • Alodine • Iridite
3. Apply conversion coatings to fastener holes	Chromic acid: • Degrease with volatile solvent • Dry • Apply chromic acid solution • Avoid spillage and puddling • Remove solution after prescribed time period • Follow WHMIS regulations for disposal of rags • Apply primer Alodine and Iridite: • Degrease with volatile solvent • Apply deoxidizer solvent • Rinse with distilled water • Dry • Apply solution • Avoid spillage and puddling • Rinse off solution after prescribed time period • Dry • Apply primer
4. Apply corrosion inhibiting primer to material surface of fastener holes	• Primer must conform to U.S. Specification MIL-P-22-1757 • Brush or spray primer into hole • Inspect for uniform coating • Wet or dry fastener installation according to manufacturer's specification

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.10 Use Temporary Fasteners

Objectives

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

LEARNING TASKS	CONTENT
1. Describe the use of temporary fasteners	• Ease of installation and removal • Align parts or assemblies
2. Describe the fitting, alignment and sequence of part assembly	• Pre-fitting parts • Laying-out of parts • Sequence of assembly • Shimming
3. Avoid oil-canning of sheet metal parts	• Start in the middle and work outward\ • Heat sheet metal during assembly • Shimming

4. Use temporary sheet fasteners	• Manufacturer's brand name:
	  ○ Clecos
	  ○ Avdels
	• Clecos pliers

5. Use the holding devices	• C-Clamps • Plain nuts and bolts • Toggle clamps • Wooden wedges

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.11 Set and Buck Rivets

Objectives

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

LEARNING TASKS	CONTENT
1. Describe the methods of driving solid rivets	• Hand riveting • Gun riveting • Compression riveting
2. Describe types of rivet guns used in aircraft assembly and repair	• Offset handle • Pistol grip • Straight handle • Fast-hitting • Slow-hitting • Gun sizes
3. Describe types of rivet sets/snaps used in aircraft assembly and repair	• Universal head • Reduced head (universal) • Flush (solid) • Flush (ball and socket) • Flush with rubber or plastic rim (skin riveting) • Straight • Offset • Double offset (cranked)
4. Describe characteristics of bucking bars used in gun riveting	• Hardened steel bars with smooth, polished face • Actually bucks the rivet, not the gun • Weight of bar is important • Weight of buck bar to be 0.5 Kilo (1lb) less than rivet gun

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.11 Set and Buck Rivets (cont'd)

Objectives

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

LEARNING TASKS	CONTENT
5. Set up and adjust rivet gun	• Select correct rivet set/snap • Insert and secure with beehive spring • Attach air supply • Press set/snap firmly against piece of scrap wood (not plywood) • Squeeze trigger for few seconds • Stop and inspect indentation • Wood should be indented but not shattered • Adjust air supply as required • Never point gun at any person or object and pull the trigger
6. Drive solid rivets with rivet gun	• Insert rivet of correct length • Rivet shank should protrude 1.5 x rivet diameter (d) • Place gun with set/snap against manufactured head of rivet • Holding bucking bar against material beside rivet shank • Squeeze trigger momentarily • Draw material together by 2 or 3 very light blows of gun • Hold bucking bar against shank of rivet • Balance pressure forces • Squeeze trigger • Form shop head with fewest possible blows of gun • Inspect rivet

Line (GAC): 10 **SHEET METAL FABRICATION**

Competency: 10.11 **Set and Buck Rivets (cont'd)**

Objectives

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

LEARNING TASKS	CONTENT

7. Evaluate driven solid rivet for correct bucking	• Shop head diameter about 1.5 x rivet diameter (d) or manufacturer's specifications
	• Shop head height about 0.5 x rivet diameter ((d)) or manufacturer's specifications
	• Shop head should not be:
	  ○ Cracked
	  ○ Clinched
	  ○ Cut
	  ○ Cocked

8. Remove improperly driven rivets without damage to aircraft material	• Centre punch rivet manufactured head lightly • Drill through manufactured head with drill bit slightly smaller than rivet shank diameter • Pry off head with pin punch • Drive out rivet shank with pin punch • Inspect hole for condition • If no elongation of hole, replace with same size rivet, otherwise ream hole out to next larger rivet size

9. Describe equipment used in compression riveting	• Portable and stationary rivet squeezers
	  ○ Alligator type
	  ○ Straight line "C" – yoke type (preferably)
	  ○ Compression riveting preferable to gun riveting

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.11 Set and Buck Rivets (cont'd)

Objectives

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

LEARNING TASKS	CONTENT
10. Set and adjust compression riveter	• Insert correct head dolly/snap into stationary jaw • Inset flat dolly/snap into moveable jaw • Connect air source • Insert rivet into hole drilled in same size scrap metal • Place rivet maufactured head into cut of dolly/snap • Squeeze trigger • Inspect shop head for correct size • Place shim washer under dollies/snap if adjustment required
11. Describe the microshaver process	• Material alignment
12. Adjust and use a microshaver	• Manufacturer's operating instructions

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.12 Assemble Parts with Structural Fasteners

Objectives

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

LEARNING TASKS	CONTENT
1. Describe types and sizes of fasteners	• Solid rivets • Blind rivets • Lock bolts • Blind lock bolts • Hex drive bolts • Standard, first oversize, second oversize, third oversize
2. Describe hole sizes and installation procedures	• Standards reamer size for standard fastener size • Advancing each reamer diameter for each oversize fastener diameter
3. Obtain pertinent fastener installation instructions	• Technical Drawings • Structural Repair Manual • Drawing fastener codes • Manufacturer's Fastener Code Manual • Manufacturer's Fastener Substitution Code list
4. Assemble parts using structural fasteners	• Solid rivets • Blind rivets • Lock bolts • Blind lock bolts • Hex drive bolts • Stand, first oversize, second oversize, third oversize

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.13 Punch and Drill Sheet Metal

Objectives

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

LEARNING TASKS	CONTENT
1. List tools and equipment used for punching holes in sheet metal	• Hand punch (Whitney punch) • Chassis punch • Press punch (single and rotary)
2. Explain limitations in punching holes in sheet metal	• Thickness of material • Hardness of material • Reach or throat of punch • Punching may score the sides of a hole • Never punch fastener holes to finished size • Fastener holes must be drilled to size
3. List tools and equipment used for drilling holes in sheet metal	• Drill bits • Hand drill • Drill motor (electric and air driven) • Drill press • Drill jigs/fixtures • Drill bushings

Line (GAC): 10 **SHEET METAL FABRICATION**

Competency: 10.13 **Punch and Drill Sheet Metal (cont'd)**

Objectives

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

LEARNING TASKS	CONTENT

4. Punch holes in sheet metal	• Fastener holes
	  ○ Lay-out fastener pattern
	  ○ Mark metal with centre punch
	  ○ Pre-punch fastener holes to pilot size only
	• Chassis punch
	  ○ Lay-out pattern
	  ○ Mark metal with centre punch
	• Drill pilot hole
	• Drill hole up to bolt clearance size for drive screw
	• Insert drive screw through hollow dies and sheet metal
	• Thread punch ram onto bolt until seated on the metal
	• Tighten bolt until punch pierces metal
	• On thicker material: release pressure, move ram around about 15 degrees and repeat
	• Punch press (single and rotary)
	• Layout pattern
	  ○ Mark metal with centre punch
	  ○ Select matching die
	  ○ Insert sheet metal
	  ○ Line-up centre punch mark with punch centre point
	  ○ Move lever to bring punch and metal in contact with die
	  ○ Apply force on lever to pierce metal
	  ○ Release lever slowly
	  ○ Metal with rise again stripping shoe and be released

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.13 Punch and Drill Sheet Metal (cont'd)

Objectives

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

LEARNING TASKS	CONTENT
5. Drill holes in sheet metal	• Lay-out fastener pattern • Mark metal with centre punch • Select pilot drill • Stop and check for concentricity • Correct if required by learning the drill or re-centre punching • Finish drilling pilot hole • Select nominal size drill • Drill to size • Deburr hole

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.14 Dimple/Countersink Sheet Metal

Objectives

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

LEARNING TASKS	CONTENT
1. Describe dimpling processes for sheet metal	• Radius dimpling • Coin dimpling • Hot dimpling
2. Explain advantages of dimpling over countersinking	• Thinner sheets can be joined with flush fasteners • Dimpled joint is stronger in shear load • Cladding is not removed • Corrosion occurrence is minimized

3. Describe differences between radius dimpling and coin dimpling	• Radius dimpling:
	  ○ Holes must be deburred
	  ○ Smaller equipment size
	  ○ Can be done in tight places
	  ○ Folds hole edges down with a radius
	  ○ Hole edges are not parallel to fastener shank
	  ○ Stacked sheets have ring cavity at each successive sheet
	  ○ Stacked sheets do not nest properly
	  ○ Faster
	  ○ Less expensive
	  ○ Opening around fastener head
	• Coin dimpling:
	  ○ Forges or coins the material
	  ○ No hole deburring required
	  ○ Hole edges are parallel to fastener shank
	  ○ No opening around fastener head
	  ○ Better nesting of stacked dimples

4. Explain reasons for hot dimpling	• Hard alloys, such as 7075 and magnesium, may crack during dimpling and must be heated before dimpling pressure is applied

Line (GAC): 10 **SHEET METAL FABRICATION**

Competency: 10.14 **Dimple/Countersink Sheet Metal (cont'd)**

Objectives

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

LEARNING TASKS	CONTENT
5. Dimple sheet metal	• Drill fastener holes in a test strip • Clean metal • Deburr holes if radius dimpling • Select and insert dimpling dies • Connect compressed air source • Insert pilot of male die in fastener hole • Move hands away from jaws • Press trigger • Test formed dimple with flush fastener • Inspect for cracks in dimple • Inspect for impact marks on metal • Complete dimpling on production part • Inspect part • Disconnect compressed air source • Clean and store dies
6. Explain advantages of countersinking over dimpling	• Can be used in situation • Can be used in cramped places
7. Describe minimum thickness requirement for countersinking sheet metal	• Sheet thickness (T) must be equal or greater than the height of the fastener head • Structural Repair Manual requirements
8. Countersink sheet metal to accommodate the head of flush fasteners	• Check for correct countersink angle • Solid body countersinkers (with or without pilots) • Adjustable countersinkers (Microstop) • Slow cutting speed to avoid chatter

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.15 Heat Treat Rivets

Objectives

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

LEARNING TASKS	CONTENT
1. Describe source of information for heat-treating aluminum alloys	• Aircraft Manufacturer's Specification • Rivet vendor's specification • U.S. Specification MIL-H-6088F
2. Heat-treat aluminum alloy rivets	• Don protective clothing and face protection • Check pyometer for correct temperature of oven or bath • Inset rivet batch • Record time "in" • Soak for prescribed time period • Remove rivet batch • Quench immediately • Record time "out" • Rinse • Dry
3. Describe methods of retarding age hardening of heat-treated rivets	• Store in freezer below -1°C (-30°F) • Store in insulated container with dry ice • Maximum storage time

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.16 Trim and Fit Parts

Objectives

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

LEARNING TASKS	CONTENT
1. Describe edge distance, dimensions and gap	• Rivet edge distance/dimensions • Gap requirements for joining parts
2. Trial-fit for trimming purposes	• Aligning
3. Remove excess material to trim and fit parts	• Aviation snips • Shears • Hacksaw • File • Router
4. Chamfer radius edges of sheet metal	• Sanding • Filing • Deburring • File • Router

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.17 Disassemble Components and Parts

Objectives

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

LEARNING TASKS	CONTENT
1. Describe how to temporarily mark the components and parts before disassembly	• Non-permanent marking pen • Non-graphite pencil
2. Disassemble components and parts	• Mark components and parts • Remove temporary fasteners • Place and store removed parts in proper sequence

Line (GAC): 10 SHEET METAL FABRICATION

Competency: 10.18 Apply Corrosion Protection

Objectives

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

LEARNING TASKS	CONTENT
1. Clean parts to remove grease and oils	• Solvents • Nylon abrasive pads • Aluminum wool • "Water-break" test
2. Confirm metal is aluminum alloy	• Identification with acid • Identification by Eddy Current method
3. Describe purpose of conversion coatings	• Creates aluminum oxide coating • Prevents corrosion • Adhesion enhancement
4. Describe types of corrosion	• Surface corrosion • Pitting • Galvanic • Intergranular/exfoliation • Stress • Fretting • Galling • Brineling
5. Apply conversion solution to aluminum parts	• Conversion solutions are dipped, sprayed or brushed onto the aluminum part • Soaking period as specified by vendor • Rinse with clean water • Air dry
6. Apply approved primer and finish coats	• Follow vendor's instructions for application procedures and curing times

Line (GAC): 11 CORROSION CONTROL

Competency: 11.1 Identify Conditions for Corrosion

Objectives

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

LEARNING TASKS	CONTENT
1. Describe conditions that foster corrosion on aircraft metals	• Deterioration of protective finish • Environmental conditions within aircraft • Accidental contamination • Operational environment of aircraft • Improper maintenance practises • Improper heat treatment practises
2. Describe the three requirements which must be met for corrosion to form	• Electrode potential difference within metal • Conductive path between areas of potential difference • Presence of electrolyte
3. Describe the effect of corrosion attack on aircraft metals	• Weakening of aircraft structure • Possibility of catastrophic failure • Aircaft downtime • Corrosion control cost 12% of each maintenance dollar

Line (GAC): 11 CORROSION CONTROL

Competency: 11.2 Describe Types of Corrosion

Objectives

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

LEARNING TASKS	CONTENT
1. List types of corrosion of aircraft metals	• Oxidization • Uniform surface attack • Pitting • Intergranular • Exfoliation • Galvanic • Concentration cell • Filiform • Microbial • Stress • Fretting

Line (GAC): 11 CORROSION CONTROL

Competency: 11.3 Describe Treatment of Aluminum Alloys

Objectives

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

LEARNING TASKS	CONTENT
1. Describe processes used to protect aluminum alloys against surface corrosion	• Cladding • Anodizing • Conversion coating • Chromic acid • Metal spraying • Shot/Flap-peening • Organic primer
2. Describe chemicals used to prepare aluminum surfaces for conversion coating	• Solvents • Deoxidizers • Phosphoric acid etch
3. Perform and assess water surface tension test prior to conversion coating of aluminum alloys	• Distilled water • Light source

4. Select conversion treatments to protect aluminum alloys against surface corrosion	• Conversion coatings such as:
	  ○ Alodine
	  ○ Iridite

5. Select methods for application of conversion coatings	• Brushing • Spraying • Immersion
6. Apply conversion coating solution to aluminum ally	• Application timing • Colour change of metal surface
7. Flush excess solution form part and dispose of waste solution properly	• Rinsing • WHMIS Regulations
8. Clean and inspect aircraft metal surfaces before priming and painting	• Aromatic solvents • Dustless environment • Application methods

Line (GAC): 11 CORROSION CONTROL

Competency: 11.3 Describe Treatment of Aluminum Alloys (cont'd)

Objectives

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

LEARNING TASKS	CONTENT
9. Describe types of corrosion inhibiting primers for aluminum alloys	• Zinc-chromate primer for aluminum • Replacement aluminum primer with zinc-chromate must meet U.S. Military Specification MIL-22-P-1757 • Epoxy primer
10. Describe importance of shelf life expiry dates for primers and paints	• Life expectancy of unused volatile products in storage
11. Measure proportions and mix primers and paints	• Measuring cups • Weight scales
12. Select methods of application for primers and paints	• Brushing • Immersion • Spraying
13. Prepare spray painting equipment	• Spray booth • Ventilating fan • Standard spray gun • Electrostatic spray gun • Pressure pots
14. Apply primers and paints and test for proper curing	• Vendor's instructions

Line (GAC): 11 CORROSION CONTROL

Competency: 11.4 Describe Treatment of Steel Alloys

Objectives

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

LEARNING TASKS	CONTENT

1. Describe methods used by aircraft manufacturers to protect the surface of aircraft steel alloys against corrosion	• Plating with:
	  ○ Nickel
	  ○ Chrome
	  ○ Cadmium
	• Other coatings:
	  ○ Galvanzing
	  ○ Metal spraying
	  ○ Painting

2. Describe methods available to aircraft structural repair technicians to protect the surface of aircraft steel alloys against corrosion	• Greasing • Oiling • Portable spot plating • Painting
3. Identify primer coatings used to protect steel alloys against corrosion	• Iron oxide primer • Epoxy primer

Line (GAC): 11 CORROSION CONTROL

Competency: 11.5 Describe Treatment of Magnesium Alloys

Objectives

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

LEARNING TASKS	CONTENT
1. Describe coatings for protection of magnesium alloys from corrosion	• Chromic acid (conforming to MIL-M-7161A, Type I) • Dichromate conversion coating (conforming to MIL-M-3171A, type IV) • Anodizing

Line (GAC): 11 CORROSION CONTROL

Competency: 11.6 Describe Water Displacing Compounds

Objectives

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

LEARNING TASKS	CONTENT

1. Describe properties of water displacing corrosion inhibitors	• Water displacing corrosion inhibitors conforming to Military Specifications
	  ○ C-16173D
	  ○ C23411
	  ○ C-81309D, II, III and/or BOEING Material Standards 3-23D
	• Capillary action
	• TYPE I – Colourless film
	• TYPE II – Coloured film

2. Apply corrosion inhibitors to corrosion prone areas	• Electric ground for aircraft
	• Primers and paints must have cured from 8 hours
	• Pre-cleaning, applied by:
	  ○ Spraying
	  ○ Swabbing
	  ○ Brushing
	  ○ Remove excess
	  ○ Forced ventilation
	  ○ Respiratory equipment
	  ○ Skin protection
	  ○ Fire hazard
	• Do not apply inhibitors to:
	  ○ Electrical connectors
	  ○ Control cables
	  ○ Pulleys
	  ○ Teflon bearings

Line (GAC): 11 CORROSION CONTROL

Competency: 11.7 Describe Levelling Compounds

Objectives

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

LEARNING TASKS	CONTENT
1. Explain reasons for providing a clear drainage path inside aircraft structure	• Liquids act as electrolyte • Corrosion prevention
2. Explain reasons for applying levelling compounds only to clean and dry surfaces	• Entrapment of moisture and other electrolytes
3. Describe methods for positioning aircraft into flying attitude	• Aircraft jacks • Plumb bob • Spirit level • Built-in level indicators
4. Describe procedures to prepare and apply levelling compounds to specified aircraft interior points	• Materials • Cleaning and preparation • Levelling A/C • Apply a levelling compound
5. Inspect and test existing drains for proper function	• As available

Line (GAC): 11 CORROSION CONTROL

Competency: 11.8 Apply Corrosion Protection

Objectives

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

LEARNING TASKS	CONTENT
1. Clean parts to remove grease and oils	• Solvents • Nylon abrasive pads • Aluminum wool • "Water-break" test
2. Confirm metal is aluminum alloy	• Identification with acid • Identification by Eddy Current method
3. Describe purpose of conversion coatings	• Creates aluminum oxide coating • Prevents corrosion • Adhesion enhancement
4. Describe types of corrosion	• Surface corrosion • Pitting • Galvanic • Intergranular/exfoliation • Stress • Fretting • Galling • Brineling
5. Apply conversion solution to aluminum parts	• Conversion solutions are dipped, sprayed or brushed onto the aluminum part • Soaking period as specified by vendor • Rinse with clean water • Air dry
6. Apply approved primer and finish coats	• Follow vendor's instructions for application procedures and curing times

Line (GAC): 12 SEALING

Competency: 12.1 Refer to Technical Information

Objectives

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

LEARNING TASKS	CONTENT
1. Describe locations of required sealing in aircraft structures	• Floats • Hull • Integral fuel tanks • Pressurized areas • Environmental areas • Corrosion areas • Electrical areas • Firewall areas • Acid areas • Critical areas for aerodynamic smoothness
2. Interpret sealing symbols from technical drawings	• Fraying surface seal • Fillet seal • Fillet seal continuation • Injection seal • Prepack seal • Hole filling seal
3. Identify aircraft manufacturer's publications containing sealing instructions	• Service/Maintenance Manual • Structural Repair Manual • Overhaul Manual • Standard Practices Manual • Sealing Handbook • Vendor's Instructions

Line (GAC): 12 SEALING

Competency: 12.2 Prepare Surfaces and Mask Off Sealing Areas

Objectives

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

LEARNING TASKS	CONTENT
1. Describe cleaning equipment and materials	• Vacuum cleaner • Brushes • Animal bone/plastic scrapers • Cheesecloth • Cloth/Paper wipes • Pipe cleaners • Solvents • Plastic squeeze bottles
2. Clean areas in preparation for sealing	• Forced ventilation • Fire/explosion hazard
3. Describe types of masking materials	• Masking tape • Plastic sheets • Wax paper
4. Mask off cleaning areas in preparation for sealing	• Edge distance • Sealing width height • Proper removal of masking material

Line (GAC): 12 SEALING

Competency: 12.3 Select Sealants

Objectives

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

LEARNING TASKS	CONTENT
1. Describe curing characteristics of approved aircraft sealants	• Corrosion inhibiting tape seals • Corrosion inhibiting flushing compounds • Polysulfides • Silicones (one part) • Silicones (two part)
2. Describe specification classifications of sealants	• Class A – Brushcoat sealant • Class B – Filleting sealant • Class C – Faying surface sealant • Class D – Hole filling sealant • Class E & F – Sprayable sealants
3. Describe properties of sealants	• Application time • Squeeze-out life • Tack-free time • Cure time • Environmental effect
4. Describe special precaution for silicones in uncured state	• Absorption of carbon dioxide (CO_2) • No dry ice storage • Storage in mechanical freezer only • Separate storage from other type of sealants • No cross use of application tools
5. Inspection containers of sealant materials	• Shelf life expiry date • Storage temperatures • Lids closed tightly • No contamination

Line (GAC): 12 SEALING

Competency: 12.4 Demonstrate Mixing Sealants

Objectives

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

LEARNING TASKS	CONTENT
1. Describe storage requirements for premixed sealant materials	• Freezer storage • Maximum temperature - 40°C (-40°F)
2. Avoid skin contact with sealant materials	• Toxicity • Rubber/plastic gloves
3. Preform hand mixing of sealant	• Premeasured sealant kits • Use all accelerator • Bulk containers • Mixing ratio • Weigh scales • Thorough stirring • Spatula • Mixing container/surface
4. Thaw frozen pre-mixed sealants	• 30 minutes at room temperature • 10 minutes in warm water
5. Apply sealant promotor	• Apply promotor as per vendor's specification • Observe chemical reaction time

Line (GAC): 12 SEALING

Competency: 12.5 Demonstrate Applications of Sealants to Seams and Joints and Fasteners

Objectives

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

LEARNING TASKS	CONTENT
1. Describe tools and equipment for application of sealants	• Sealant gun • Various nozzles • Metal/rubber rollers • Brushes • Plastic scrapers • Fairing tools • Inspection mirrors • Explosion proof flashlight • Pressure sprayers • Pressure rollers
2. Verify acceptable temperature of aircraft structure	• Temperature gauge (thermometer) • Minimum application temperature 21°C (50°F)
3. Apply sealants according to prescribed “Standard Practices: procedures”	• Structural Repair Manual, Chapter 20
4. Cover cone of flush or countersunk rivet/bolt heads with sealant	• Finger wipe sealant immediately prior to installation • Use rubber gloves • Remove excess
5. Cover flat underside of protruding head rivets/bolts with sealant	• Finger wipe sealant immediately prior to installation • Use rubber gloves • Remove excess

Line (GAC): 13 HEAT TREATMENT

Competency: 13.1 Explain Heat Treatment of Sheet Aluminum

Objectives

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

LEARNING TASKS	CONTENT

1. Describe processes used for the heat treatment of aluminum alloys	• Heat treatable aluminum alloys 2xxx, 4xxx, 6xxx, 7xxx
	• Solution heat treatment
	• Precipitation heat treating
	• Annealing
	• Methods of heating
	  ○ Air furnace
	  – still air
	  – circulation air
	  ○ Salt bath
	  ○ Open flame (not recommended)
	• Time and temperatures
	• Quenching
	  ○ Methods
	  ○ Timing concerns
	• Measurement of hardness

2. Heat treat aluminum alloys	• Don protective clothing and face protection • Check temperature • Insert material to be heat treated • Record time in • Soak for prescribed time period • Remove material • Quench or cool slowly as required • Record time out • Measure hardness
3. Review aluminum alloy temper designation	• “0” condition • T3 • T4 • T6

Line (GAC): 13 HEAT TREATMENT

Competency: 13.1 Explain Heat Treatment of Sheet Aluminum (cont'd)

Objectives

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

LEARNING TASKS	CONTENT
4. Describe non-heat treatable aluminum alloys	• 1xxx, 3xxx, 5xxx • H1 • H2 • H3 • Hardness designation

Line (GAC): 13 HEAT TREATMENT

Competency: 13.2 Heat Treatment of Steel

Objectives

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

LEARNING TASKS	CONTENT
1. Describe principles of the steel hardening process	• Crystals and grains • Effect of carbon • Effect of cooling rate

2. Describe process used for the heat treatment of steel	• Hardening
	• Tempering
	• Normalizing
	• Annealing
	• Case hardening
	  ○ Carbonizing
	  ○ Nitrating
	• Safety process
	• Heating equipment
	• Measurement of hardness

Line (GAC): 13 HEAT TREATMENT

Competency: 13.3 Explain Heat Treatment of Rivets

Objectives

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

LEARNING TASKS	CONTENT
1. Describe source of information for heat-treating aluminum alloys	• Aircraft Manufacturers' Specifications • Rivet vendor's specification • U.S. Specification MIL-H-6088F
2. Heat-treat aluminum alloy rivets	• Don protective clothing and face protection • Check pyrometer for correct temperature of oven or bath • Insert rivet batch • Record time "in" • Soak for prescribed time period • Remove rivet batch • Quench immediately • Record time "out" • Rinse • Dry
3. Describe methods of retarding age hardening of heat-treated rivets	• Storage in freezer below -1°C (-30°F) • Store in insulated container with dry ice • Maximum storage time

Line (GAC): 14 SPECIAL FASTENER INSTALLATION PROCESSES

Competency: 14.1 Install Standard and Special Fasteners

Objectives

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

LEARNING TASKS	CONTENT
1. Explain "grip length" on threaded structural fasteners	• Unthreaded portion of standard and special fasteners • Grip length is never less than total material thickness • Small surplus grip length can be controlled by adding washers • Maximum of 3 washers
2. Give reason for applying predetermined torque to aircraft threaded fasteners and describe torque limiting devices	• Increases the holding power of the fastener by placing it under an initial tensile load which is greater than the load the fastener will be subjected to in service • Must use calibrated torque wrench or torque limiting collar
3. Describe the three basic types of torque wrenches	• Deflecting beam type with pointer and scale • Toggle type with adjustable micrometer handle • Torsion bar type with indicator dial
4. Identify devices the limit loosening of threaded fasteners	• Self-locking nuts • Castle nuts with cotter pins • Check nuts • Pal nuts • Spring washers • Tab washers • Locking wire • Witness wire • Locking clips
5. Give minimum and maximum three exposure after completed installation of washer(s) and nut	• Minimum: End chamfer of bolt protruding from nut • Maximum: Three threads exposed

Line (GAC): 14 SPECIAL FASTENER INSTALLATION AND PROCESSES

Competency: 14.2 Install Panel and Cowling Fasteners

Objectives

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

LEARNING TASKS	CONTENT
1. Name special quick-release panel and cowling fasteners	• Dzus fasteners • Airlock fasteners • Camlock fasteners
2. Install quick-release panel and cowling fasteners	• Refer to vendor's instructions

Line (GAC): 14 SPECIAL FASTENER INSTALLATION AND PROCESSES

Competency: 14.3 Install Blind Nuts

Objectives

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

LEARNING TASKS	CONTENT
1. Name blind and anchor type nuts used on one-sided fastener installation application	• Rivnuts • Fixed anchor nuts • Floating anchor nuts • Sheet spring (Tinnerman) nuts • Blind (Hi-Shear) nuts
2. Install blind, anchor type and Tinnerman nuts on aircraft structure	• Refer to vendor's instruction

Line (GAC): 14 SPECIAL FASTENER INSTALLATION AND PROCESSES

Competency: 14.4 Install Blind Bolts and Rivets

Objectives

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

LEARNING TASKS	CONTENT
1. Name blind bolts and blind rivets used in aircraft construction and repair	• Blind bolt (Jo-Bolt Visu-Lock and blind huck) • Pop rivet (non-structural) • Cherry Frictionlock (non-structural) • Cherry Pull-through hollow rivet (non-structural) • Cherrylock • Cherrymax • Huck rivet equivilants • Olympic-Lok
2. Determine proper grip range for blind fasteners	• Use hook scale supplied by fastener vendor
3. Install generic blind bolts and rivets	• Insert blind fastener into hole • Push installation tool onto protruding stem of fastener • Hold installation tool steady and at right angle to surface • Exert down pressure to hold tool firmly against surface • Activate tool until stem breaks off • Remove stem from tool • Inspect installed fastener for correct installation • Consult vendor instructions for reject indications4.
4. Remove blind bolts and rivets	• Consult vendor's specialized removal instructions (Remember: Body of knocked out fastener remains trapped in aircraft structure)

Line (GAC): 14 SPECIAL FASTENER INSTALLATION AND PROCESSES

Competency: 14.5 Cold-Work Fastener Holes

Objectives

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

LEARNING TASKS	CONTENT
1. Explain the purpose of pre-stressing fastener holes by cold-working	• Compression stress increases fatigue limits of drilled material • Resistant to cracking
2. Explain procedure of cold-working fastener holes	• Undersized fastener hold is expanded by pulling an oversized steel pin through the hole and then reaming hole to size (at least two different systems: Solid die or expandable sleeve)
3. Describe how installation of certain special fasteners increases the fatigue limits of drilled metal	• Taper-lok and Hi-tigue bolts exert radial compressive forces onto the material surrounding the hole during installation and thereby cold-work the fastener holes

Line (GAC): 14 SPECIAL FASTENER INSTALLATION AND PROCESSES

Competency: 14.6 Flap Peen Large Holes

Objectives

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

LEARNING TASKS	CONTENT
1. Describe purpose of shot-peening metal	• Increase compressive stress of metal surface • Tensile stress must overcome compressive stress
2. Describe measurement of the intensity of flap-peening	• "ALMEN" test sample method (Measures deformation of test sample with dial gauge)
3. Describe the preparation operation of flap-peening equipment	• Constand RMP drill motor • Mandrel • Steel shot imbedded in flexible straps • Strobe light • Timing device • Documentation records

Line (GAC): 14 SPECIAL FASTENER INSTALLATION AND PROCESSES

Competency: 14.7 Bond/Spot Weld Parts

Objectives

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

LEARNING TASKS	CONTENT

1. Describe the procedures and sequences of bonding	• Clean area – water break free test
	• Etch area
	• Apply bonding agent
	• Bond line thickness
	  ○ Scrim cloth
	  ○ Microspheres
	• Clamp parts together
	• Cure in oven

2. Describe types of chemical bonding agents	• Bonding adhesives suppliers/manufacturers • Potting compounds • Edge potting compounds • Fire retardent compounds
3. Explain the mixing ratio and applications of chemical bonding agents	• Bonding agents and accelerators • Mixing ratios
4. Apply bond adhesive	• Spatulas • Tongue depressors • Brushing
5. Clean up excess of bonding adhesives	• Solvents • Soap/water • Paper towels • Air tight trash cans

Line (GAC): 14 SPECIAL FASTENER INSTALLATION AND PROCESSES

Competency: 14.7 Bond/Spot Weld Parts (cont'd)

Objectives

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

LEARNING TASKS	CONTENT

6. Explain safety aspects of spot-welder	• Electrical power familiarization
	• Cooling systems
	• Personal protection devices
	  ○ Face shield
	  ○ Gloves
	  ○ Apron
	  ○ Safety cap
	  ○ Leather boots

7. Explain settings and controls of spot-welder	• Welder settings
	  ○ Heat range
	  ○ Gap
	  ○ Electrode alignment
	• Timer controls

8. Operate spot-welder	• Check proper operation on test pieces • Follow manufacturer's instructions

Line (GAC): 14 SPECIAL FASTENER INSTALLATION AND PROCESSES

Competency: 14.8 Assemble Parts with Structural Fasteners

Objectives

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

LEARNING TASKS	CONTENT
1. Describe types and sizes of fasteners	• Solid rivets • Blind rivets • Lock bolts • Blind lock bolts • Hex drive bolts • Standard, first oversize, second oversize, third oversize
2. Describe hole sizes and installation procedures	• Standard reamer size for standard fastener size • Advancing each reamer diameter for each oversize fastener diameter
3. Obtain pertinent fastener installation instructions	• Technical drawings • Structural Repair Manual • Drawing fastener codes • Manufacturer's Fastener Code Manual • Manufacturer's Fastener Substitution Code list
4. Assemble parts using structural fasteners	• Solid rivets • Blind rivets • Lock bolts • Blind lock bolts • Hex drive bolts • Standard, first oversize, second oversize, third oversize

Line (GAC): 14 SPECIAL FASTENER INSTALLATION AND PROCESSES

Competency: 14.9 Fasten Sheet Metal by Bonding

Objectives

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

LEARNING TASKS	CONTENT
1. Explain the advantages of structural adhesive bonding over other structural fasteners	• High strength-to-weight ratio • Superior fatigue characteristics • Aerodynamically smooth surface • Sonic dampening • Very thin sheets than cannot be riveted or spot-welded • Dissimilar metals can be joined • Leakproof joints • Less corrosion • Lower production costs
2. List manuals that contain structural adhesive bonding instructions	• Structural Repair Manual • Standard practices • Manufacturer's Handbooks
3. Describe requirements for bonding sheet metal	• "Clean" room • Personal protection equipment • Proper surface preparation • Prescribed resins • Proper mixing procedures
4. Demonstrate procedural steps structural adhesive bonding	• Prefitting of parts • Cleaning and surface preparation • Application of core splice adhesive or • Application of film (tape) adhesives • Assembly of parts • Curing cycle by positive pressive or vacuum • Application of protective coating • Finish trimming • Clean up • Nondestructive inspections (NDI) • Final protective coat

Level 2

Aircraft Structural Technician

Line (GAC): 15 COIN DIMPLING

Competency: 15.1 Describe Work Order Procedures and Specifications

Objectives

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

LEARNING TASKS	CONTENT
1. Describe work order notation for coin dimpling	• Symbols • Notes

Line (GAC): 15 COIN DIMPLING

Competency: 15.2 Describe Materials to be Dimpled

Objectives

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

LEARNING TASKS	CONTENT
1. Describe materials that may be dimpled	• Stainless steel • Aluminum alloys • Titanium

Line (GAC): 15 COIN DIMPLING

Competency: 15.3 Explain Dimpling Equipment

Objectives

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

LEARNING TASKS	CONTENT
1. Describe dimpling equipment	• Electrical supply • Air inlet • Master switch • Equipment selector • Air outlet • Heater outlet • #1 temperature control meter • #2 temperature control meter • Heater switches • Dwell timer • Dimpling timer • Perform peressure regulator • Low pressure regulator • Heater lights • Various yokes • Punches and dies • Die heaters • Portable ram coin dimples

Line (GAC): 15 COIN DIMPLING

Competency: 15.4 Describe Quality Control

Objectives

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

LEARNING TASKS	CONTENT
1. Describe quality control checks	• Test pieces • Inspection for cracks • Straight edge inspection • Dimpler trouble shooting

Line (GAC): 16 COLD WORKING HOLES

Competency: 16.1 Describe Split Sleeve Method

Objectives

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

LEARNING TASKS	CONTENT
1. Explain the need for cold working of holes	• Cold working is a process that will improve structural air worthiness • Prestresses metal around hole • Help prevent fatigue cracking • Enhances the fatigue life of holes by a factor of 3X
2. Describe the split sleeve method	• Drill • Ream • Check hole size • Inspect mandrel • Perform the expansion • Verify hole size • Ream • Install fastener

Line (GAC): 16 COLD WORKING HOLES

Competency: 16.2 Demonstrate Tools and Equipment

Objectives

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

LEARNING TASKS	CONTENT
1. Explain use of split sleeve cold expansion process	• The split sleeve is lubricated to reduce pull force and protect the hole • The split sleeves distort during cold working – do not reuse • Combination gauge
2. Demonstrate tools and equipment	• Mandrel check • CB tooling for aluminum and mild steels • CA tooling for titanium and high strength steel • CR tooling for rework cold working in aluminum and mild steel • KB system for countersink cold expansion

Line (GAC): 17 SPOT FACING

Competency: 17.1 Explain Reason for Spot Facing

Objectives

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

LEARNING TASKS	CONTENT
1. List hardware that may require spot facing	• Hilocks • Bolt-head • Screws • Nuts • Rivets • Fastener lead seating • Location • Torquing
2. Describe spot facing requirements	• 8% angularity or more • Spot face diameter as it relates to fastener diameter • Spot face radius

Line (GAC): 17 SPOT FACING

Competency: 17.2 Demonstrate Spot Facing Tools and Equipment

Objectives

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

LEARNING TASKS	CONTENT
1. Perform spot facing procedure	• Aluminum • Steel • Castings
2. Perform reverse spot facing	• Blind area

Line (GAC): 17 SPOT FACING

Competency: 17.3 Describe Quality Control

Objectives

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

LEARNING TASKS	CONTENT
1. List source documents for QC	• Manufacturer specs • Mil • Boeing (BAC eg.) • SAP • SRM
2. Describe spot facing limits	• Fillet radii • Depth • Diameter

Line (GAC): 18 REAMING

Competency: 18.1 Explain Reason for Reaming

Objectives

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

LEARNING TASKS	CONTENT
1. Describe reaming requirements	• Close tolerance fit • Hole repair • Taper fit • High-speed lubrication

Line (GAC): 18 REAMING

Competency: 18.2 Demonstrate Reaming Tools and Equipment

Objectives

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

LEARNING TASKS	CONTENT
1. Describe types of reamers	• Straight fluted • Spiral – RH-LH • Adjustable • Hand and machine
2. Demonstrate reamer use	• Direction of cut • Blade protection • Adjustment • Removal from hole • CCW and CW reamer spiral • All reamers turn CW • Care and storage of reamers

Line (GAC): 18 REAMING

Competency: 18.3 Describe Quality Control

Objectives

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

LEARNING TASKS	CONTENT
1. Describe accuracy checking tools	• Small hole gauge • Go no go • Micrometer
2. Inspect hole condition	• Chattering • On size • Cutter condition • Reamer rotation

Line (GAC): 19 TEMPORARY AND PERMANENT FASTENER INSTALLATION

Competency: 19.1 Describe Temporary Fastener

Objectives

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

LEARNING TASKS	CONTENT
1. Describe temporary fasteners	• Avdels • Clecos • Nuts and bolts • Tack weld • Adhesive • Rivets • Clamps

Line (GAC): 19 TEMPORARY AND PERMANENT FASTENER INSTALLATION

Competency: 19.2 Demonstrate Temporary Fasteners Installation

Objectives

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

LEARNING TASKS	CONTENT
1. Fasten structure together temporarily	• Clecos • Avdels • Nuts and bolts • Wedge locks • Spring clamps

Line (GAC): 19 TEMPORARY AND PERMANENT FASTENER INSTALLATION

Competency: 19.3 Describe Permanent Fastener

Objectives

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

LEARNING TASKS	CONTENT
1. Describe permanent fasteners	• Solid rivets • Blind rivets • Cherry max • Lock bolt • Jo bolt • Hi lock • AIV/MSI/NAS hardware

Line (GAC): 19 TEMPORARY AND PERMANENT FASTENER INSTALLATION

Competency: 19.4 Demonstrate Permanent Fasteners Installation

Objectives

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

LEARNING TASKS	CONTENT
1. Install permanent fasteners	• Hole prep/tolerance • Hardware • Torquing

Line (GAC): 20 TORQUING

Competency: 20.1 Review Torqueing Principles

Objectives

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

LEARNING TASKS	CONTENT
1. Review torqueing procedures	• Torque wrench types • Torquing applications
2. List reasons for applying predetermined torque	• Strength • Even loading • Fatigue resistance • Engineering requirement
3. Explain grip length	• Locking devices • Thread binding • Washer stack-up
4. Explain principles of torqueing	• Levers • Rotation

Line (GAC): 20 TORQUEING

Competency: 20.2 Describe Torque Wrench

Objectives

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

LEARNING TASKS	CONTENT
1. Describe torque wrench types	• Deflecting beam • Toggle type • Torsion bar type

Line (GAC): 20 TORQUEING

Competency: 20.3 Install and Torque Fasteners

Objectives

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

LEARNING TASKS	CONTENT

1. Install and torque hardware	• Hole condition/tolerance
	• Hardware selection
	• Torque wrench limits/selection
	• Thread bound limits
	  ○ Grip length
	  ○ Witnessing

Line (GAC): 21 SAFETY DEVICES

Competency: 21.1 Describe Safety Devices

Objectives

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

LEARNING TASKS	CONTENT
1. Describe safety devices	• Self-locking nuts • Castle nuts – cotter pins • Check nuts • Pal nuts • Spring washers • Tab washers • Locking wire • Witness wire • Locking clips

Line (GAC): 21 SAFETY DEVICES

Competency: 21.2 Demonstrate Safety Practices and Procedures

Objectives

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

LEARNING TASKS	CONTENT

1. Perform lockwiring	• Lockwire types/techniques
	• Lockwire locations
	  ○ Flight controls
	  ○ Engine controls
	• Lockwire safety
	• Witnessing

2. Perform cotter pinning	• Pin size • 50% of hole fill • Hole height in castellation • Tail finish • Witnessing

Line (GAC): 22 MANUFACTURER'S SPECIFIC FASTENERS

Competency: 22.1 Describe Manufacturer's Specific Fasteners

Objectives

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

LEARNING TASKS	CONTENT
1. Describe manufacturer's specific fasteners used by major aircraft manufacturers	• Boeing • McDonald Douglas • Bell • Airbus • Eurocopter • DeHavilland • Canadair

Line (GAC): 22 MANUFACTURER'S SPECIFIC FASTENERS

Competency: 22.2 Demonstrate the Installation of Fasteners

Objectives

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

LEARNING TASKS	CONTENT
1. Install, torque and safety special fasteners	• Canadair specifics • Boeing specs • McDonald Douglas • DeHavilland

Line (GAC): 23 PERMASWAGE

Competency: 23.1 Describe Permaswage Fasteners

Objectives

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

LEARNING TASKS	CONTENT
1. Describe the reasons for using swaged fittings	• Harsh working environment • Vibration resistance • High operating pressure • Predictable results • Permanence
2. Describe the tools and equipment used for swaging	• Stainless steel tubing • Aluminum tubing • External swaging • Internal swaging • Lubrication • Templates • Functional testing • Installation

Line (GAC): 23 PERMASWAGE

Competency: 23.2 Demonstrate Permaswage Installation

Objectives

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

LEARNING TASKS	CONTENT
1. Describe safety as it relates to swaging	• Legislation • Tools and equipment • Fire safety • First aid • Personal protection • Workplace venting • Rules and reporting procedures
2. Demonstrate swaging procedures	• Preparation • Installation • Functional testing

Line (GAC): 24 ELECTRICAL BONDING OF A/C

Competency: 24.1 Discuss Reasons for Electrical Bonding of A/C

Objectives

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

LEARNING TASKS	CONTENT
1. Describe reasons for electrical bonding of A/C	• Low-resistance wire • Metal strap • Connecting structural components • Static discharge (static wicks) • Radio interference • Lightning strike safety • Ground strapping (airframe ground path) • Fuelling hazards • Radomes • Mesh in composites • Antenna grounds

Line (GAC): 24 ELECTRICAL BONDING OF A/C

Competency: 24.2 Describe Electrical Bonding of A/C

Objectives

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

LEARNING TASKS	CONTENT
1. Describe types of electrical bonding materials	• Straps • Wicks • Wire • Braid

Line (GAC): 24 ELECTRICAL BONDING OF A/C

Competency: 24.3 Demonstrate Electrical Bonding of A/C

Objectives

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

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LEARNING TASKS	CONTENT
1. Perform continuity test of airframe	• VOM meter • Meggar
2. Perform continuity test on static wicks	• VOM meter

Level 3

Aircraft Structural Technician

Line (GAC): 25 ALODINING

Competency: 25.1 Review Alodining Process

Objectives

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

LEARNING TASKS	CONTENT
1. Review conditions that foster corrosion on A/C metals	• Operational environments • Environmental conditions within the aircraft
2. Review processes used to protect aluminum alloys against surface corrosion	• Cladding • Primers • Anodizing • Metal spraying • Shot and flap preening • Alodining
3. Describe chemicals used to prepare aluminum surfaces for conversion coatings	• Solvents • Deoxidizers • Phosphoric acid etch
4. Describe conversion treatments and methods of application	• Alodine • Iridite • Brushing • Spraying • Immersion

Line (GAC): 25 ALODINING

Competency: 25.2 Explain Preparation Process

Objectives

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

LEARNING TASKS	CONTENT
1. Describe the steps in the preparation process	• Racking • Pre-cleaning and degreasing • Alkaline cleaning • Deoxidizing

Line (GAC): 25 ALODINING

Competency: 25.3 Explain Aloding and Un-Racking

Objectives

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

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LEARNING TASKS	CONTENT

1. Describe the alodining process	• Chemical
	• Chromium conversion
	• Alodine 1200
	• Alodine 1500
	• Adjusting the solution
	  ○ Monitoring the equipment
	  ○ Monitoring the process
	  ○ Coupons
	  ○ Un-Racking
	  ○ Drying
	  ○ Touching-up
	  ○ Handling and protecting

Line (GAC): 25 ALODINING

Competency: 25.4 Review of Alodining Safety

Objectives

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

LEARNING TASKS	CONTENT
1. Describe safety concerns with alodining process	• Safety legislation • Tools and equipment • (housekeeping and safety) • Fire safety • First aid • Personal protection • Ventilation • Rules and reporting procedures

Line (GAC): 26 PRIMING AND PAINTING

Competency: 26.1 Review the Painting Process

Objectives

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

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LEARNING TASKS	CONTENT
1. Describe purpose of painting	• Corrosion protection • Cosmetics
2. Describe types of paint	• Primers • Wash primers • Zinc chromate • Red iron oxide • Laquers • Enamels • Polyurethane • Thinners • Epoxy
3. Describe types of pain spray equipment	• Spray guns • Airless guns • Electro starts • Air transformers

Line (GAC): 26 PAINTING AND PRIMING

Competency: 26.2 Explain Preparation Process

Objectives

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

LEARNING TASKS	CONTENT
1. Describe preparation process	• Corrosion protection • Conversion coating • Wash primer • Epoxy primer • Mixing • Induction time • Surface preparation • Pot life, induction time • Working time • Recoat times

Line (GAC): 26 PAINTING AND PRIMING

Competency: 26.3 Demonstrate Painting Technique

Objectives

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

LEARNING TASKS	CONTENT
1. Describe correct application procedure	• Strain paint • Correct air cap and nozzle • Paint at correct viscosity • Tack cloth surface • Temperature and humidity • Gun 6 to 10 inch away • Correct air pressure • Trigger release timing • Parallel strokes
2. Describe common paining problems	• Blisters • Correct blushing • Orange peel • Pin holes • Runs and sags

Line (GAC): 26 PAINTING AND PRIMING

Competency: 26.4 Review Painting Safety

Objectives

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

LEARNING TASKS	CONTENT
1. Outline safety hazards associated with spray painting	• Solvent flammability • Vaporized solvent • Static discharge • Dry sanding dust hazards • Wet sanding preferred • Proper material storage • Paint booth cleanliness • Avoid electric drill motors • Protective clothing • Goggles • Respirators

Line (GAC): 12 SEALANTS

Competency: 12.6 Review the Sealing Process

Objectives

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

LEARNING TASKS	CONTENT
1. Review types and functions of sealants	• Fillet seals • Injection seals • Faying surface seals • Prepack seals • Brush coat seals • Two-part seals • Classification of sealants and sealant properties
2. Review tools and equipment for application of sealants	• Sealant gun • Nozzles • Rollers • Brush • Scrapers • Fairing tools • Sprayers

Line (GAC): 12 SEALANTS

Competency: 12.7 Explain Preparation Process

Objectives

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

LEARNING TASKS	CONTENT
1. Review surface preparation	• Remove all contaminants • Solvent wipe surface • Clean wider area • Temperature

Line (GAC): 12 SEALANTS

Competency: 12.8 Demonstrate Sealing Processes

Objectives

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

LEARNING TASKS	CONTENT
1. Demonstrate cleaning for sealing purposes	• Small area cleaned progressively • Clean wider area • Use approved solvents and wiping materials
2. Demonstrate fillet sealing	• Continuous bead • Flow rate • Speed of gun travel • Hold gun near vertical
3. Demonstrate injection sealing	• Channel filling • Remove excess • Fair smoothly
4. Demonstrate faying surface sealant	• Mask area • Extrude sealant on smaller part • Spread sealant
5. Demonstrate fastener sealant	• Wet installation • Flush head • Protruding head

Line (GAC): 12 SEALING

Competency: 12.9 Review Sealing Safety

Objectives

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

LEARNING TASKS	CONTENT
1. Review safety issues related to sealing	• Solvents must be kept away from heat, fire or sparks • Avoid contact with skin • Rubber gloves • Eye protection • Ventilation • Respiratory protection

Line (GAC): 27 WINDOWS AND LENSES

Competency: 27.1 Inspect Windows and Lenses

Objectives

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

LEARNING TASKS	CONTENT
1. Identify the defects common to windows and lenses	• Edge chipping • Shelling • Scratches • Cracks • Crazing • Distortion • Chemical damage • Debonding • Acceptable defects • Repairable defects • Replacement
2. Describe inspection procedures and concerns	• Material thickness • Fastener holes • Inspection prism • Inspection light • Cleanliness • Laminated

Line (GAC): 27 WINDOWS AND LENSES

Competency: 27.2 Demonstrate Sand, Buff and Polish Windows/Lenses

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss the requirements for sanding, buffing and polishing windows/lenses	• Optical qualities • Buffing materials • Lense thickness and pressurized aircraft • 320 to 6000 grit sandpaper • Circular motion • Lubricants • Avoid overheating • Tools • Techniques

Line (GAC): 27 WINDOWS AND LENSES

Competency: 27.3 Demonstrate Patching Windows/Lenses

Objectives

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

LEARNING TASKS	CONTENT
1. Prepare a simulated crack in plexiglass	• 6 x 6 1/4" plexiglass • Hacksaw with 24TPI • Support plexiglass from behind
2. Stop drill the "crack"	• Find the precise end of the crack • #30 drill • Drill motor
3. Stitch the crack	• S.S. or brass lock wire • #40 drill bit
4. Alternatively apply a patch	• Same thickness material • Cut material 1"larger all around • Chamfer patch edges • Adhesive

Line (GAC): 27 WINDOWS AND LENSES

Competency: 27.4 Demonstrate Installing Windows and Lenses

Objectives

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

LEARNING TASKS	CONTENT
1. Demonstrate window/lens installation as per manufacturer's instructions	• Manufacturer's instructions

Line (GAC): 27 WINDOWS AND LENSES

Competency: 27.5 Fabricating a Plastic Lens

Objectives

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

LEARNING TASKS	CONTENT
1. Demonstrate the fabrication of a plastic lens	• Thermoplastic properties of plexiglass • One 8" x 16" plexiglass acrylic sheet and one 8" x 1" plexiglass practise strip • "Handle" for both ends of plexiglass practise strip • Protective wrap • 210 polish • 30 minutes in oven @ 285°F • Drop over wing using handles • Hold until cool • Remove from wing

Line (GAC): 28 NON-DESTRUCTIVE INSPECTION (NDI)

Competency: 28.1 Discuss Inspection Procedures

Objectives

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

LEARNING TASKS	CONTENT
1. Describe methods of non-destructive inspection	• Visual • Dye penetrant • Ultra sonic • Eddy current • Magnetic particle • X-ray • Holography • Infrared thermography
2. Interpret results of non-destructive inspection	• Read lab report • Classify damage

Line (GAC): 28 NON-DESTRUCTIVE INSPECTION (NDI)

Competency: 28.2 Describe Visual Inspection

Objectives

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

LEARNING TASKS	CONTENT
1. Describe visual inspection	• Light source • Mirror • Magnifying glass • Boroscope

Line (GAC): 28 NON-DESTRUCTIVE INSPECTION (NDI)

Competency: 28.3 Demonstrate Liquid Penetrant

Objectives

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

LEARNING TASKS	CONTENT
1. Describe advantages and disadvantages of dye penetrant	• Damage must be open to the surface • Improper application can inhibit further testing • Minimum part preparation required • Ease of application allows field use • Inexpensive • Provides immediate results
2. Demonstrate liquid penetrant	• Clean surface • Apply penetrant • Remove excess penetrant • Apply developer • Use black light if required

Line (GAC): 28 NON-DESTRUCTIVE INSPECTION

Competency: 28.4 Demonstrate Eddy Current Inspection

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss advantages and disadvantages of eddy current	• Surface and subsurface inspection • Portability • Moderate cost • Provides immediate results • Sensitive to small imperfections • Minimum part preparation required
2. Demonstrate eddy current inspection	• Inspection sequence

Line (GAC): 28 NON-DESTRUCTIVE INSPECTION (NDI)

Competency: 28.5 Demonstrate Ultrasonic Inspection

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss advantages and disadvantages of ultrasonic inspection	• Suitable for surface and subsurface inspection • Sensitive to small imperfections • Minimum part preparation • Surface must be accessible to sonic probe • Rough interface interferes with test results • Method is directional • High degree of skill required
2. Demonstrate ultrasonic inspection	• Inspection sequence

Line (GAC): 28 NON-DESTRUCTIVE INSPECITON (NDI)

Competency: 28.6 Discuss Radiographic Inspection

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss advantages and disadvantages of radiographic inspection	• Ability to inspect for both internal and external defects • Ability to inspect covered parts or structures • Provides permanent test records • Minimum area preparation required • Expensive • Aircraft have to be defueled • Area must be cleared of personnel • Method is partial directional • High degree of operator skill required • Access to both sides required

Line (GAC): 28 NON-DESTRUCTIVE INSPECTION (NDI)

Competency: 28.7 Review Safety Issues

Objectives

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

LEARNING TASKS	CONTENT
1. Review safety issues in non-destructive testing	• Chemicals • Radiation • Disposal of waste

Line (GAC): 29 PRESS BRAKE

Competency: 29.1 Review Bend Allowance

Objectives

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

LEARNING TASKS	CONTENT
1. Explain terminology and concepts used in bending sheet metal	• Grain direction • Bend radius • Neutral axis • Mould line • Mould point • Bend tangent line • Set back • K-factor • Flat • Bend allowance
2. Determine bend allowance for single and multiple bends	• Empirical formula • Bend allowance charts • 90° bends • Bends other than 90°

Line (GAC): 29 PRESS BRAKE

Competency: 29.2 Explain Press Brake Operation

Objectives

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

LEARNING TASKS	CONTENT
1. Explain press brake operation	• Pre start-up • Start-up procedure • Die installation • Press brake test bends

Line (GAC): 29 PRESS BRAKE

Competency: 29.3 Demonstrate Press Brake Operation

Objectives

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

LEARNING TASKS	CONTENT
1. Demonstrate press brake	• Back stop positions • Material protection mylar • Adjustment for bend angles • Removal and installation of dies • Die handling and cleaning • Alignment of dies • Accupress controls
2. Discuss operator awareness	• Never become casual about press brake operation • Never place body parts within the point of operation • Wear appropriate clothing • Position yourself away from movement of part being formed • Do not hang tools from press ram • Keep the die area clear

Line (GAC): 13 HEAT TREATMENT

Competency: 13.4 Review Heat Treatment Aluminum Alloys

Objectives

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

LEARNING TASKS	CONTENT
1. Review purpose of heat treating metals	• Heat treatable alloys • Non-heat treatable alloys • Solution heat treat • Precipitation heat treat • Improved strength • Improved machining • Increased corrosion resistance

Line (GAC): 13 HEAT TREATMENT

Competency: 13.5 Demonstrate Air Furnace

Objectives

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

LEARNING TASKS	CONTENT

1. Discuss the feature of the air furnace	• Electric resistance heaters
	• Refractory brick
	• Ceramic fibre
	• Air circulation
	• Controls
	  ○ Single set point control
	  ○ Programmable control

2. Review heat treatment of aluminum alloys	• Preparation
3. Demonstrate the use of the air furnace	• Solution heat treat • Precipitation heat treat • Annealing • Furnace racking and loading • Quenching • Parts distortion • Resolution heat treating

Line (GAC): 13 HEAT TREATMENT

Competency: 13.6 Demonstrate Salt Bath

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss features of the salt bath furnace	• Controls
2. Demonstrate the use of the salt bath furnace	• Controls

Line (GAC): 13 HEAT TREATMENT

Competency: 13.7 Review Safety Requirements

Objectives

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

LEARNING TASKS	CONTENT
1. Review heat treatment safety issues	• High temperature required • Thermal gloves • Face shields • No steam from salt bath • Water caused explosions with salt bath

Line (GAC): 30 FLUID LINES AND CONDUITS

Competency: 30.1 Refer to Technical Information

Objectives

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

LEARNING TASKS	CONTENT
1. Review technical information/drawings appropriate to the equipment that is available	• Mueller test equipment • Drawings • Shop planning packets • Production permits • Process standards • Deutsh MPS174-17 • Sierracin/Harrison MPS174-16 • Engineering orders

Line (GAC): 30 FLUID LINES AND CONDUITS

Competency: 30.2 Identify/Label Lines and Fittings

Objectives

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

LEARNING TASKS	CONTENT
1. Explain part identification	• System markings • Rigid pipelines • Flexible pipelines • Identify systems using pipelines • Fluid line hardware
2. Identify materials used in fabricating fluid lines and conduits	• Copper • Aluminum alloys • Carbon steel • Monel • Plastic • Synthetic rubber • Teflon

Line (GAC): 30 FLUID LINES AND CONDUITS

Competency: 30.3 Demonstrate Disassembling of Aircraft Systems

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss and demonstrate disassembly of aircraft systems	• Fluids and gases used in aircraft lines • Disassembly procedures • Assembly and installation procedures • Tools and equipment

Line (GAC): 30 FLUID LINES AND CONDUITS

Competency: 30.4 Select Materials and Fittings

Objectives

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

LEARNING TASKS	CONTENT
1. Explain material and fitting selection	• Drawings and blueprints • Technical information • A/C standards • Tubing materials • Copper • Aluminum alloy • Carbon steel • Stainless steel • Monel • Plastic

Line (GAC): 30 FLUID LINES AND CONDUITS

Competency: 30.5 Attach/Replace Fittings

Objectives

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

LEARNING TASKS	CONTENT
1. Perform single and double flaring procedures of the tube ends	• Automotive and A/C flaring • Angle difference • Advantages of double flaring • Maximum tubing diameter for double flaring 3/8 • "O" condition material • Cut and polish tube ends • Lubricate cone • Install "B" nut and sleeve • Flaring with rolling core tools • Flaring with impact tools
2. Perform installation procedures for flawless fittings	• Cut and polish tube ends • Install "B" nut and ferrule • Lubricate ferrule and threads of presetting tool • Preset with presetting tool • Inspect for uniform ridge on tubing • Acceptable: rotation of ferrule • Fore and aft movement not acceptable

Line (GAC): 30 FLUID LINES AND CONDUITS

Competency: 30.6 Band Tubing as per Drawing/Sample

Objectives

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

LEARNING TASKS	CONTENT
1. Identify minimum bend radius required for tubing material and diameter 88	• Minimum bend radii tables for aluminum alloy and steel tubing
2. Bend rigid tubing	• Incidence mark on tubing • Zero mark on radius block • Desired degree of mark on radius block
3. Inspect bend area on rigid tubing	• Flattening limits • Wrinkles • Kinks

Line (GAC): 30 FLUID LINES AND CONDUITS

Competency: 30.7 Demonstrate Fabrication of Flexible Hose Assemblies

Objectives

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

LEARNING TASKS	CONTENT
1. Select hose material for flexible fluid lines by outer cover or bend and M/L specification number	• Low pressure • Medium pressure • High pressure • High pressure for Ester based hydraulic fluid (Skydrol)
2. Describe required identification information printed on hose outer surface or metal band	• Milspec • Manufacturer's name • Quarter year and calender year of manufacturer • Hose size dash number • Continuous lay-line • Part number
3. Describe purpose and materials of protective sleeves	• Fire sleeves • Abrasion sleeves
4. Select fittings according to sample hose assembly or to manufacturer's specifications	• Reusable fittings • Swayed fittings
5. Install fittings on flexible hose according to instructions	
6. Describe shelf life limits of synthetic rubber hoses	• Bulk hose materials • Hose assemblies
7. Describe shelf life of Teflon hoses	• None • On-condition inspection • Consult manufacturer/vendor

Line (GAC): 30 FLUID LINES AND CONDUITS

Competency: 30.8 Demonstrate Testing Assembly for Leakage

Objectives

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

LEARNING TASKS	CONTENT
1. Locate minimum proof and burst pressures from manufacturer's or vendor's tables	
2. Test line assembly by applying minimum proof pressure	• Test rig • Eye protection • Pressure pump (hand or power) • Pressure gauge • Correct hydraulic fluid • Cleaning solvent • Compressed air supply • Pressure regulator • Leak detecting solution
3. Complete required documentation after test	• Serviceable tag • Work order

Level 4

Aircraft Structural Technician

Line (GAC): 31 COMPOSITE CONSTRUCTION

Competency: 31.1 Discuss Principles of Composite Construction

Objectives

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

LEARNING TASKS	CONTENT

1. Discuss principles of composite construction	• Two or more materials combined to form a stronger structure than either material
	• Fabrics
	• Fibres
	• Foams
	• Honeycomb
	• Matrix or resin system
	• Hystorical examples
	  ○ Wood
	  ○ Adobe
	  ○ Dope and fabric

2. Discuss aircraft applications	• Civil aircraft • Military aircraft
3. Discuss composite safety issues	• Safety legislation • Housekeeping • Fire safety • First aid • Tool and equipment safety • Personal protection • Workplace ventilation • Reporting procedures • Company safety rules

Line (GAC): 31 COMPOSITE CONSTRUCTION

Competency: 31.2 Demonstrate Composite Construction

Objectives

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

LEARNING TASKS	CONTENT
1. Demonstrate fabricating cutting pattern for lay-up plies	• Ply orientation significance • Engineering data lay-up information • Selection of ply pattern materials • Transferring ply dimensions • Cut patterns and identify for lay-up sequence
2. Demonstrate preparing plies for wet/pre-peg lay-up	• Fabric material and weave pattern • Clean room requirements for composite lay-ups • Published instructions for wet resin systems • Strength-by-parts theory for resin-cloth weight ratios • Storage requirements and use of pre-peg materials • Fabric warp direction • Full wet out • Optimal component resin content

Line (GAC): 31 COMPOSITE CONSTRUCTION

Competency: 31.2 Demonstrate Composite Construction (cont'd)

Objectives

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

LEARNING TASKS	CONTENT
3. Demonstrate curing a lay-up	• Autoclave cures • Vacuum bags • Hot bonders • Room temperature cures • Heat and pressure requirements • Curing blankets • Ovens • Autoclaves • Autoclave curing • Debagging • Trimming • Test coupon process • Drawing inspection • Assembly • Sand and fill • Primer • Packaging and shipment
4. Demonstrate checking for delamination/voids	• Visual inspection • Tap testing

Line (GAC): 32 ADVANCED BLUEPRINT READING

Competency: 32.1 Discuss Advanced Blueprint Details

Objectives

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

LEARNING TASKS	CONTENT
1. Describe title block	• Location • Sheet one format • Continuation sheet format • Drawing number • Drawing titles • Scale • Tolerances • Manufacturing specification notes
2. Explain materials list	• List of material
3. Explain notes and specifications	• Notes area • Process specifications • Manufacturer's specifications
4. Explain revision block	• Drawing revisions • Advance drawing change notice • Drawing change notice • Drawing departure authorization • Other drawing forms • Revision block
5. Explain Boeing application block	• Next assembly column • Used-on column • Section number column • Serial number column • Part number column • Release column indicator • Drawing sheet number column • Revision letter column • Flag note tabulation

Line (GAC): 32 ADVANCED BLUEPRINT READING

Competency: 32.1 Discuss Advanced Blueprint Details (cont'd)

Objectives

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

LEARNING TASKS	CONTENT
6. Explain the picture area	• Drawing terminology • Orthographic drawings • Basic views • Reference planes • Locating special views • Dimensioning • Line standards • Symbols • Standard structural shapes
7. Explain the automated parts list	• Introductino • Drawing converision • APL booklet description • Customer variables • Customer installations • Part number arrangement within the automated parts list • Change notice
8. Explain the parts list mechanization	• Title page • Revisions and general notes parts • List of material parts
9. Explain the omnibus concept	• Basic airframe • Customer variables • Tabulation

Line (GAC): 32 ADVANCED BLUEPRINT READING

Competency: 32.2 Discuss and Compare Company Blueprint Standards

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss company blueprint standards	• Manufacturers' standards • Third angle projection • First angle projection

Line (GAC): 32 ADVANCED BLUEPRINT READING

Competency: 32.3 Discuss and compare Manufacturers' Blueprint Standards

Objectives

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

LEARNING TASKS	CONTENT
1. Contrast and compare various manufacturers' blueprint standards	• Boeing • Canadian • DeHavilland • Bell

Line (GAC): 32 ADVANCED BLUEPRINT READING

Competency: 32.4 Interpret Detailed Blueprints

Objectives

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

LEARNING TASKS	CONTENT
1. Demonstrate the interpretation of detailed blueprints	• Title block • Materials list • Notes and specifications • Revision block • Application block • Picture area • Parts list mechanization • Omnibus concept • Production illustration

Line (GAC): 32 ADVANCED BLUEPRINT READING

Competency: 32.5 Work with Manufacturers' Drawings

Objectives

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

LEARNING TASKS	CONTENT
1. Practise interpreting manufacturers' drawings	• Boeing • Canadian • DeHavilland • Bell

Line (GAC): 33 INTRO TO SHOP COMPUTER USE

Competency: 33.1 Demonstrate Computer Access to Work Orders

Objectives

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

LEARNING TASKS	CONTENT

1. Describe tracking of parts and processes related to area of responsibility	• Tabulation of process time
	  ○ Standard
	  ○ Actual
	• Inventory levels
	  ○ Parts
	  ○ Details
	• Bill of materials
	• Shop order release
	  ○ Quantity
	  ○ location
	• Scheduled due date

2. Demonstrate Windows 98 (or later version) Desktop basics	• 1 cons • Tool bar • Menus • Help menu

Line (GAC): 33 INTRO TO SHOP COMPUTER USE

Competency: 33.2 Discuss Computers for Shop Control

Objectives

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

LEARNING TASKS	CONTENT
1. Explain hardware components	• Types of processes • System type • Communications • Input/output device
2. Explain software components	• Operating system • Software programs • Ews on line • Help menu • Knowledge quest help • User desktop
3. Explain BaaN	• Application software

Line (GAC): 33 INTRO TO SHOP COMPUTER USE

Competency: 33.3 Explain Shop Computers Regarding Latest Drawings and Revisions Latest Eos and RESs

Objectives

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

LEARNING TASKS	CONTENT
1. Explain concepts	• BaaN • Ews • Knowledge quest

2. Demonstrate BaaN navigation	• Log on to system
	• Navigate through
	  ○ DEMs
	  ○ Help menus

Line (GAC): 33 INTRO TO SHOP COMPUTER USE

Competency: 33.4 Explain Specifications and Process Control and QASP

Objectives

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

LEARNING TASKS	CONTENT
1. Explain BaaN Enterprise Resource Planning System	• Process plan chart • Business control model • Operational strategies • Dynamic enterprise modelling terminology • Integrated BaaN ERP solution
2. Explain BaaN Item Master Control System Data Access	• Operational Strategies
3. Describe various types of data	• General • Cost • Inventory • Purchase • Sales • Order • Production • Process • Inspection • Default

Line (GAC): 34 MOULD MAKING

Competency: 34.1 Discuss Principles of Mould Making

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss principles of mould making	• Master model/pattern materials • Design considerations for pattern construction • Pattern finishes • Mould surface preparation • Mould release agents

Line (GAC): 34 MOULD MAKING

Competency: 34.2 Fabricate Master Mould

Objectives

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

LEARNING TASKS	CONTENT
1. Describe types, applications and materials used to construct master model/pattern	• Wood • Plaster • Fibre reinforced plastic • Reinforcement –
2. Describe various design considerations for pattern construction	• Split moulds • Parting boards • Joint lines • Taper • Trim flanges
3. Describe pattern finishes used to produce surface finish of completed part	• Aerodynamic smoothness • Gel coats • Sanding surfaces
4. Describe typical, simple master model/pattern	• Materials • Layout • Cutting material • Assembling • Trimming
5. Describe pattern surface preparation	• Sanding • Buffing • Pinhole repairs
6. Describe mould release agents application	• Waxes • Polyvinyl acetate

Line (GAC): 34 MOULD MAKING

Competency: 34.3 Pull Off Mould From Master Model

Objectives

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

LEARNING TASKS	CONTENT
1. Describe requirements of mould tooling	• Production quantities • Temporary or permanent mould • Part configuaration • Fabrication process
2. Describe choice of materials used to construct mould	• Final part material • Cure temperature • Glass fibre • Carbon fibre • Surface porosity • Gel coat • Metal • Ceramic
3. Describe design considerations for mould construction	• Split moulds • Parting boards • Joint lines • Part tape • Trim flanges • Mating flanges • Split mould alignment • Part removal • Mandrels
4. Describe use of stiffening structure in mould design	• Part cure pressure • Vacuum bag technique • Ribs • Egg crate • Tubes • Sandwich cure construction

Line (GAC): 34 MOULD MAKING

Competency: 34.3 Pull Off Mould From Master Model (cont'd)

Objectives

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

LEARNING TASKS	CONTENT
5. Mix mould resins and lay up mould	• Resin specifications • Resin mix ratios • Fibre/resin ratio • Personal safety • Exotherm • Weight scales

Line (GAC): 34 MOULD MAKING

Competency: 34.4 Fabricate Cutting Pattern for Lay-up Piles

Objectives

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

LEARNING TASKS	CONTENT
1. Describe significance of ply orientation in part lay-up	• Isotropic strength • Warp strength • Fill strength • Unidirectional tape • Symmetrical lay-up • Thermal balance
2. Obtain lay-up information form engineering data	• Ply orientation • Fabric type • Fabric style • Lay-up sequence • Ply dimensions
3. Describe criteria for selection of ply pattern materials	• Wet/pre-preg lay-up • One-of use • Production use • Cutting process • Paper • Mylar • Metal
4. Transfer ply dimensions to pattern materials	• Lay-out tools • Photo-etch
5. Cut patterns to size and identify patterns for lay-up sequence and orientation	• Scissors • Knife • Bandsaw • Shears • Files • Router

Line (GAC): 34 MOULD MAKING

Competency: 34.5 Prepare Plies for Wet/Pre-Preg Lay-up

Objectives

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

LEARNING TASKS	CONTENT
1. Identify fibre material and fabric weave pattern	• Glass • Aramid • Carbon/Graphite • Boron • Fabric weave styles
2. Describe clean room requirements for composite lay-ups	• Dust • Positive pressure room • Clothing
3. Prepare wet resin systems in accordance with published instructions	• Ratio calculations • Manufacturer's data • Company process standards • Triple beam balance • Electronic scale • Mixing utensils • Resin pot life • Personal safety • Exotherm
4. Describe strength-by-parts theory for resin/cloth weight ratios for wet lay-up	• Resin rich • Resin starved • Ratio
5. Describe storage requirements and sue of pre-preg materials	• "B" stage cure • Storage temperature • Temperature records • Log cards (time out) • Pre-preg shelf life • Protective bagging • Condensation • Pre-cut kits • Bench lift • Safe handling

Line (GAC): 34 MOULD MAKING

Competency: 34.5 Prepare Plies for Wet/Pre-Preg Lay-up (cont'd)

Objectives

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

LEARNING TASKS	CONTENT
6. Interpret engineering drawings for mould/component orientation and ply rosette alignment	• 0/90/ 45 degrees • Mould rosette markings • Cutting pattern markings
7 Identify fabric warp direction	• Selvage edge • Tracer threads • Pre-preg backing film
8. Describe cutting fabric and pre-preg materials	• Cutting pattern • Scissors • Knife • Water jet
9. Describe archiving full wet-out of fabric plies to optimize component resin content	• Cloth weight • Resin weight • Pre-preg technique • Brush application • Remove all bubbles

Line (GAC): 34 MOULD MAKING

Competency: 34.6 Demonstrate Mould Surface Preparation

Objectives

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

LEARNING TASKS	CONTENT
1. Prepare mould surface	• Buffing • Polishing
2. Apply mould release agents	• Waxes • Polyvinyl acetate • Parting film • Perforated release film • Flash breaker tape

Line (GAC): 35 AUTO CLAVE OPERATION

Competency: 35.1 Discuss Operational Requirements

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss auto clave curing	• Heated pressure vessel • Safety • Inspection • Loading • Vacuum connection • Vacuum check • Thermocouple check • Complete documentation • Closing and securing auto clave
2. Discuss auto clave starting cycle	• Auxiliary system activation • Initiating the program
3. Discuss monitoring the cycle	• Ramp-up • Dwell • Ramp-down • Ending a cycle
4. Discuss ending the cycle	• Ending a cycle • Nitrogen atmosphere auto claves

Line (GAC): 35 AUTO CLAVE OPERATION

Competency: 35.2 Demonstrate Equipment

Objectives

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

LEARNING TASKS	CONTENT
1. Explain the auto clave requirements	• Heated pressure vessel • Vacuum system • Curing pressures • Size limits • Bagging requirements

Line (GAC): 35 AUTO CLAVE OPERATION

Competency: 35.3 Demonstrate Operating Procedures

Objectives

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

LEARNING TASKS	CONTENT
1. Demonstrate auto clave curing	• Heated pressure vessel • Safety • Inspection • Loading • Vacuum connections • Thermocouple connections • Vacuum check • Thermocouple check • Complete documentation • Closing and securing auto clave
2. Demonstrate auto clave starting cycle	• Auxiliary system activation • Initiating the program
3. Demonstrate monitoring the cycle	• Ramp-up • Dwell • Ramp-down • Ending a cycle
4. Demonstrate ending the cycle	• Ending a cycle • Nitrogen atmosphere auto claves

Line (GAC): 35 AUTO CLAVE OPERATIOIN

Competency: 35.4 Discuss Maintenance Requirements

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss maintenance requirements	• Cleanliness • Calibration • General maintenance items

Line (GAC): 35 AUTO CLAVE OPERATION

Competency: 35.5 Review Safety

Objectives

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

LEARNING TASKS	CONTENT
1. Review safety requirements	• Safety legislation • Housekeeping • Fire safety • Precautionary measures • Tool and equipment safety • Workplace ventilation • Reporting procedures • Company safety rules
2. Discuss the confined space program	• Purpose • Scope • References and definitions • Responsibilities • Employer • Supervisors • Employees • Health and safety coordinator

Line (GAC): 36 TEMPER INSPECTION

Competency: 36.1 Review and Temper Designations

Objectives

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

LEARNING TASKS	CONTENT
1. Review alloy designations	• Unalloyed pure aluminum • Copper • Manganese • Silicon • Magnesium and silicon • Zinc • Other elements • 2024, 6062, 7075
2. Review temper designations	• T1 through T8 • O • W

Line (GAC): 36 TEMPER INSPECTION

Competency: 36.2 Discuss Standards and Specifications

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss standards and specification examples	• Company names • Specification number and title • Requirement for documentation • Intended use of the part • Equipment set-up and next calibration • Test-speciman • Surface preparation • Acceptance limits • Calibration of equipment • Precautions for various metal conditions • Reading and recording of rest results • Part marking requirements • ASTM standards • MIL standards
2. Discuss record keeping	• Inspection reporting/records • Identification • Record retention • Accpetable alternate records • Hardness testing tolerances

Line (GAC): 36 TEMPER INSPECTION

Competency: 36.2 Discuss Standards and Specifications (cont'd)

Objectives

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

LEARNING TASKS	CONTENT

2. Discuss record keeping (continued)	• What inspection records must include:
	  ○ Purchase order or work order
	  ○ Part number
	  ○ Alloy and temper
	  ○ Conductivity or test equipment
	  ○ Lot size
	  ○ Quantity accepted or rejected
	  ○ Inspections stamp
	• Part marketing
	  ○ Individual company requirements
	  ○ Stamp requirements
	  ○ Unacceptable parts
	  ○ Questionable parts
	  ○ Scrap parts

Line (GAC): 36 TEMPER INSPECTION

Competency: 36.3 Review Hardness Testing

Objectives

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

LEARNING TASKS	CONTENT

1. Discuss Rockwell hardness testing	• Precision machine
	• Diamond point penetrator
	• Steel ball penetrator
	• Depth of penetration
	• Pre-loading
	• Calibrated weight
	• Dial indicator
	• Tester equipment
	  ○ Brale diamond penetrator check
	  ○ Brale diamond point
	  ○ 1/16 steel ball penetrator check
	  ○ 50 steel balls
	  ○ 60, 100, 150 kg major
	  ○ Test blocks
	  ○ Anvils

2. Demonstrate Rockwell testing	• 2 step procedure
	  ○ Minor load
	  ○ Major load
	• Measurement depends on increase in depth between minor and major load
	• 3-5 second time
	• Hardness number shown on dial gauge
	• B and C scales
	• B, E and 15T for aluminum materials

Line (GAC): 36 TEMPER INSPECTION

Competency: 36.4 Review Conductivity Testing

Objectives

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

LEARNING TASKS	CONTENT

1. Discuss conductivity testing	• Eddy current
	• Comparative measuring system
	  ○ Electromagnetic fields that produce pulsating currents
	  ○ Current flow produces patterns
	  ○ Patterns change in relation to each metal's properties e.g. conductivity
	• Company specifications

Line (GAC): 36 TEMPER INSPECTION

Competency: 36.5 Discuss Inspection Procedures

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss conductivity inspection procedures	• Test materials • Test instruments • Test instrucment equipement, e.g. probes, penetrators • Reference standards • Work process specifications • Test frequency • Calibration records • Correct factors • Special inspection techniques

Line (GAC): 37 GEOMETRIC TOLERANCING

Competency: 37.1 Discuss Geometric Dimensioning and Tolerancing

Objectives

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

LEARNING TASKS	CONTENT
1. Describe advantages of CMM inspection	• Reduced human error • Reduced cost • Increased productivity • Speed • Accuracy • Repeatability • Guaranteed part interchangeability • Part feature size tolerance • Part feature form (flatness, rounding) • Part relationship of geometrical • Part location (parallelism, concentricity)
2. Explain geometric dimensioning and tolerancing principles	• Fundamental rules • Tolerance systems • Limits and fits • Tolerance accumulation • Datums • Form controls • Orientation controls • Location controls • Run-out controls • Profile controls • Tolerance cost models

Line (GAC): 37 GEOMETRIC TOLERANCING

Competency: 37.2 Explain Geometric Symbols

Objectives

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

LEARNING TASKS	CONTENT
1. Explain geometric symbols	• Feature • Feature of size • Datum • Datum feature • Basic dimension • Maximum material condition • Least material • Regardless of feature size

Line (GAC): 38 PHOSPHORIC CHROMIC ACID ANODIZING

Competency: 38.1 Discuss Preparation Processes

Objectives

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

LEARNING TASKS	CONTENT

1. Discuss preparation processes	• Pre-cleaning
	• Degreasing
	  ○ Vapour
	  ○ Manual
	• Customer specifications
	• Drying
	• Alkaline cleaning
	• Water rinse
	• Deoxidizing
	• Water break test

Line (GAC): 38 PHOSPHERIC CHROMIC ACID ANODIZING

Competency: 38.2 Discuss the Anodizing Process

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss the anodizing process	• Racking • Degreasing • Alkaline cleaning • Deoxidizing • Anodizing • Unracking

Line (GAC): 39 PASSIVATION

Competency: 39.1 Discuss Reasons for Passivation

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss the purpose of passivation	• Stainless steel • Dipping process • Removal of iron particles • Oxidation of iron particles

Line (GAC): 39 PASSIVATION

Competency: 39.2 Demonstrate Process and Equipment

Objectives

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

LEARNING TASKS	CONTENT

1. Discuss and demonstrate passivation process and equipment	• Passivation tanks
	• Passivation area
	• Federal specification QQ-P-35C
	• Solutions
	  ○ Type II
	  ○ Type VI
	  ○ Type VII
	  ○ Type VIII
	• Pre-checks
	• Vapour degreasing
	• Alkaline cleaning
	• Rinsing after cleaning
	• Water break test
	• Temperature
	• Timing
	• Pre-cleaning
	• Passivating
	• Treatment after passivation
	• Post-shift check

Line (GAC): 39 PASSIVATION

Competency: 39.3 Discuss IQC and Maintenance

Objectives

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

LEARNING TASKS	CONTENT

1. Discuss quality control	• Quality of passivation solution checks
	• Discrepancy notices
	  ○ Warning
	• Discrepancy major
	  ○ Shut down notice
	• Ramdom sampling
	• Copper sulphate test

Line (GAC): 39 PASSIVATION

Competency: 39.4 Review Safety Requirements

Objectives

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

LEARNING TASKS	CONTENT
1. Review safety requirements	• Safety legislation • Tools and equipment • Fire safety • First aid • Personal protection • Workplace ventilation • Company rules and reporting procedures

Line (GAC): 40 HYDRO PRESS

Competency: 40.1 Explain Metal Forming Requirements

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss metal forming requirements	• Press tonnage • Working pressure • Working area • Forming dies • Straight forming • Concave flanging • Convex flanging • Form block construction • Spring back • Blanking holes • Locating pins • Pin size • Location of pins • Hot forming • Annealed material

Line (GAC): 40 HYDRO PRESS

Competency: 40.2 Demonstrate Hydro Press

Objectives

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

LEARNING TASKS	CONTENT
1. Demonstrate hydro-press	• Work area • Press tonnage • Part location • Press operation

Line (GAC): 40 HYDRO PRESS

Competency: 40.3 Discuss Safety Precautions

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss safety precautions	• Work area cleanliness • Part location and storage • Operating procedures

Line (GAC): 41 METAL BONDING

Competency: 41.1 Describe Metal Bonding

Objectives

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

LEARNING TASKS	CONTENT
1. Describe metal bonding advantages	• Structural adhesives • Replaces rivets or spot welds • Avoids high temperature • Continuous bonds • Even loading • Eliminates gaps and bulges • Improved sonic dampening • Improved fatigue life
2. Describe metal bonding process	• Performance requirements • Production requirements • Control, details, procedures, processes, surface preparation • Quality • Production schedule • Manufacture of details • Shop order issued

Line (GAC): 41 METAL BONDING

Competency: 41.2 Discuss Metal Bonding Preparation

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss metal bonding preparation	• Prefit • Cleaning and surface preparation

Line (GAC): 41 METAL BONDING

Competency: 41.3 Demonstrate Metal Bonding Steps

Objectives

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

LEARNING TASKS	CONTENT
1. Demonstrate metal bonding steps	• Prefit • Cleaning and surface preparation • Adhesive film or resin application • Detail assembly • Adhesive curing • Final trim and clean-up • Quality

Line (GAC): 41 METAL BONDING

Competency: 41.4 Discuss Safety Precautions

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss safety precautions	• Safety legislation • Housekeeping • Fire safety • First aid • Tool and equipment safety • Personal protection • Workplace ventilation • Reporting procedures • Company safety rules

Line (GAC): 42 SHOT PEENING

Competency: 42.1 Describe Shot Peening Process

Objectives

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

LEARNING TASKS	CONTENT
1. Describe reasons for the shot peening process	• Surface tensile stresses • Residual compressive stress • Improved fatigue life • Improved resistance to stress corrosion
2. Describe the shot peening process	• Equipment used • Size and hardness of the shot • Velocity and angle of impingement • Exposure time • Surface coverage • Shot breakdown
3. Describe/demonstrate shot peening equipment and process	• Shot • Shot number • Blast method • Increasing shot size • Test strips • Peening intensity • Peening standards • Angle of impingement • Surface coverage • Exposure time • Equipment adjustment • Surface improvement • Temperature • Roto peen flap assembly

Line (GAC): 43 QUALITY CONTROL

Competency: 43.1 Explain Quality Assurance

Objectives

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

LEARNING TASKS	CONTENT
1. Explain quality assurance	• Director of Quality Assurance • Tranport Canada's role • Inspections • Quality assurance system procedures • QCP change control • QCP amendment policies • QCP content awareness responsibility • References to other documents • Initiation, issue revision and cancellation • Format of QCP documents

Line (GAC): 43 QUALITY CONTROL

Competency: 43.2 Discuss ISO 9000

Objectives

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

LEARNING TASKS	CONTENT

1. Discuss ISO 9000	• History and membership
	• Basic concepts
	• Standardization
	  ○ Types of standards
	  ○ Organization of standards
	  ○ Dimensional agreements
	  ○ Recognized test procedures
	  ○ Specified material
	  ○ Performance requirements
	  ○ Specialized technical language
	• Vocabulary
	• Quality management
	• Quality assurance

Line (GAC): 43 QUALITY CONTROL

Competency: 43.3 Explain Quality Control (QC) Inspection Procedures

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss quality control inspection procedures	• Visual inspection • Dimensional inspection • Jig and tool inspection • Goods receiving inspection • Surface finish inspection • Assembly inspection • Sheet metal detail inspection • Composite fabrication inspection • NDT inspection • Other QC inspection procedures

Line (GAC): 43 QUALITY CONTROL

Competency: 43.4 Explain Statistical Process Control

Objectives

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

LEARNING TASKS	CONTENT
1. Describe SPC	• Product identification and traceability • Process “in control” • Xbar charts • R charts

Line (GAC): 44 METAL ROUTING

Competency: 44.1 Discuss Metal Routing Principles

Objectives

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

LEARNING TASKS	CONTENT

1. Describe routing operations	• Portable routers
	• Air tool air supply requirements
	• Assembly area work
	• Cutouts in metal
	• Skins panels or bulkheads
	• Net trimming
	• Flat work surfaces
	• Curved surface
	• Setback
	• Router jigs
	• Guide bushings
	• Router bits
	• Templates
	• Safety issues
	  ○ Eye protection
	  ○ Hearing protection
	  ○ Kick back
	  ○ Projectiles

Line (GAC): 44 METAL ROUTING

Competency: 44.2 Demonstrate Hand Routing

Objectives

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

LEARNING TASKS	CONTENT
1. Demonstrate hand routing	• Tool selection • Tool preparation • Router bit selection • Bit installation • Guide bushing installation • Surface preparation • Template preparation • Start-up • Tool control • Safety precautions

Line (GAC): 44 METAL ROUTING

Competency: 44.3 Demonstrate Computer Controlled Router

Objectives

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

LEARNING TASKS	CONTENT
1. Discuss and demonstrate securing parts	• Clamps through fasteners
2. Discuss and demonstrate coordinate systems	• Rectangular (X, Y, Z) • Spherical (Polar) (r, L)
3. Discuss and demonstrate speed (head)	• GOTO (positioning) • Cutting
4. Discuss and demonstrate speed (spindle)	• Cutting speed • Dependent on materials
5. Discuss and demonstrate cutter shape	• Straight flute • Up spiral • Down spiral
6. Discuss and demonstrate programming	• Video run (testing) • Machine run (parts)

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

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

- www.ccaa.ca

Recommended Resources

- www.ccaa.ca

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
- Precision Sheet Metal, Blueprint Reading, 3rd Edition by Richard Budzik Practical Publications
- Spencer Aircraft Aerospace, Fastners Catalogue
- "What's WHMIS" Workbook

Instructor Requirements

Occupation Qualification

The instructor must possess:

- AME-S 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