

AVIATION MAINTENANCE TECHNICIAN CERTIFICATION SERIES

MAINTENANCE PRACTICES

7



EASA 2023-889 COMPLIANT

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VERSION	EFFECTIVE DATE	DESCRIPTION OF REVISION(S)
001	2016.01	Module creation and release.
002	2016.08	Format update and minor content revisions.
003	2019.10	Refined content sequencing to Appendix 1.
003.1	2021.10	Corrected description of file types (Submodule 7, pages 3.15-3.16).
003.2	2023.04	Submodule 8 - Added content on <i>Friction</i> and <i>Mechanical lock blind rivet</i> procedures.
004	2024.01	Regulatory update for EASA 2023-989 Compliance.
004.1	2024.07	Included missing Figures from Submodule 3 (3-136 and 3-137). Corrected sequence of Figures 3-117 and 3-118. Additional typo errors fixed.
004.2	2025.01	Page 5.9 - Corrected orientation of Figure 5-10B. Page 5.25 - Corrected y axis identifier for Figure 5-36. Page 12.3 - Corrected orientation of checknuts Figure 12-9.

Module was reorganized based upon the EASA 2023-989 subject criteria. Enhancements included in this version 004.2 are:

- 7.1 *Fuel Tank Safety* - topic added.
- 7.1 *Ballistic Parachutes* - topic added.
- 7.4 *Avionics Test Equipment* - topic moved to Modules 11, 12, and 13 per 2023-989.
- 7.7 *Connector Pin Wire Support* - topic added.
- 7.7 *Soldering Electrical Wires* - topic added.
- 7.7 *HIRF Protection Principles* - topic added.
- 7.8 *Special Purpose Rivets and Fasteners* - topic added.
- 7.9 *Visual Inspection of Springs* - topic added.
- 7.9 *Inspecting Squareness of Springs* - topic added.
- 7.13 *Cable Tension Regulators* - topic added.
- 7.13 *Cable Guides and Adjustment* - topic added.
- 7.14 *Additive Manufacturing* - topic added.
- 7.15 *Welding* - submodule deleted per 2023-989.
- 7.18 *Structural Repair Manuals* - topic added.
- 7.18 *Dye Penetrant Color Contrast* - topic added.
- 7.19 *HIRF Test Equipment* - topic added.
- 7.21 *Documentation and Communication* - new submodule added.

MEASUREMENT STANDARDS

SI Units

The measurements used in this book are presented with the International System of Units (SI) standards in all cases except when otherwise specified by ICAO (for example, altitude expressed in feet or performance numbers as specified by a manufacturer). The chart below can be used should your studies call for conversions into imperial numbers.

Number Groups

This book uses the International Civil Aviation Organization (ICAO) standard of writing numbers. This method separates groups of 3 digits with a space, versus the European method by periods and the American method by commas.

For example, the number one million is expressed as:

ICAO Standard 1 000 000
European Standard 1.000.000
American Standard 1,000,000

Prefixes

The prefixes used in the table below form names of the decimal equivalents in SI units.

PREFIX AND SYMBOLS CHART

MULTIPLICATION FACTORS	PREFIX	SYMBOL
1 000 000 000 000 000 000 = 10^{18}	exa	E
1 000 000 000 000 000 = 10^{15}	peta	P
1 000 000 000 000 = 10^{12}	tera	T
1 000 000 000 = 10^9	giga	G
1 000 000 = 10^6	mega	M
1 000 = 10^3	kilo	k
100 = 10^2	hecto	h
10 = 10^1	deca	da
0.1 = 10^{-1}	deci	d
0.01 = 10^{-2}	centi	c
0.001 = 10^{-3}	milli	m
0.000 001 = 10^{-6}	micro	μ
0.000 000 001 = 10^{-9}	nano	n
0.000 000 000 001 = 10^{-12}	pico	p
0.000 000 000 000 001 = 10^{-15}	femto	f
0.000 000 000 000 000 001 = 10^{-18}	atto	a

COMMON CONVERSIONS CHART

IMPERIAL	TO	SI (METRIC)
Distance		
1 Inch	is equal to	2.54 Centimeters
1 Foot	is equal to	0.304 Meters
1 (Statute) Mile	is equal to	1.609 Kilometers
Weight		
1 Pound	is equal to	0.454 Kilograms
Volume		
1 Quart	is equal to	0.946 Liters
1 Gallon	is equal to	3.785 Liters
Temperature		
$^{\circ}$ Fahrenheit	is equal to	-17.778 Celsius ($^{\circ}$ C)
$^{\circ}$ Fahrenheit	is equal to	255.37 Kelvin (K)
Area		
1 Square Inch	is equal to	6.451 Square Centimeters
1 Square Foot	is equal to	0.093 Square Meters
1 Square Mile	is equal to	2.59 Square Kilometers
Velocity		
1 Foot Per Second	is equal to	0.304 Meters Per Second
1 Mile Per Hour	is equal to	1.609 Kilometers Per Hour
1 Knot	is equal to	1.852 Kilometers Per Hour

SI (METRIC)	TO	IMPERIAL
Distance		
1 Centimeter	is equal to	0.394 Inches
1 Meter	is equal to	3.28 Feet
1 Kilometer	is equal to	0.621 Miles
Weight		
1 Kilogram	is equal to	2.204 Pounds
Volume		
1 Liter	is equal to	1.057 Quarts
1 Liter	is equal to	0.264 Gallons
Temperature		
$^{\circ}$ Celsius ($^{\circ}$ C)	is equal to	33.8 $^{\circ}$ Fahrenheit
$^{\circ}$ Kelvin (K)	is equal to	-459.67 Fahrenheit
Area		
1 Square Centimeter	is equal to	0.155 Square Inches
1 Square Meter	is equal to	10.764 Square Feet
1 Square Kilometer	is equal to	0.386 Square Miles
Velocity		
1 Meter Per Second	is equal to	3.281 Feet Per Second
1 Kilometer Per Hour	is equal to	0.621 Miles Per Hour
1 Kilometer Per Hour	is equal to	0.540 Knots

Pressure

pounds per square inch (psi)	kiloPascals (kPa)	6.897
pounds per square inch (psi)	Pascals (Pa)	6.894

BASIC KNOWLEDGE REQUIREMENTS

Qualification on basic subjects for each aircraft maintenance license category or subcategory is accomplished in accordance with the following matrix. Where applicable, subjects are indicated by an "X" in the column below the license heading.

EASA LICENSE CATEGORY CHART MODULE NUMBER AND TITLE		A1 Airplane Turbine	B1.1 Airplane Turbine	B1.2 Airplane Piston	B1.3 Helicopter Turbine	B1.4 Helicopter Piston	B2 Avionics
1	Mathematics	X	X	X	X	X	X
2	Physics	X	X	X	X	X	X
3	Electrical Fundamentals	X	X	X	X	X	X
4	Electronic Fundamentals		X	X	X	X	X
5	Digital Techniques, Electronic Instrument Systems	X	X	X	X	X	X
6	Materials and Hardware	X	X	X	X	X	X
7	Maintenance Practices	X	X	X	X	X	X
8	Basic Aerodynamics	X	X	X	X	X	X
9	Human Factors	X	X	X	X	X	X
10	Aviation Legislation	X	X	X	X	X	X
11	Aeroplane Aerodynamics, Structures and Systems	X	X				
12	Rotorcraft Aerodynamics, Structures and Systems				X	X	
13	Aircraft Aerodynamics, Structures and Systems						X
14	Propulsion						X
15	Gas Turbine Engine	X	X		X		
16	Piston Engine			X		X	
17	Propeller	X	X	X			

Basic knowledge requirements as outlined in Part-66, Appendix I

The knowledge level indicators are defined on 3 levels as follows:

Level 1

A familiarization with the principal elements of the subject.

Objectives:

- The applicant should be familiar with the basic elements of the subject.
- The applicant should be able to give a simple description of the whole subject, using common words and examples.
- The applicant should be able to use typical terms.

Level 2

A general knowledge of the theoretical and practical aspects of the subject and an ability to apply that knowledge.

Objectives:

- The applicant should be able to understand the theoretical fundamentals of the subject.
- The applicant should be able to give a general description of the subject using, as appropriate, typical examples.
- The applicant should be able to use mathematical formula in conjunction with physical laws describing the subject.
- The applicant should be able to read and understand sketches, drawings and schematics describing the subject.
- The applicant should be able to apply his knowledge in a practical manner using detailed procedures.

Level 3

A detailed knowledge of the theoretical and practical aspects of the subject and a capacity to combine and apply the separate elements of knowledge in a logical and comprehensive manner.

Objectives:

- The applicant should know the theory of the subject and interrelationships with other subjects.
- The applicant should be able to give a detailed description of the subject using theoretical fundamentals and specific examples.
- The applicant should understand and be able to use mathematical formula related to the subject.
- The applicant should be able to read, understand and prepare sketches, simple drawings and schematics describing the subject.
- The applicant should be able to apply his knowledge in a practical manner using manufacturer's instructions.
- The applicant should be able to interpret results from various sources and measurements and apply corrective action where appropriate.

PART 66 BASIC KNOWLEDGE REQUIREMENTS

SUBMODULE KNOWLEDGE DESCRIPTIONS		LEVEL
		B1
7.1	Safety Precautions – Aircraft and Workshop Aspects of safe working practices including precautions to be taken when working with electricity, gases (especially oxygen), oils, and chemicals. Fuel tank safety, fuel tank entry procedures and precautions. Awareness and precautions regarding aircraft equipped with ballistic recovery systems. Also, instructions in the remedial action to be taken in the event of a fire or another accident with one or more of these hazards including knowledge of fire extinguishing agents.	3
7.2	Workshop Practices Care of tools / drills and reamers, control of tools, use of workshop materials; Dimensions, allowances and tolerances, workmanship standards; Calibration of tools and equipment, calibration standards.	3
7.3	Tools Common hand-tool types; Common power-tool types; Operation and use of precision-measuring tools; Lubrication equipment and methods; Operation, function, and use of electrical general test equipment.	3
7.4	Submodule reserved for future use.	–
7.5	Engineering Drawings, Diagrams, and Standards Drawing types and diagrams, their symbols, dimensions, tolerances and projections; Identification of title block information; Microfilm, microfiche, and computerised presentations; Specification 100 of the Air Transport Association (ATA) of America; Aeronautical and other applicable standards including ISO, AN, MS, NAS and MIL; Wiring diagrams and schematic diagrams.	2
7.6	Fits and Clearances Drill sizes for bolt holes, classes of fits; Common system for fits and clearances; Schedule of fits and clearances for aircraft and engines; Limits for bow, twist and wear; Standard methods for checking shafts, bearings, and other parts.	2
7.7	Electrical Wiring Interconnection System (EWIS) Continuity, insulation and bonding techniques and testing; Use of crimp tools: hand and hydraulic operated; Testing of crimp joints; Connector pin removal and insertion; Coaxial cables: testing and installation precautions; Identification of wire types, their inspection criteria and damage tolerance; Wiring protection techniques: cable looming and loom support, cable clamps, protective sleeving techniques including heat shrink wrapping, shielding; High-Intensity Radiated Fields (HIRF) and protection principles; Soldering of electrical wires, EWIS installations, inspection, repair, maintenance, and cleanliness standards.	3
7.8	Riveting Riveted joints, rivet spacing and pitch; Tools used for riveting and dimpling; Inspection of riveted joints.	2
7.9	Pipes and Hoses Bending and belling/flaring aircraft pipes; Inspection and testing of aircraft pipes and hoses; Installation and clamping of pipes.	2
7.10	Springs Inspection and testing of springs.	2
7.11	Bearings Testing, cleaning and inspection of bearings; Lubrication requirements for bearings; Defects in bearings and their causes.	2
7.12	Transmissions Inspection of gears, backlash; Inspection of belts and pulleys, chains and sprockets; Inspection of screw jacks, lever devices, push–pull rod systems.	2

PART 66 BASIC KNOWLEDGE REQUIREMENTS

SUBMODULE KNOWLEDGE DESCRIPTIONS		LEVEL
		B1
7.13	Control Cables Swaging of end fittings; Inspection and testing of control cables; Bowden cables; aircraft flexible control systems.	2
7.14	Material Handling 7.14.1 Sheet Metal Marking out and calculation of bend allowance; Sheet metal working, including bending and forming; Inspection of sheet metal work.	2
7.14.2	Composite and Non-metallic Bonding practices; Environmental conditions; Inspection methods.	2
7.14.3	Additive Manufacturing Common additive manufacturing techniques and their influence on the mechanical properties of the finished part; Inspection of additive manufactured parts and common production failures.	1
7.15	Submodule reserved for future use.	–
7.16	Aircraft Weight and Balance (a) Calculation of centre-of-gravity / balance limits: use of relevant documents. (b) Preparation of aircraft for weighing; Aircraft weighing.	2 2
7.17	Aircraft Handling and Storage Aircraft taxiing/towing and associated safety precautions; Aircraft jacking, chocking, securing and associated safety precautions; Aircraft storage methods; Refuelling/defuelling procedures; De-icing/anti-icing procedures; Electrical, hydraulic, and pneumatic ground supplies; Effects of environmental conditions on aircraft handling and operation.	2
7.18	Disassembly, Inspection, Repair, and Assembly Techniques (a) Types of defects and visual inspection techniques; Corrosion removal, assessment and reprotection; (b) General repair methods, structural repair manual; Ageing, fatigue, and corrosion control programmes; (c) Non-destructive inspection techniques including penetrant, radiographic, eddy current, magnetic particle, ultrasonic and borescope inspections; including practical training in colour contrast penetrant inspection; (d) Disassembly and reassembly techniques; (e) Troubleshooting techniques.	3 2 2 2 2
7.19	Abnormal Events (a) Inspections following lightning strikes and HIRF penetration; (b) Inspections following abnormal events such as heavy landings and flight through turbulence.	2 2
7.20	Maintenance Procedures Maintenance planning; Modification procedures; Stores procedures; Certification/release procedures; Interface with aircraft operation; Maintenance Inspection / Quality Control / Quality Assurance; Additional maintenance procedures; Control of life-limited components.	2
7.21	Documentation and Communication Documentation: elements and criteria for writing work reports, troubleshooting reports, and shift handover instructions. Communication: clear, comprehensive, and concise.	2

TABLE OF CONTENTS

MAINTENANCE PRACTICES

Revision Log	iii
Measurement Standards	iv
Basic Knowledge Requirements	v
Part 66 Basic Knowledge Requirements	vi
Table of Contents	ix

7.1 SAFETY PRECAUTIONS — AIRCRAFT AND WORKSHOP..... 1.1

Safety Around Electricity	1.1
Fire Safety Around Electricity	1.1
Safety Around Compressed Gases	1.2
Oxygen Safety Considerations	1.2
Safety Around Hazardous Materials	1.2
Safety Around Machine Tools	1.3
Fuel Tank Entry Procedures and Precautions	1.4
Fuel Tank Entry Procedures and Precautions	1.4
Chemical Hazards	1.4
Physical Hazards	1.4
Preparation for Entry	1.5
Ensuring Adequate Ventilation	1.5
Ventilation Techniques	1.5
Monitoring Air in Fuel Tanks	1.5
Conditions Required for Entry	1.5
Communication	1.5
Respiratory Protection	1.5
Electrically Powered Equipment	1.5
Airplane Damage Considerations	1.6
Ballistic Recovery Systems	1.6
Awareness and Precautions Regarding Ballistic Recovery Systems	1.6
Basic Understanding	1.6
Primary Components	1.6
Safety Around Ballistic Recovery Systems	1.6
Inspection and Maintenance	1.6
Installation and Removal	1.7
Fire Safety	1.7
Requirements for a Fire to Occur	1.7
Classification of Fires	1.7
Ordinary Combustibles	1.7
Flammable Liquid and Gas	1.8
Electrical	1.8
Metal	1.8
Cooking Oils	1.8
European Standards	1.8
Fire Extinguishers	1.9
Identifying Fire Extinguishers	1.11
Inspection of Fire Extinguishers	1.11
Using Fire Extinguishers	1.12
Flight Line Safety	1.12
Hearing Protection	1.12
Foreign Object Damage (FOD)	1.12
Safety Around Airplanes	1.12
Safety Around Helicopters	1.12
Submodule 1 Practice Questions	1.13
Submodule 1 Practice Answers	1.14

7.2 WORKSHOP PRACTICES2.1

Care and Control of Tools; Use of Workshop Materials	2.1
Care of Tools	2.1
Benches	2.1
Vices	2.1
Drilling Machines	2.1
Grinder	2.1
Motor Drives	2.2
Measuring Instruments	2.2
Drills and Reamers	2.2
Control of Tools	2.2
Tool Control Procedures	2.2
Workshop Materials	2.3
Dimensions, Allowances and Tolerances; Workmanship Standards	2.3
Dimensions, Allowances, and Tolerances	2.3
Standards of Workmanship	2.4
Tool Calibration	2.4
Submodule 2 Practice Questions	2.7
Submodule 2 Practice Answers	2.8

7.3 TOOLS.....3.1

Common Hand Tools	3.1
Screwdrivers	3.1
Pliers and Plier-Type Cutting Tools	3.2
Clamps and Vises	3.3
C-Clamps	3.3
Vises	3.3
Hammers and Mallets	3.3
Punches	3.4
Wrenches	3.4
Open-End Wrenches	3.5
Box-End Wrenches	3.5
Socket Wrenches	3.5
Adjustable Wrenches	3.5
Special Wrenches	3.5
Strap Wrenches	3.6
Impact Wrenches	3.7
Torque Wrenches	3.7
Torque Tables	3.8
Cutting Tools	3.8
Hand Snips	3.9
Metal Shears	3.10
Hacksaws	3.10
Chisels	3.10
Files	3.11
File Types and Use	3.12
Commonly Used Files	3.12
Care of Files	3.13
Burring Tools	3.13
Reamers	3.13
Taps and Dies	3.14
Common Power Tools	3.16
Saws	3.16
Circular Cutting Saws	3.16
Kett Saw	3.16

TABLE OF CONTENTS

Pneumatic Circular-Cutting Saw	3.16	Twist Drill Bits	3.29
Reciprocating Saw	3.16	Cobalt Alloy Drill Bits	3.29
Die Grinders	3.17	Step Drill Bits	3.29
Cut-Off Wheels	3.17	Twist Drill Construction and Sizes	3.29
Nibblers	3.17	Drill Bit Sizes	3.30
Table Top, and Bench Tools	3.17	Hole Drilling Techniques	3.31
Notchers	3.17	Drilling Large Holes	3.34
Band Saws	3.17	Drill Lubrication	3.34
Metal Shears	3.18	Drill Accessories	3.34
Throatless Shears	3.18	Drill Stops	3.34
Scroll Shears	3.18	Drill Bushings	3.34
Rotary Punch Press	3.18	Drill Bushing Holder	3.34
Foot Operated Shears	3.18	Precision Measuring Tools	3.35
Squaring Shears	3.18	Rules	3.35
Sanders	3.19	Combination Sets	3.35
Disk Sander	3.19	Scriber	3.35
Belt Sander	3.19	Dividers and Pencil Compasses	3.35
Grinders	3.19	Calipers	3.36
Grinding Wheels	3.20	Micrometer Calipers	3.37
Bending Tools	3.20	Micrometer Parts	3.37
Bar Folding Machine	3.21	Reading a Micrometer	3.37
Cornice Brake	3.21	Vernier Scale	3.38
Box and Pan Brake	3.21	Using a Micrometer	3.38
Press Brake	3.22	Dial Indicator	3.39
Slip Roll Former	3.22	Slide Calipers	3.39
Rotary Machine	3.23	Lubrication Equipment	3.39
Shrinking, Stretching Tools and Procedures	3.23	Electrical Test Equipment	3.40
Shrinking Tools	3.23	DC Measuring Equipment	3.40
Stretching Tools	3.24	D'Arsonval Meter Movement	3.40
Forming Tools and Procedures	3.24	Current Sensitivity and Resistance	3.41
Stretch Forming	3.24	Dampening	3.41
Drop Hammer	3.24	Electrical Damping	3.41
Hydropress Forming	3.24	Mechanical Damping	3.41
Spin Forming	3.24	Multirange Ammeter	3.42
Forming with an English Wheel	3.25	Precautions	3.42
Piccolo Former	3.25	Voltmeters	3.42
Manual Sheet Metal Shrinker	3.25	Voltmeter Sensitivity	3.42
Hand-Operated Shrinker/Stretcher	3.26	MultiRange Voltmeters	3.42
Forming Blocks	3.26	Voltmeter Circuit Connections	3.43
Dollies and Stakes	3.26	Influence of the Voltmeter in the Circuit	3.43
Hardwood Form Blocks	3.26	Ohmmeter	3.43
V-Blocks	3.26	Zero Adjustment	3.43
Shrinking Blocks	3.26	Ohmmeter Scale	3.43
Sandbags	3.26	Multirange Ohmmeter	3.44
Hammers and Mallets	3.26	Megger (Megohmmeter)	3.44
Drilling	3.26	AC Measuring Equipment	3.45
Portable Power Drills	3.27	Electrodynamometer Meter Movement	3.46
Pneumatic Drill Motors	3.27	Moving Iron Vane Meter	3.46
Angled Drill Motors	3.27	Inclined Coil Iron Vane Meter	3.47
Two Hole Drill Motors	3.27	Varmeters	3.47
Drill Extension and Adapters	3.27	Wattmeter	3.47
Extension Drill Bits	3.27	Oscilloscope	3.47
Angle Adapters	3.28	Horizontal Deflection	3.48
Snake Attachment	3.28	Vertical Deflection	3.49
Drill Press	3.28	Tracing a Sine Wave	3.49
Types of Drill Bits	3.28	Control Features on an Oscilloscope	3.49

TABLE OF CONTENTS

Flat Panel Color Displays for Oscilloscopes	3.50	Applied Geometry	5.7
Digital Multimeters	3.50	Orthographic Projection	5.7
Basic Circuit Analysis and Troubleshooting	3.51	Detail View	5.9
Voltage Measurement	3.51	Pictorial Drawings	5.9
Current Measurement	3.51	Perspective Drawings	5.10
Checking Resistance	3.52	Isometric Drawings	5.10
Continuity Checks	3.52	Oblique Drawings	5.10
Capacitance Measurement	3.52	Exploded View Drawings	5.10
Inductance Measurement	3.53	Lines and Their Meanings	5.11
Troubleshooting the Open Faults in Series Circuits	3.53	Centerlines	5.12
Tracing Opens with the Voltmeter	3.54	Dimension Lines	5.12
Tracing Opens with the Ohmmeter	3.54	Extension Lines	5.12
Troubleshooting the Shorting Faults in Series Circuits	3.54	Sectioning Lines	5.12
Tracing Shorts with the Ohmmeter	3.55	Phantom Lines	5.13
Tracing Shorts with the Voltmeter	3.55	Break Lines	5.13
Troubleshooting the Open Faults in Parallel Circuits	3.55	Leader Lines	5.13
Tracing an Open with an Ammeter	3.56	Hidden Lines	5.13
Tracing an Open with an Ohmmeter	3.56	Outline or Visible Lines	5.13
Troubleshooting the Shorting Faults in Parallel Circuits	3.56	Stitch Lines	5.13
Troubleshooting the Shorting Faults in Series-Parallel Circuits	3.56	Cutting Plane and Viewing Plane Lines	5.13
Tracing Opens with the Voltmeter	3.57	Drawing Symbols	5.13
Submodule 3 Practice Questions	3.59	Material Symbols	5.13
Submodule 3 Practice Answers	3.60	Shape Symbols	5.14
Submodule 3 Practice Questions	3.61	Electrical Symbols	5.14
Submodule 3 Practice Answers	3.62	Reading and Interpreting Drawings	5.14
7.4 RESERVED.....4.1		Drawing Sketches	5.16
This submodule is reserved by EASA for future use.	4.1	Sketching Techniques	5.16
7.5 ENGINEERING DRAWINGS, DIAGRAMS, AND STANDARDS...5.1		Basic Shapes	5.16
Purpose and Function of Aircraft Drawings	5.1	Repair Sketches	5.16
Drawings and Diagrams; Symbols, Dimensions, Tolerances, and		Care of Drafting Tools	5.16
Projections	5.1	Title Blocks	5.16
Drawing Types	5.1	Drawing or Print Numbers	5.17
Detail Drawings	5.1	Reference and Dash Numbers	5.17
Assembly Drawings	5.2	Computerized Presentations	5.17
Installation Drawings	5.2	Microfilm and Microfiche	5.17
Sectional View Drawings	5.2	Digital Images	5.18
Full Section	5.2	Specification 100 of the Air Transport Association (ATA)	5.18
Half Section	5.2	ATA 100 and iSpec 2200	5.18
Revolved Section	5.2	Aeronautical Standards	5.19
Removed Section	5.2	ISO	5.19
Universal Numbering System	5.2	AN (Army/Navy)	5.20
Drawing Standards	5.2	MS (Military Standard)	5.20
Bill of Material	5.2	NAS (National Aerospace Standard)	5.20
Other Drawing Data	5.2	BS (British Standards)	5.20
Revision Block	5.2	Wiring and Schematic Diagrams	5.20
Notes	5.6	Diagrams	5.20
Zone Numbers	5.7	Installation Diagrams	5.20
Station Numbers and Location Identification on Aircraft	5.7	Schematic Diagrams	5.20
Allowances and Tolerances	5.7	Block Diagrams	5.20
Finish Marks	5.7	Wiring Diagrams (Schematics)	5.20
Scale	5.7	Flowcharts	5.20
Application	5.7	Troubleshooting Flowchart	5.20
Methods of Illustration	5.7	Logic Flowchart	5.20
		Graphs and Charts	5.21
		Reading and Interpreting Graphs and Charts	5.21
		Nomograms	5.21

TABLE OF CONTENTS

Submodule 5 Practice Questions	5.27	Insertion	7.7
Submodule 5 Practice Answers	5.28	Removal	7.7
7.6 FITS AND CLEARANCES.....6.1		Adjacent Locations	7.8
Drill Sizes for Bolt Holes; Classes of Fits	6.1	Sealing	7.8
Accuracy of Drilled Holes	6.1	Drainage	7.8
Classes of Fit	6.1	Wire Support	7.8
Common System of Fits and Clearances	6.2	Coaxial Cables; Testing and Installation	7.8
Newall System	6.2	Testing Coaxial Cable	7.10
British Standards BS 4500 System	6.2	Identification of Wire Types, Inspection and	
BS 4500 Definitions:	6.2	Damage Tolerance	7.10
BS 4500 Basic Hole System	6.4	Identification of Wire Types	7.10
BS 4500 Basic Shaft System	6.4	Placement of Identification Markings	7.10
Basic Hole Method - Metric	6.4	Types of Wire Markings	7.10
Dimensions, Allowances and Tolerances	6.4	Wire Inspection	7.11
Dimensions	6.4	Wire Protection: Cable Looms and Support, Clamps,	
Allowances	6.5	Heat Shrink Wrap and Shielding	7.11
Tolerances	6.5	Wire Bundles and Routing	7.11
Unilateral and Bilateral Tolerances	6.5	Slack in Wire Bundles	7.12
Baseline and Continued Tolerances	6.5	Twisting Wires	7.12
Schedule of Fits and Clearances	6.5	Spliced Connections In Wire Bundles	7.12
Limits for Bow, Twist and Wear	6.6	Lacing and Tying Wire Bundles	7.13
Limits for Bow	6.6	Bend Radii	7.13
Limits for Twist	6.6	Wire Protection	7.14
Limits for Wear	6.6	Protection Against Chafing	7.14
Limits for Ovality	6.6	Protection Against High Temperature	7.14
Standard Methods for Checking Shafts, Bearings, and		Protection Against Solvents and Fluids	7.14
Other Parts	6.6	Protection of Wires in Wheel Well Areas	7.15
Checking for Bow	6.6	Clamp Installation	7.15
Clearance Measured By Feeler Gauges	6.6	Wire and Cable Clamp Inspection	7.17
Checking for Twist	6.6	Movable Controls Wiring Precautions	7.17
Piston Engine Connecting Rod Twist	6.7	Conduit	7.17
Checking for Ovality	6.7	Rigid Conduit	7.18
Submodule 6 Practice Questions	6.9	Flexible Conduit	7.18
Submodule 6 Practice Answers	6.10	Heat Shrink Wrapping	7.18
7.7 ELECTRICAL WIRING INTERCONNECT SYSTEM (EWIS) 7.1		Wire Shielding	7.19
Continuity, Insulation, Bonding, and Testing	7.1	Junction Boxes	7.19
Continuity	7.1	High-Intensity Radiated Fields (HIRF) Protection Principles	7.20
Insulation	7.1	HIRF Protection	7.20
Bonding and Grounding	7.2	Soldering Electrical Wires	7.21
Grounding	7.2	Soldering and Spacing of Wires	7.21
Bonding	7.3	Soldering Wires to a Circuit Board	7.22
Testing of Bonds and Grounds	7.3	Soldering Wires to a Connector	7.22
Bonding Jumper Installation	7.3	EWIS Installation, Repair, Maintenance and Cleanliness	7.22
Stripping and Crimping Tools; Hand and Hydraulic	7.4	EWIS Standards	7.22
Stripping Wire	7.4	EWIS Inspection, Repair and Maintenance	7.23
Terminal Strips	7.5	EWIS Cleaning Requirements and Methods	7.24
Terminal Lugs	7.5	Submodule 7 Practice Questions	7.25
Copper Wire Terminals	7.6	Submodule 7 Practice Answers	7.26
Aluminum Wire Terminals	7.6	7.8 RIVETS8.1	
Pre-Insulated Splices	7.6	Riveted Joints, Rivet Spacing, and Pitch	8.1
Emergency Splicing Repairs	7.6	Solid Shank Rivets	8.1
Crimping Tools	7.6	Rivet Head Shape	8.1
Inspection and Testing of Crimped Joints	7.7	Rivet Construction	8.1
Connector Pin Removal and Insertion	7.7	Solid Rivet Types	8.1
		Rivet Strength	8.2

TABLE OF CONTENTS

Stresses Applied to Rivets	8.3	Double Flaring.....	9.4
Rivet Length	8.3	Beading	9.4
Repair Layout	8.3	Flexible Hoses	9.6
Rivet Spacing.....	8.3	Flexible hose Size Designations	9.6
Edge Distance	8.4	Fabrication and Replacement of Flexible Hoses	9.6
Rivet Pitch	8.4	Inspection and Testing of Pipes and Hoses.....	9.6
Transverse Pitch.....	8.4	Rigid Tubing Inspection	9.6
Rivet Layout Example	8.5	Flexible Hose Inspection.....	9.6
Tools Used for Riveting and Dimpling	8.5	Flexible Hose Testing	9.6
Hand Tools	8.5	Installation of Pipes and Hoses.....	9.6
Rivet Cutter.....	8.5	Rigid Tube Installation and Inspection.....	9.6
Bucking Bar	8.5	Connection and Torque.....	9.8
Hand Rivet Set	8.6	Flareless Tube Installation.....	9.8
Dimple Dies.....	8.6	Hose Clamps	9.9
Chip Chasers	8.6	Installation of Flexible Hose Assemblies	9.10
Powered Tools	8.6	Submodule 9 Practice Questions.....	9.13
Pneumatic Rivet Gun	8.6	Submodule 9 Practice Answers	9.14
Rivet Sets and Headers	8.7	7.10 SPRINGS.....	10.1
Microshavers	8.8	Inspection and Testing of Springs.....	10.1
Compression Riveting	8.8	Visual Inspection	10.1
Reusable Sheet Metal Fasteners.....	8.8	Static Measurement.....	10.1
Cleco Fasteners	8.9	Corrosion	10.1
Hex Nut and Wing Nut Fasteners.....	8.9	Overheating	10.1
Riveting Procedures.....	8.9	Fatigue	10.1
Universal Head Rivets	8.9	Load Deflection	10.2
Hole Transfer.....	8.9	Squareness Inspection of Valve Springs	10.2
Hole Preparation	8.9	Submodule 10 Practice Questions.....	10.3
Drilling	8.9	Submodule 10 Practice Answers	10.4
Driving the Rivet.....	8.10	7.11 BEARINGS.....	11.1
Countersunk Rivets.....	8.10	Testing, Cleaning, and Inspection of Bearings.....	11.1
Countersink Tools	8.10	Testing Bearings	11.1
Dimpling	8.11	Cleaning the Wheel Bearings	11.1
Coin Dimpling.....	8.11	Wheel Bearing Inspection.....	11.1
Radius Dimpling	8.12	Lubrication Requirements of Bearings	11.3
Hot Dimpling	8.12	Bearing Handling and Lubrication.....	11.3
Dimpling Inspection	8.12	Lubricants	11.3
Blind Rivets	8.13	Types of Lubricants	11.3
Friction-Locked Blind Rivets	8.13	Hydrodynamic Lubrication.....	11.3
Mechanical-Lock Blind Rivets	8.13	Boundary Lubrication	11.4
Removal of Mechanically-Locked Blind Rivets	8.14	Hydrostatic Lubrication.....	11.4
Inspection of Riveted Joints.....	8.15	Solid Film	11.4
Removal of Rivets	8.15	Storage	11.4
Replacing Rivets	8.16	Defects in Bearings and Their Causes	11.4
Double Flush Riveting.....	8.16	Contamination and Corrosion.....	11.4
Submodule 8 Practice Questions.....	8.19	Electric Current Damage	11.4
Submodule 8 Practice Answers	8.20	Submodule 11 Practice Questions.....	11.5
7.9 PIPES AND HOSES	9.1	Submodule 11 Practice Answers	11.6
Metal Tubes and Pipes.....	9.1	7.12 TRANSMISSIONS.....	12.1
Bending and Belling/Flaring Aircraft Pipes.....	9.1	Inspection of Gears, Backlash.....	12.1
Tubing Sizes.....	9.1	Gears	12.1
Tube Cutting	9.1	Lash and Pattern	12.1
Tube Bending.....	9.2	Inspection of Belts and Pulleys, Chains and Sprockets	12.2
Alternative Bending Methods.....	9.2	Belts and Pulleys	12.2
Tube Flaring	9.3		
Rolling Type Flaring Tools	9.4		

TABLE OF CONTENTS

Chains and Sprockets	12.2	Layout Method	14.15
Inspection of Screw Jacks, Lever Devices, and Push-Pull Rod Systems	12.3	Open and Closed Bends	14.15
Jack Screws	12.3	Open End Bend (Less Than 90°)	14.15
Levers	12.3	Closed End Bend (More Than 90°)	14.16
Push-pull Rod Systems	12.3	Hand Forming	14.16
Submodule 12 Practice Questions	12.5	Straight Line Bends	14.16
Submodule 12 Practice Answers	12.6	Formed or Extruded Angles	14.16
		Stretching with V-Blocks	14.16
		Shrinking with the V-Blocks and Shrinking Blocks	14.17
		Flanged Angles	14.17
		Shrinking	14.17
		Stretching	14.18
		Curved Flanged Parts	14.18
		Concave Surfaces	14.19
		Convex Surfaces	14.20
		Forming By Bumping	14.20
		Form Blocks or Dies	14.20
		Sandbag Bumping	14.21
		Joggling	14.22
		Lightening Holes	14.23
		Flanging Lightening Holes	14.23
		Working Stainless Steel	14.23
		Inconel® Alloys 625 and 718	14.23
		Working Magnesium	14.23
		Working Titanium	14.25
		Description of Titanium	14.25
		Inspection of Sheet Metal Work	14.26
		Inspection of Riveted Joints	14.26
		Inspection for Corrosion	14.27
		7.14.2 Composite and Non-Metallic	14.27
		Bonding Practices	14.27
		Bonding Methods	14.27
		Thermoplastic Adhesives	14.27
		Thermosetting Adhesives	14.27
		Environmental Conditions	14.28
		Inspection Methods	14.28
		Visual Inspection	14.28
		Tap Testing	14.28
		Ultrasonic Inspection	14.28
		Electrical Conductivity	14.28
		7.14.3 - Additive Manufacturing	14.29
		Common Additive Manufacturing Techniques	14.29
		Additive Manufacturing Techniques	14.29
		Methods of Additive Manufacturing	14.29
		Vat Photopolymerization	14.29
		Material Jetting	14.29
		Binder Jetting	14.29
		Material Extrusion	14.29
		Ultrasonic Additive Manufacturing	14.29
		Powder Bed Fusion	14.29
		Directed Energy Deposition	14.29
		Finishing Parts after Printing	14.29
		Mechanical Properties of Finished Parts	14.30
		Inspection of Additive Manufactured Parts and Common Production Failures	14.30
		Common Production Failures	14.30
7.13 CONTROL CABLES	13.1		
Swaging of End Fittings	13.1		
Splicing	13.2		
Swaged Ball Terminals	13.2		
Cable Slippage In Terminal	13.2		
Nicopress® Swaged End Fittings	13.2		
Inspection and Testing of Cables	13.4		
Manufacturer Wire Splices	13.7		
Testing Cable Tension	13.7		
Tension Regulators	13.7		
Spring-Back	13.7		
Aircraft Flexible Control Systems	13.7		
Cable System Installation	13.7		
Cable Guides	13.7		
Travel Adjustments	13.8		
Bowden Cable Systems	13.8		
Teleflex Cable Systems	13.9		
Adjustment of Teleflex End Fittings	13.9		
Submodule 13 Practice Questions	13.11		
Submodule 13 Practice Answers	13.12		
7.14 MATERIAL HANDLING	14.1		
7.14.1 Sheet Metal	14.1		
Marking out and Calculations of Bend Allowances	14.1		
Terminologies	14.1		
Layout or Flat Pattern Development	14.2		
Making Straight Line Bends	14.2		
Bending a U-Channel	14.3		
Using a Formula To Calculate the Setback	14.4		
Using a Setback Chart To Find the Setback	14.4		
Formula 1: Bend Allowance for a 90° Bend	14.6		
Formula 2: Bend Allowance for a 90° Bend	14.6		
Using a Bend Allowance Chart for a 90° Bend	14.6		
Using a Chart for Other Than a 90° Bend	14.7		
Using a J-Chart To Calculate Total Developed Width	14.8		
How To Find the Total Developed Width Using a J-Chart	14.9		
Sheet Metal Working (Bending and Forming)	14.10		
Sheet Metal Forming Process	14.10		
Forming Operations and Terms	14.11		
Stretching	14.11		
Shrinking	14.11		
Bumping	14.11		
Crimping	14.11		
Folding Sheet Metal	14.12		
Using a Sheet Metal Brake To Fold Metal	14.12		
Folding a Box	14.13		
Relief Hole Location	14.14		

TABLE OF CONTENTS

Inspection of Additive Manufactured Parts	14.31	Section B	16.18
Ultrasonic Testing	14.31	Preparation of Aircraft for Weighing	16.18
Radiographic Testing	14.31	Weight and Balance Equipment	16.18
CT Scans	14.31	Scales	16.18
Eddy Current Testing	14.31	Spirit Level.	16.19
Submodule 14 Practice Questions	14.33	Plumb Bob	16.19
Submodule 14 Practice Answers	14.34	Hydrometer	16.19
7.15 RESERVED	15.1	Preparing an Aircraft for Weighing	16.20
This submodule is reserved by EASA for future use.	15.1	Fuel System	16.20
7.16 AIRCRAFT WEIGHT AND BALANCE	16.1	Oil System	16.20
Section A	16.1	Miscellaneous Fluids	16.20
Calculation of Center of Gravity Limit / Balance Limits: Use. 16.1		Flight Controls.	16.20
of Relevant Documents	16.1	Other Considerations	16.20
Aircraft Weight and Balance.	16.1	Weighing Points	16.21
Need and Requirements for Aircraft Weighing	16.1	Weight and Balance for Large Airplanes	16.21
Weight and Balance Terminology.	16.2	Weighing an Aircraft.	16.21
Datum	16.2	Jacking the Aircraft	16.21
Arm	16.2	Leveling the Aircraft.	16.21
Moment	16.2	Safety Considerations	16.21
Center of Gravity.	16.3	Built-In Electronic Weighing	16.22
Maximum Weight	16.3	Helicopter Weighing	16.22
Empty Weight	16.3	Submodule 16 Practice Questions	16.25
Empty Weight Center of Gravity	16.4	Submodule 16 Practice Answers	16.26
Useful Load	16.4	7.17 AIRCRAFT HANDLING AND STORAGE	17.1
Minimum Fuel.	16.4	Aircraft Taxiing/Towing and Associated Safety Precautions.	17.1
Tare Weight	16.4	Engine Starting and Operations	17.1
Standard Weights for Aircraft Weight and Balance	16.4	Reciprocating Engines.	17.1
Procedures for Determining Weight and Balance.	16.4	Hand Cranking Engines	17.2
Weight and Balance Data	16.6	Turboprop Engines	17.3
Center of Gravity Range	16.6	Turboprop Starting Procedures	17.3
Empty Weight Center of Gravity Range.	16.8	Turbofan Engines	17.4
Operating Center of Gravity Range	16.9	Starting a Turbofan Engine.	17.4
Example Weight and Balance Computations	16.9	Auxiliary Power Units (APUs)	17.6
EWCG Formulas.	16.9	Unsatisfactory Turbine Engine Starts	17.6
Datum Forward of the Airplane – Nosewheel		Hot Start	17.6
Landing Gear.	16.10	False or Hung Starts	17.6
Datum Aft of the Main Wheels – Nosewheel		Engine Will Not Start	17.6
Landing Gear.	16.10	Extinguishing Engine Fires	17.6
Location of Datum	16.10	Taxiing Aircraft.	17.6
Datum Forward of the Main Wheels – Tail Wheel Landing		Taxi Signals	17.7
Gear	16.10	Towing Aircraft.	17.7
Datum Aft of the Main Wheels – Tail Wheel		Aircraft Jacking, Chocking, Securing, and Associated	
Landing Gear.	16.10	Safety Precautions	17.10
Loading an Airplane for Flight	16.11	Aircraft Jacking	17.10
Example Loading of an Airplane for Flight	16.11	Tiedown, Chocking and Securing.	17.11
Adverse-Loaded CG Checks.	16.12	Securing Light Aircraft	17.11
Weight and Balance Extreme Conditions.	16.12	Securing Heavy Aircraft	17.11
Equipment Change and Aircraft Alteration	16.12	Tiedown Procedures for Seaplanes	17.12
Example Calculations After an Equipment Change.	16.13	Tiedown Procedures for Skiplanes	17.12
The Use of Ballast	16.13	Tiedown Procedures for Helicopters	17.13
Loading Graphs and CG Envelopes	16.14	Aircraft Storage Methods	17.13
Large Airplanes – Mean Aerodynamic Chord	16.16	Hangars	17.13
Helicopter Weight and Balance.	16.16	Fire Precautions	17.13
Weight and Balance Records.	16.17	Storage Processes	17.14
		Phase 1 – Preparation	17.14

TABLE OF CONTENTS

Phase 2 – Routine Servicing	17.14	Handles, Latches, Panels and Doors	18.5
Phase 3 – Repreparation In Storage	17.14	Other Inspection Items	18.5
Phase 4 – Return To Service	17.14	Life Limited Items	18.6
Refueling/Defueling Procedures	17.14	Corrosion Removal, Assessment and Reprotection	18.6
Fuel Types and Identification	17.14	Preventive Maintenance	18.6
Contamination Control	17.14	Corrosion Removal	18.6
Fueling Hazards	17.15	Surface Cleaning and Paint Removal	18.6
Grounding and Bonding	17.15	Corrosion of Ferrous Metals	18.7
Fueling Procedures	17.15	Mechanical Removal of Iron Rust	18.7
Over the Wing Refueling	17.15	Chemical Removal of Rust	18.8
Pressure Refueling	17.15	Chemical Surface Treatment of Steel	18.8
Defueling	17.17	Removal of Corrosion from Highly Stressed Steel Parts	18.8
De-icing/Anti-Icing Procedures	17.17	Corrosion of Aluminum and Aluminum Alloys	18.8
De-icing and Anti-icing of Transport Aircraft	17.17	Treatment of Unpainted Aluminum Surfaces	18.8
Deicing Fluid	17.17	Treatment of Anodized Surfaces	18.9
Holdover Time (HOT)	17.17	Treatment of Intergranular Corrosion In Heat-Treated	
Critical Surfaces	17.17	Aluminum Alloy Surfaces	18.9
Frost Removal	17.19	Corrosion of Magnesium Alloys	18.9
Ice and Snow Removal	17.19	Treatment of Wrought Magnesium Sheet and Forgings	18.10
Electrical, Hydraulic and Pneumatic Ground Supplies	17.19	Treatment of Installed Magnesium Castings	18.10
Electric Ground Power Units	17.19	Corrosion of Titanium and Titanium Alloys	18.10
Hydraulic Ground Power Units	17.20	Protection of Dissimilar Metal Contacts	18.10
Ground Support Air Units	17.20	Contacts Not Involving Magnesium	18.10
Ground Air Heating and Air Conditioning	17.20	Contacts Involving Magnesium	18.11
Oxygen Servicing Equipment	17.20	Corrosion Limits	18.11
Oxygen Hazards	17.21	Processes and Materials used in Corrosion Control Metal	
Air/Nitrogen, Oil, and Fluid Servicing	17.21	Finishing	18.11
Effects of Environmental Conditions on Aircraft Handling and		Surface Preparation	18.11
Operation	17.21	Chemical Treatments	18.11
Submodule 17 Practice Questions	17.23	Anodizing	18.11
Submodule 17 Practice Answers	17.24	Alodizing	18.12
		Chemical Surface Treatment and Inhibitors	18.12
		Chromic Acid Inhibitor	18.12
		Sodium Dichromate Solution	18.12
		Protective Paint Finishes	18.12
7.18 DISASSEMBLY, INSPECTION, REPAIR, AND		Section B	18.12
ASSEMBLY TECHNIQUES	18.1	General Repair Methods, Structural Repair Manual; Aging;	
Introduction	18.1	Fatigue and Corrosion Control Programs	18.12
Section A	18.1	General Repair Methods	18.12
Types of Defects and Visual Inspection	18.1	Inspection	18.13
Basic Inspection Techniques and Practices	18.1	Classification of Damage	18.13
Preparation	18.1	Negligible Damage	18.13
Aircraft Logs	18.2	Damage Repairable by Patching	18.14
Checklists	18.2	Damage Repairable by Insertion	18.14
Publications	18.3	Damage Necessitating Replacement of Parts	18.14
Manufacturers' Service Bulletins and Instructions	18.3	Repairability of Sheet Metal Structure	18.14
Maintenance Manuals	18.3	Structural Support During Repair	18.14
Overhaul Manual	18.3	Assessment of Damage	18.15
Structural Repair Manual	18.3	Maintaining Original Strength	18.15
Illustrated Parts Catalog	18.3	Shear Strength and Bearing Strength	18.15
Visual Inspection Techniques	18.3	Maintaining Original Contour	18.15
Types of Defects	18.3	Keeping Weight to a Minimum	18.15
External Damage	18.4	Flutter and Vibration Precautions	18.15
Inlets and Exhausts	18.4	Damage Removal	18.17
Liquid Systems	18.4	Repair Material Selection	18.17
Gaseous Systems	18.4	Repair Parts Layout	18.17
Landing Gear	18.5		
System Indicators and Gauges	18.5		
Probes	18.5		

TABLE OF CONTENTS

Rivet Selection	18.17	Acoustic Emission Inspection	18.44
Rivet Spacing and Edge Distance	18.17	Magnetic Particle Inspection.	18.44
Corrosion Treatment	18.17	Development of Indications.	18.44
Sheet Metal Repair Methods	18.17	Types of Discontinuities Disclosed	18.44
Repair of Stressed Skin Structure	18.17	Preparation of Parts for Testing.	18.45
Patches	18.18	Effects of Flux Direction	18.45
Lap or Scab Patch	18.18	Effects of Flux Density	18.46
Flush Patch	18.18	Magnetizing Methods	18.46
Open and Closed Skin Area Repair	18.18	Identification of Indications.	18.46
Design of a Patch for a Non-Pressurized Area	18.18	Magnaglo Inspection	18.46
Typical Repairs for Aircraft Structures	18.19	Magnetizing Equipment	18.47
Floats	18.19	Fixed Nonportable Unit.	18.47
Corrugated Skin Repair.	18.19	Portable Unit	18.47
Replacement of a Panel	18.21	Indicating Mediums	18.48
Outside the Member	18.21	Demagnetizing	18.48
Inside the Member.	18.21	Demagnetizing Practice.	18.49
Edges of the Panel	18.21	Radiographic	18.49
Repair of Lightning Holes	18.22	Radiographic Inspection	18.49
Repairs to a Pressurized Area	18.22	Preparation and Exposure	18.49
Stringer Repair.	18.22	Radiation Hazards	18.49
Former or Bulkhead Repair.	18.23	inspection of Composites.	18.50
Longeron Repair	18.25	Tap Testing	18.50
Spar Repair	18.25	Electrical Conductivity	18.50
Rib and Web Repair	18.26	Thermography	18.50
Leading Edge Repairs	18.26	Section D	18.50
Trailing Edge Repairs	18.28	Disassembly and ReAssembly Techniques	18.50
Specialized Repairs	18.29	Replacement of Major Components and Modules	18.51
Inspection Openings	18.29	Disassembly and Reassembly of Major Components	18.51
Structural Repair Manuals	18.29	Disassembly and Reassembly of Minor Components	18.51
Aging, Fatigue and Corrosion Control Programs	18.30	Basic Disassembly and Reassembly Techniques	18.52
Section C	18.31	Discarding of Parts	18.52
Non-destructive Inspection Techniques	18.31	Freeing Seized Components	18.52
Visual Inspection	18.31	Assembly	18.52
Surface Cracks	18.34	Section E	18.52
Borescopes	18.35	Trouble Shooting Techniques	18.52
Liquid Penetrant	18.35	Submodule 18 Practice Questions	18.55
Surface Drying	18.35	Submodule 18 Practice Answers	18.56
Interpretation of Penetrant Results	18.35	Submodule 18 Practice Questions	18.57
Color Contrast Penetrant Inspection	18.36	Submodule 18 Practice Answers	18.58
Brightness Contrast	18.36		
Color Contrast	18.36		
False Indications	18.36		
Penetrant Precautions	18.37		
Eddy Current Inspection	18.37		
Basic Principles	18.37		
Principles of Operations	18.37		
Eddy Current Instruments	18.38		
Ultrasonic Inspection	18.39		
Pulse Echo	18.39		
Through Transmission	18.41		
Resonance	18.41		
Ultrasonic Instruments	18.42		
Reference Standards	18.43		
Couplants	18.43		
Inspection of Bonded Structures	18.44		
Types of Defects	18.44		
		7.19 ABNORMAL EVENTS	19.1
		Special Inspections	19.1
		Inspection following Lightning Strikes and HIRF	
		Penetration	19.1
		Lightning Strikes	19.1
		High Intensity Radiated Fields (HIRF) Penetration	19.2
		Specific Testing - HIRF	19.2
		HIRF Test Equipment	19.3
		Signal Pulse Generators	19.3
		Pulse Amplifiers	19.3
		RF Power Meters	19.3
		EMC Antennas	19.3
		Inspection Following Heavy Landings or Flight Through	
		Turbulence	19.3
		Hard or Overweight Landings	19.3
		Post Heavy Landing Inspection	19.3

TABLE OF CONTENTS

Severe Turbulence Inspection	19.4
Other Types of Damage	19.4
Fire Damage	19.4
Flood Damage	19.5
Seaplanes	19.5
Aerial Application Aircraft	19.5
Submodule 19 Practice Questions	19.7
Submodule 19 Practice Answers	19.8

7.20 MAINTENANCE PROCEDURES20.1

Maintenance Planning	20.1
Modification Procedures	20.2
Stores Procedures	20.3
Certification and Release Procedures	20.4
Interface with Aircraft Operation	20.5
Maintenance Inspection / Quality Control / Quality Assurance	20.5
Additional Maintenance Procedures	20.6
Control of Life-limited Components	20.6
Submodule 20 Practice Questions	20.7
Submodule 20 Practice Answers	20.8

7.21 DOCUMENTATION AND COMMUNICATION21.1

Documentation	21.1
Task Cards	21.1
Work Reports / Technical Records	21.1
Personal Logbooks	21.2
Troubleshooting Reports	21.2
Shift Handover Instructions	21.2
The Handover Procedure	21.3
Communication	21.3
Listening	21.3
Asking Questions	21.3
Written Communication	21.3
Basic Elements of Communication	21.3
The Source	21.4
The Receiver	21.4
Effective Communication	21.4
Clarity	21.4
Comprehensive	21.4
Concise	21.4
Barriers to Effective Communication	21.4
Lack of Common Experience	21.4
Lack of Precision	21.4
Interference	21.4
Writing Reports and Essays	21.4
How to Write an Essay Answer	21.5
Study the Question	21.5
Planning	21.5
Writing the Essay	21.5
Hints and Tips	21.5
Submodule 21 Practice Questions	21.7
Submodule 21 Practice Answers	21.8

Acronym Definitions	A.1
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The method of operation of dry powder fire extinguishers varies from gas cartridge charges, or stored pressure within the container which forces the powder charge out of the container, to tossing the powder on the fire by hand, by scooping pails or buckets of the powder from large containers or barrels.

Dry powder is not recommended for aircraft use (except on metal fires as a fire extinguisher) because the leftover chemical residues and dust often make cleanup difficult, and can damage electronic or other delicate equipment.

IDENTIFYING FIRE EXTINGUISHERS

Fire extinguishers should be marked to indicate suitability for a particular class of fire. The markings on **Figure 1-16** should be placed on the fire extinguisher and in a conspicuous place in the vicinity of the fire extinguisher. When the location is marked, however extreme care must be taken to ensure that the fire extinguisher kept at that location is in fact the type depicted by

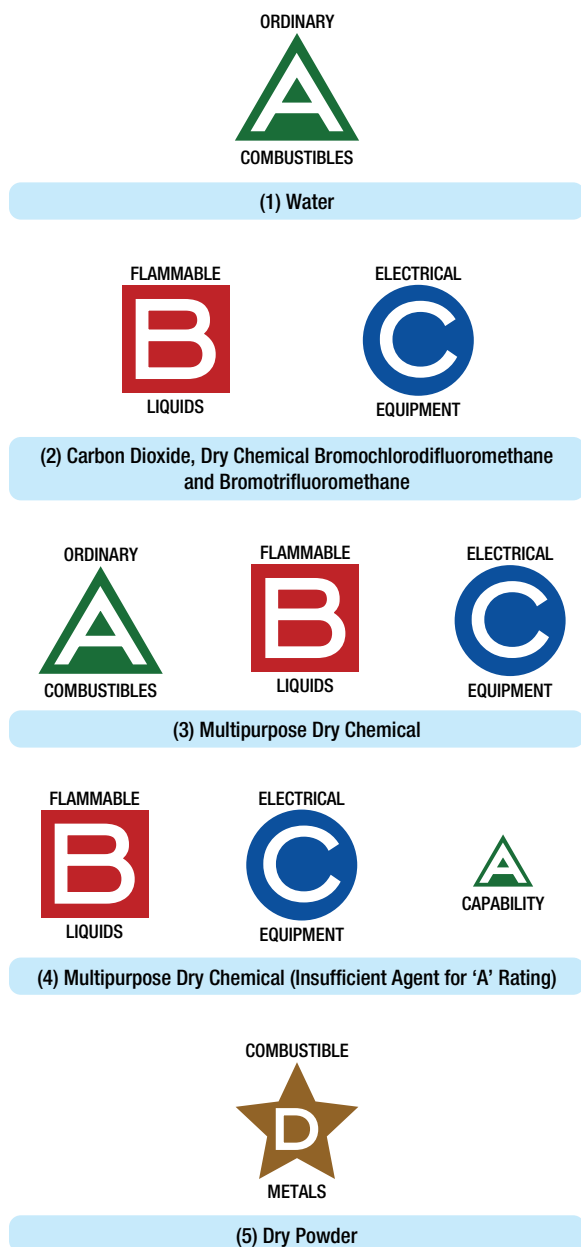


Figure 1-16. Typical extinguisher markings.

the marking. In other words, if a location is marked for a Class B fire extinguisher, ensure that the fire extinguisher in that location is in fact suitable for Class B fires. Markings should be applied by decalcomanias (decals), painting, or similar methods. They should be legible and as durable as necessary for the location. For example, markings used outside need to be more durable than those in the hangar or office spaces.

Where markings are applied to the extinguisher, they should be located on the front of the shell (if one is installed) above or below the extinguisher nameplate. Markings should be large enough and in a form that is easily seen and identifiable by the average person with average eyesight at a distance of at least 3 feet.

Where markings are applied to wall panels, and so forth, in the vicinity of extinguishers, they should be large enough and in a form that is easily seen and identifiable by the average person with average eyesight, at a distance of at least 25 feet.

[Figure 1-17 and 1-18]

INSPECTION OF FIRE EXTINGUISHERS

Fire extinguishers should be checked periodically using a checklist. If a checklist is unavailable, check the following as a minimum:

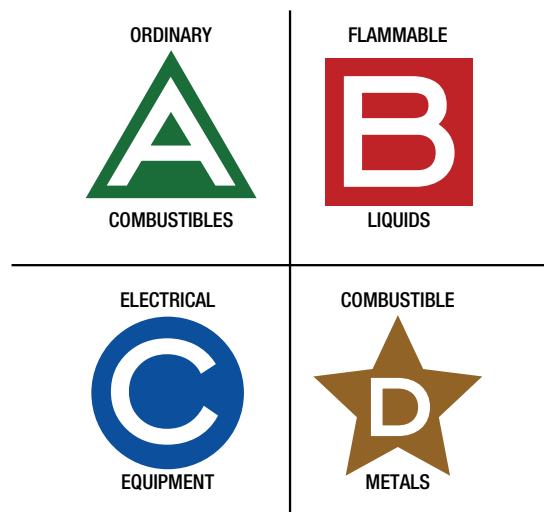


Figure 1-17. United States identification codes of fire extinguishers.

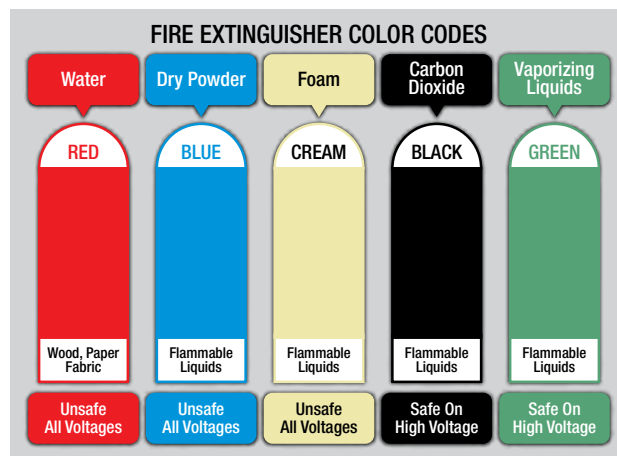


Figure 1-18. European and Australian identification codes of fire extinguishers.

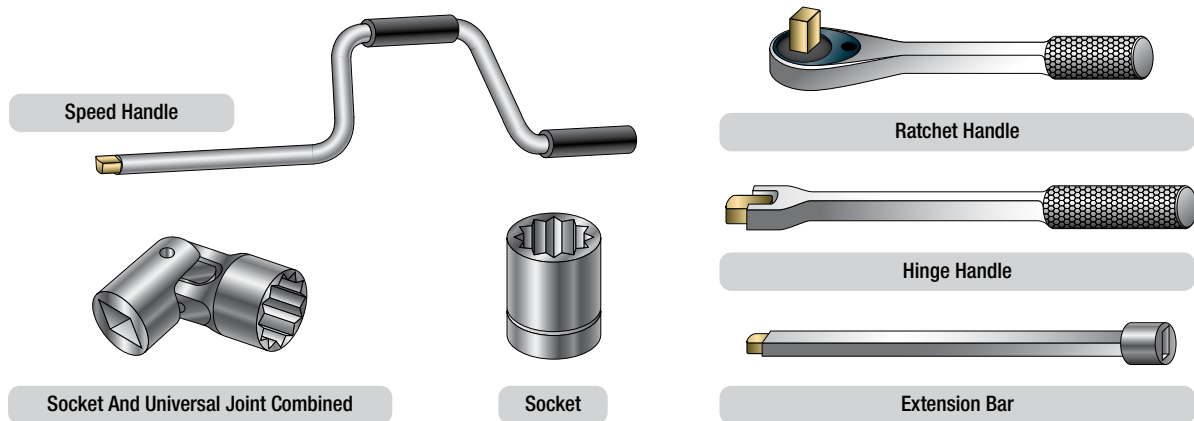


Figure 3-10. Socket wrench set.

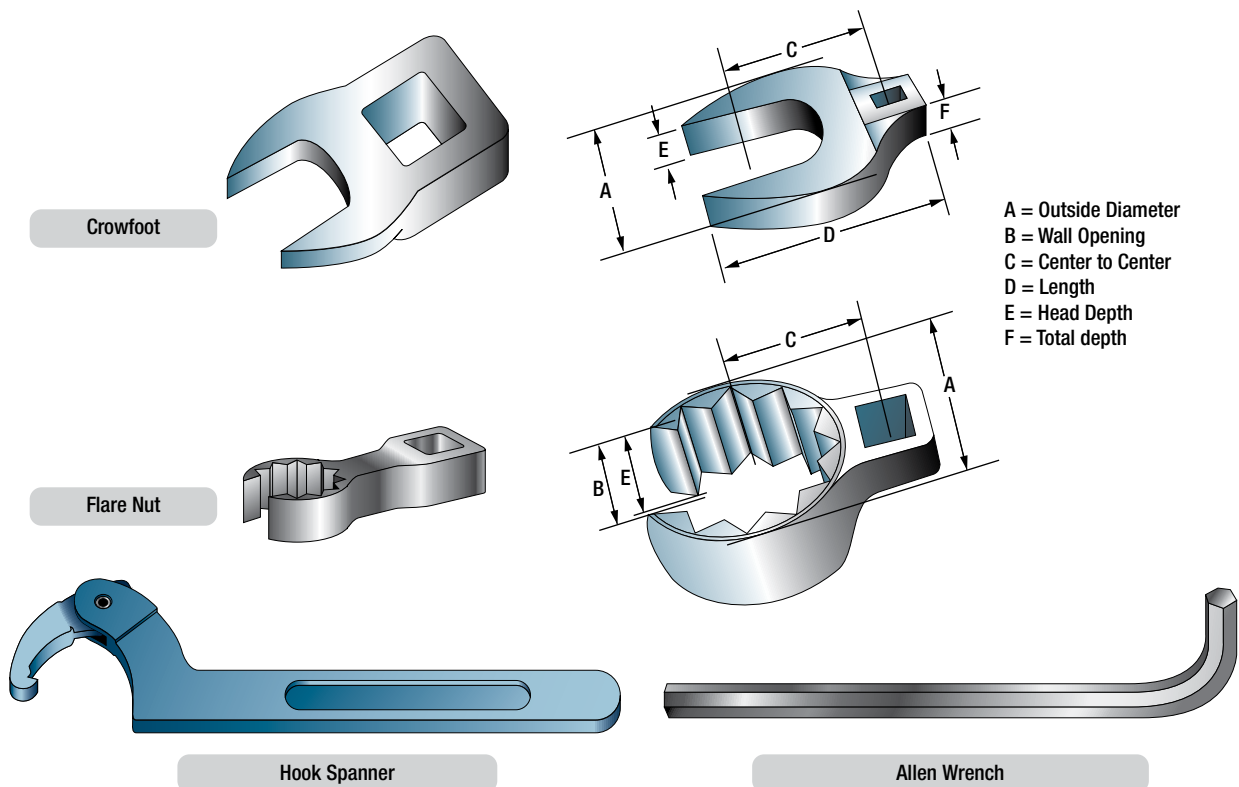


Figure 3-11. Special wrenches.

The hook spanner is for a round nut with a series of notches cut in the outer edge. This wrench has a curved arm with a hook on the end that fits into one of the notches on the nut. The hook is placed in one of these notches with the handle pointing in the direction the nut is to be turned.

Some hook spanner wrenches are adjustable and will fit nuts of various diameters. U-shaped hook spanners have two lugs on the face of the wrench to fit notches cut in the face of the nut or screw plug. End spanners resemble a socket wrench, but have a series of lugs that fit into corresponding notches in a nut or plug. Pin spanners have a pin in place of a lug, and the pin fits into a round hole in the edge of a nut. Face pin spanners are similar to the U-shaped hook spanners except that they have pins instead of lugs.

Most headless setscrews are the hex-head Allen type and must be installed and removed with an Allen wrench. Allen wrenches are six-sided bars in the shape of an L, or they can be hex-shaped bars mounted in adapters for use with hand ratchets. They range in size from $\frac{3}{64}$ to $\frac{1}{2}$ -inch and fit into a hexagonal recess in the setscrew.

STRAP WRENCHES

The strap wrench can prove to be an invaluable tool for the AMT. By their very nature, aircraft components such as tubing, pipes, small fittings, and round or irregularly shaped components are built to be as light as possible, while still retaining enough strength to function properly. The misuse of pliers or other gripping tools can quickly damage these parts. If it is necessary to grip a part to hold it in place, or to rotate it to facilitate removal, consider using a strap wrench that uses a plastic covered fabric strap to grip the part. [Figure 3-12]

Figure 5-10, with the front view as principal view. If the right-side view is shown, it will be to the right of the front view. If the left-side view is shown, it will be to the left of the front view. The top and bottom views, if included, will be shown in their respective positions relative to the front view.

One-view drawings are commonly used for objects of uniform thickness, such as gaskets, shims, and plates. A dimensional note gives the thickness as shown in **Figure 5-11**. One-view drawings are also commonly used for cylindrical, spherical, or square parts if all the necessary dimensions can be properly shown in one view. When space is limited and two views must be shown, symmetrical objects are often represented by half views, as illustrated in **Figure 5-12**.

Aircraft drawings seldom show more than two principal or complete views of an object. Instead, there will be usually one complete view and one or more detail views or sectional views.

DETAIL VIEW

A detail view shows only a part of the object, but in greater detail and to a larger scale than the principal view. The part that is shown in detail elsewhere on the drawing is usually encircled by a heavy line on the principal view. **[Figure 5-13]** The principal view shows the complete object, while the detail view is an enlarged drawing of a portion of the object.

PICTORIAL DRAWINGS

A pictorial drawing is like a photograph. **[Figure 5-14]** It shows an object as it appears to the eye, but it is not satisfactory for showing complex forms and shapes. Pictorial drawings are useful in showing the general appearance of an object and are used extensively with orthographic projection drawings. Pictorial drawings are used in Aircraft Maintenance Manuals (AMM), Structural Repair Manuals (SRM), and Illustrated Parts Catalogues (IPC). Three types of pictorial drawings used frequently by aircraft engineers and technicians are: perspective, isometric, oblique, and exploded view.

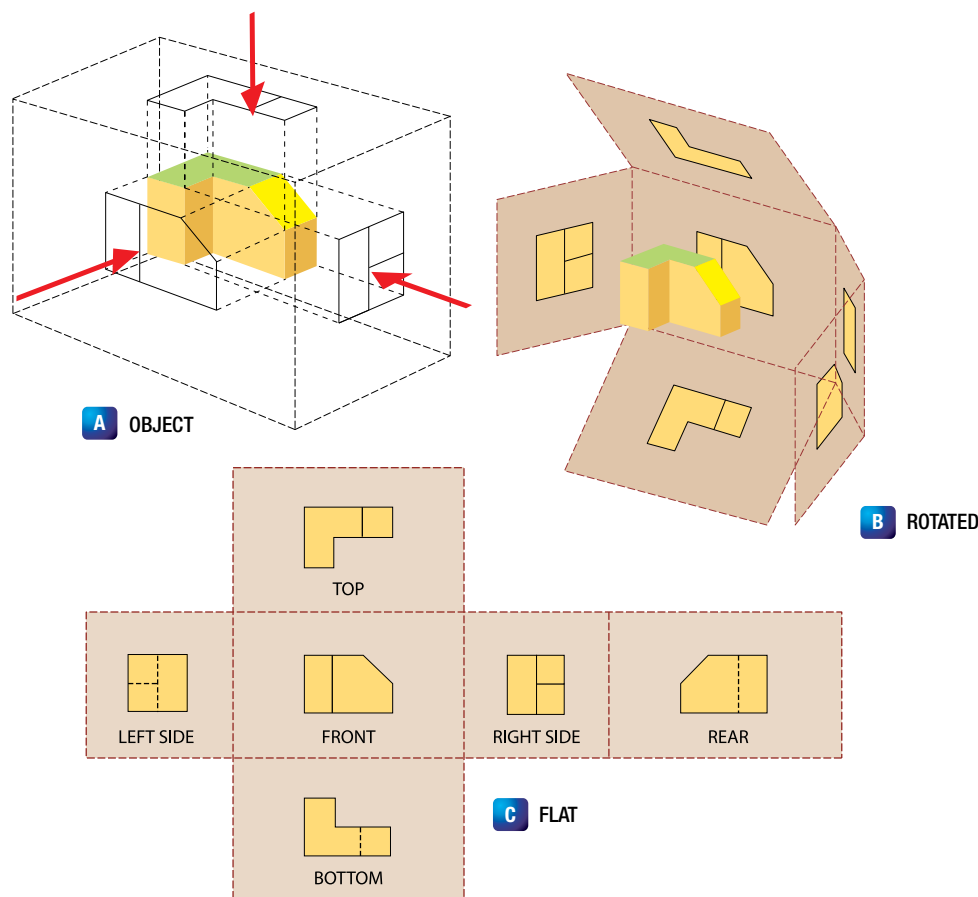


Figure 5-10. Orthographic projection.

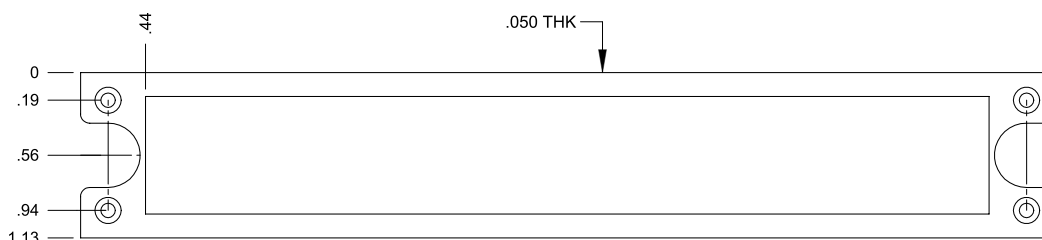


Figure 5-11. One-view drawing.

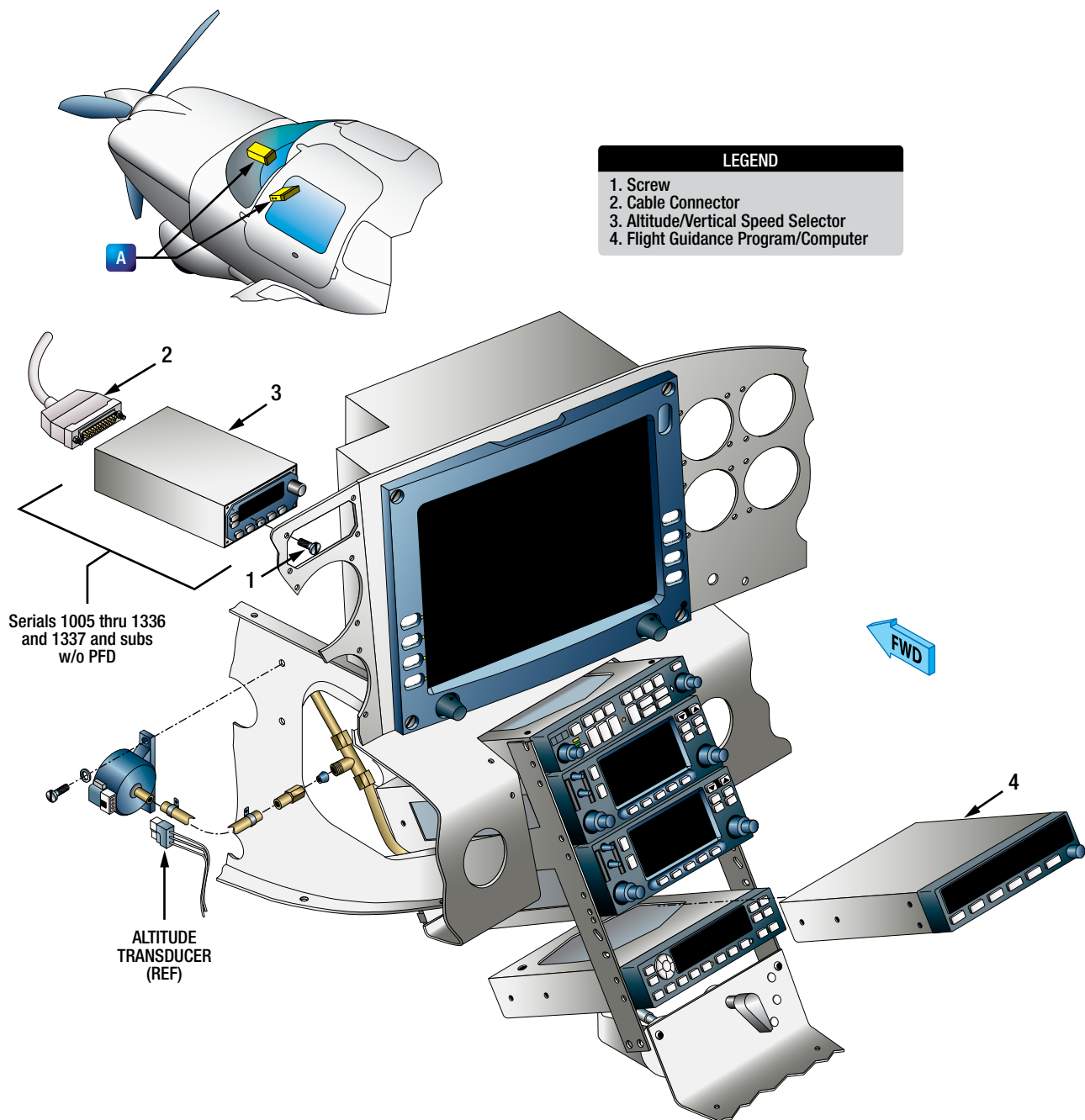


Figure 5-30. Example of an installation diagram (flight guidance components).

GRAPHS AND CHARTS

Graphs and charts are frequently used to convey information graphically or information given certain conditions. They often utilize values shown on the "x" and "y" axes that can be projected up and across to arrive at a specific result. Also, when data is entered into a computer database, software programs can create a variety of different bar graphs, pie charts, and so forth, to graphically represent that data.

READING AND INTERPRETING GRAPHS AND CHARTS

When interpreting information shown on graphs and charts, it is extremely important that all the notes and legend information be carefully understood to eliminate any misinterpretation of the information presented.

NOMOGRAMS

A nomogram is a graph that usually consists of three sets of data. Knowledge of any two sets of data enables the interpreter to obtain the value for the third unknown corresponding value. One type of nomogram consists of three parallel scales graduated for different variables, so that when a straight edge connects any two values, the third can be read directly. Other types may use values on the "x" and "y" axes of a graph with the third corresponding value determined by the intersection of the "x" and "y" values with one of a series of curved lines. **Figure 5-36** is an example of a nomogram that shows the relationship between aviation fuels, specific weight, and temperature.

The aircraft wiring chart shown in **Figure 5-37** depicts a common but more complex type of nomogram. This particular graph is

Density Variation of Aviation Fuel Based on Average Specific Gravity

Fuel	Average Specific Gravity at 15°C (59°F)
Aviation Kerosene Jet A and Jet A1	0.812
Jet B (JP-4)	0.785
AV Gas Grade 100/130	0.703

NOTE: The fuel quantity indicator is calibrated for correct indication when using Aviation Kerosene Jet A and Jet A1. When using other fuels, multiply the indicated fuel quantity in pounds by 0.99 for Jet B (JP-4) or by 0.98 for Aviation Gasoline (100/130) to obtain actual fuel quantity in pounds.

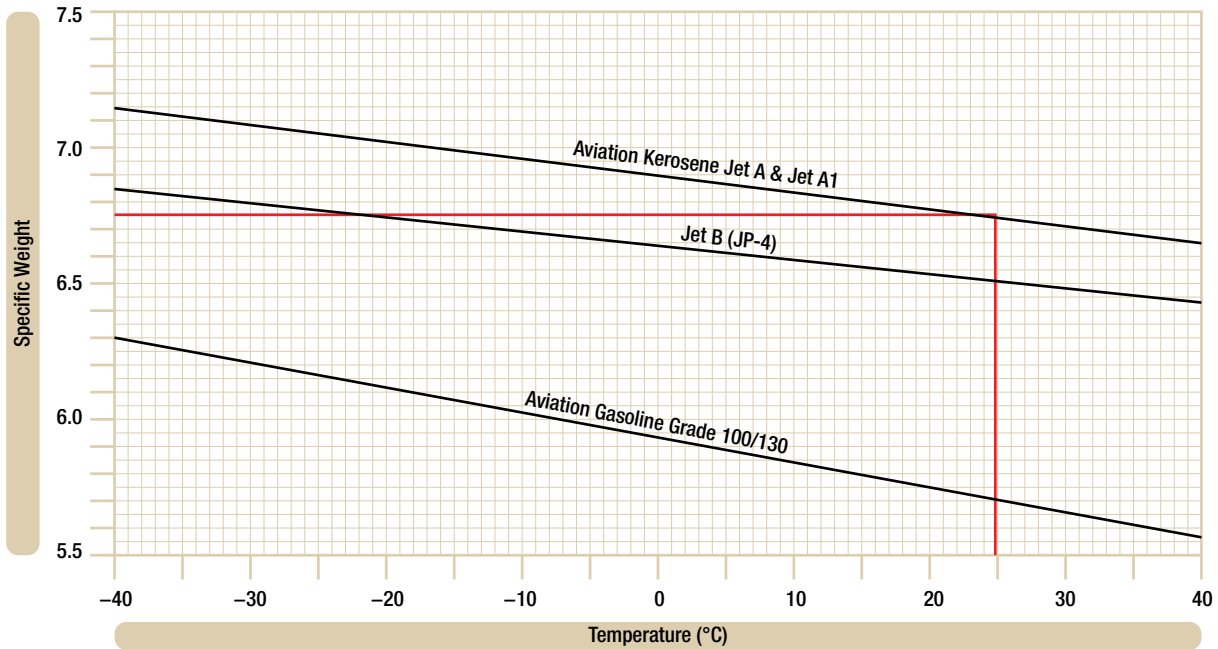


Figure 5-36. Nanogram.

	Circuit Voltage			
	115	200	14	28
Wire length in feet for allowable voltage drop	800		100	200
	600		75	150
	400	700	50	100
	360	630	45	90
	320	560	40	80
	280	490	35	70
	240	420	30	60
	200	350	25	50
	160	280	20	40
	120	210	15	30
	100	175	12	25
	80	140	10	20
	72	120	9	18
	64	112	8	16
	56	98	7	14
	48	84	6	12
	40	70	5	10
	36	63	4	9
	32	56		8
	28	49		7
	24	42	3	6
	20	35	2	5
Voltage Drop				
	4	7	.5	1

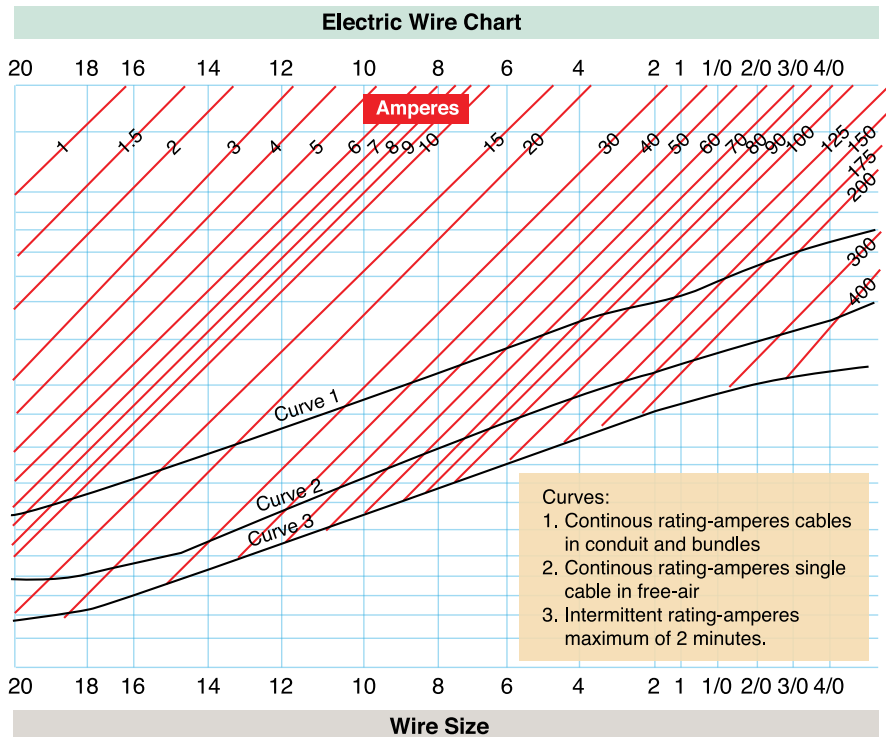


Figure 5-37. Electric wire chart.