

## **BLUEPRINT AND STRUCTURES TRAINING FOR C-17 WORK**

Middle Georgia Technical College provides a 160 hour aircraft sheet metal training program focused on the C-17 work at the Warner Robins Air Logistics Center, 402<sup>nd</sup> Maintenance Wing. The training focuses on blueprint reading and specific fasteners for work on the Boeing C-17 aircraft. A Training Outline is attached.

### **Location and Schedule:**

This training will be conducted at Middle Georgia Technical College in the classroom and aircraft structural technology labs.

Training will be from 7:00am to 4:00pm, Monday through Friday for four consecutive weeks.

### **Tools and Equipment:**

Students should bring their own personal protective equipment (ear and eye protection, etc.) and a calculator. All other tools and equipment will be provided.

### **Point of Contact:**

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### **Training Syllabus:**

The training is conducted in accordance with the following outline:

## **RAFB Blueprint Training 40 Hrs.**

40 hrs Basic Shop Math  
Blueprint Fundamentals  
Aircraft Coordinate System  
Interpretation of Aircraft Blueprints

## **Basic Shop Math**

- Introduction
- Decimals
  - Understanding Decimals
  - Rounding Decimals
  - Addition and Subtraction of Decimals
  - Multiplication of Decimals
  - Division of Decimals
- Fractions
  - Defining a Fraction
  - Reducing Fractions
  - Converting Fractions
  - Adding Fractions
  - Addition of Uncommon Fractions
  - Subtracting Fractions
  - Improper Fractions
  - Multiplying Fractions
  - Dividing Fractions
  - Converting Decimals to Fractions
- Summary

## **Blueprint Fundamentals**

- Introduction
- Basic Geometric Definitions
  - Point
  - Line
  - Horizontal
  - Vertical
  - Perpendicular
  - Parallel
  - Surface
  - Plane
  - Circle
  - Circumference
  - Diameter
  - Radius
  - Arc
  - Angles and Degrees

- The Language of Lines
  - Introduction
  - Visible Lines
  - Hidden Lines
  - Sectional Lines
  - Center Lines
  - Leader Lines
  - Dimension Lines
  - Extension Lines
  - Cutting Plane Lines
  - Break Lines
  - Phantom Lines
  - Loft Lines
  - Heel Lines
  - Stitching Lines
  - Ditto Lines
  
- Orthographic Drawings
  - Introduction
  - Visualization
  - Drafting Techniques
  - Construction of Views
  - Projecting Points Using the 45° Reference Line
  - Interpreting Features Through Drafting
  - Projecting Hidden Features
  - Projecting Angles and Radii-Base Lines
  - Projecting Angles and Radii-Object Lines
  - Interpreting Features Through Drafting
  - Visualizing Shapes
  
- Dimensioning Standards and Practices
  - Introduction
  - Types of Dimensioning
  - Application of Dimensions
  
- Blueprint Components
  - Drawing Identification and Classification
  - Airplane Qualifications
  - Application List
  - Drafting Standards
  - Variations to Specified Dimensions
  - Signature and Dates
  - Special Project Data
  - Mirror Opposite Notation
  - Drawing Notes

# Aircraft Coordinate Systems

- Introduction
  - Distance, Direction, and a Starting Point
- Reference Planes and Coordinate Systems
  - Aircraft Orientation Nomenclature
  - Fuselage Station Point of Origin
  - Fuselage Coordinates
  - Locating Forward/Aft Coordinates
  - Vertical Coordinates
  - Vertical Coordinate Identification
  - Locating Vertical Coordinates
  - Inboard/Outboard Coordinates-Plane of Symmetry (POS)
  - Inboard/Outboard Coordinate Identification
  - Finding Specific Locations
  - Triangulating the Coordinate
  - Summary
- Interpretation of Aircraft Coordinate Systems
  - Introduction
  - View Locators
  - View Looking Down
  - View Looking up
  - Symmetry Focal Point
  - View Looking Forward
  - View Looking Outboard
  - View Looking Forward
  - View Looking Aft
  - Sub Systems
  - Summary

# Interpretation of Aircraft Blueprints

- Introduction
- Engineering Numbering System
  - Introduction
  - Basic Numbers and terminology
  - Configuration Identification
  - Low Dash Numbers
  - Summary
- Engineering Revision Control Systems
  - Introduction
  - Revision Letters

Part Identification  
Identification at “No Change” Condition  
Physical Changes “Is” and “Was” Conditions  
“Paper” Changes  
Adding “Foreign Usage” Parts  
Summary

- **Blueprint Part List Interpretation**
  - Introduction
  - Types of Parts Lists
  - Parts Lists Page Numbers
  - Quantity Control Columns
  - Configuration Numbers
  - Item Quantities
  - Part Numbers
  - Quantity Required Columns
  - Engineering Subassemblies
  - Nomenclature or Description Column
  - FSCM or Code Ident Column
  - Stock Size Column
  - Stock Size Versus Blueprint Size
  - Material Description and Specification Columns
  - Parts Lists Notes
  - Use of Multiple Notes
  - Notes/Drawing Field Cross-Reference
  - IPRSX Columns
  - Item Find Number Column
  - Zone Column
  - Summary
  
- **Fastener Callouts and Symbols**
  - Introduction
  - Runs, Clusters, and Patterns
  - Symbol Coding and Location
  - Fastener Reference Code
  - Code Part Number Cross-Reference
  - Diameters and Placement
  - Positioning
  - Fastener Length
  - Special Hole Preparation
  - Specific Hole Preparation Codes
  - Interpreting Special Codes
  - Summary
  
- **The Body/Field of the Drawing**
  - Introduction

Parts Callouts  
Locating Parts  
Locating Multiple Parts  
Part Callout Leader Lines  
Surface Identification Symbols  
Mirror-Opposite Parts  
True Mirror Opposites  
Mirror-Opposite Details  
Mirror-Opposite Part Callouts  
Mirror-Opposite Details on Mirror-Opposite

## Configurations

Mirror-Opposite Details on Single Configurations  
Assembly Center Identifiers  
Mirror-Opposite Exceptions  
Mirror-Opposite Positions  
Section and Views  
Section Cross-Reference  
Parent Illustrations  
Locating Parts Through Sections  
Omission of Details  
Supporting Views  
Configuration Differences  
Configuration Illustrations  
View Comparisons  
Research Techniques  
Summary

- Detail Drawing Interpretation

Introduction

Features

Low Dash Number Detail Drawings-Single View

Detail in Rigged Position

Low Dash Number Detail Drawings-Multiple View

Specifications

Projected Views

Flat Pattern Detail Drawings 9930514-39 Specifications

View Comparison Flat pattern Layout versus Orthographic

## Views

Joggles

Bend Specifications

Low Dash Number Formal Detail Drawing 9930514-41

Formal Detail Drawings of Foreign Details

Next Higher Assembly

Detail/Assembly/Installation Drawing Relationships

Finding the Feature on the Detail Drawing

Shop Technique

## Summary

- Configured (Book Form) Drawings
  - Introduction
  - Summary
- Methods Drawings
  - Introduction
  - Summary
- Undimensioned Drawing Interpretation
  - Introduction

# RAFB Structures Training

120Hrs.

Fastener Layout Methods  
Hole Preparation  
Boeing Process Standards  
Fastener Installation  
Production Documents  
NACA Riveting  
Precision Hole Preparation  
Precision Fastener Installation  
Production Detail Parts  
Composite Panel Drilling, Countersinking, Damage Assessment and Repair

## FASTENER LAYOUT METHODS

Performance Objectives  
Reading the 6-inch Scale  
Measurement Technique  
Fastener Layout Markings  
Hole Pattern Layout Standards  
Hole Pattern Layout Formula  
Staggered Layout Hole Pattern  
Layout of Inside/Outside Radii

## HOLE PREPARATION

- Introduction
- Performance Objectives
- Hand Files
- Classification of File Cuts
- Use of Hand Files
- Types of Drills
- Standard Twist Drills
- Drilling Aids
- Twist Drill Sizes
- Pneumatic Drill Motors
- Drill Motor Selection
- Drill Chucks
- Positioning Detail Parts
- Acceptable Part Preload Conditions
- Step Drilling
- Use of Clecos
- Drill Selection
- Step Drilling Procedures and Techniques
- Deburring Holes in Detail Parts
- Causes of Excessive Burrs

## DOUGLAS PROCESS STANDARDS

- Introduction
- DPS Numbering System
- DPS Header Information
- General Referencing Data
- Table of Contents
- Reference Tables
- Reference Figures
- Revision Control
- Effectivity Block
- Process Engineering Order Text
- Research Guidelines
- General Instructions

## FASTENER INSTALLATION

- Installation of Universal Rivets
- Fastener Selection
- Alloy Codes
- Rivet Length Selection
- Universal Rivet Sets..
- Bucking Bar Selection
- Rivet Guns
- Rivet Gun Adjustment
- Installation Procedures
- Acceptance Criteria

- Installation Standards
- Rivet Removal
- Basic Countersinking
- Countersink Gauges
- Method Drawing Selection and Usage
- Troubleshooting
- Flush Rivet Installation
- Manufactured Head Configurations
- Fastener Selection
- Standard Flush Rivet Part Numbers
- Douglas Crown Flush Rivet Part Numbers
- Rivet Length
- Installation Tools and Procedures
- Rivet Guns
- Bucking Bar
- Pre-installation
- Flush Rivet Installation
- Acceptance Criteria
- Flush Rivet Removal
- Rivet Milling
- Tool Selection and Maintenance
- Tool Setup
- Flush Rivet Gauge Usage

## PRODUCTION DOCUMENTS

- Engineering Orders
- Title Block
- Handling Instructions
- Effectivity Block
- Approval Signatures
- Note Section
- Continuation Sheets
- Parts List Revision Sheet
- Advanced Assembly Outlines
- Header Information

## NACA COUNTERSINKING

- Introduction
- Countersink Standards
- Countersink Tooling
- Fastener Orientation
- Rivet Length Selection
- NACA Rivet Installation
- Acceptance Criteria
- Rivet Removal

## PRECISION HOLE PREPARATION

- Introduction
- Performance Objectives
- Hole Classification and Fit
- Document Selection
- DPS Research
- Hole and Countersink Diameter Selection
- Countersink Tooling Selection
- Hole Preparation Tooling Selection
- Drilling and Processing Precision Holes

## PRECISION FASTENER INSTALLATION

- Introduction
- Performance Objectives
- Lockbolt Part Numbers
- Lockbolt Collars
- Length Selection
- Pre-installation
- Titanium and Steel Lockbolt Installation
- Acceptance Criteria for Lockbolts
- Lockbolt Fastener Removal
- Hi-bk and DAC MD Pin Installation
- Fastener Callouts
- Hi-bk, DAC MD Pin & Fastener Removal
- NAS Bolt Pre-installation
- Acceptance Criteria
- Fastener Removal
- Fastener Reuse

## PRODUCTION DETAIL PARTS

- Introduction
- Performance Objectives
- Safety in the Shop
- Rotary Files
- Hole Saws
- Tapered Pin Routers
- Rotary Sanders
- Kett Saws
- Band Saws
- Power Routers

## COMPOSITE PANEL DAMAGE ASSESSMENT and REPAIR

- Inspection Techniques
  - Visual Inspection
  - Tap test

# GLOSSARY

## Acronyms and Abbreviations

### Practical's

- 1 6X6 protruding rivet plate
- 1 6X6 countersunk rivet plate
- 1 6X6 Hilok/Lockbolt plate
- 1 12X12 all fastener plate
- 3 Layout, drill and countersink composite panels