MECHANICAL DRAWING AND READING USED ON LARGE MACHINERY INDUSTRY

-- CIVIL AVIATION MRO

JAN-2021

International Trade Compliance
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CONTENT

- **Company Brief Introduction**
- Nacelle Structure Repair
- Civil Aviation MRO industry
- Aircraft Drawing and Reading

Collins Aerospace

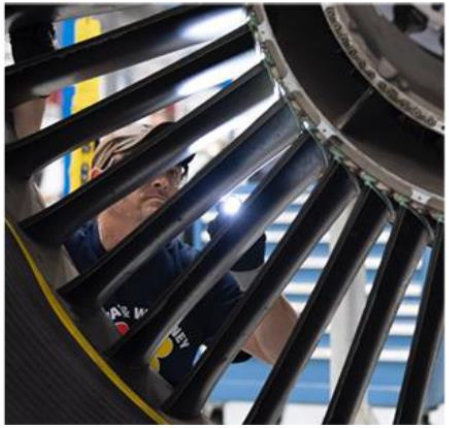
Raytheon Technologies

Collins Aerospace

Raytheon Intelligence & Space

Pratt & Whitney

Raytheon Missiles & Defense



Collins Aerospace

Specializes in aerostructures, avionics, interiors, mechanical systems, mission systems and power controls that serve customers across the commercial, regional, business aviation and military sectors.

$26 billion

2019 net sales

78,000

Employees

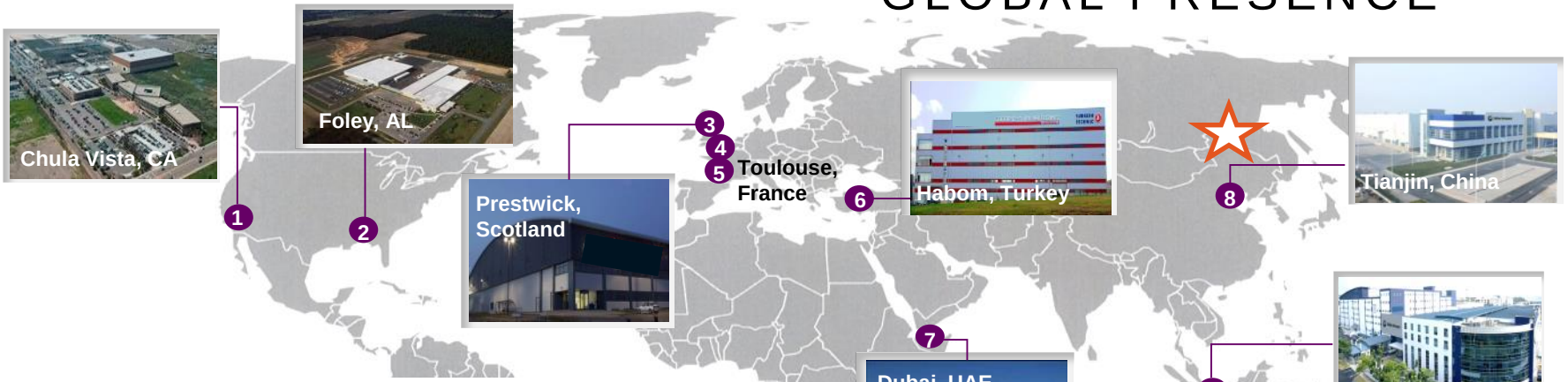
Collins Aerospace

Act.

5

AEROSTRUCTURES AFTERMARKET

GLOBAL PRESENCE



1. Aerostructures HQ, Chula Vista, USA
2. MRO Center, Alabama ,USA
3. MRO Center, Prestwick, Scotland
4. Airline Support Office, UK
5. MRO & Spares Center, Toulouse, France
6. MRO Center, Turkey
7. MRO Center, Dubai, UAE
8. **MRO Center, Tianjin, PR China**
9. MRO Center & Airline Support Office, Singapore

tration Act.

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AEROSTRUCTURES MRO IN CHINA

- Goodrich Aerostructures Service (China) (GASCH)
- Established June 2009
- Inside Tianjin Free Trade Zone
- Next to Airbus Final Assembly Line
- 60,000 ft^2
- ~76 employees

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AEROSTRUCTURES PRODUCTS - AIRBUS

A220
PW1500G Engine – Inlet, Fan Cowl, Thrust Reverser, Nozzle, Centerbody, QEC, Engine Mount

A300/A310
CF6-80C2 Engine – Inlet, Fan & Core Cowl, QEC
PW4000 Engine – Inlet, Fan Cowl, Thrust Reverser, Nozzle & Plug, QEC

A320 Family
CFM56-5A/B Engine – Inlet, Fan Cowl, Thrust Reverser, Nozzle, Plug, QEC, Engine Mount
V2500 Engine – Inlet, Fan Cowl, Thrust Reverser, Nozzle, Cone, QEC, Engine Mount

A320neo
PW1100G Engine – Inlet, Fan Cowl, Thrust Reverser, Nozzle, Centerbody, QEC, Engine Mount
Leap Engine – Engine Mount

A330
CF6-80E Engine – Inlet, Fan & Core Cowl, QEC
PW4168 Engine – Engine podding
TRENT 700 Engine – Nozzle, Cone

A340-200/300
CFM56-5C Engine – Inlet, Fan Cowl, Thrust Reverser, Nozzle & Cone, QEC

A350XWB
Trent XWB Engine – Inlet, Fan Cowl, Thrust Reverser, Nozzle, Centerbody

The techn *ion Act.*

AEROSTRUCTURES PRODUCTS - BOEING

B717
BR715 Engine – Inlet, Fan Cowl, Thrust Reverser, QEC

B737NG
CFM56-7 Engine – Inlet, Fan Cowl

B747 / B767
CF6-80C2 Engine – Inlet, Fan & Core Cowl
RB211-524H Engine – Nozzle, Cone

B757
RB211-535 Engine – Fan Cowl, Thrust Reverser, Nozzle, Cone, Pylon
PW2000 Engine – Pylon

B787
GEnx Engine – Inlet, Fan Cowl, Thrust Reverser, Nozzle, Centerbody
Trent 1000 Engine – Inlet, Fan Cowl, Thrust Reverser, Nozzle, Centerbody

MD-11
CF6-80C2 Engine – Inlet, Fan & Core Cowl, QEC, Pylon
PW4000 Engine – Inlet, Fan Cowl, Thrust Reverser, Nozzle & Cone, QEC

MD-90
V2500 Engine – Inlet, Fan Cowl, Thrust Reverser, Nozzle, QEC, Engine Mount

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NACELLE

WHAT IS NACELLE?

- A nacelle is a housing, separate from the fuselage, that holds engines, fuel, or equipment on an aircraft.

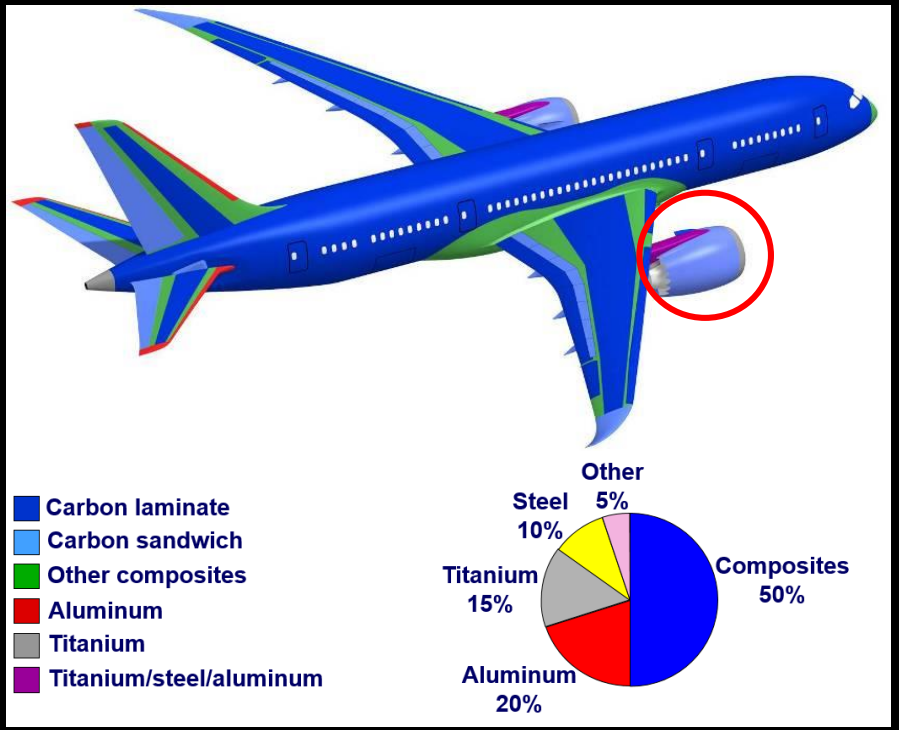
VIDEO

The

OVERVIEW OF AIRCRAFT MATERIAL

MATERIAL ELEMENT

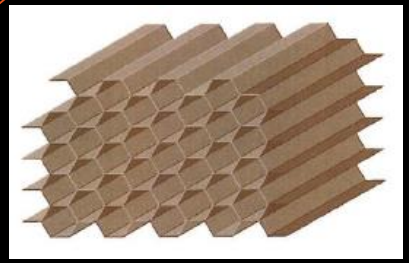
- Composite 50% including fibers & honeycomb core
- Aluminum 20% T2024 / T2219 / T6061 / T7075
- Other 30% Titaninum /Steel

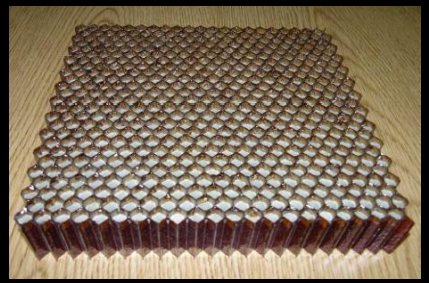


COMPOSITE TYPES

FIBER + HONEYCOMB CORE = "SANDWICH STRUCTURE"

+





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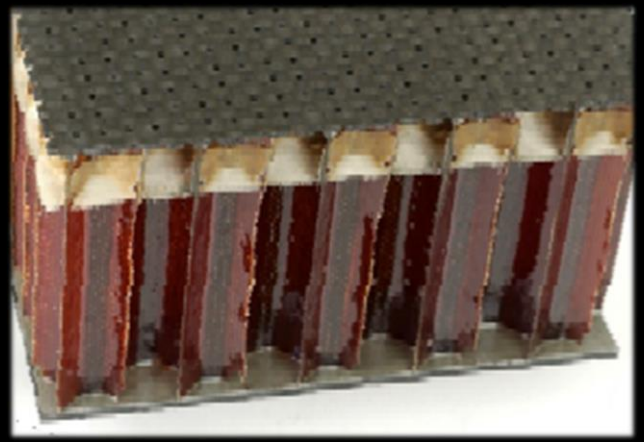
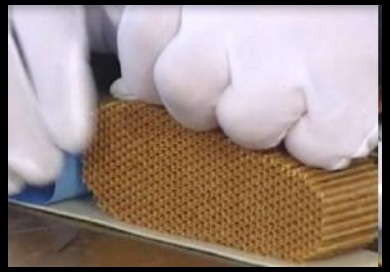


TYPICAL CONPOSITE REPAIR

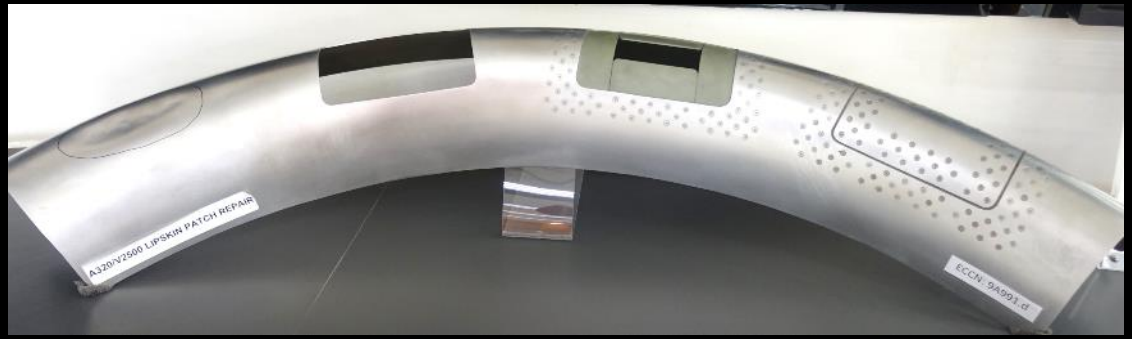
FIBER REPAIR

HONEYCOMB CORE REPAIR



TYPICAL METAL REPAIR

LIPSKIN PATCH REPAIR



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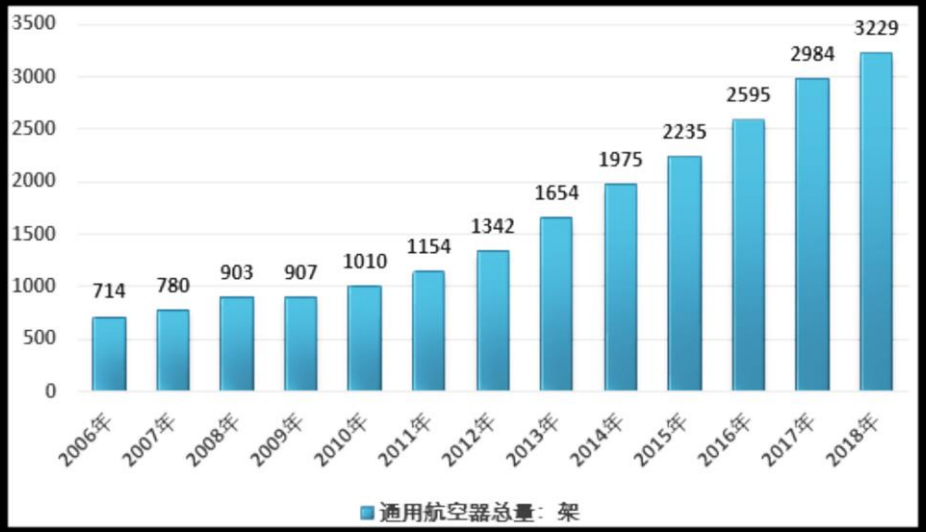
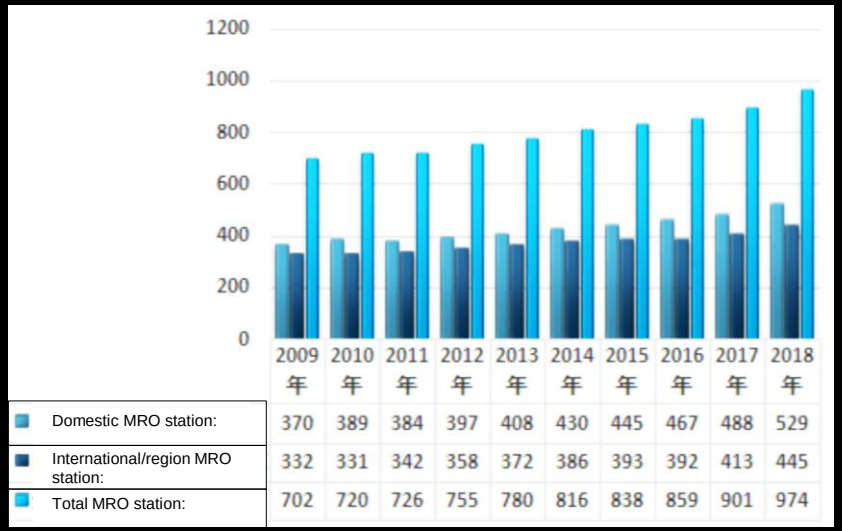
AIRCRAFT MRO INDUSTRY IN CHINA

MRO-- MAINTENANCE & REPAIR & OPERATIONS



AIRCRAFT QTY IN CHINA
2006-2018



	2009年	2010年	2011年	2012年	2013年	2014年	2015年	2016年	2017年	2018年
Domestic MRO station:	370	389	384	397	408	430	445	467	488	529
International/region MRO station:	332	331	342	358	372	386	393	392	413	445
Total MRO station:	702	720	726	755	780	816	838	859	901	974

MRO STATION QTY IN CHINA
2009-2018

China’s aviation MRO industry is becoming an important growth in the world.

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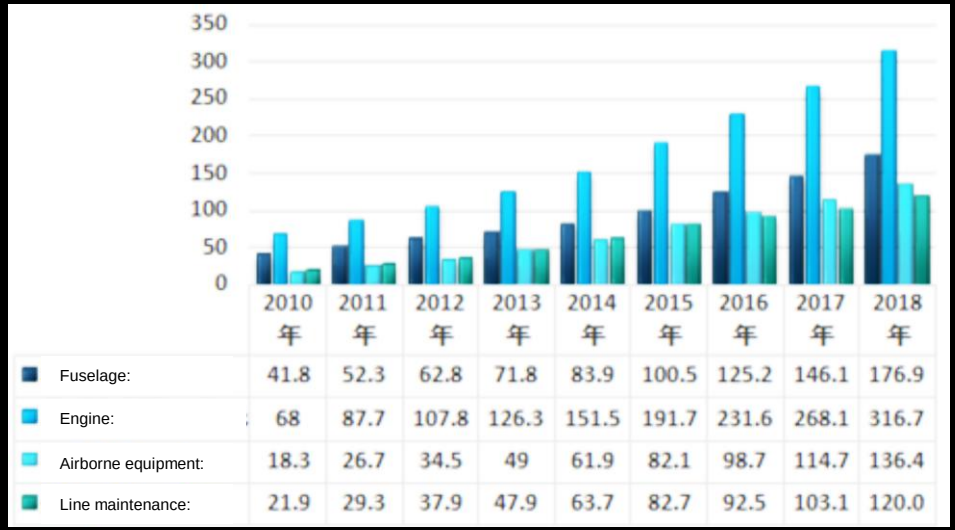
AIRCRAFT MRO INDUSTRY IN CHINA

MRO-- MAINTENANCE & REPAIR & OPERATIONS

AIRCRAFT MRO MARKET (100 Million)
2010-2018



MRO MARKET SEGMENT CHART(100M)
2010-2018

China’s aviation MRO industry is becoming an important growth in the world.

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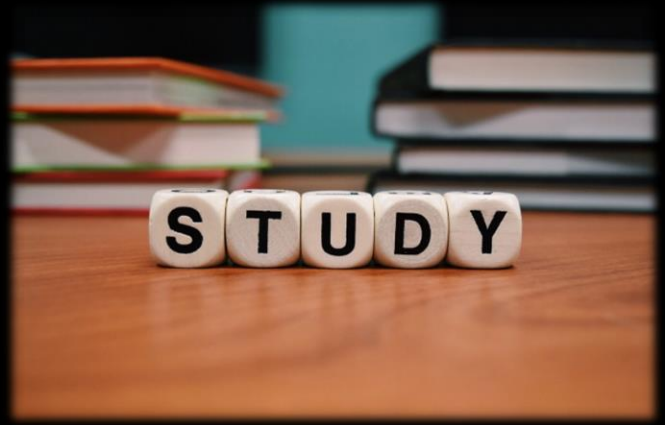
SKILLS REQUIREMENT FOR MRO INDUSTRY

WHAT CAN WE DO ?

- Basic knowledge of engineering disciplines
  Mechanical drawing / Tolerance and fit / Mechanical design
  Metal material molding/ Composite material properties

- Skills of English
  Reading, understanding, writing

- Pay more attention civil aviation industry
  Civil aviation regulations



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- **Aircraft Drawing and Reading**

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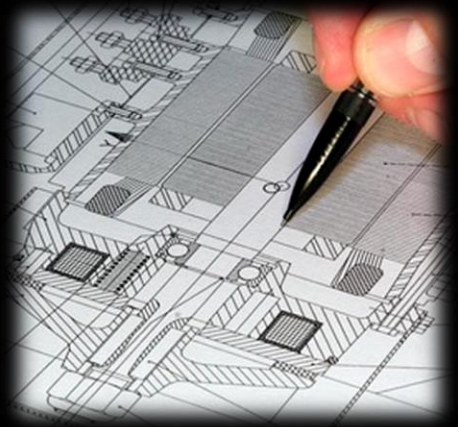
DRAWINGS

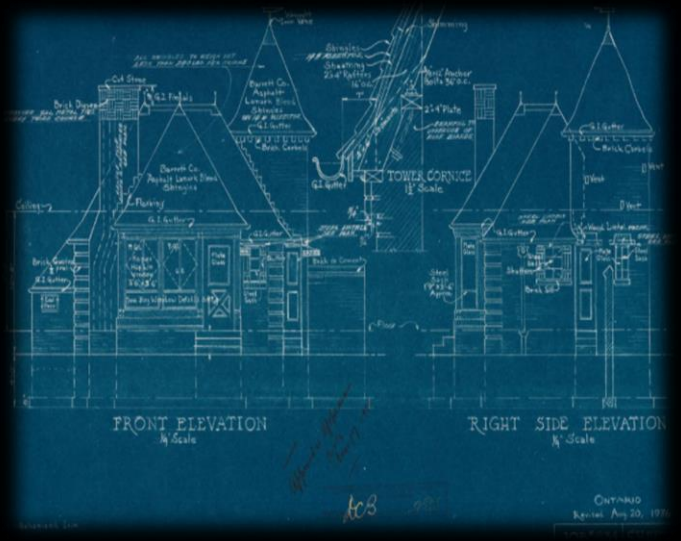
WHAT IS DRAWING?

- A method of conveying ideas concerning the construction / assembly of objects.
- Link b/w Designer and Assembler
- Described by lines, notes, abbreviations,



BLUEPRINT

WHY SOMETIMES “DRAWING” IS CALLED “BLUEPRINT”?



- Common use of the word “blueprint” is a technical drawing, typically of an architectural or engineering design.

BLUEPRINT

THE STORY OF BLUEPRINT

- A process invented in 1861 by French chemist Alphonse Louis Poitevin used the properties of a light-sensitive gum that turns blue to create a process to copy paper document to paper or other materials. The result is a blue negative conversion where the black lines become white, and the background white color becomes blue.

- In today's modern world, architectural scanners & copiers can recreated a standard drawing in a matter of seconds.

- All new design work can done in software, such as AutoCAD by Autodesk.

TYPES OF DRAWINGS

- Engineering – also known as production or working drawings
- Block diagram
- Schematics
- Sketches
- Installation

PRODUCTION DRAWING TYPES

3 TYPES

- Detail Drawing
- Assembly Drawing
- Installation Drawing

PRODUCTION DRAWING TYPES

DETAIL / ASSEMBLY/ INSTALLATION

Detail Drawing

- ✓ A description of a single part,
- ✓ Described by lines, notes, and symbols the specifications for size, shape, material, and methods of manufacture.
- ✓ Several detail drawings may be shown on the same sheet or print.

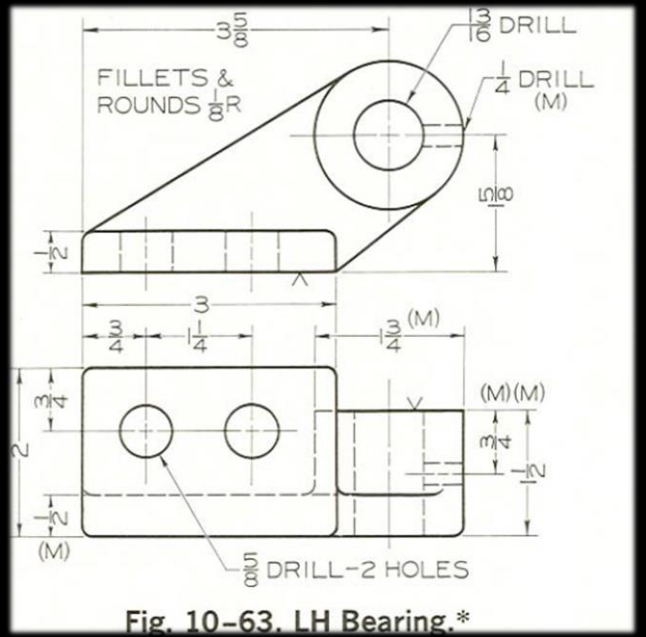


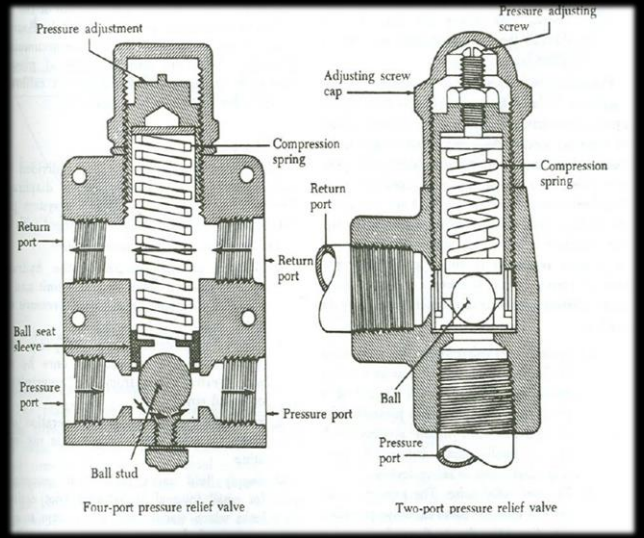
Fig. 10–63. LH Bearing.*

PRODUCTION DRAWING TYPES

DETAIL / **ASSEMBLY**/ INSTALLATION

Assembly Drawing

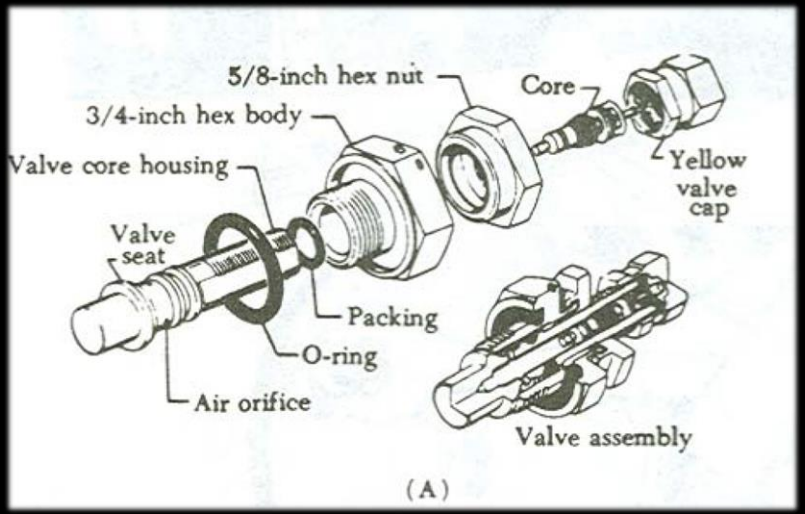
- ✓ A description of an object made up of two or more parts.
- ✓ To show the relationship of the various parts assembled.
- ✓ An assembly drawing is usually more complex than detail drawing and accompanied by detail drawings.

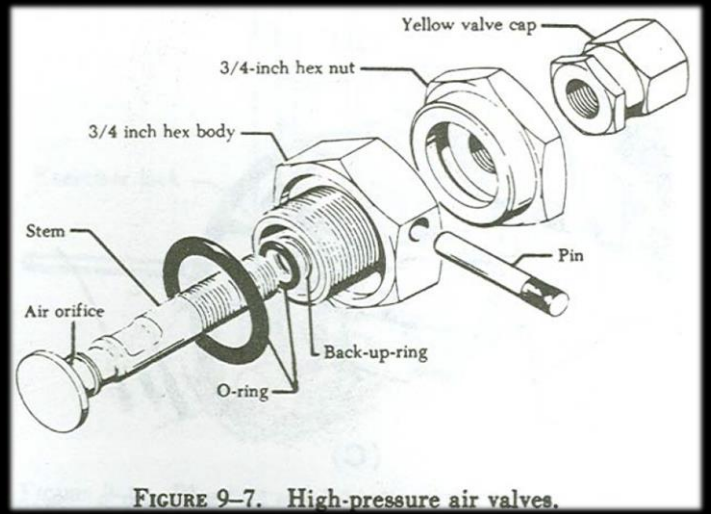


Cut-Away View

PRODUCTION DRAWING TYPES

DETAIL / **ASSEMBLY**/ INSTALLATION





Exploded View

PRODUCTION DRAWING TYPES

DETAIL / ASSEMBLY/ **INSTALLATION**

Installation Drawing

- ✓ All necessary info for a part or an assembly in the final installed position in the aircraft.
- ✓ Shows dimensions necessary for location of parts with relation to the other parts
- ✓ Reference dimensions that are helpful in later work in the shop.

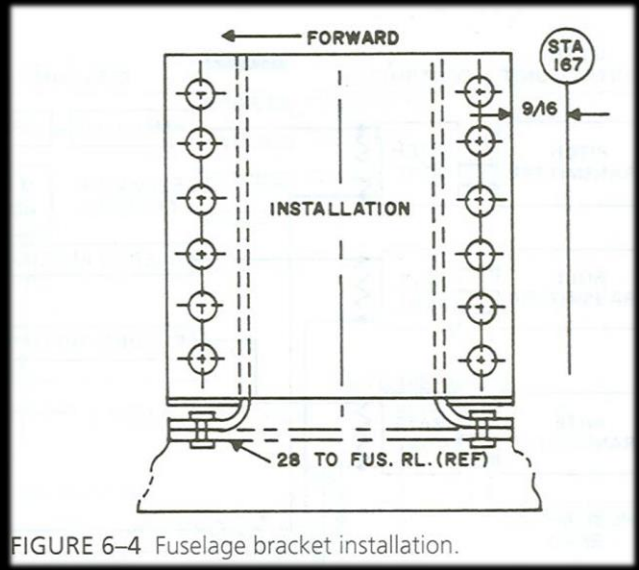


FIGURE 6–4 Fuselage bracket installation.

SECTIONAL VIEW DRAWINGS

- Section / Sectional view is obtained by cutting away part of an object to show the shape and construction at the cutting plane.

- Parts cut away are shown by use of section (crosshatching) lines.

- Types of sections are:
  - Full Section
  - Half Section
  - Revolved Section
  - Removed Section

SECTIONAL VIEW DRAWINGS TYPES

FULL SECTION / HALF SECTION / REVOLVED SECTION / REMOVED SECTION

Full Section

- ✓ Used when interior construction or hidden features of an object cannot be shown clearly by exterior views.

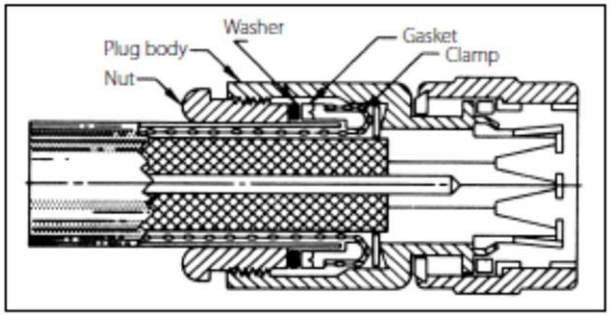


Figure 2-4. Sectional view of a cable connector.

SECTIONAL VIEW DRAWINGS TYPES

FULL SECTION / **HALF SECTION** / REVOLVED SECTION / REMOVED SECTION

Half Section

- ✓ The cutting plane extends only halfway across the object
- ✓ Leaving the other half of the object as an exterior view.
- ✓ Used to advantage with symmetrical objects to show both the interior and exterior.

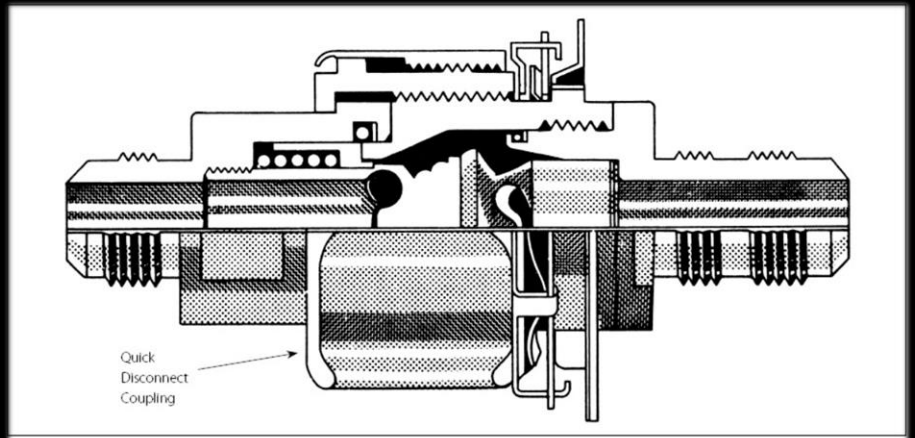


Figure 2-5. Half section.

SECTIONAL VIEW DRAWINGS TYPES

FULL SECTION / HALF SECTION / **REVOLVED SECTION** / REMOVED SECTION

Revolved Section

- ✓ Drawn directly on exterior view
- ✓ Shows the shape of the cross section of a part.

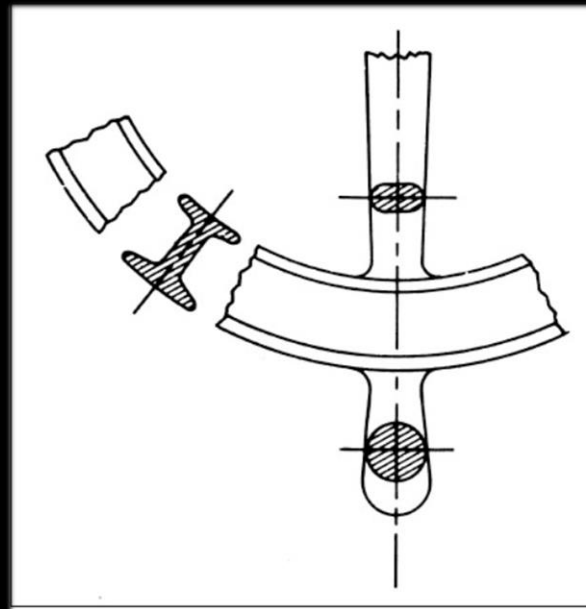


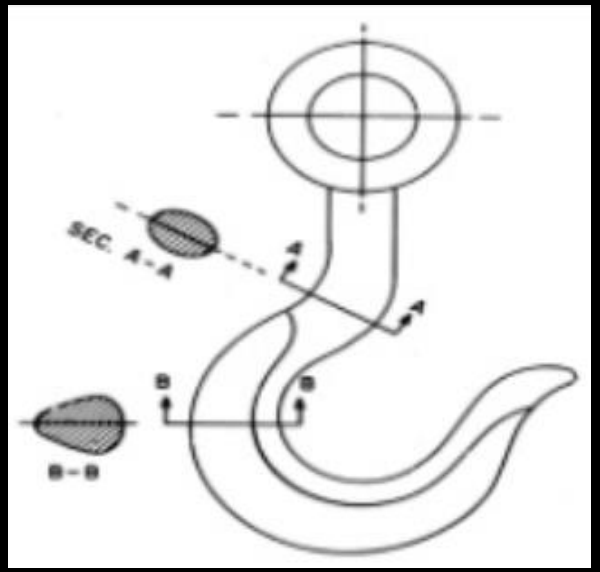
Figure 2-6. Revolved sections.

SECTIONAL VIEW DRAWINGS TYPES

FULL SECTION / HALF SECTION / REVOLVED SECTION / **REMOVED SECTION**

Removed Section

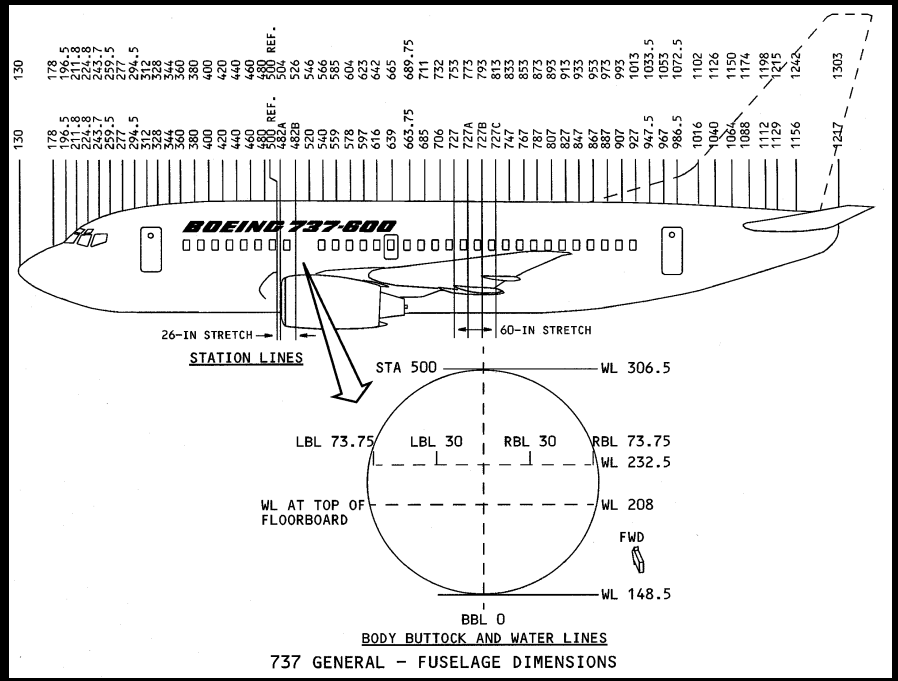
- ✓ Illustrates particular parts of an object
- ✓ Drawn like revolved sections
- ✓ Placed at one side
- ✓ To bring out pertinent details
- ✓ Often drawn to a larger scale than view indicated.



1. AIRCRAFT POSITION

THE DIMENSIONING GIVES THE POSITIONING ON THE FUSELAGE.

- ✓ Fuselage station line (STA, Station)
- ✓ The fuselage longitudinal section line (BL, Buttock Line)
- ✓ Waterline (WL, Waterline)



737 GENERAL – FUSELAGE DIMENSIONS

2. DRAWING ZONE

READ FROM RIGHT TO LEFT

- ✓ Drawing zone designators are used on the largest drawing, Zoning help to locate or relocate , a particular part of the drawing . The zone locator are located on the margin, out side the border line. On the large drawing “A””B””C” and “D”, shown in the side margins, read from bottom to the top. The numbers 1 through 8, shown on the top and bottom edges, read from right to left

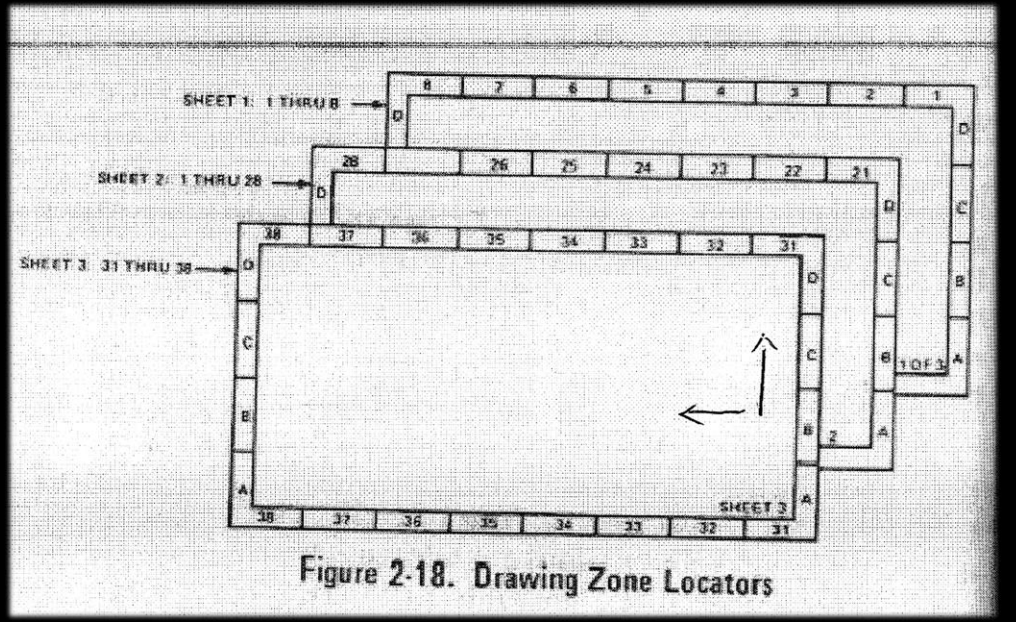
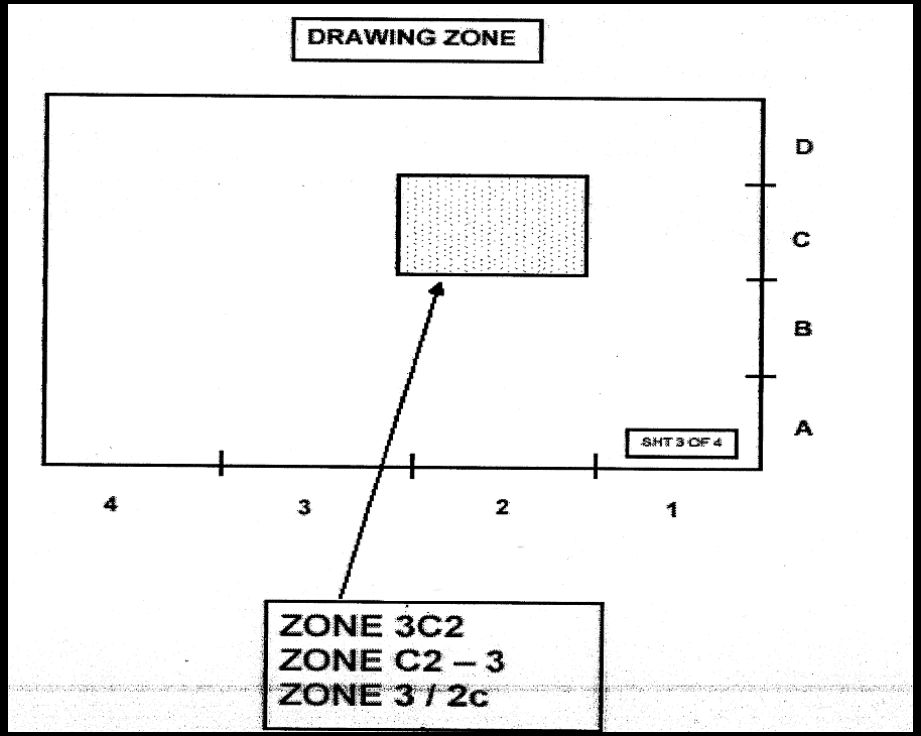


Figure 2-18. Drawing Zone Locators

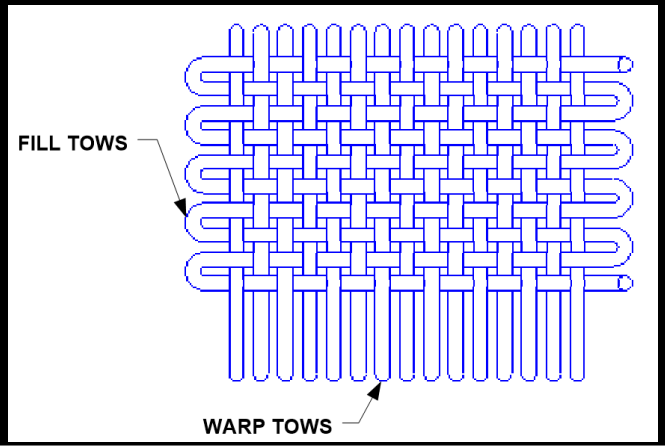
2. DRAWING ZONE

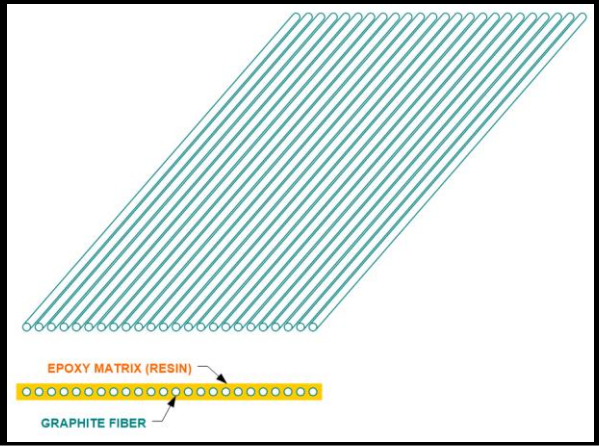


3. COMPOSITE MATERIAL DRAWING

COMPOSITE MATERIAL MAY HAVE ITS OWN ORIENTATION

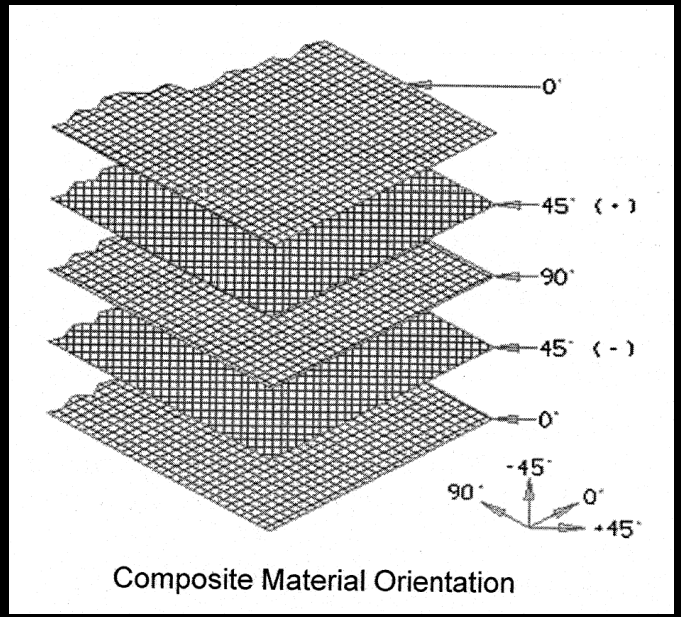
- ✓ Composites consist of material bonded together with some form of resin.
- ✓ There are two forms of composite material “woven cloth & unidirectional tape.
- ✓ To create a composite part, lay-up material to desired ply thickness, in varying sequences with fiber direction of each successive layer alternating





3. COMPOSITE MATERIAL DRAWING

COMPOSITE MATERIAL MAY HAVE ITS OWN ORIENTATION



Composite Material Orientation

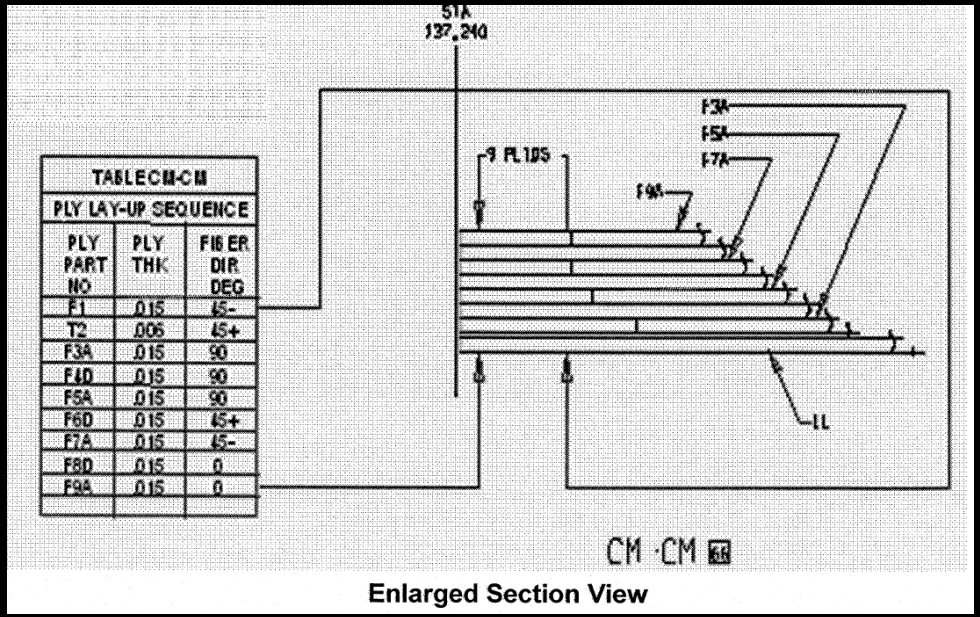


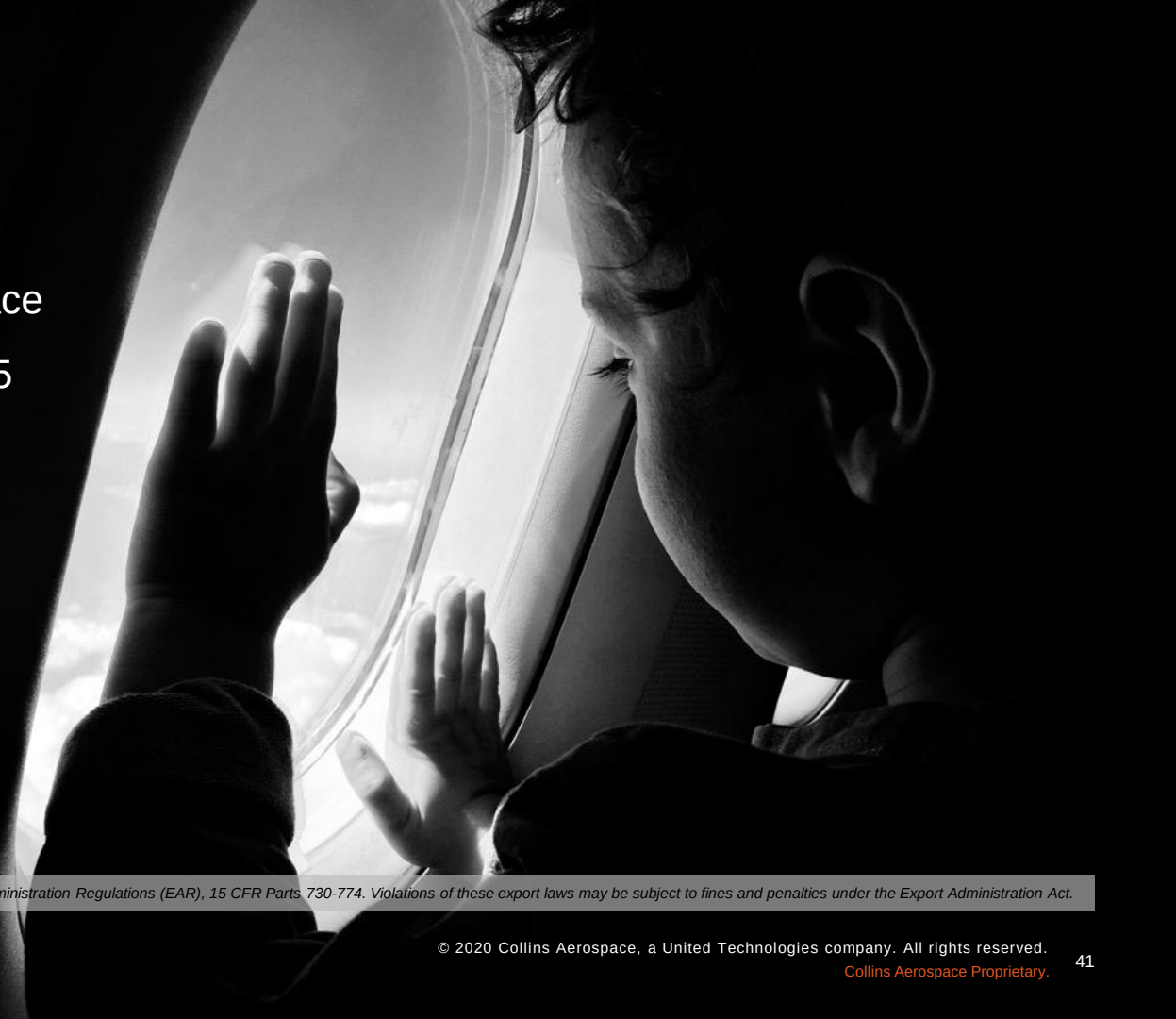
TABLE CM-CM

PLY LAY-UP SEQUENCE

PLY PART NO	PLY THK	FIBER DIR DEG
F1	.015	45-
T2	.006	45+
F3A	.015	90
F4D	.015	90
F5A	.015	90
F6D	.015	45+
F7A	.015	45-
F8D	.015	0
F9A	.015	0

Enlarged Section View

THANK YOU.



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