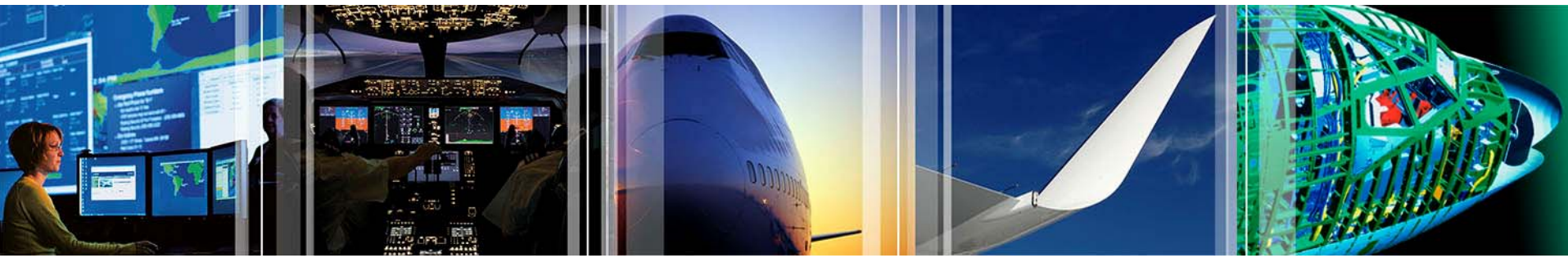


Airplane Fuselage Structural Integrity Forum

Panel 4: Manufacturing and Production Quality Assurance

Erik Nelson
Boeing Commercial Airplanes

September 21, 2011

Common Set of Drivers

737

777

747

767

Regulatory
- Build per type design
- Fit for safe operation & continued airworthiness
- Repeatable

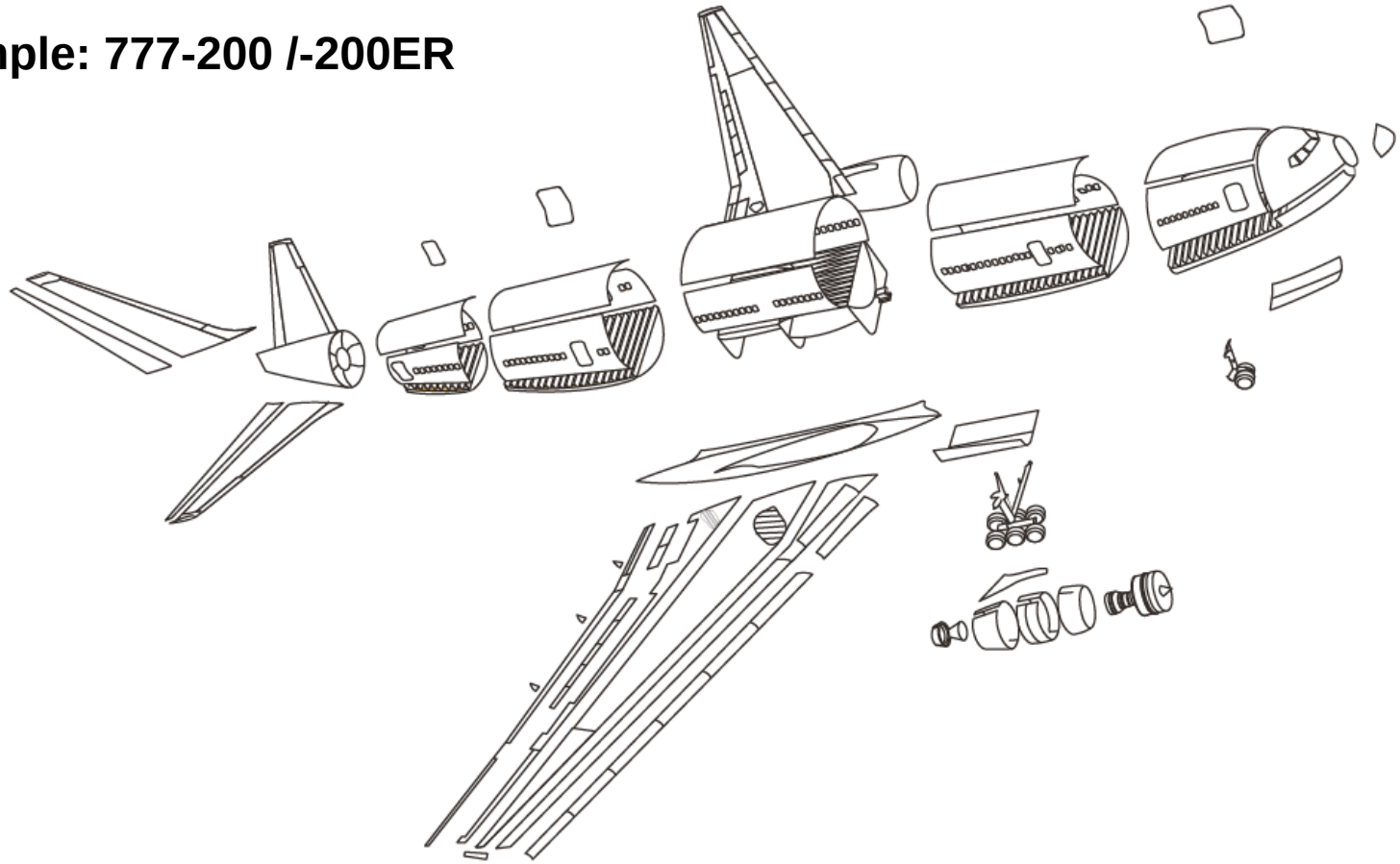
Customer
- High Quality
- Repairable
- Easy to maintain
- Aesthetically pleasing

Manufacturer
- High quality
- Root cause corrective action

Boeing Quality Expectations

Major Build Components
Commercial Airplanes

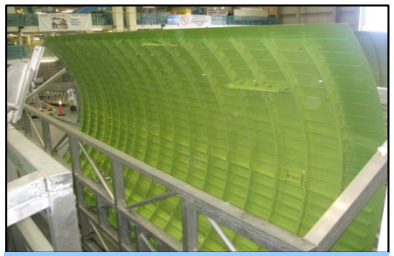
Example: 777-200 /-200ER



Integration of Major Structural Components

Manufacturing General Overview

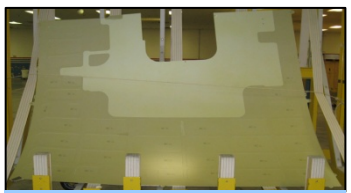
Fabrication & Assembly



Skin Assembly

Barrel Assembly

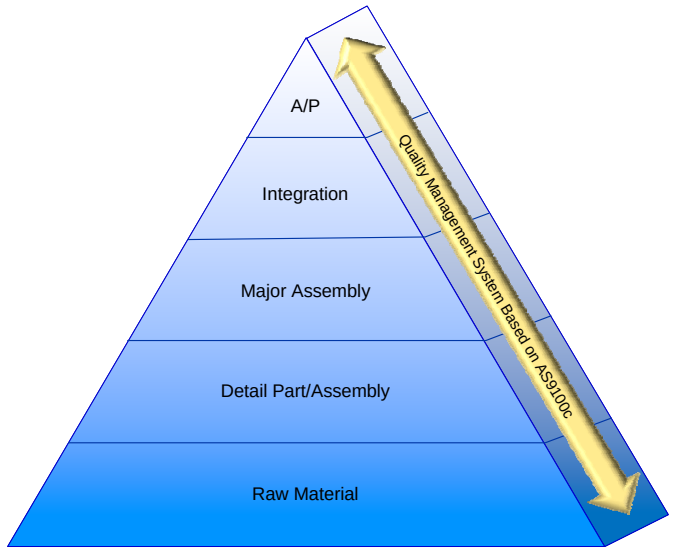
Fuselage Join



Skin

Stringer

Frame



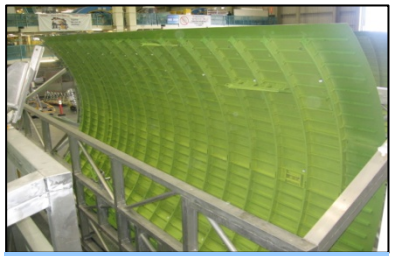
Building Blocks of Fuselage Assembly

Put Together Quickly Video

Manufacturing General Overview

Examples of Quality Inspection

- Geometry and relative orientation of parts
- Hole checks
- Fastener check
- Completed assembly inspection



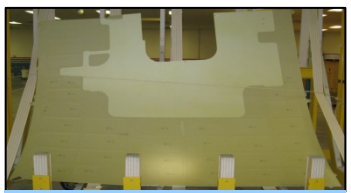
Skin Assembly

Barrel Assembly

- Major assembly relative orientation
- Hole and fastener checks
- Completed assembly inspection

Fuselage Join

- Barrel assembly relative orientation and location
- Hole and fastener checks
- Completed assembly pressure tests

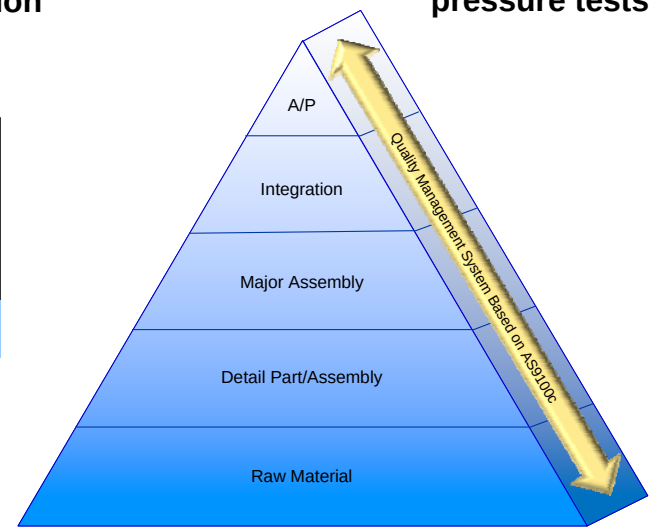


Skin

Stringer

Frame

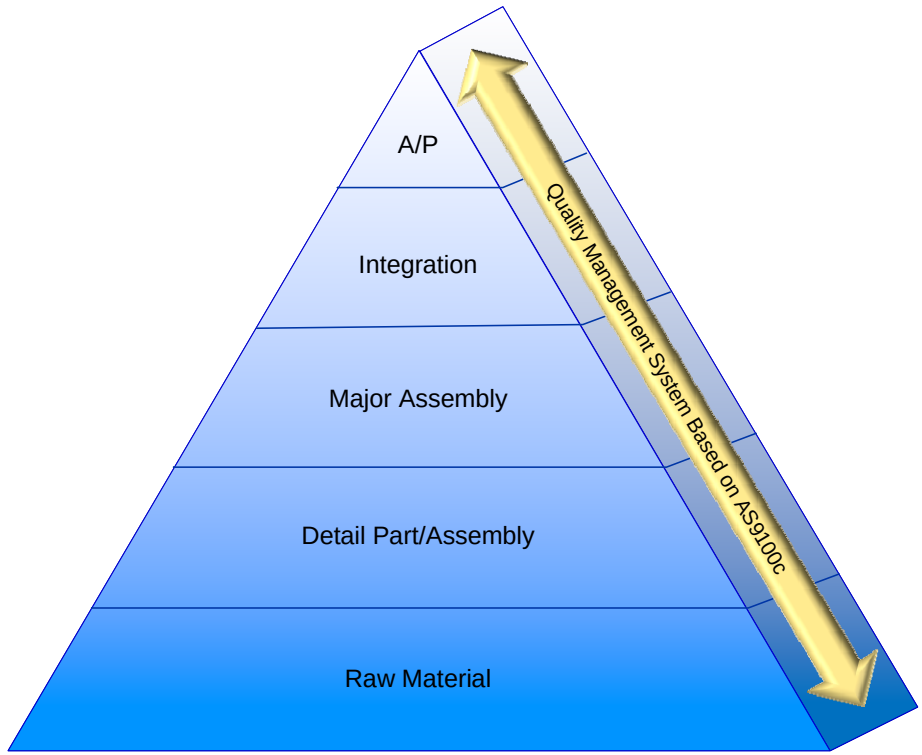
- Dimensional inspections, periphery, thickness, contour, etc.
- Material – hardness, alloy type, paint coverage, corrosion treatments, etc.



Processes at All Levels of the Build which Verify Design Requirements

Boeing Quality Management System

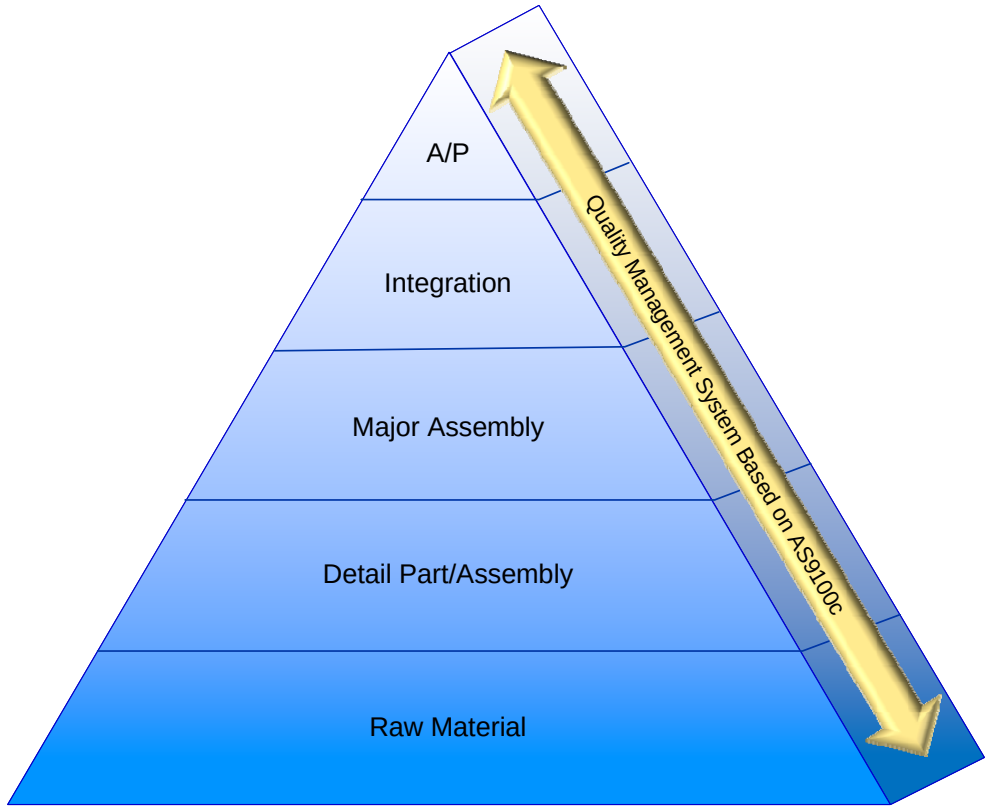
- **Based on the AS 9100C – Aerospace Standard**
- **Requirement of CFR Title 14, Part 21**
- **Processes and procedures approved by the FAA as a part of production certificate oversight**
- **Inspection and test procedures are established to validate the product conforms to type design**
- **Audited both internally and externally**
- **Encompasses the entire supply chain**



Quality Is Built Throughout the System – Suppliers Through Airline Support

Quality Management System
Corrective Action

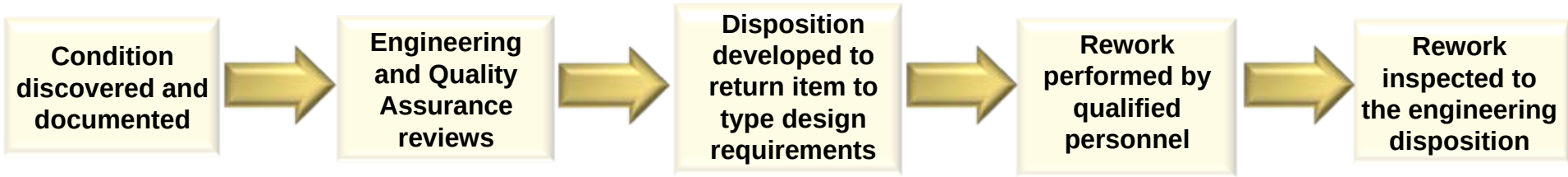
- **Deviations can occur from a variety of sources throughout the supply chain**
- **Quality is integrated into the build process**
- **Once identified, Engineering and Quality expertise brings the condition back to type design requirements**
- **Communication to affected parties (e.g., supply base, internal, fleet)**
- **Drive continuous improvement by root cause corrective action**



Engineering and Quality Review to Return the Condition to Design Requirements

Quality Management System
Material Review Board

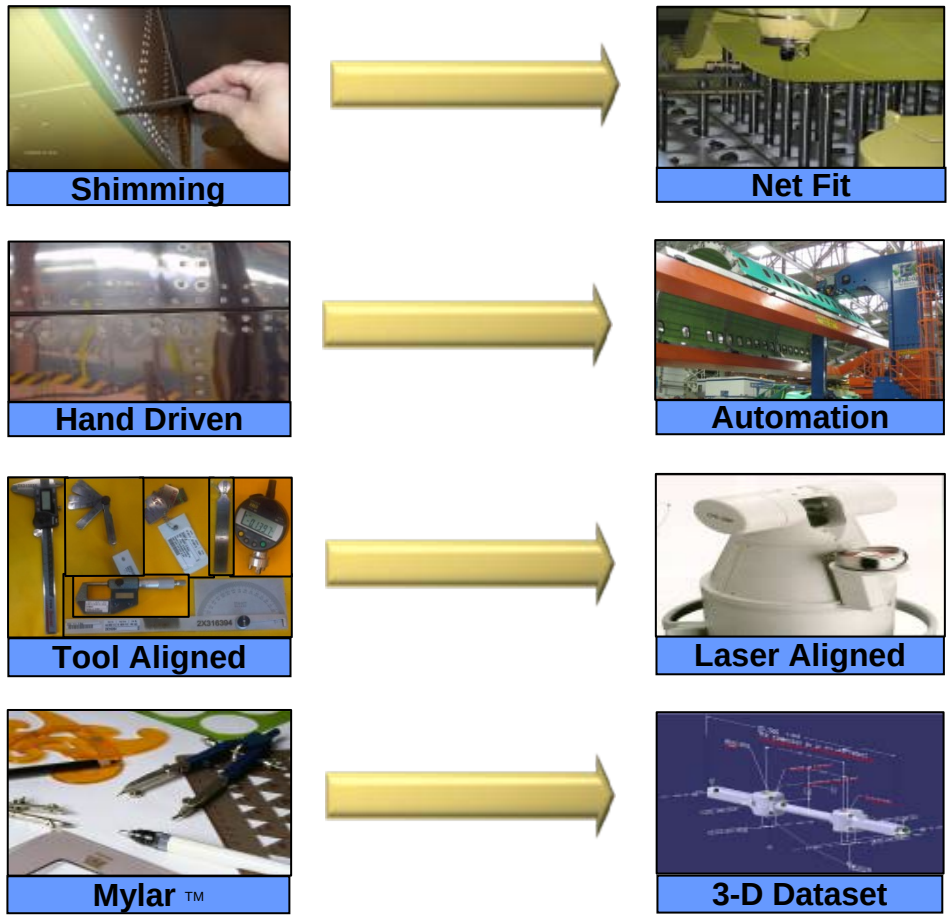
- **In-house and vendor deviations are handled through the Material Review Board (MRB) process**



Ensures Proper Engineering Assessment, Rework and Quality Inspection

Evolution of Methods

Examples of methods that have evolved to enhance quality



Continuously Enhancing Airplane Quality

Summary

- **Building quality in everything we do**
- **Robust Quality Management System encompassing entire supply chain**
- **Quality checks built into all stages of assembly**
- **Corrective action addressed by disciplined engineering and quality assurance review**
- **Focused on continuous improvements**