

WELCOME

Lean Engineering, The Forgotten Element



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2005 IIE Lean Solutions



Lean Engineering – The Forgotten Element



Lean

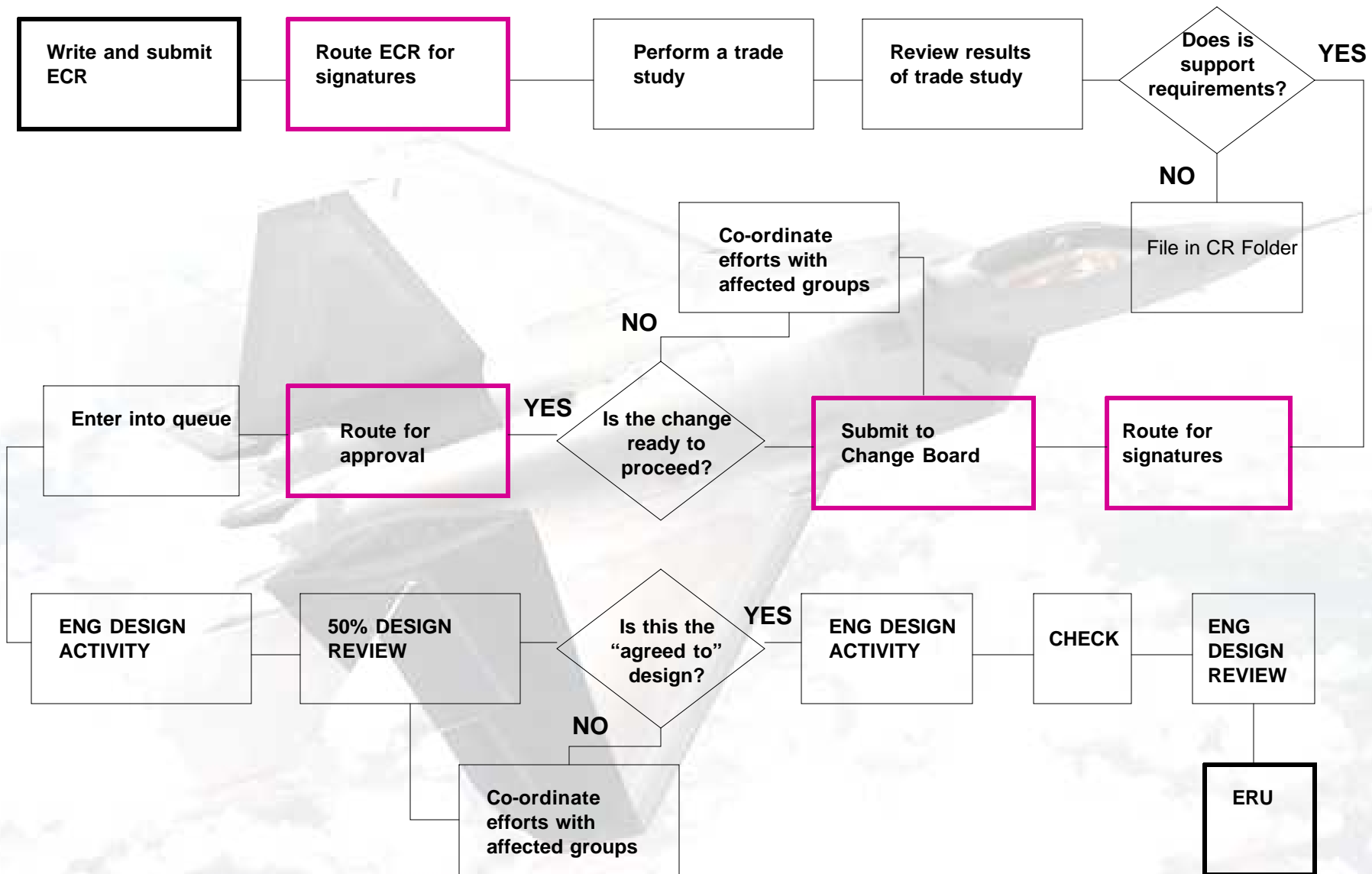
Engineering

World-Class Integrated Product Definition Processes and Tools

- .. **Process**
- .. **Tools**
- .. **Implementation**
- .. **Benefits**
- .. **Linkages to other processes**
- .. **Lessons Learned**



Lean Engineering – The Forgotten Element





Lean Engineering – The Forgotten Element



Cha Ching!



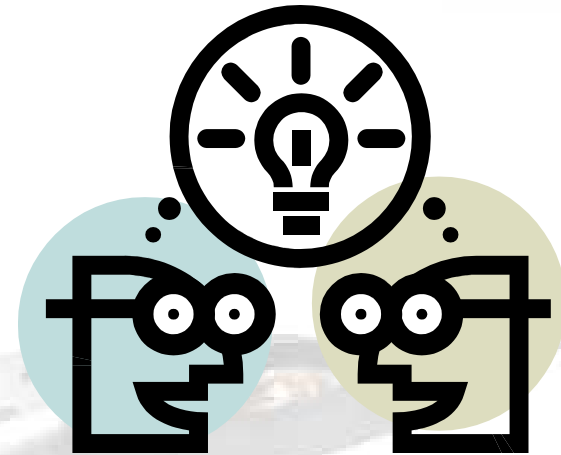
Lean Engineering – The Forgotten Element

- .. **Process**
- .. ***Tools***
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Lean Engineering – The Forgotten Element

- Ø Value Stream Mapping
- Ø Electronic Simulations
- Ø Dimensional Management
- Ø ATA / DA
- Ø DFMA
- Ø Design / Re-use
- Ø Virtual Design Review



Kaizen events

3P (7 different ways)

AIWs

Empowerment Teams

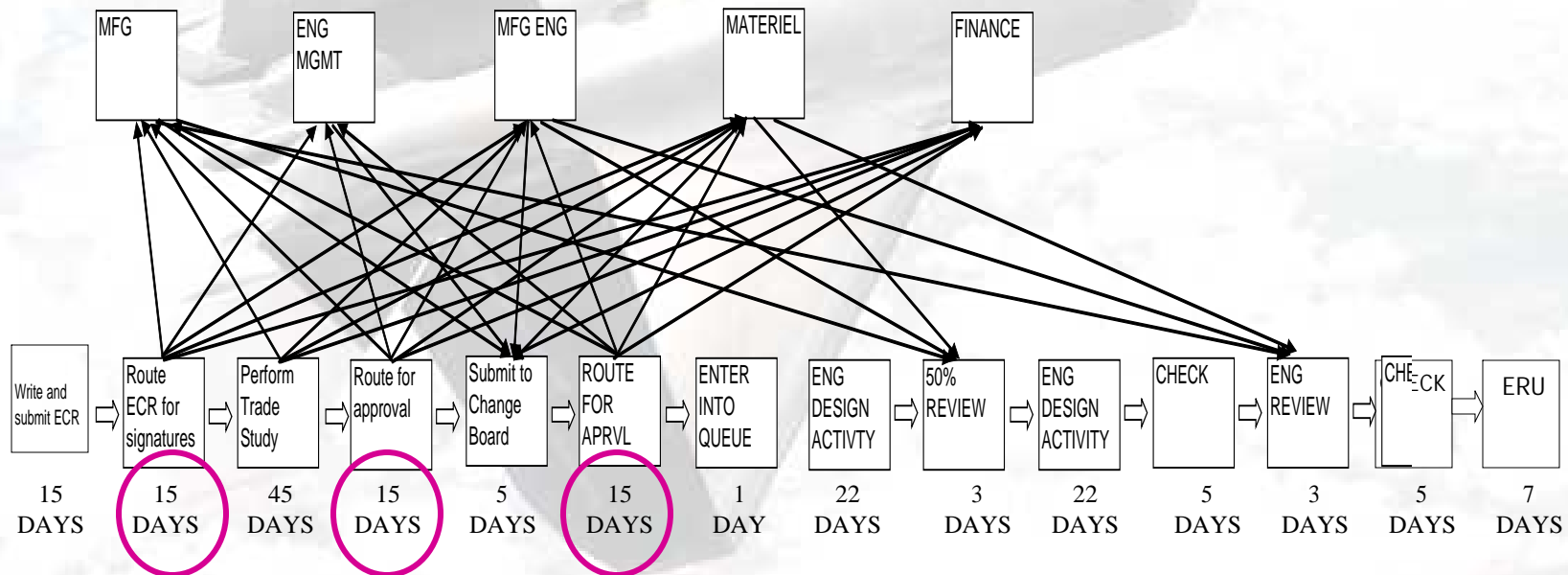


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Value Stream Mapping

178 DAYS = FLOW
116 DAYS = WORK

DESIGN PROCESS FLOW – VALUE STREAM MAP - BEGINNING





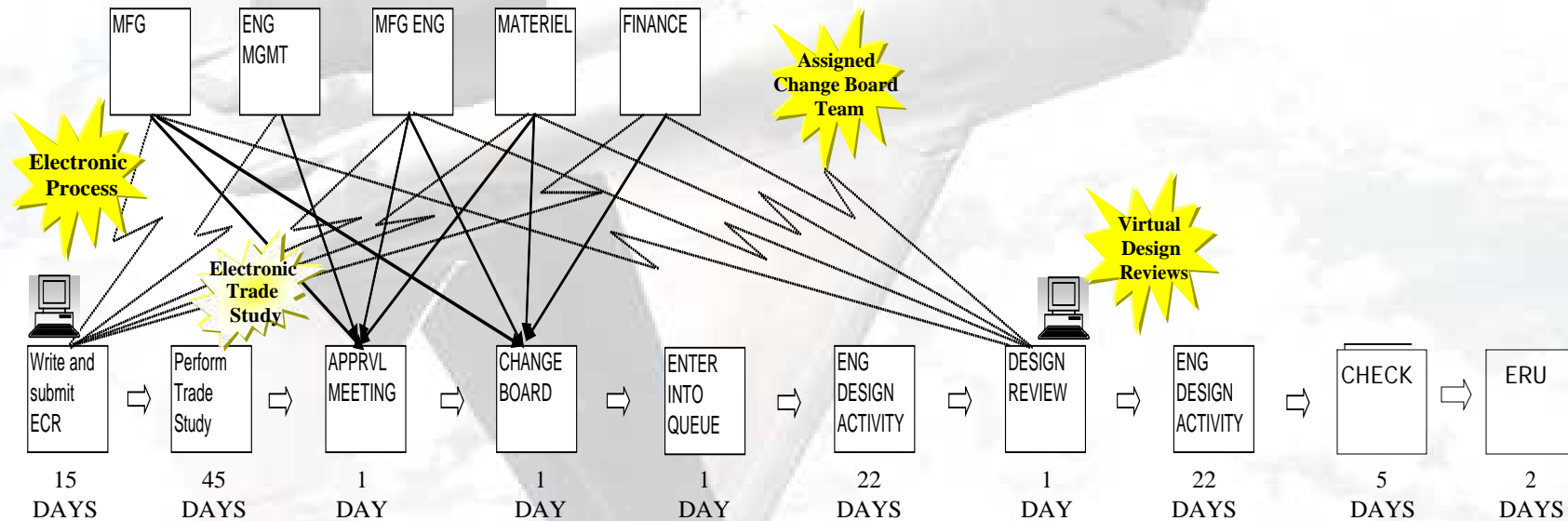
Lean Engineering – The Forgotten Element

Value Stream Mapping

115 DAYS = FLOW
115 DAYS = WORK
35% REDUCTION



DESIGN PROCESS FLOW – VALUE STREAM MAP – END STATE 2005

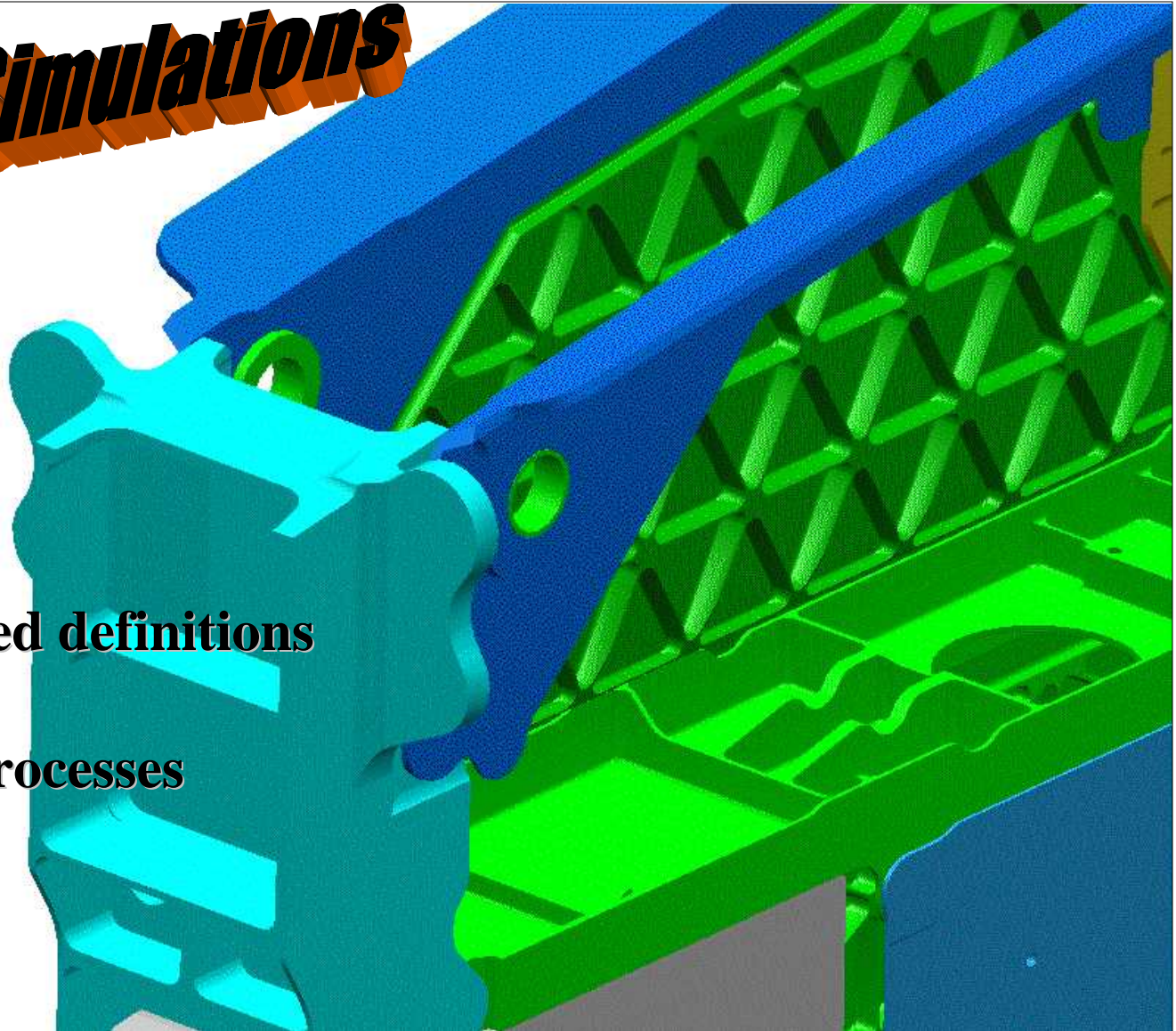




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Electronic Simulations

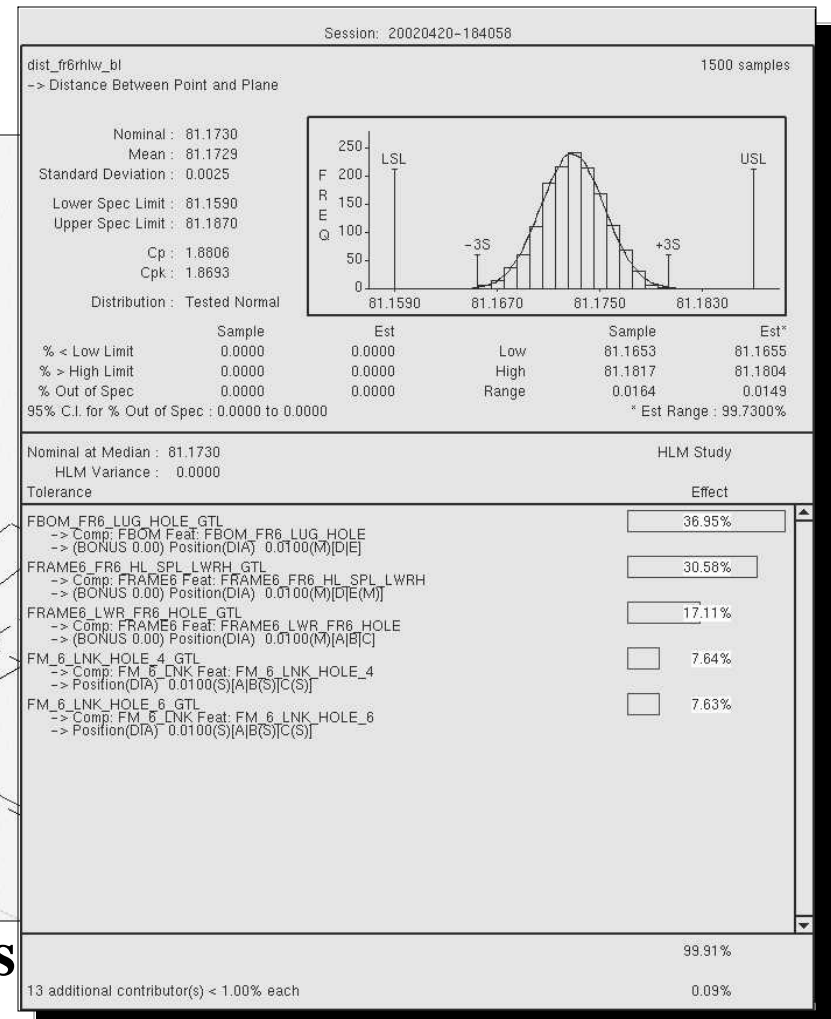
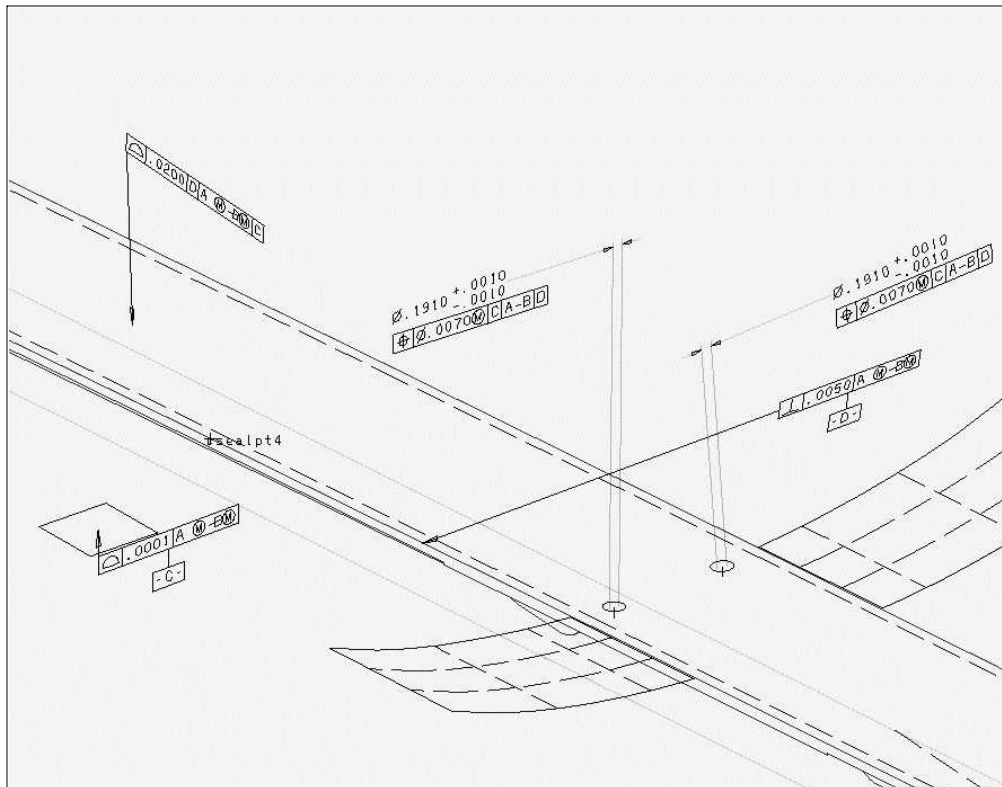
- Using model based definitions
verify:
 - machining processes
 - assembly fit
 - accessibility





Lean Engineering – The Forgotten Element

Dimensional Management

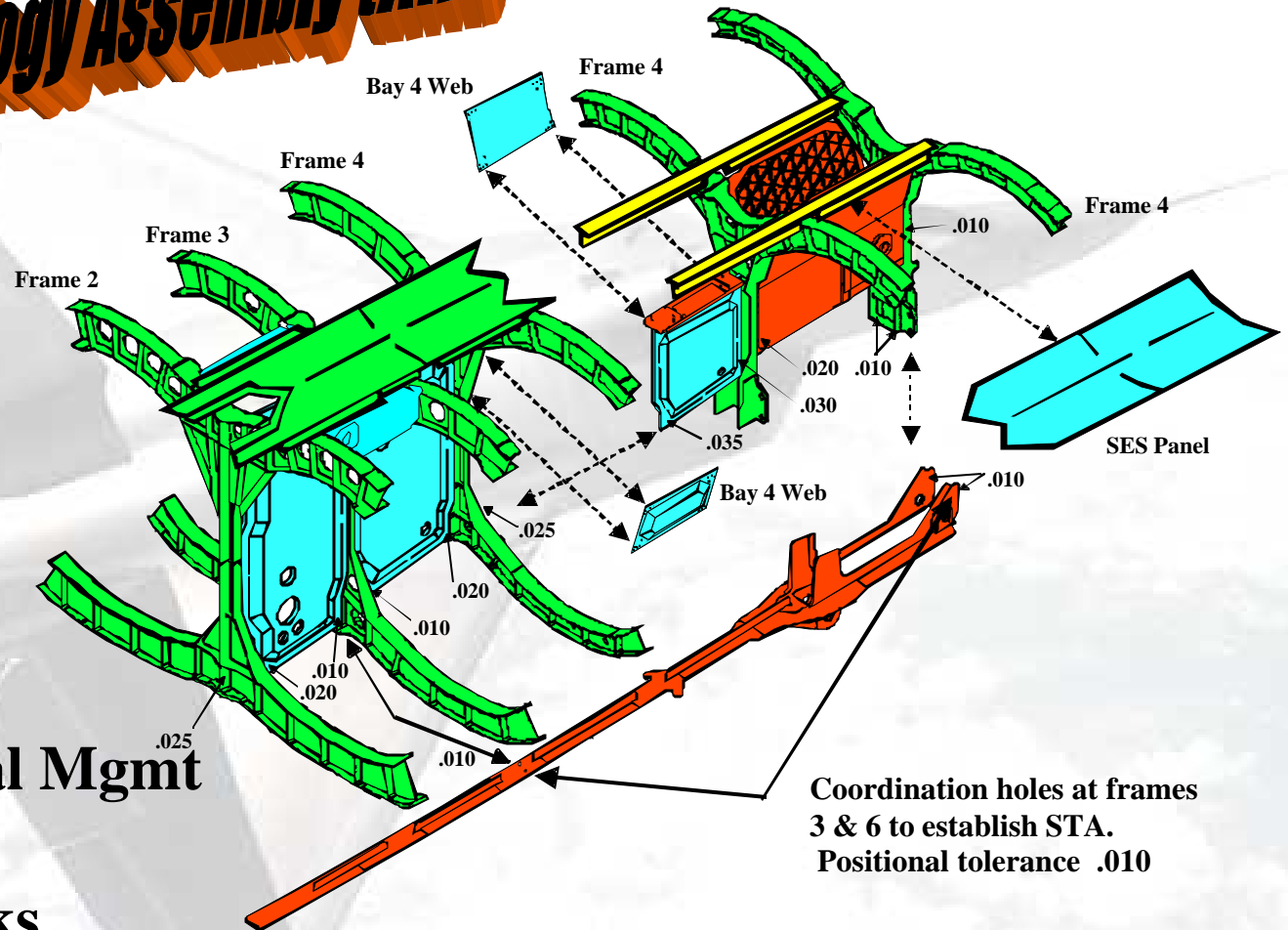


VSA – Variation Simulation Analysis



Lean Engineering – The Forgotten Element

Advanced Technology Assembly (ATA)

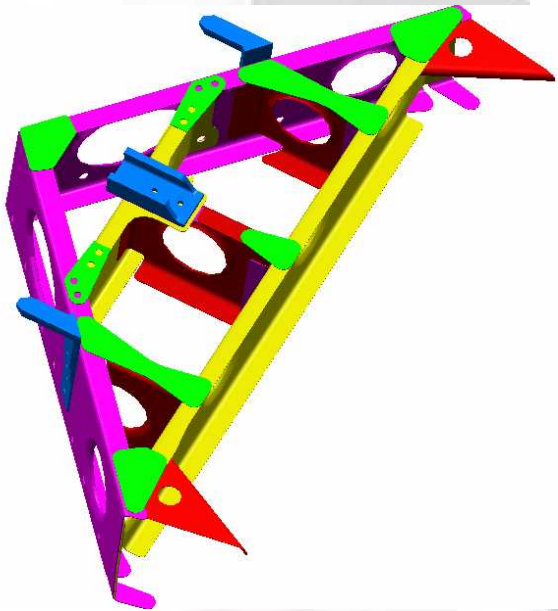


- Using Dimensional Mgmt
- verify:
 - tolerance stacks
 - assembly fit



Lean Engineering – The Forgotten Element

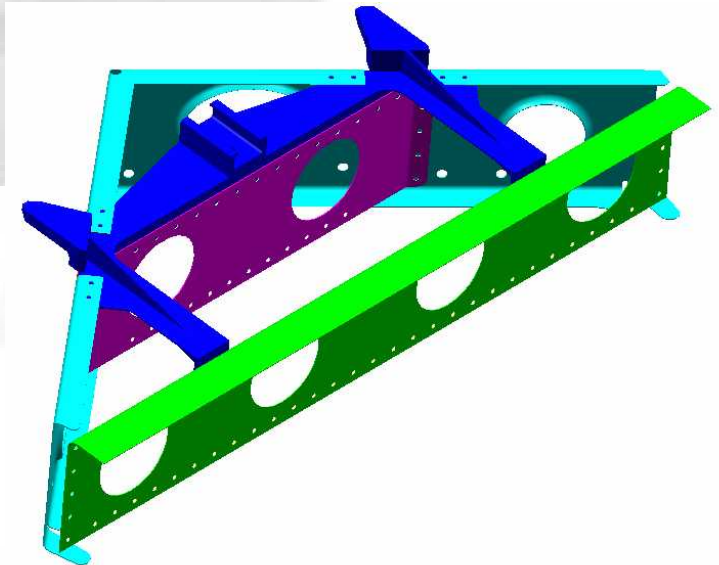
Design for Manufacturing & Assembly (DFMA)



Before DFMA

Consider:

- Machining time
- Assembly time
- Part quantities



After DFMA



Lean Engineering – The Forgotten Element

Design Re-use



If it's tested and proven, use it!

- reduction of engineering research, modeling and development time
- reduction of material costs
- reduces variability





Lean Engineering – The Forgotten Element

Virtual Design Reviews





Lean Engineering – The Forgotten Element

- .. **Process**
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Lean Engineering – The Forgotten Element

Define the goal!

- reduce costs by 15%
- reduce process time by 10 days
- become competitive
- vie for new business

Develop a plan to achieve the goal!

- project file with assigned tasks and completion dates

Communicate the plan to everyone!

Education and train affected personnel!



Lean Engineering – The Forgotten Element

- **Process**
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- *Benefits*
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Lean Engineering – The Forgotten Element

BENEFITS!

- **Reduced Engineering Costs!**
- **Reduced Manufacturing Costs!**
 - easier to assemble
 - agreed to processes
 - reduced flow
- **Job Security!**
- **New Opportunities!**
- **Improved Quality!**





Lean Engineering – The Forgotten Element

- **Process**
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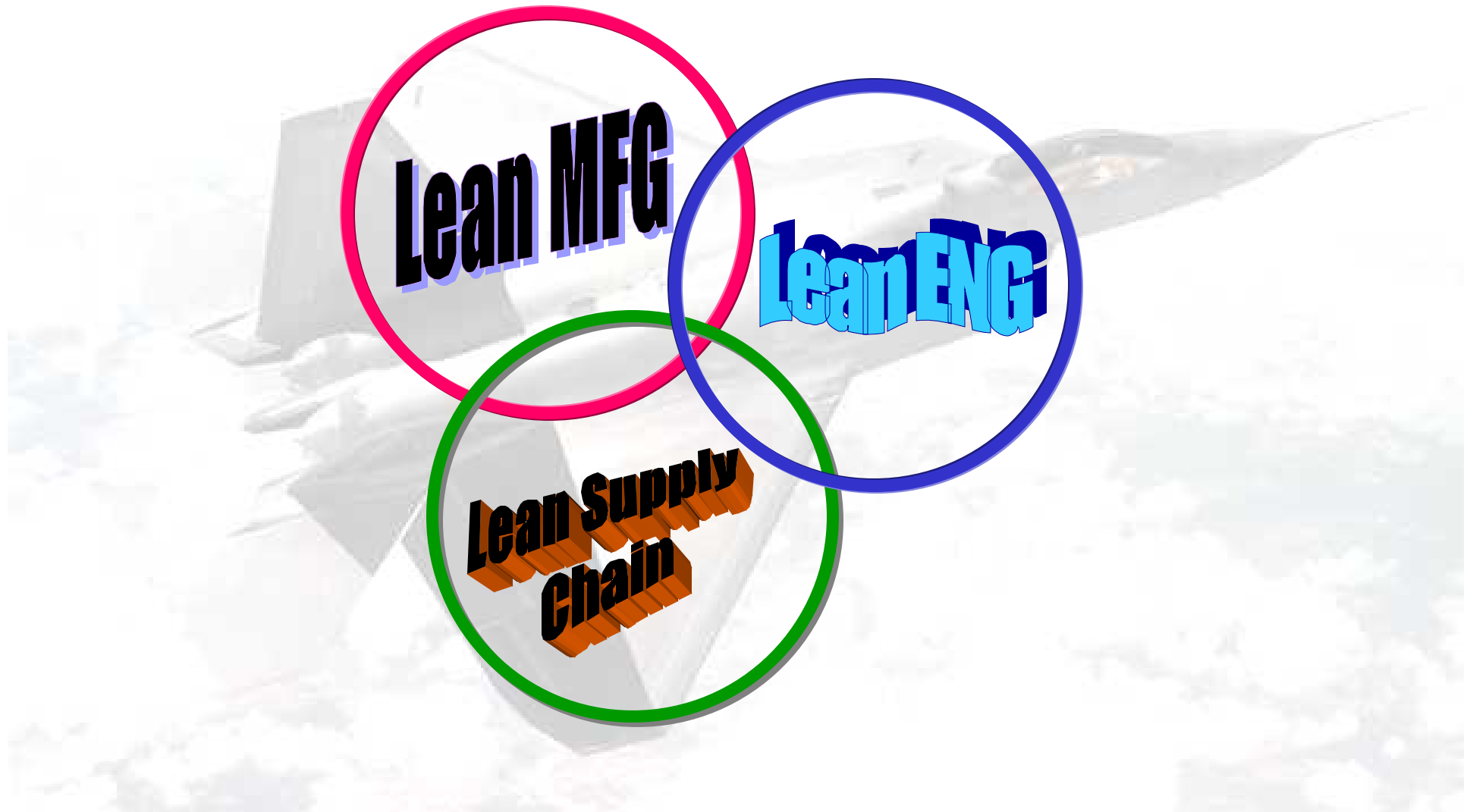


Lean Engineering – The Forgotten Element

Lean MFG

Lean ENG

**Lean Supply
Chain**





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- *Lessons Learned*



Lean Engineering – The Forgotten Element

Lessons Learned:

- Do not “assume” that everyone understands what lean is**
- Develop teams to create an environment to foster lean thinking**
- Ensure that the management team is on board**
- Follow through with the ideas**



Lean Engineering – The Forgotten Element

Summary

- ‡ **Process**
- ‡ **Tools**
- ‡ **Implementation**
- ‡ **Benefits**
- ‡ **Linkages to other processes**
- ‡ **Lessons Learned**

Questions

