Summary of Open Discussion

ASIP Session on Challenges to Lean Certification
11 December 2002

Each slide represents a different speaker
Open Discussion

• **Can’t decouple loads/controls**
  – Suggest internal IPT during development to improve communications between the disciplines

• **Include dynamics in initial loads**
Open Discussion

• **Analytical Certification needs to:**
  – Account for residual stresses and variance in manufacturing processes.
  – Account for workmanship
  – Screen for flight critical cases – not necessarily highest stress
  – Take a probabilistic approach

• **AC is only as good as the assumptions that go into it.**
Open Discussion

• AC needs to include risk analysis at early stages
• Tools capability is not the critical link application of the tool (engineering experience) is
  – Unnecessary use of tool capability simply because it exists drives unnecessary cost/time
  – Taking full advantage of analytical accuracy up-front entails elevated risk down stream
    • When other design parameters predominate - loads come in higher, flight control laws need to be modified to improve performance, material performance for as produced structure does not meet original expectations
Open Discussion

- There is more value to testing than providing a pathway to certification.
  - V&V of new tools, etc
  - Future value lost if we don’t preserve test data
Open Discussion

- Sizing structural components using static loads may not be sufficient. The critical case may be driven by fatigue or manufacturing imperfections
  - Not feasible/possible to fine grid all critical design details - fatigue testing is relied on totally for verification that most significant hot spots are identified
Open Discussion

• Engineers are becoming overly risk averse.
  – Engineers need to be more responsive to quantifying risk - need tools and training
• They tend to over analyze.
• We have lost our ability to conduct an intuitive risk analysis
• Analysis tools are used inappropriately.
Open Discussion

• Young engineers don’t understand tools
• Every analyst should be required to serve as an MRB representative
• Documentation upfront and well defined documentation review/approval processes are essential to:
  – increasing success rate in certification
  – more quickly/accurately characterizing structural integrity
  – saving program dollars down-stream
Open Discussion

- F-22 conducted about 12000 composite coupon tests and had almost no failures on the static test article.
- Analysis is getting better.
- How analysis is used is important
Open Discussion

• Analysis is only as good as the manufacturing processes.
Open Discussion

• Work smarter not harder.
• Better analysis tools have lead to more analysis.
• More complex analysis has led to smaller margins
• We need to focus more on analyzing critical cases.
Open Discussion

- Certification and certification by analysis need to be better defined. Seems to be confusion even among IPT concerning definitions.
- Do not equate test and certification
- Developmental test is not performed as planned
Open Discussion

• Consistency of purpose-IPT charter needs to include Lean Certification/Efficient Certification.
Open Discussion

- **AC is futile because**
  - Cracking/failures occur at unexpected locations
  - Neglected residual stresses