2015 COMPOSITES INDUSTRY

SHAPING FACTORS, TRENDS, AND GAPS
Industry Engagement

• Industry representatives provided candid feedback regarding shaping factors, trends and gaps.
  – Seven Industry Segments:
    • engines, marine, 1st tier small, 1st tier large, fixed wing, rotary wing, materials.
  – Fourteen Companies

A Broad Industrial Perspective
2015 Summary
6 Composites Industry Shaping Factors
(Not in rank order)

• Customer Driven
  – Decision making for improved structures continues to favor Acquisition vs. Life Cycle Costs
  – Increased demand for structural efficiency for enhanced performance
  – Increasing complexity and performance targets for new designs is increasing production risk
  – Expressed desire for an agile supply base

• Technology Driven
  – Increasing volume of data
  – Increasing industrial / commercial production automation

Swapped Shaping Factor...Was “Additive Manufacturing Bow Wave”
Shaping Factor:

- Decision making for improved structures continues to favor Acquisition vs. Life Cycle Costs

Trend:

- Fewer life cycle structural improvements to systems are implemented leading to a slower reductions in life cycle costs

Gap:

- No technology gap
- Practices gap: Little incentive for acquisition managers to make life cycle cost decisions
- Data gap: Information required to make life cycle decisions can be difficult to find and may be of questionable fidelity.
Composites Production
Shaping Factor #2

• Shaping Factor:
  – Increased demand for structural efficiency to achieve enhanced performance

• Trend:
  – Large integrated structures designed to meet efficiency requirements
  • Realizing limitations for the benefits of unitization
  • Leaning towards more bonded structures to achieve the next level of structural efficiency

• Gap:
  – No current wide-area bond verification method
  – Certification challenges (expensive and extensive)
Composites Production
Shaping Factor #3

• Shaping Factor:
  – Increasing complexity and performance targets for new designs is increasing production risk

• Trend:
  – Cost overruns and schedule slippage result as unexpected manufacturing outcomes are discovered leading to non-conformances

• Gap:
  – Limited ability to predict the quality when producing features, sizes and capabilities outside of the experience envelope
    • In-Depth Process Understanding
    • Validated and Verified process modeling
Composites Production
Shaping Factor #4

• Shaping Factor:
  – DoD expressed desire for an agile supply base

• Trend:
  – Discussions of agile manufacturing and the benefits of low volume, high mix cost effective production to meet warfighter needs
  – Discussions relative to flattening the learning curve
  – Several efforts to reduce the time and cost for structures qualification
  – Increasing interest in flexible automation
  – Reduced number of programs to support industry investment in automation and new technologies

• Gap:
  – Maturation of agile design/manufacturing/assembly and supply chain capabilities for cost effective agile production
Composites Production
Shaping Factor #5

• Shaping Factor:
  – Increased volume of data

• Trend:
  – More machines and processes producing more data
  – Low cost sensors enabling the “internet of things/sensors”
  – Automation, MTConnect, etc. increasing the amount of data available

• Gap:
  – Open architecture, data compatibility, standards – ability to transfer data to/from software, systems, equipment, vendors/OEMs
  – Business analytics to enable the extensive information to be transformed into actionable data.
Composites Production
Shaping Factor #6

• Shaping Factor:
  – Increasing industrial / commercial production automation

• Trend
  – Aerospace no longer leading innovation for commercial/industrial processing and fabrication
    • Automotive example, BMW i3 pushing forward with composites processing automation
  – Rapid cure, thermoplastics, automated preforming

• Gap:
  – Reduced cost of automation which can be justified for DoD volumes
  – Increased flexibility of automation which can be justified for DoD volumes and product mix
  – Reduced set-up for automation which can be justified for DoD volumes and product mix