

# **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, 1<sup>st</sup> tier small, 1<sup>st</sup> 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"

# Composites Production Shaping Factor #1



- 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