Today’s Systems Engineering Challenges

Mark Burgess
Chief Engineer, Engineering, Operations & Technology
The Boeing Company
The SERC and Boeing

- Boeing became the first corporate partner of the SERC program in 2012
- Led by Chief Engineering Mark Burgess
- Boeing’s SERC Steering Team
  - Marc Nance – Enterprise Domain Leader for Systems / Software Engineering
  - Gary Motchan – BDS Function Director, Systems Engineering, Software Engineering
  - Kevin Leath – BCA Systems Engineering
  - Bob Scheurer – BDS Systems Engineering Leader
  - Kareem Mohammad – BCA Systems Engineering Leader
  - Christi Gau Pagnanelli – BDS Systems Engineering Leader
Boeing’s 1st SERC Fellow

William Harkness
- Enterprise Technology Domain Engineer
- Engineering Operation & Technology

Supports: Enterprise Domain Leader for Systems Engineering, Marc Nance

Sponsored by: Dr. Mithra Sankrithi, Advanced Concepts Chief Engineer, Boeing Commercial Airplanes
Boeing’s 2\textsuperscript{nd} SERC Fellow

Julie Peirson
- 737 MAX Product Development Chief Engineer
- Boeing Commercial Airplanes

Supports: Small Airplane Product Development,

Sponsored by: Mark Burgess and Greg Hyslop (VP of Boeing Research and Technology)
Boeing’s 3rd SERC Fellow

Josh Goldschmid
• Seat Integration project Engineer
• Boeing Commercial Airplanes
• The Boeing Company

Supports: Seats program across all models of Boeing Commercial Airplanes

Sponsored by: Kevin Leath, Director of Affordability and Boeing Product Development System (BPDS)
Boeing Major Business Units

Engineering Operations & Technology (EO&T)

Boeing Research & Technology

Boeing Test & Evaluation

Boeing Information Technology

Boeing Commercial Airplanes

- Headquartered in the Puget Sound region of Washington state
- 2012 revenues of $49.1 billion
- Approximately 66,000 employees
- Offering a family of airplanes and a broad portfolio of aviation services for passenger and cargo carriers worldwide
- Represent three quarters of the world’s fleet, nearly 12,000 jetliners in service
- 70 percent of Boeing commercial airplane sales outside of the United States
- Includes Commercial Avionics Services (CAS)

~ 18,000 Personnel World Wide

Boeing Defense, Space & Security

- Headquartered in St. Louis, Mo., with global operations in 4 nations and 21 states
- 2012 revenues of $32.6 billion
- Approximately 66,000 employees
- Balanced backlog across all markets including a strong mix of development, production and support contracts
- Integrating defense, space, intelligence, and communications capability
The Boeing Company – Circa 2014
Why this is important to us

- Fuel price
- Airline strategies & business models
- Emerging markets
- Infrastructure
- Environment
- Economic growth
- High Speed rail
- Market liberalization
- Airplane capabilities
- Airline strategies & business models
$27B in purchases annually (includes engines)
1,200 production suppliers in 4,500 factories
employing approximately 500,000 people

- 737 contains < 500K parts
- 747 contains approximately 6M parts
- >750M components & assemblies purchased each year
- Growing to over a billion* in 2014

Supplier parts and assemblies make up 60% of product cost

* Boeing Commercial Airplane only

High volume, complex business model
Product Development Evolution

(Increasing level of business model complexity)

- **1916**
  - 2,800 lbs
  - 125 horsepower
  - Wood and canvas
  - $10^3$ parts

- **1983**
  - 36,000 lbs
  - 32,000 horsepower
  - Aluminum/titanium
  - $10^5$ parts

- **2014**
  - 464,000 lbs
  - 64,000 lbf
  - Composite/aluminum/Ti
  - $10^6$ parts

**Northrop : El Segundo**

**McDonnell Douglas – St. Louis**

**Partnering / Integration Complexity**

**Product / Technology Complexity**
Aerospace Product Development

Source: DARPA
Hopes we have for the future: Why SERC is important to us
Mark’s Assertions

- Systems Engineering is paramount in improving the competitiveness of aerospace & defense

- The SERC offers the latest efforts to revolutionize SE

- Boeing recognizes the importance of the SERC and continues to support the effort
“We are embarked as pioneers upon a new science and industry in which our problems are so new and unusual that it behooves no one to dismiss any novel idea with the statement that ‘it can’t be done!’”

— William E. Boeing, founder, The Boeing Company