BOEING

Understanding the Joint Partnership between Program Management & Systems Engineering
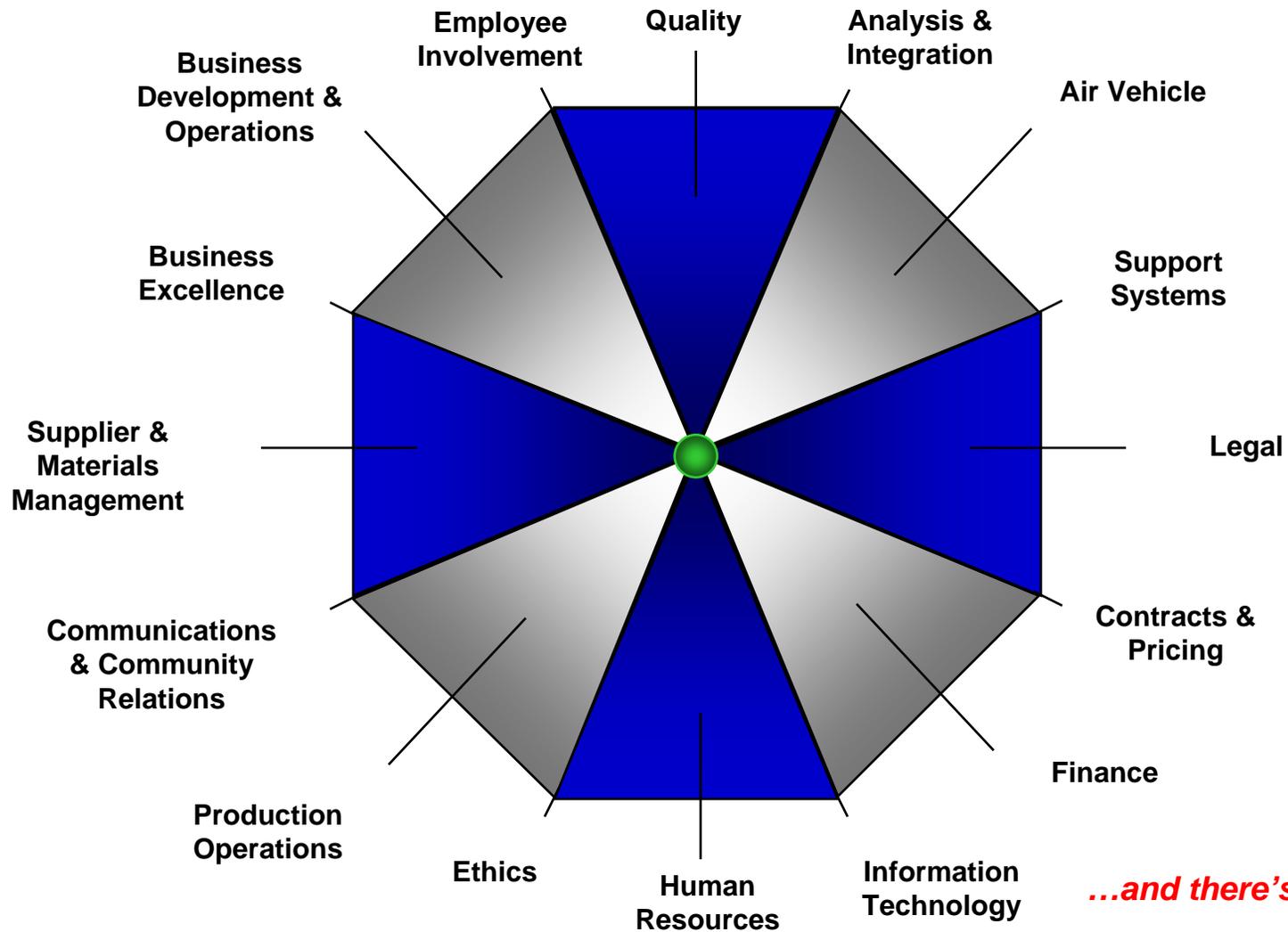
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and

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Abstract

- Program Management oversees an expansive umbrella that carries a bundle of business and technical activities. Within that umbrella, Systems Engineering supports Program Management by integrating these independent and dependent activities into one synergistic entity that will develop and deliver systems. Indeed Systems Engineering is a foundation and an enabler for Program Management.

- On a mature multi-purpose airlift program, Program Management concentrates on several key program items, such as costs, timely delivery, people, quality, risks, and ultimately customer satisfaction and confidence. These program items are a natural part of the systems engineering process. In view of these program items, Systems Engineering focuses on stabilizing and enhancing the systems engineering process.

- As joint partners, Program Management and Systems Engineering organizations must work together to define and understand their diverse objectives. Convergence of these objectives will lead to best practices that accomplish business goals, such as reducing cycle time without impacting quality, and deliver a product(s) or system(s) to the satisfied customer.

- For feedback to Program Management, a Systems Engineering Scorecard measures systems engineering performance across the multi-purpose airlift program. Inherently, this metric will positively benefit the corporate enterprise. Company financial results and performance can meet or exceed shareholders' expectations because good application of systems engineering will provide total cost visibility and will lead to reducing system life-cycle costs, including design and development costs.

- Also within this umbrella, the users, such as Project Integrators and Project Managers, of the systems engineering process can then apply and utilize it to manage product development(s) that add new capabilities to the multi-purpose airlift system. Systems engineers are critical members of the project team that aligns program management items and objectives with product development. In sum, a strong relationship between Program Management and Systems Engineering is essential to product or system development.

Topics of Discussion

• The Partnership Umbrella

• Systems Engineering Process Stabilization & Enhancement

• Users of the Systems Engineering Process at Multiple Organization Levels
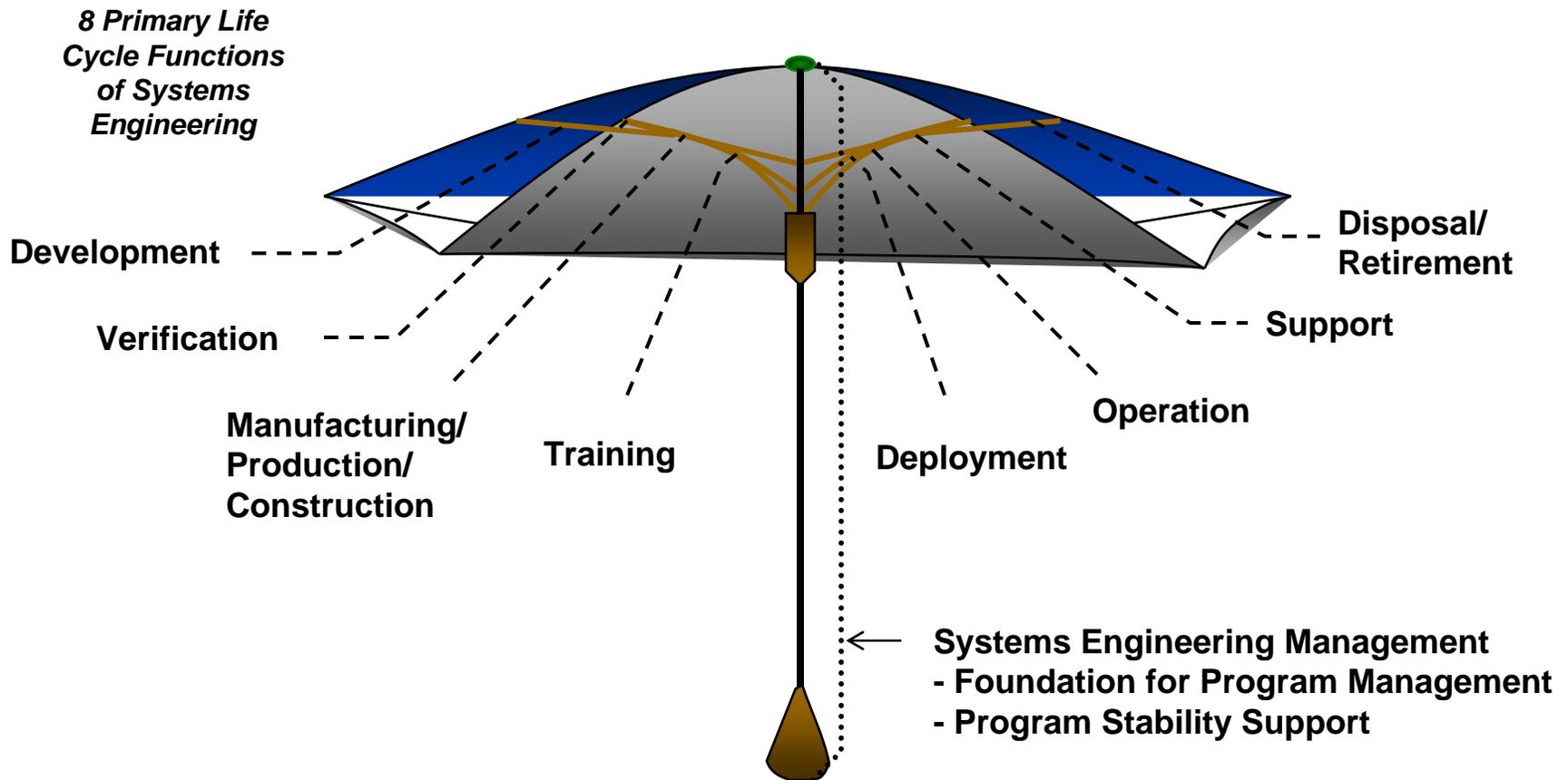
• Conclusion

Quality · **Employee Involvement** · **Analysis & Integration** · **Air Vehicle** · **Support Systems** · **Legal** · **Contracts & Pricing** · **Finance** · **Information Technology** · **Human Resources** · **Ethics** · **Production Operations** · **Communications & Community Relations** · **Supplier & Materials Management** · **Business Excellence** · **Business Development & Operations**

…and there's many more.

The Partnership Umbrella: Systems Engineering

8 Primary Life Cycle Functions of Systems Engineering

Development

Verification

Disposal/ Retirement

Support

Operation

Manufacturing/ Production/ Construction

Training

Deployment

Systems Engineering Management
- Foundation for Program Management
- Program Stability Support

Program Management →

Program Objectives
↓
Program Management Plan

Systems Engineering Plan

Program Technical Requirements

Systems Engineering ←→

Program Management Requirements

System Specification Type A

Systems Engineering Management Plan

Development Specification Type B ↔ **Product Specification Type C**

Process Specification Type D ↔ **Material Specification Type E**

Other Specifications & Standards

RM&A Plan

Human Factors Plan

System Safety Plan

ILS Plan

QA Plan

CM Plan

Software Engineering Plan

Other ESI & Design Discipline Plans

Risk Management Plan

SM Plan

Marketing Plan

Manufacturing Plan

Other Program Plans

Source: Blanchard, Benjamin S. (2004) *Systems Engineering Management.* New Jersey: John Wiley & Sons

- Systems Engineering Supporting Program Management
  - Product Development
  - Assessments & Best Practices
    - Contractor Performance Assessment Reporting (CPAR) Review
    - TA-314 Project Performance Assessment & Review
    - Program Management Best Practices
    - Engineering Best Practices
    - Systems Engineering Scorecard Review

- Assessments & Best Practices provide total visibility on strengths and weaknesses in Systems Engineering as well as progress of improvement efforts
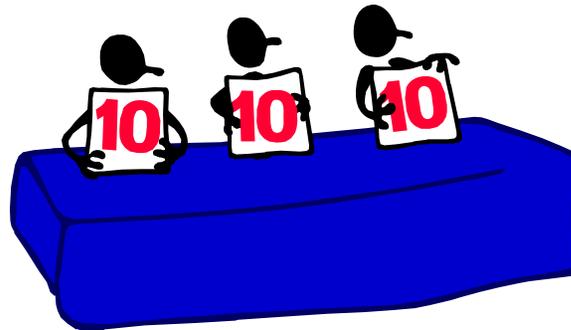
Contractor Performance Assessment Reporting (CPAR)

- Objectives:
  - Ensure that accurate data on contractor performance is current and available for use in source selections
  - Consistently provide quality, on-time products and services that conform to contractual requirements
  - Effectively communicate contractor strengths and weaknesses to source selection officials

- Systems Engineering Supporting Program Management:
  - Use Award Fee Rating Criteria
  - Review Customer's AFAST Database
  - Review Award Fee Review Charts
  - Review Project Integration Weekly Reports
  - IMP/IMS Performance

- Objectives:
  - To rate, assess, and report project performance to management and the customer

- Systems Engineering Supporting Program Management:
  - Review Technical Performance Measurement (TPM)
  - Review Systems Engineering Compliance
    - Requirements
    - Risk
    - Verification
    - Formal Review
    - Critical Action Item(s)

Program Management Best Practices

- Objectives:
  - To achieve successful program development, implementation and support based on an integrated set of Program Management Best Practices

- Systems Engineering Supporting Program Management:
  - Review maturity level for program execution & control
  - Use program execution & control best practice criteria
    - Establishment of the program's systems engineering methodology
    - Allocation and traceability of program requirements
    - Verification of program requirements
    - Program identification of TPMs
    - Allocation and reporting of TPMs

| Business Proposition	Business Plan	Program Execution & Control	Organization
Program Communication	Supplier Integration	Risk, Issue & Opportunities	Help Needed & Independent Review

Engineering Best Practice

- Objectives:
  - Vision Support Plan: Strengthen Systems Engineering
  - Maintain the Capability Maturity Model Integration (CMMI) Level 5

- Systems Engineering Supporting Program Management
  - Develop Engineering Best Practices Self Assessment Plan
  - Review overall attributes associated with each of the Best Practices
  - Improve training materials
    - Requirements Management
    - Interface Management
    - Technical Performance Measures
    - Trade Studies
    - Verification & Validation
  - Conduct trainings
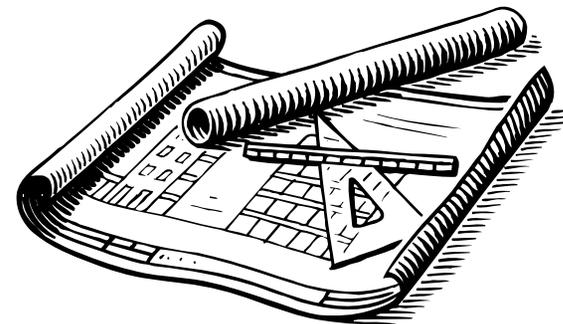
- Objectives:
  - To develop the method and criteria for measuring the effectiveness of SE at a program level
  - To define and ensure common application of World-Class SE processes and tools to meet customer expectations

- Systems Engineering Supporting Program Management:
  - Monthly assess program-level systems engineering performance
    - PMBP, Engineering BP, CPAR, PBMs, and TA-314
  - Monthly assess each IPT's compliance to systems engineering process
    - AV/FC/SE IPT, Aircraft System IPT, Airframe IPT, AV/SS IPT, Engineering Integration IPT, and NCO IPT
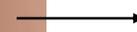 - Generate Monthly Systems Engineering Rollup Report

S E   A L I G N M E N T
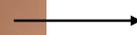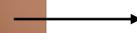
Enterprise Level

Program Level

Project Integration Level

Project Level

Image Source: University of Toronto Magazine

- While the focus of Program Management lies in the business arena and Systems Engineering in technical, the two disciplines share many fundamental principles, elements, and activities
  – Program performance and product performance are inter-dependent in many parameters

- These parameters can be integrated, mapped, aligned, and mutually supported to create a comprehensible and synergistic relationship
  – Clear visibility of overall key performance parameters
  – Consistency in assessment of overall key performance parameters

- This synergistic relationship is an essential enabler for the effective management of a program

- Good applications of the SE Process is seen at all levels of an organization to encourage consistency and alignment for product development

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Thank you!

Questions? | We might have answers…