



PHANTOM WORKS™

Innovation in
Aerospace & Defense Industry
A U.S. Perspective

Robert J. Krieger
President
Boeing Phantom Works

The Boeing Company Has a Very Diversified Aerospace Portfolio



Phantom Works Vision and Mission

Support the Boeing Vision

Boeing Vision

People working together as a Global Enterprise
for aerospace leadership

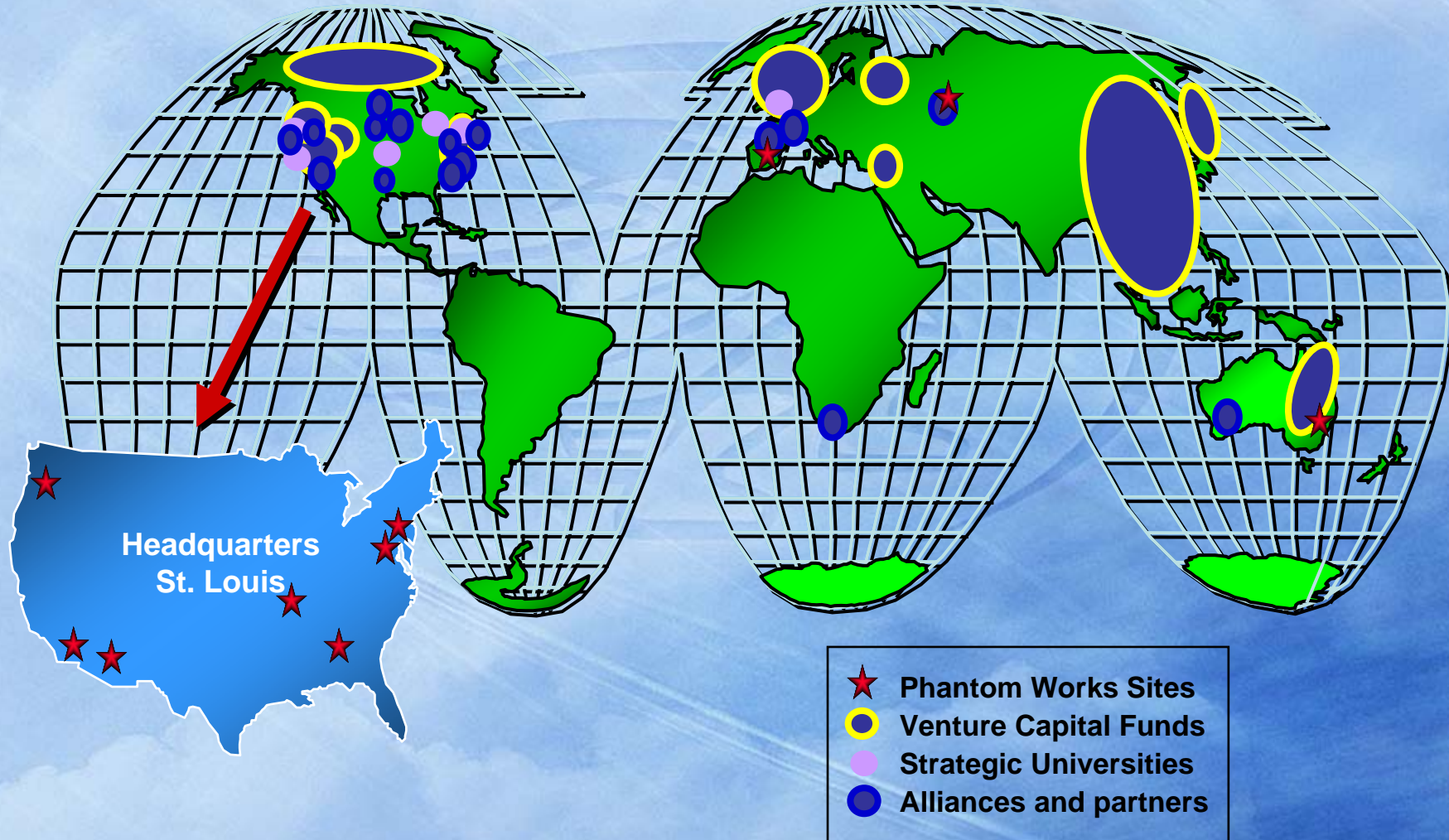
Phantom Works Vision

Innovators and Integrators working across the Boeing
Global Enterprise to create the future of aerospace

Phantom Works Mission

To be the catalyst of innovation for the Boeing Enterprise

Phantom Works Leverages Talent From Around the World

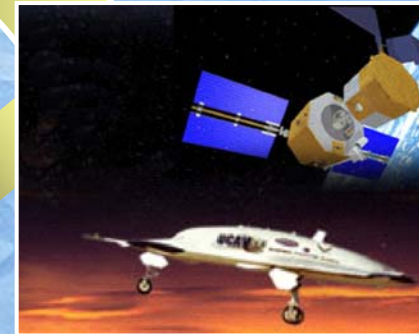


Phantom Works Is a Centrally Managed Research and Development Organization

**Boeing Commercial
Airplanes**



**Integrated Defense
Systems**

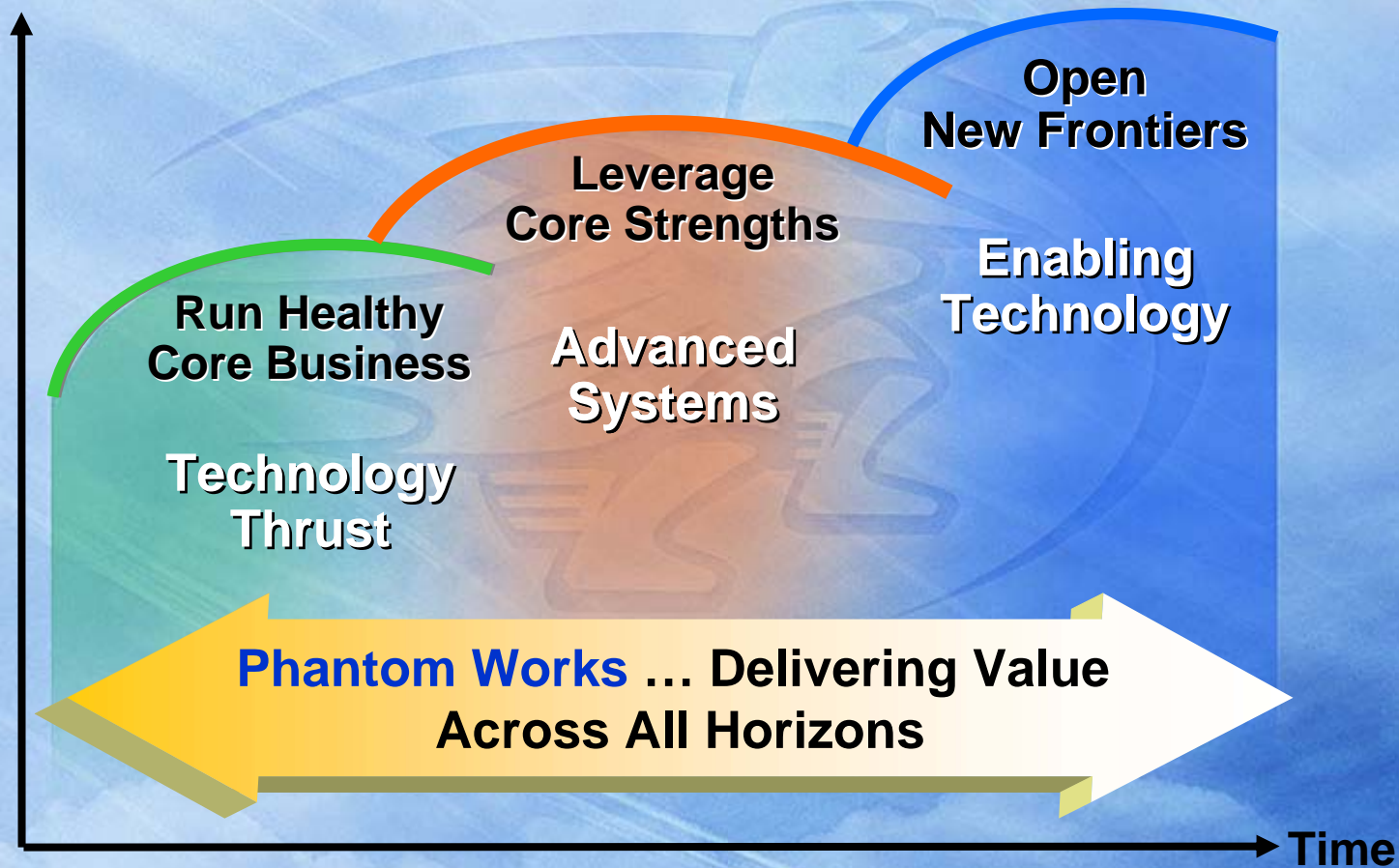


**Phantom
Works**

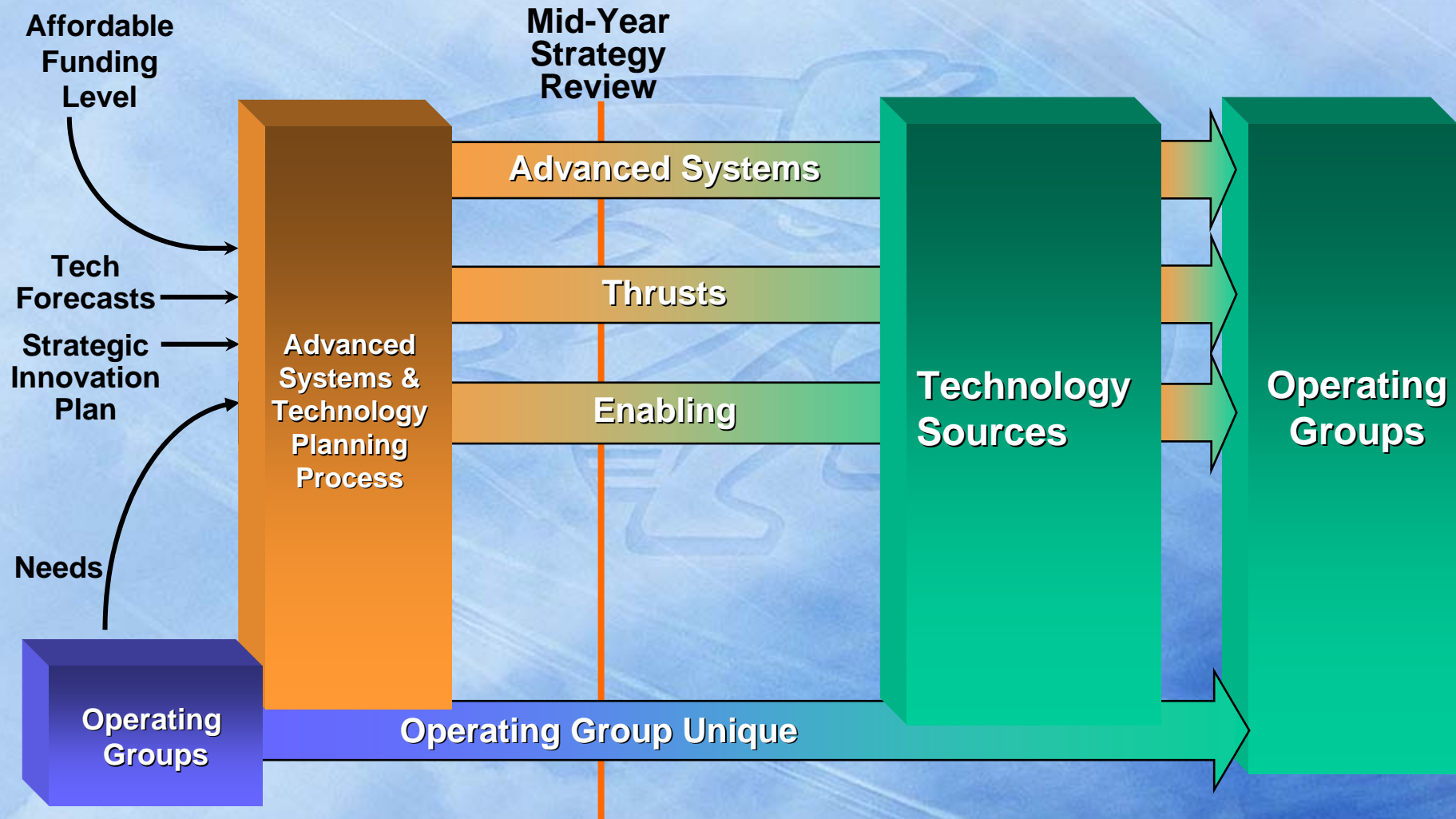


**Connexion
By Boeing**

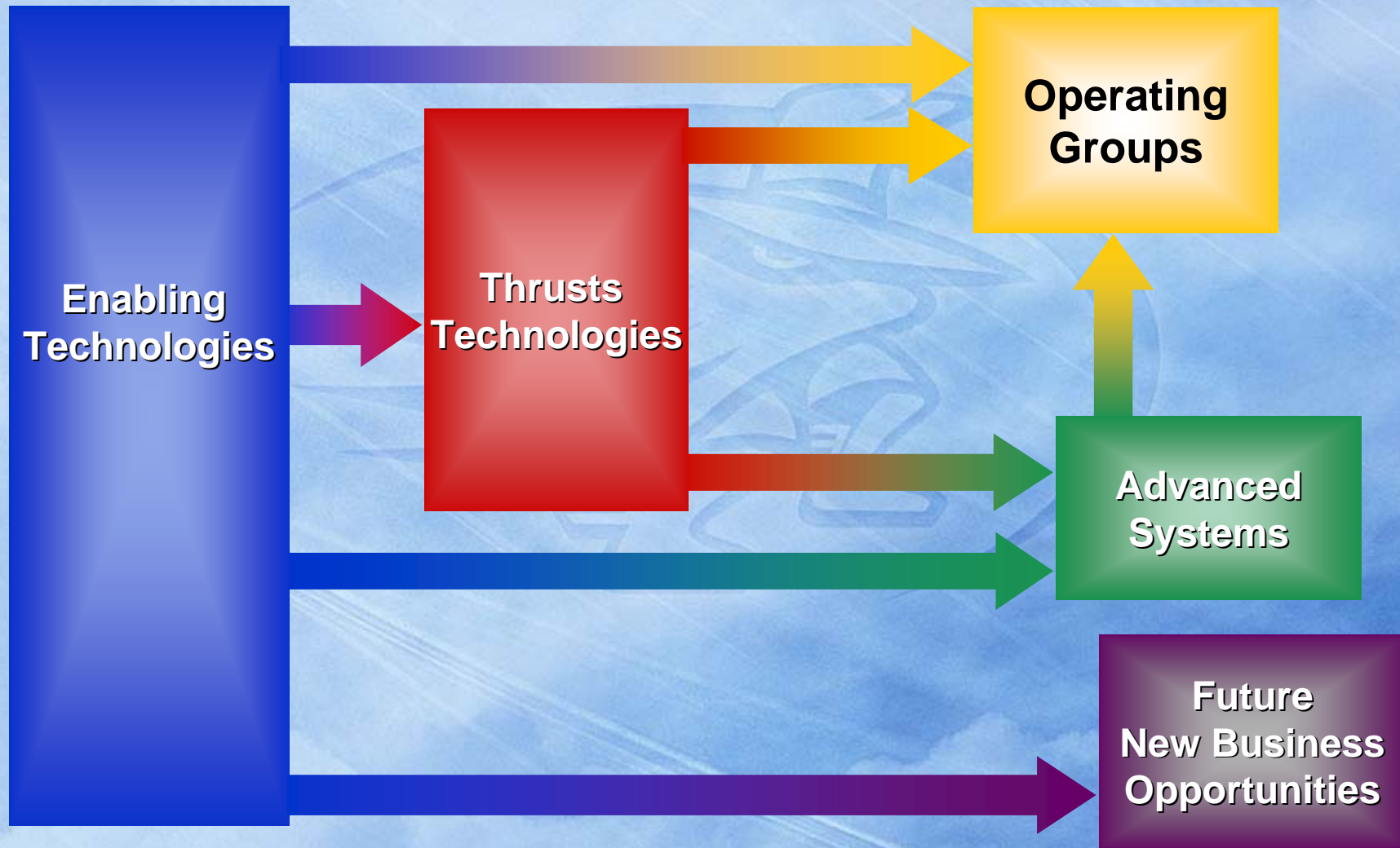
Phantom Works Strategies Align With Boeing Strategies



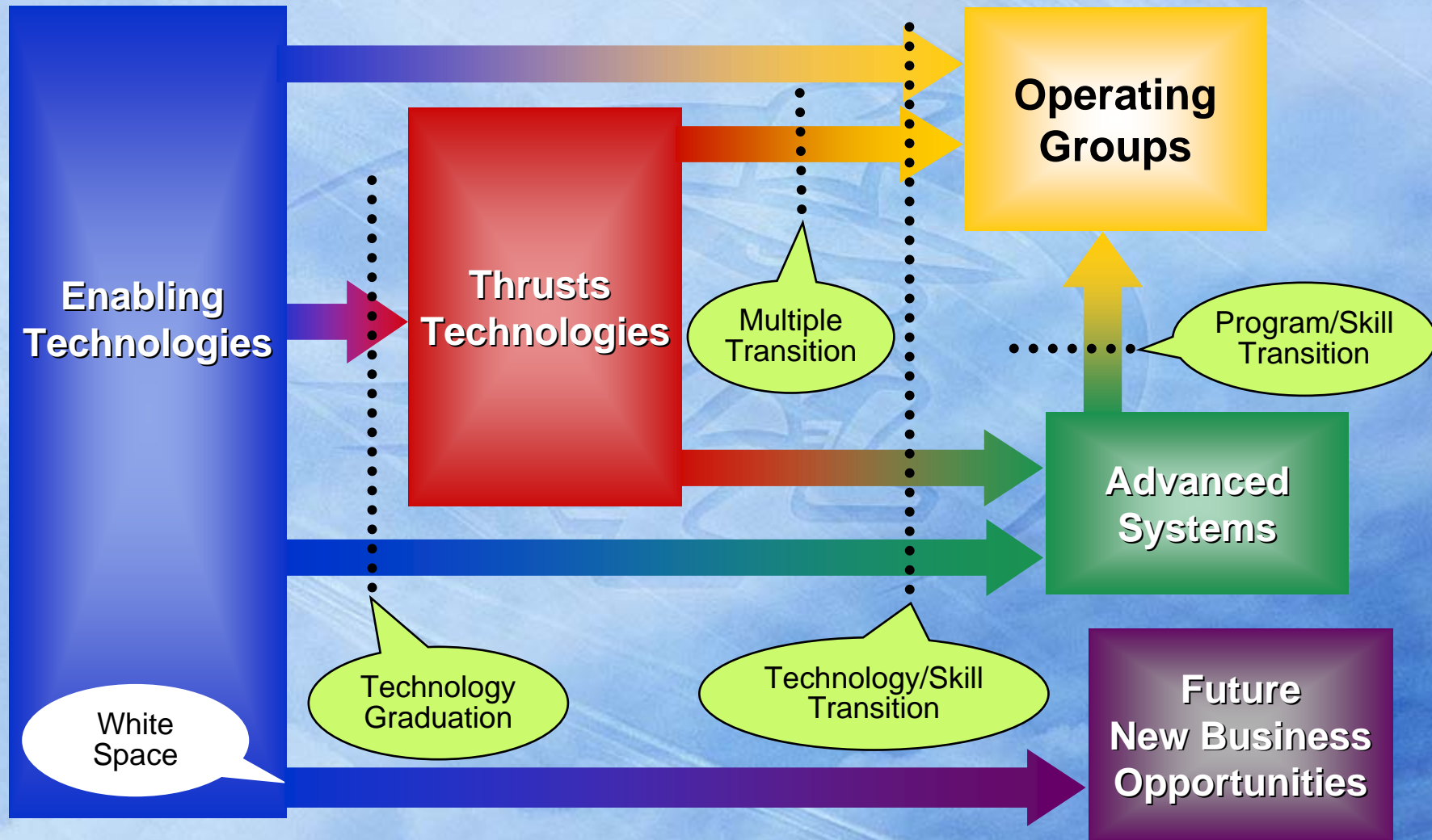
Research & Development Planning Process Is Driven by Operating Group Needs



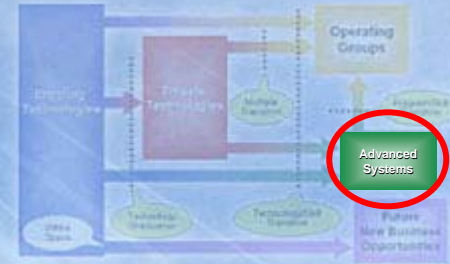
Research & Development Focuses on Moving Programs, Technologies and Skills Into Operating Groups



Transition Metrics Incentivize Working Together



Advanced Systems Develop Next Generation Systems That Are Not Derivatives

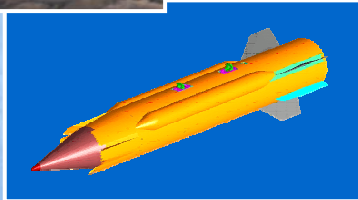


Advanced Tactical Missile Systems



Advanced Airlift & Tankers

Hypersonic Systems



Advanced Homeland Security

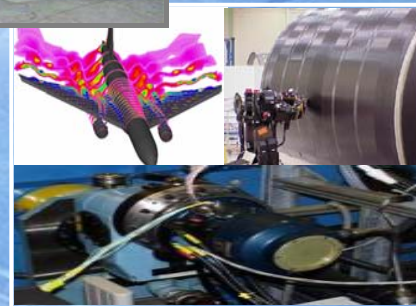


Unmanned Systems

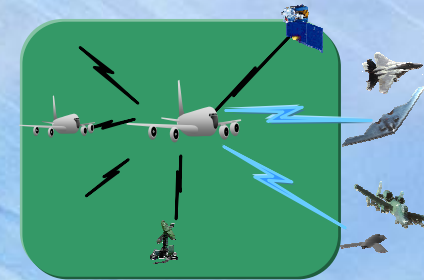
Reusable Space Vehicles



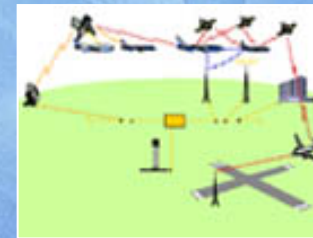
Advanced Rotorcraft



Advanced Commercial Airplane Technology



Next Generation Command and Control Systems

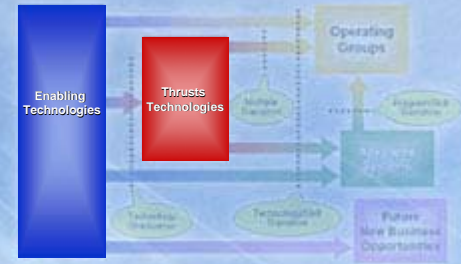


Advanced Air Traffic Management

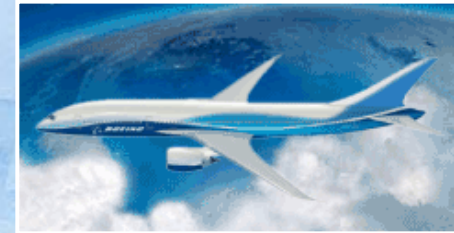
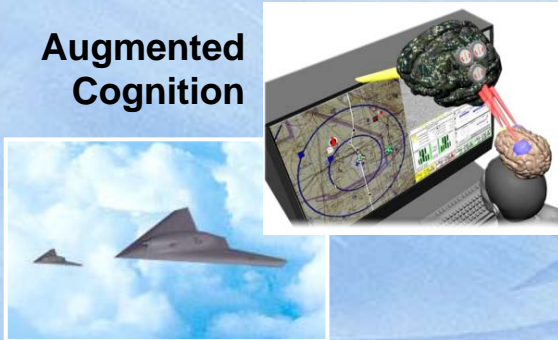


Advanced Support Concepts

Thrusts and Enabling Technologies Work Both Near and Long Term Horizons



Augmented Cognition

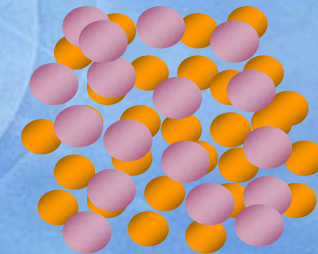


Efficient Certification of Structural Components



Network Centric Operations

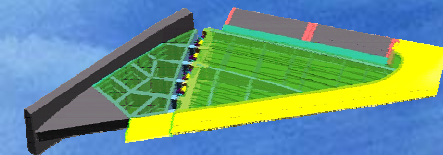
Structural Amorphous Aluminum



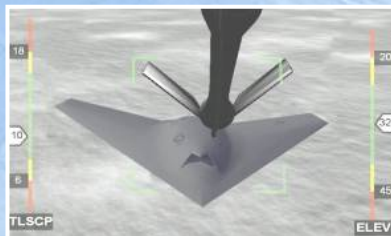
Integrated Aircraft Health Management



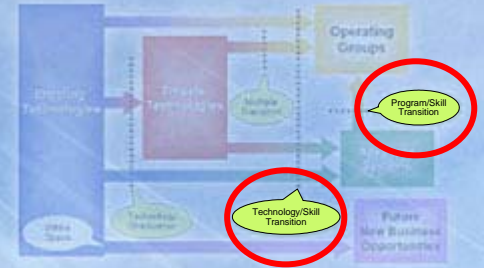
Composite Structure Assemblies



Automated Aerial Refueling



Acoustics & Noise Control



Program and Technology Transitions Are Measured by Value to the Operating Groups

Future Combat Systems



Barrier Coat Curing Process on 737



Friction Stir Joining on Delta II, III, IV



C-17 Composite Horizontal Tail



Future Program Revenue

Cost Reducing Technologies

Revenue Enhancing Technologies



Reusable Space Systems

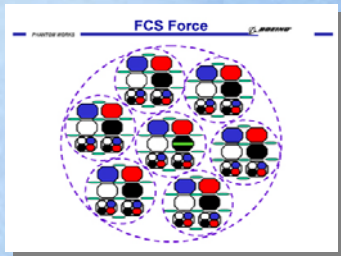


Small Diameter Bomb



F/A-18E/F Wing Fuselage Redesign

Advanced Systems Develop Programs and Transition Them to the Operating Groups (Future Combat System Example)



Application of Network Centric Operations



Strategic Teaming



Concept & Technology Demonstration

Integrated Defense Systems



Army's Lead Systems Integrator

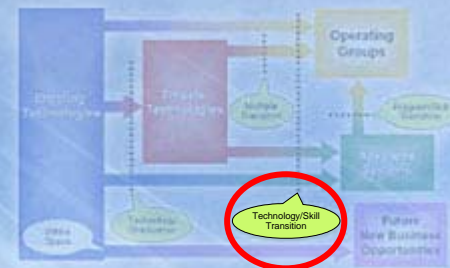


Concept Development (Vision)

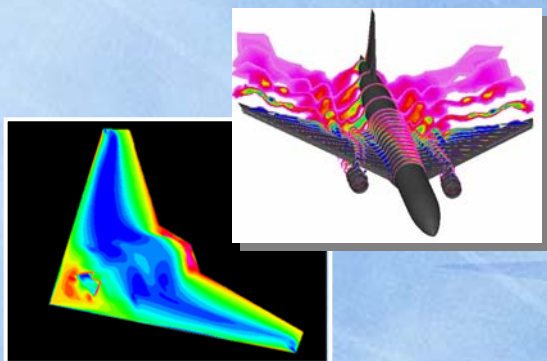
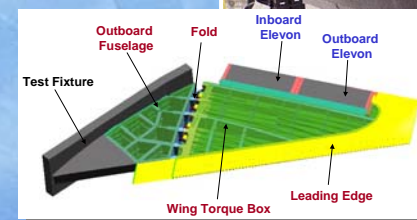
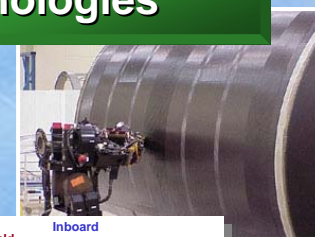


Best of Boeing

Thrusts Transition Technologies to Existing and Next Generation Programs



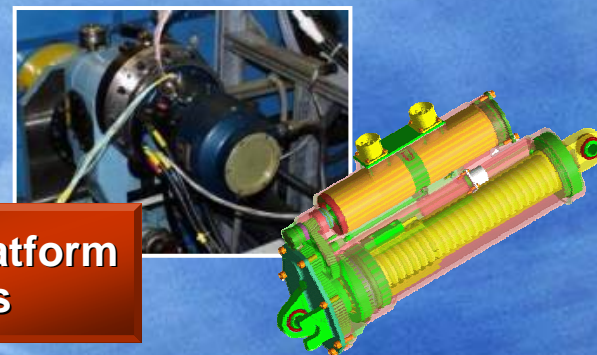
Affordable Structures & Manufacturing Technologies

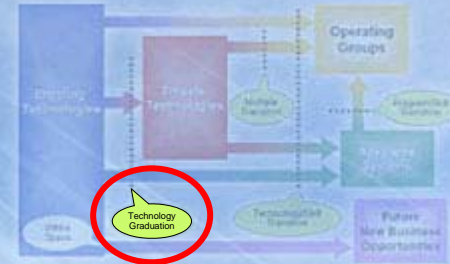


Lean & Efficient Design Processes and Tools



Advanced Platform Systems





Enabling Technologies Establish Feasibility and Transition to Thrusts

Proof of concept/feasibility



Demonstration of product readiness

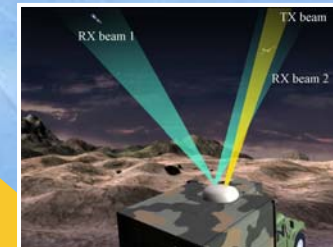


Final Product

Phased Array Antenna Component Development

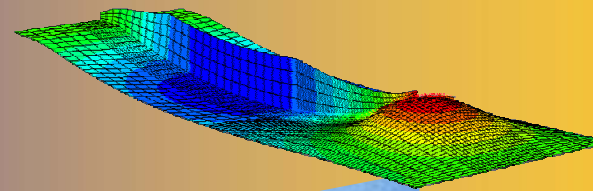
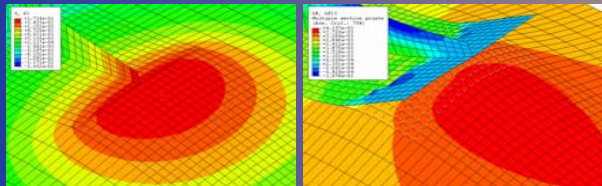


Ultra Small Aperture Terminal

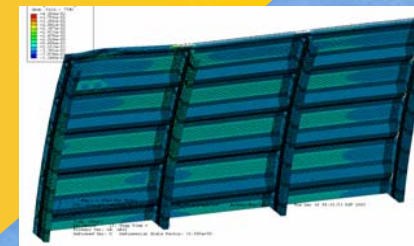


Milstar

Composite Delamination Prediction Model



Bonded Composite Stiffener Termination Under Tension



7E7 Fuselage Application

Multiple Transitions Involve People Working Together Across the Enterprise (Friction Stir Joining Example)



Integration



Integration



Innovation



777
Nacelle Lip Skin



The Welding
Institute (UK)

Innovation and
Integration



747F
Barrier Beams

Strategic Innovation Planning Identifies Potential New Businesses (White Space Studies)



