



## **SMART Briefing**

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Apache Training Systems**





# Sources of Improvements & Modifications

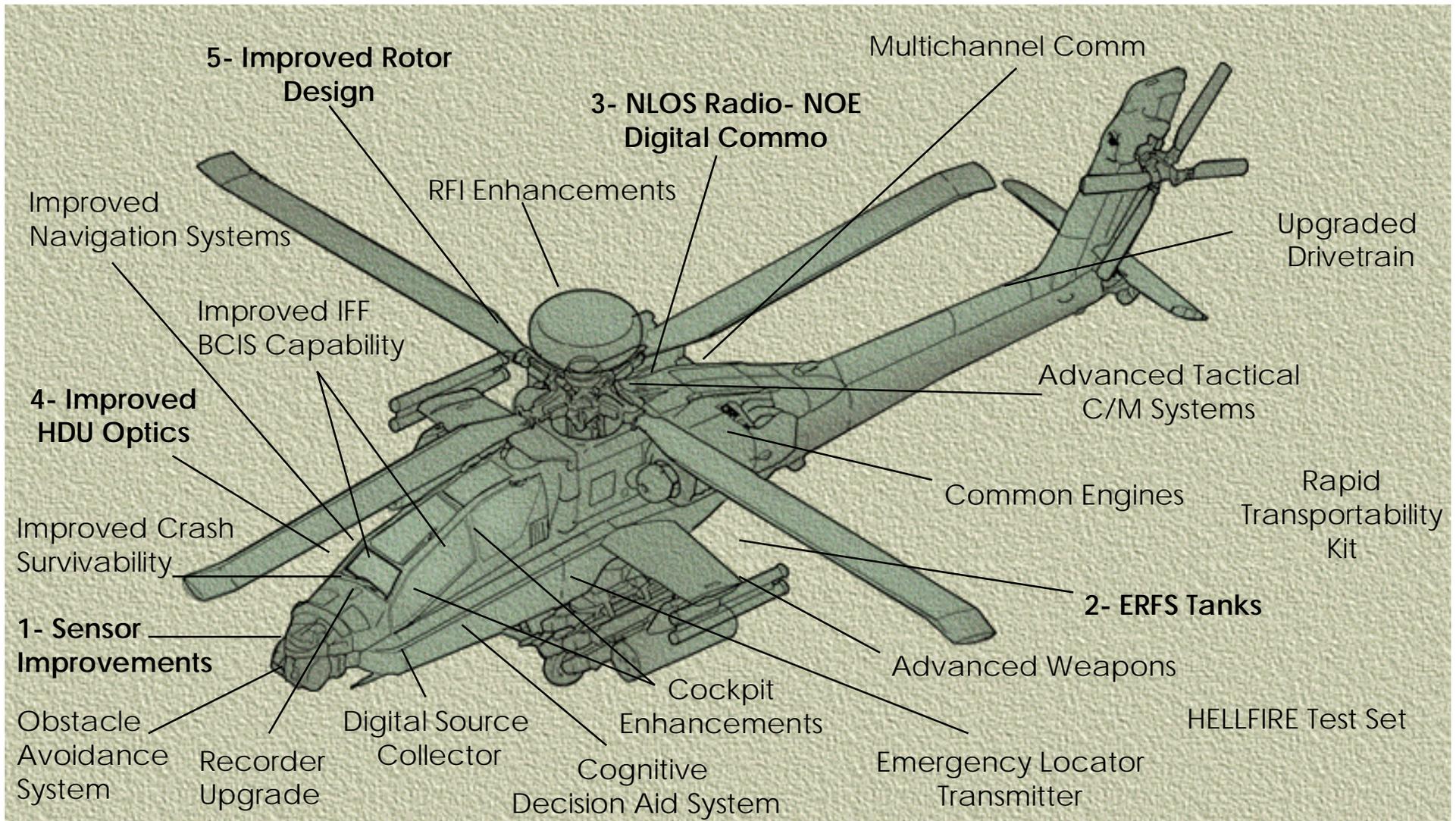


- Operational Capabilities Improvements & Priority List
- P3I List
- Funded Modifications
- Top Ten Cost Drivers
- Digitization
- Unfunded Requirements List
- Diminishing Mfg. Sources





# Operational Capabilities Improvement Priority List





# Operational Capabilities Improvement List



## *Fire Control Radar*

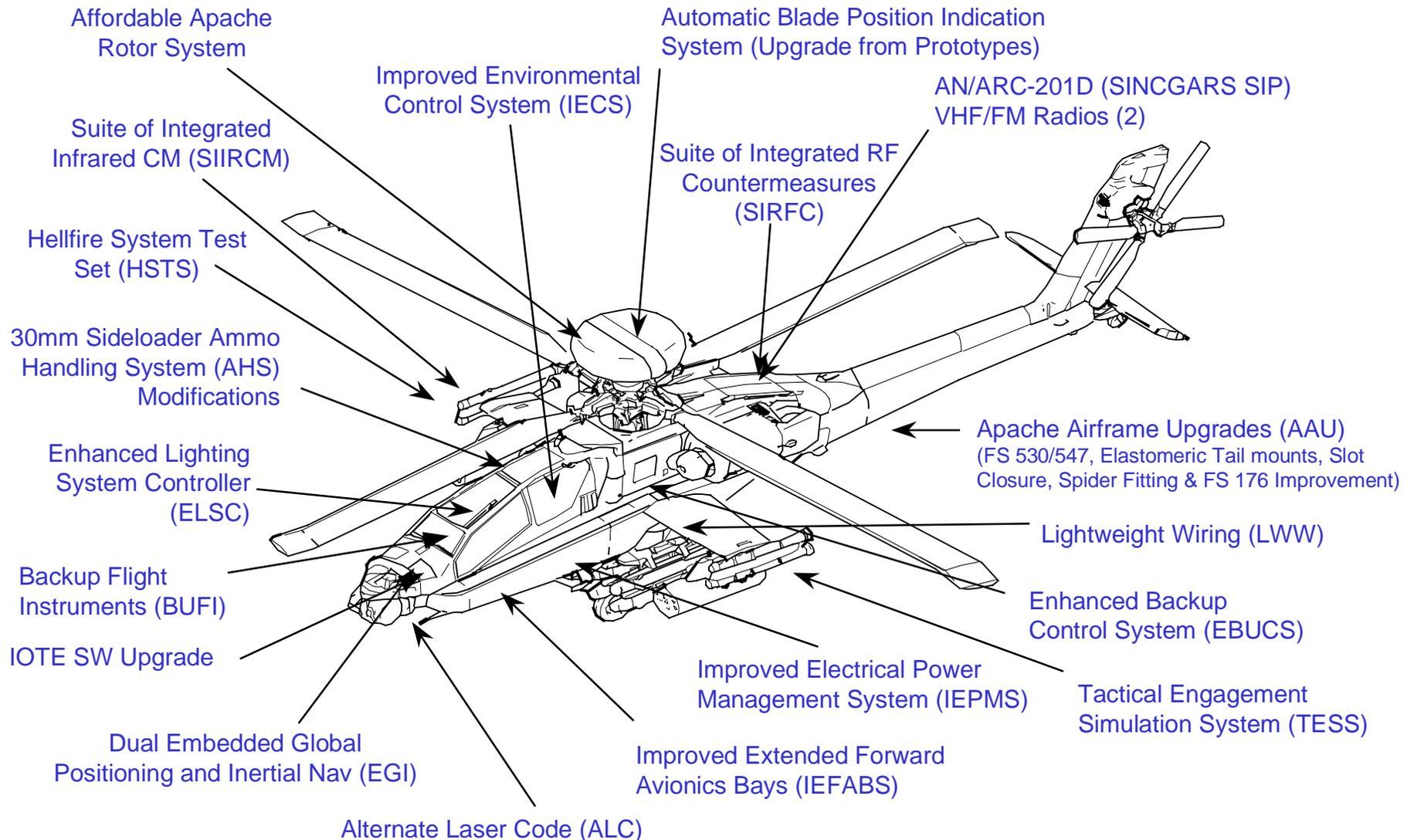
- Algorithm Robustness Improvements
- Capability to Track Targets
- Air to Air Targeting
- Terrain Profile and Ground Map
- Unmasked Indicator

## *AH-64D Aircraft*

- Sensor Improvements
- Extended Range Tanks
- NLOS Radio/Comm
- Improved HDU Optics
- Improved Rotor Design
- Upgraded Drivetrain
- Digital Map



# Funded Modifications





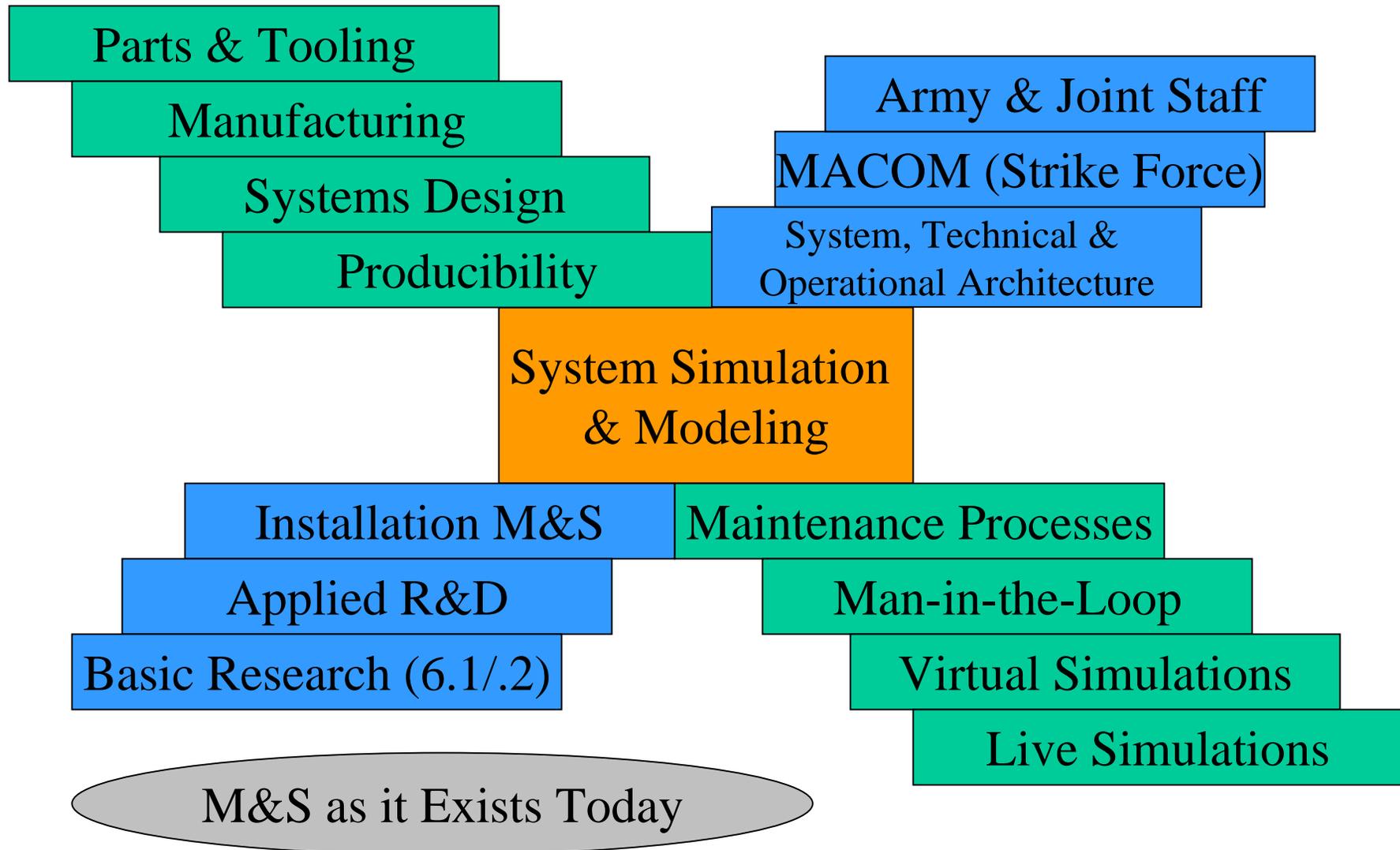
# Apache SMART Goals

- 50% Reduction in Cycle Time
- 30% Reduction in Total Cost of Ownership
- Maximize use of Industry's Investment
- Integrate with Requirements Analysis & Funding
- Execute through Performance Based Contracts
- Establish Measurements and Thresholds of Success

“Better, Faster, Cheaper”  
has taken hold of the  
acquisition community.  
But I assure you that  
this is not simply a  
slogan. It is a fundamental  
blueprint for survival...  
Dr. J. Gansler

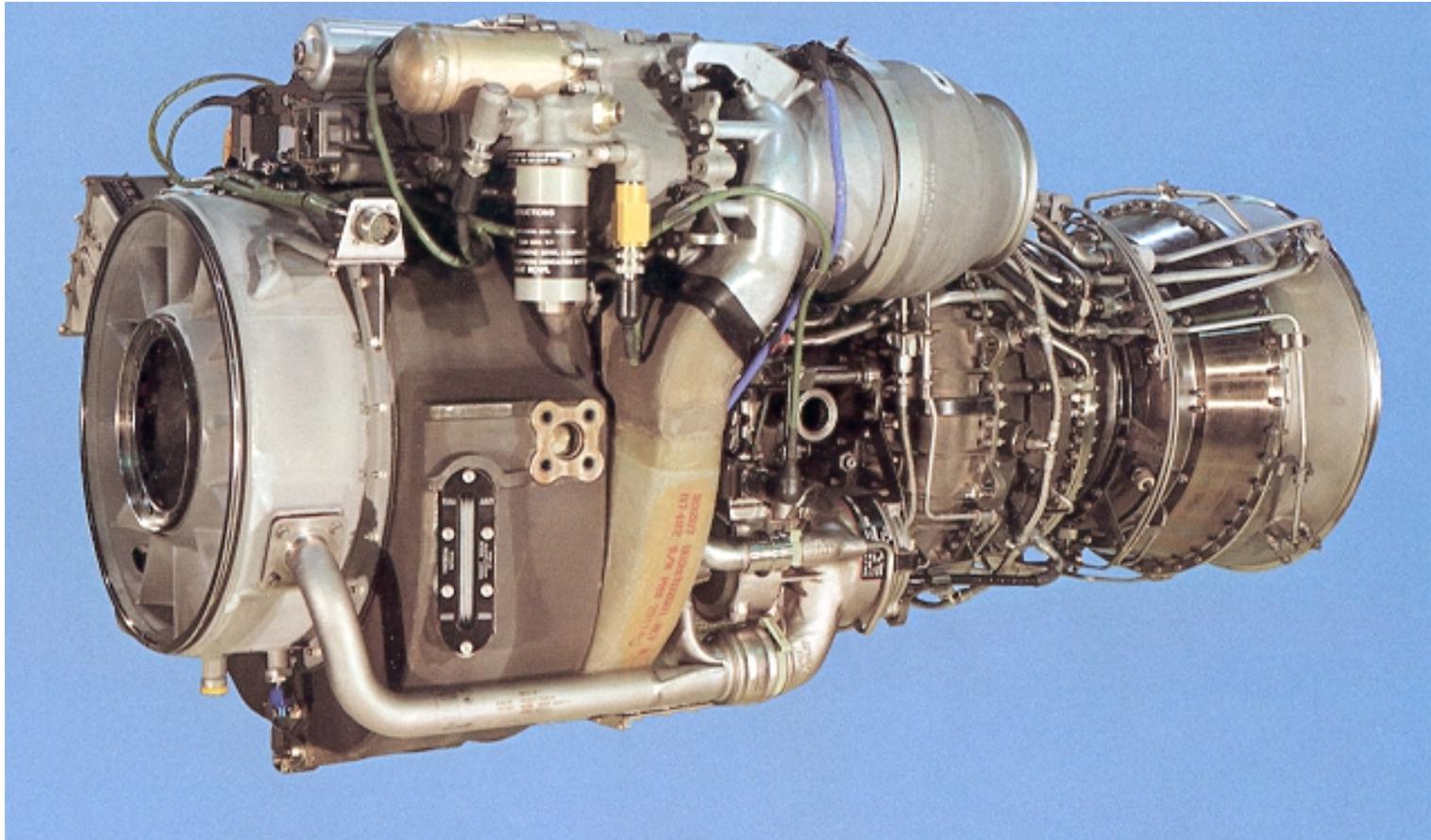


# Modeling and Simulation Efforts



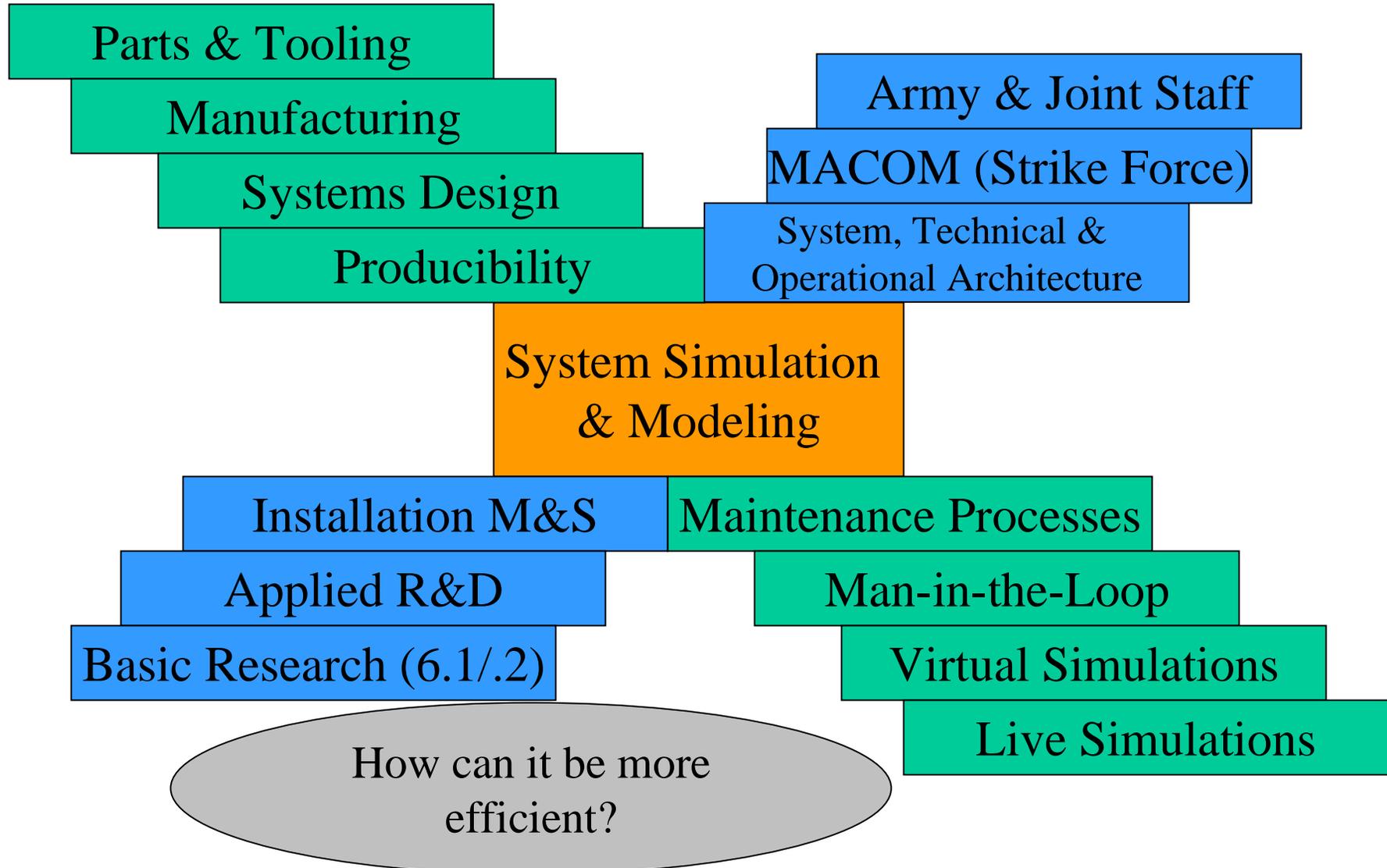


# General Electric's T-700 Engine





# Modeling and Simulation Efforts

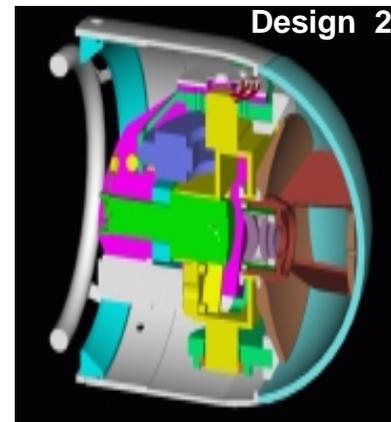
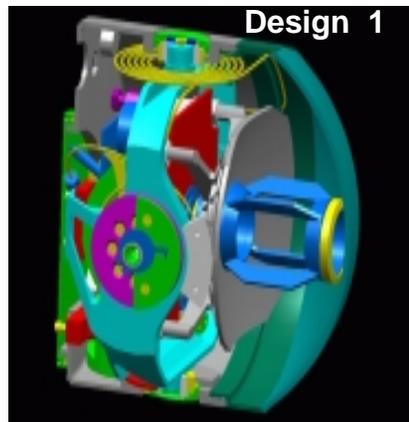




# Lockheed Martin Electronics & Missile Systems

## Development of an Adaptive Modeling Language (AML) for Knowledge-Based Engineering with Application to Interactive Gimbal Design (IGD)

	Optics	Mechanical	FE Analysis	Servo	Total
Design 1	1,082 <sup>1</sup> hrs	4,955 hrs	1,214 hrs	1,383 hrs	8,634 hrs
Design 2	1,286 hrs	2,356 hrs	3,384 hrs	0 hrs	7,026 hrs



40:1 payback  
equals  
\$6 million @  
\$100 per hour  
between design  
and  
maintenance



# Systems Analysis

## DADS animation output from Matrix-X to DADS Simulation

The screenshot displays the DADS (Dynamic Analysis and Design System) software interface. At the top, the title bar reads "DADS (R) Revision 8.5 (c) 1996 Licensed for Use to Lockheed Martin". The main window is split into two panes, "ModeWindow2" and "ModeWindow1", each showing a 3D model of a helicopter's rotor assembly in different orientations. To the right, a "DADS Modeling" panel is visible, with a sub-panel for "animation" containing options like "Execute Animation", "Loop Animation", and "Frame Increment". Below the 3D models, the "SystemBuild" environment is shown, featuring a block diagram of a control system with various functional blocks and signal lines. On the far right, a "Xmath Graphics: main.ans" window displays a multi-channel time-series plot with a vertical red line indicating a specific time point.

DADS Animation

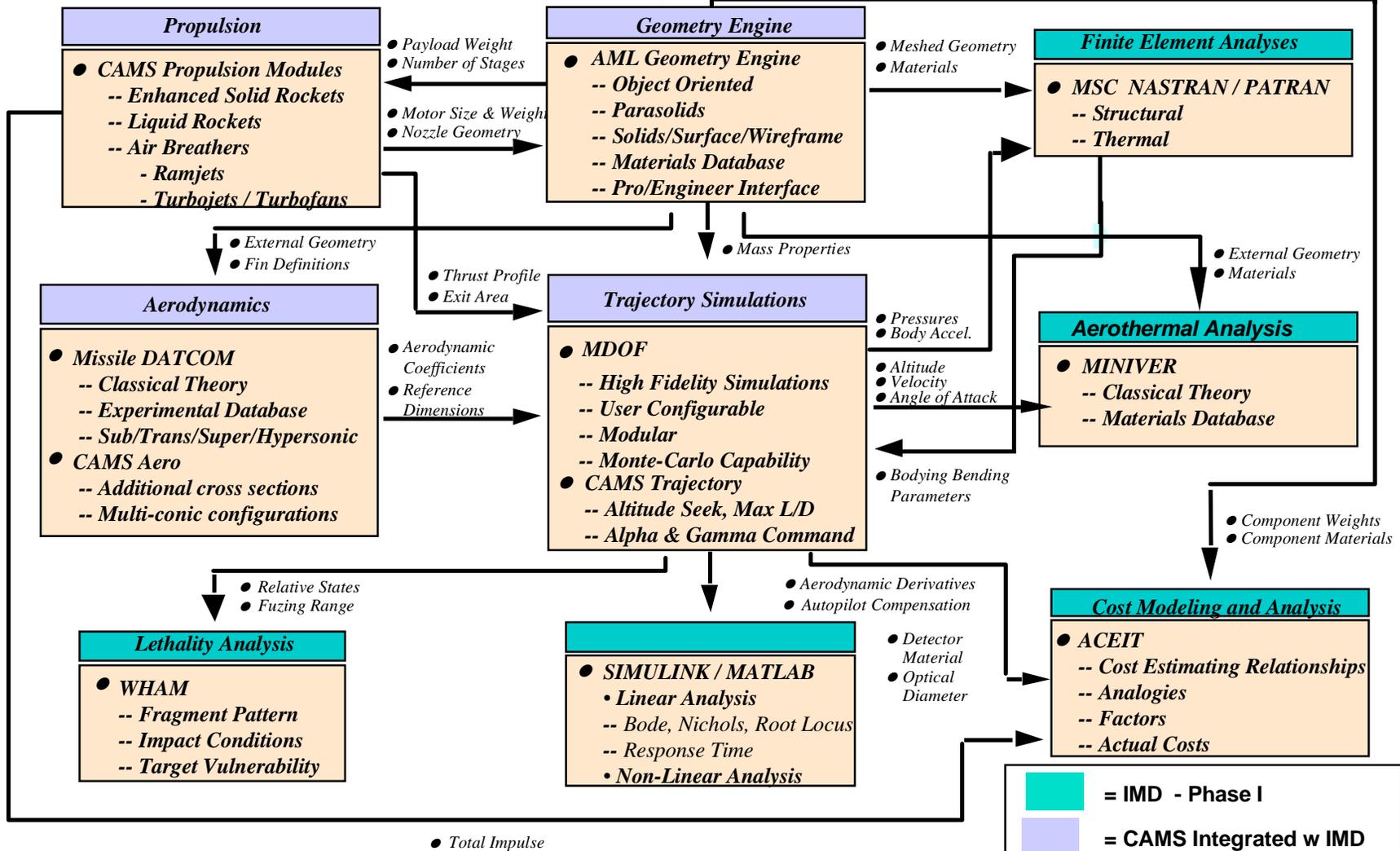
Matrix-X Output

Multi-view of DADS Output Position at 1.5 sec

Time = 1.5 sec



# Overview: Interactive Missile Design (IMD) System

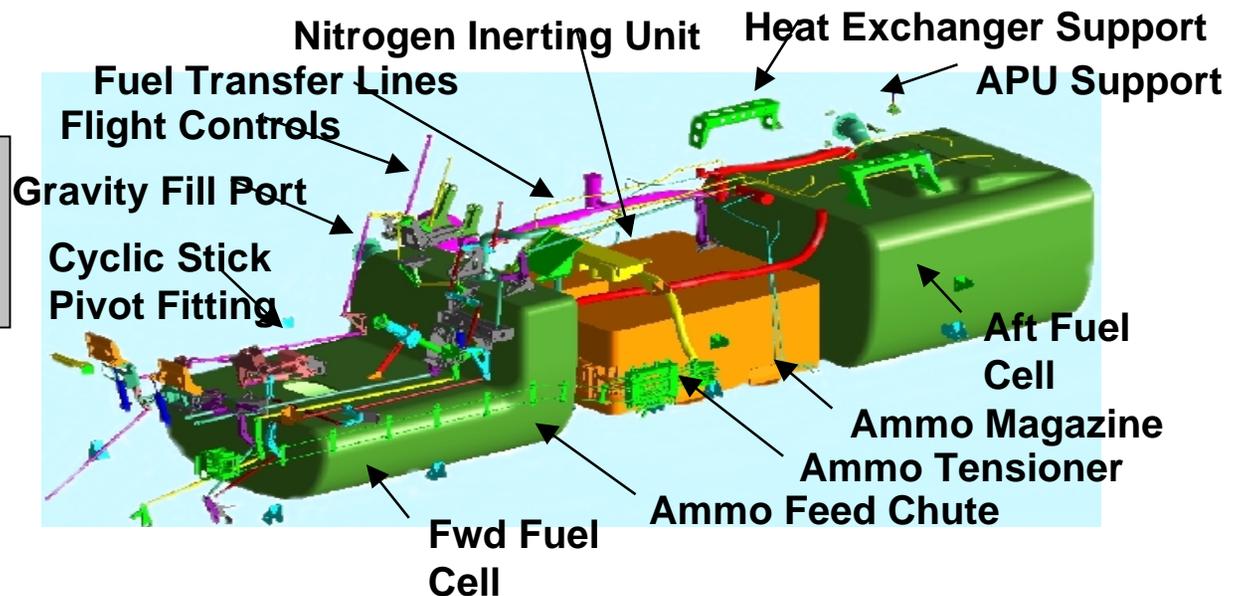




# Boeing (McDonnell Douglas Helicopter Systems)

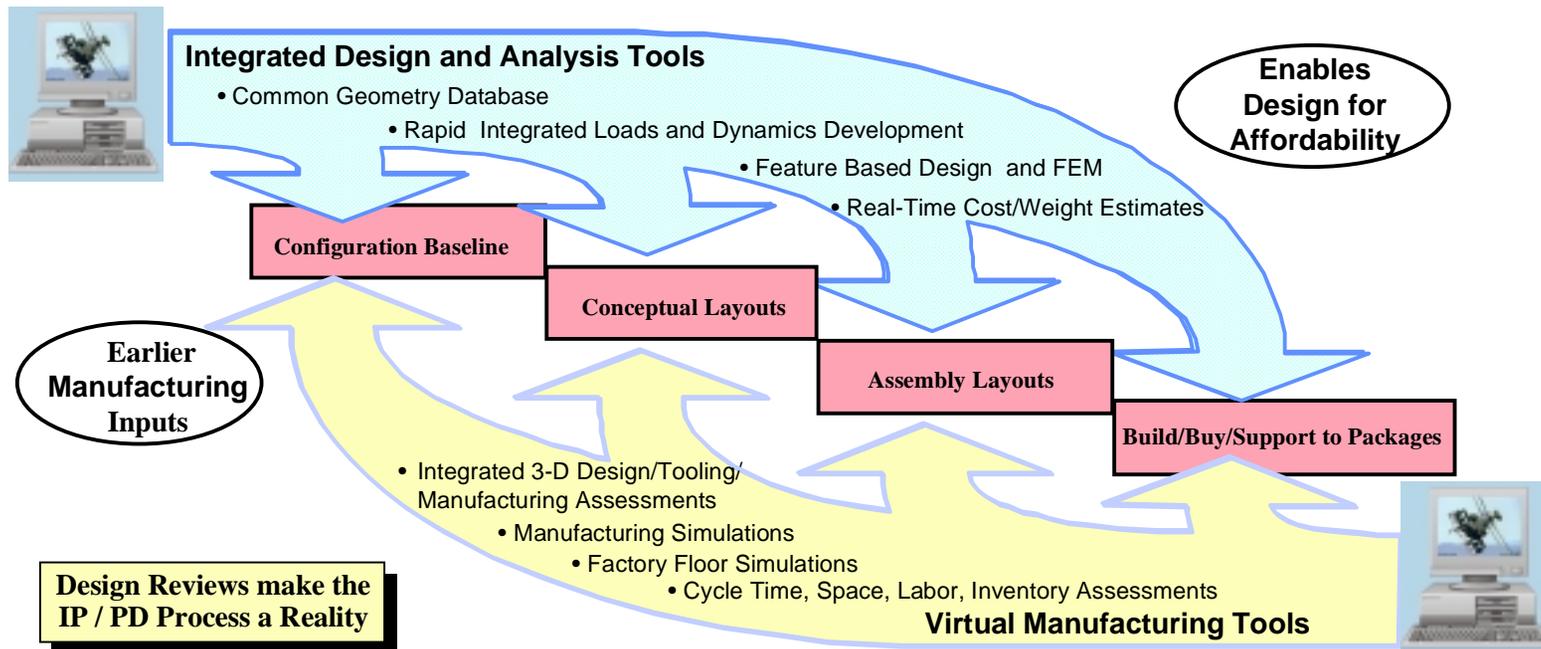
- Rotary Wing Structures Technology Demonstration Program (RWSTDP)
- DMAPS — A Suite of VPD Tools for Integrated Product and Process Development (Design, Manufacturing and Producibility Simulation)

SUBSYSTEMS IN CENTER FUSELAGE





# Flow Chart Of DMAPS Process



### Objectives

- 33 % Reduction in Design Cycle Time
- 25% Reduction in Design Personnel
- 33% Reduction in Manufacturing Cycle Time & Personnel
- 50% Reduction in Tooling Design and Fabrication Cost



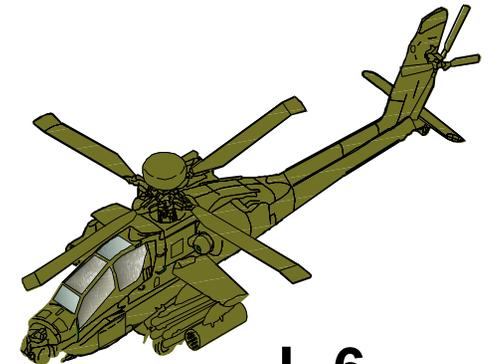
**Shortens the Design & Build Cycle Times and Improves First Time Quality**



# Apache Training Devices

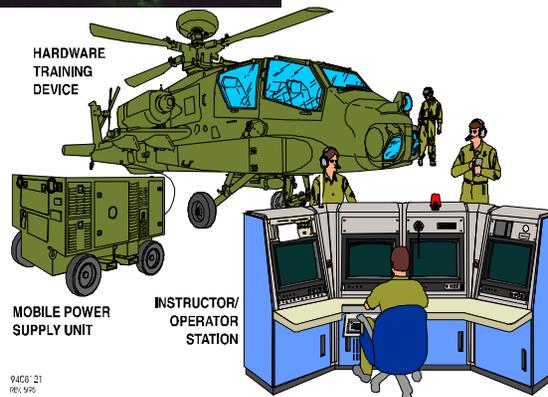


**LCTS**



**L-6**

**L-7**



9408 21  
REV 9/95



# Applications of SMART/SBA

- Candidates are in the P3I, OCIPL, Top 10 Cost Driver, and UFR Lists
- Apache Program is 93-94% Committed to Multi-year Production Contracts
- High Priority Candidates
  - 1) 2nd GEN FLIR
  - 2) Embedded Battle Command & Integrated Data Modem (IDM)
  - 3) Rotor Blade 2000
  - 4) Longbow FCR on Comanche & Future Scout
  - 5) SIRFC or ARC 220 (HF Radio)

“Industry will do what the customer wants. Outcome is determined by the rules and not by emotion. We will respond; but, there has to be an incentive.” Steven Conner, Lockheed Martin



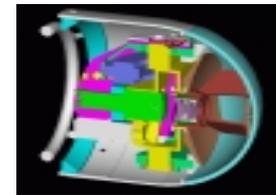
# Observations

- Profitable Corporations use M&S profitably
  - But, M&S is a Corporate Asset and Guarded Carefully
- Industry will Mirror the Customer's Priorities and Organization
  - M&S is an overhead cost and industry would like to see more integration
- Expensive, High Risk (complex), High Visibility Programs Demand Proportionate M&S
- Industry concerns: 1) Staying Power of SMART/SBA;  
2) Existing Programs Poorly Compare to “Virtual Systems”



# Conclusions

- M&S exists at every level in the program, both in the system and “environment”
- Industry has made a tremendous investment, and keeps investing for strategic advantage
- M&S is not well integrated, especially between design and operational trade-offs
  - Not a single company bill
  - Could be expensive to fix
  - Could be administratively burdensome
- 50% reduction in cycle time and 30% reduction in cost of ownership will come from integration
- How to pay for it?





# Recommendations

- Productize SMART in ACAT I and II Programs
- SMART/SBA as a Decision Component in P3I Prioritization
- Prototype 1-4 high payoff candidates, *then* Incorporate SMART/SBA as a Contract Provision in the Proposed Effort
- Cost share the application of SMART/SBA between Government and Industry



# Areas for Further Exploration

- Logistics System Modeling
- Integration of Program M&S with Information Systems Modeling (C4ISR, JTA-A, Army Enterprise Strategy)
- SMART as a Complement to Spiral Development
- SMART used to Reduce Test and Evaluation (virtual testing)
- Integration of SMART into Army & DoD Cost Models (POM Builds)
- SMART use of Process and Data Models
- HTI Validation through the use of SMART

“If you can’t do it with brainpower, you can’t do it with manpower - overtime.” Kelly Johnson, F-16 & SR71 System Architect