

Affordable Readiness Model

(formerly Lifecycle Management Cost Optimizer)

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Jerry Cothran

Senior Manager, Logistics Engineering
Lockheed Martin Corporation

Agenda

- **The Cost Modeling Challenge**
- **ARM model Methodology**
- **F-22 Supply Chain Comparative Analysis Example**
- **Summary**

The Challenge

- DoD's increasing emphasis on sustainment costs
- DoD lacks key information and cost visibility necessary to produce life-cycle O&S cost estimates and baselines
 - GAO-10-717: O&S Cost Analysis Inadequate
 - CAPE Report to Congress August 2010 re O&S baselines
- Weakness of the static point estimate approach
 - Reliant on bounded ground rules and assumptions; easily biased
 - Generates unrealistic expectations
- Need for dynamic capability reflecting range estimates and impact on operational performance

What will be the Life Cycle Cost of the X-45B Tactical Fighter Aircraft?

Or This?



Which estimate would be a more accurate early planning and decision support foundation?

This?

EXACTLY \$15.875B

Sensitivity Factors

- Life span
- Peacetime vs. Contingency use
- Mission profile
- OPTEMPO
- Technology change
- Funding availability

ARM Example Application

F-22 Supply Chain Comparative Assessment

1. **FASTeR Partnership** (*Follow-on Agile Sustainment for the Raptor*)
 - Lockheed Martin managed supply chain
 - Government hands-on depot MRO
2. **Government managed Supply Chain**
 - Government-managed supply chain
 - Government hands-on depot MRO

The Analytic Methodology

1. Identify & Define the Relevant Operational Outcomes
2. Identify & Define the Factors that Influence the Outcomes
3. Develop Representative Decision Support Interface
4. Create a Map of Processes That Impact Outcomes
5. Develop Discrete Event Simulation Populated With Distributions
6. Run the Simulation Multiple Times Across the Range of Input Factors to Capture Uncertainty Ranges
7. Validate the Simulation Outputs
8. Populate Decision Support Interface enabling comparison of alternatives against operational outcomes under various user defined ranges of input factors.

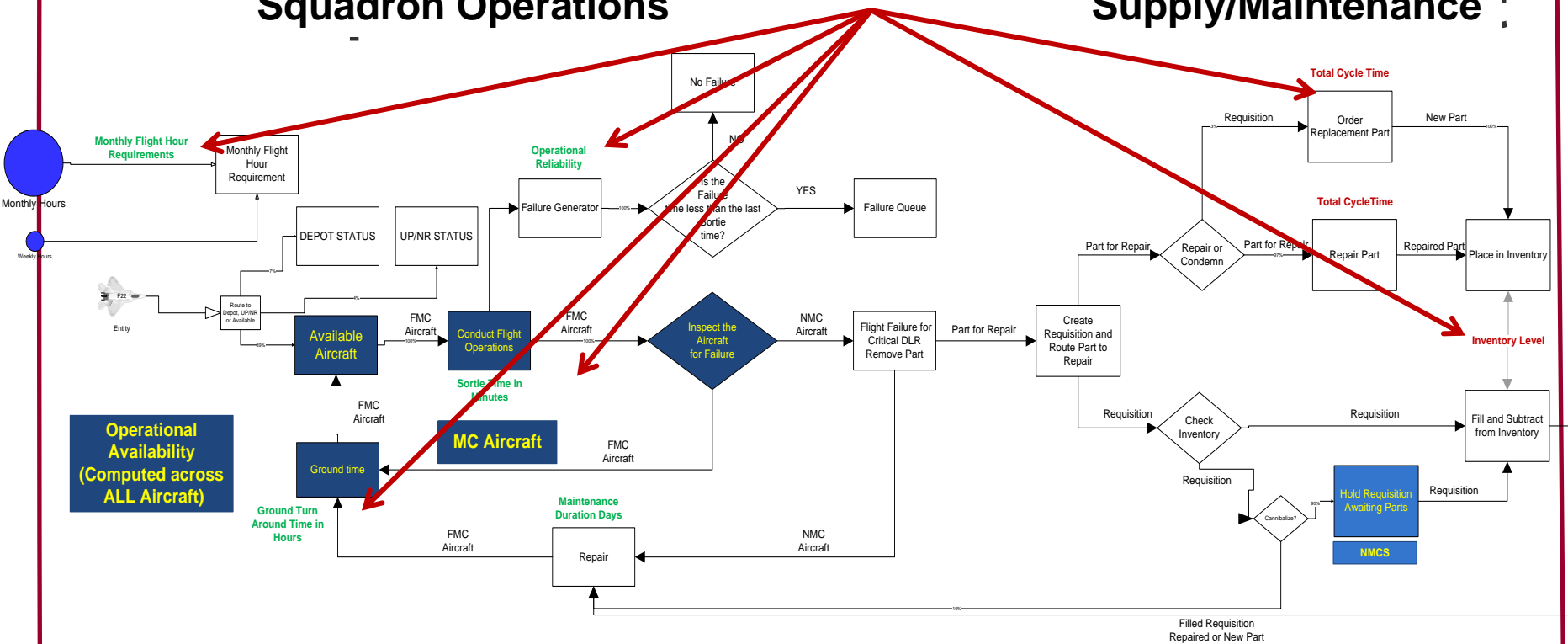
The F-22 Operations & Sustainment Process Map

Note: Includes Only Depot Maintenance

Squadron Operations

Variables

Supply/Maintenance :



Operational Availability (Computed across ALL Aircraft)

Operational and Process Factors

Input Factors

F-22 Supply Chain Management Comparative Analysis Model

ControlBox

F-22 Supply Chain Management Comparative Analysis Model

Operational Factors

Factor	Value:
Mean Flight Time Between Critical Failure (hours):	4
Sortie Time (minutes):	90
Ground Turn Around Time (hours):	3
Steady State Monthly Flight Hours:	3500
Years of Program:	25

FASTeR Reliability Improvement Toggle

Supply Chain Factors

Factor	FASTeR Partnership	Government
DLR Repair Total Cycle Time (days):	55	120
Initial Inventory Investment (Billions \$):	1.4	1.4

Supply Chain Factors (Other)

Factor	Value:
NMCS Engine Parts (%):	1
NMCS DLA Parts (%):	1

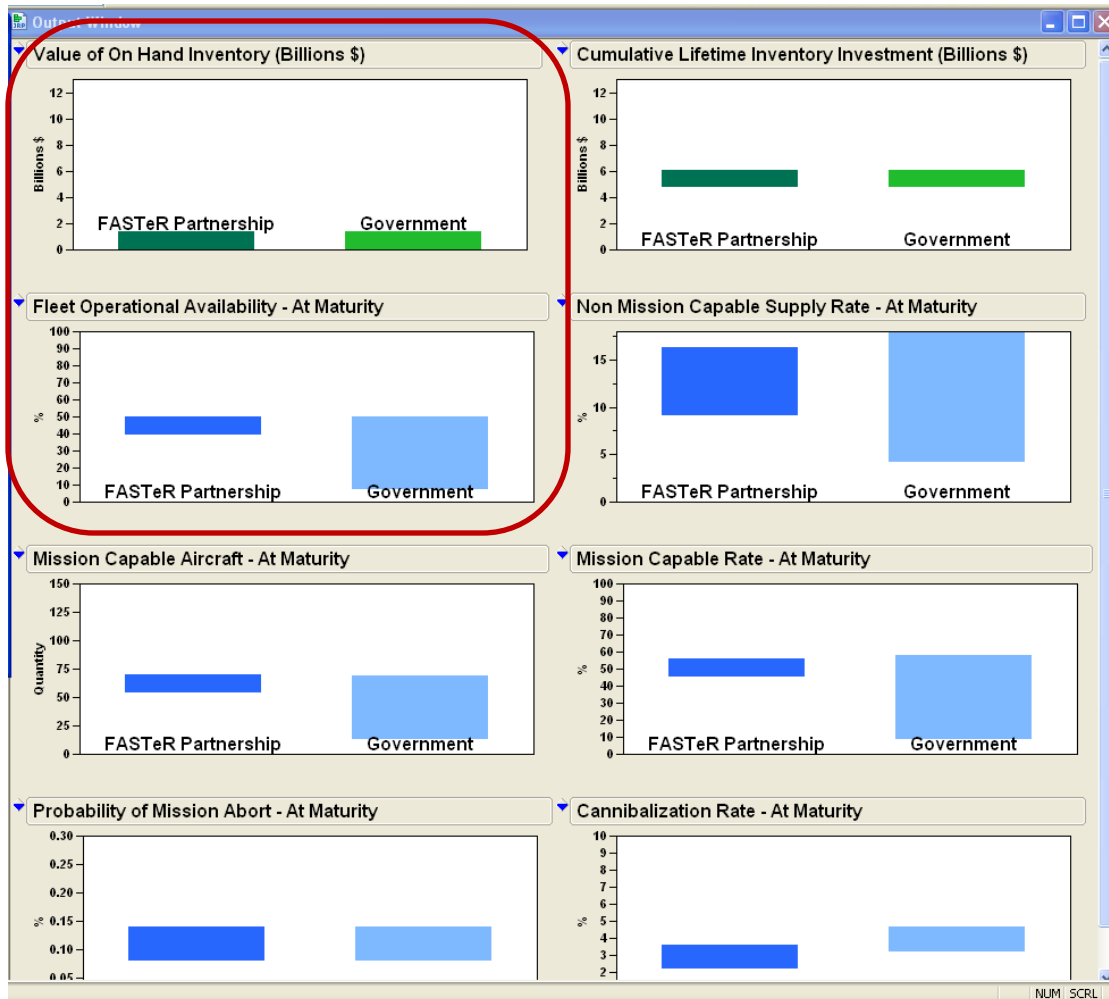
Maintenance Factors

Factor	Value:
Depot Status (%)	8
Unit Possessed/Not Reported Status (%)	6
Maintenance Duration (days):	2

Critical Driving Factors

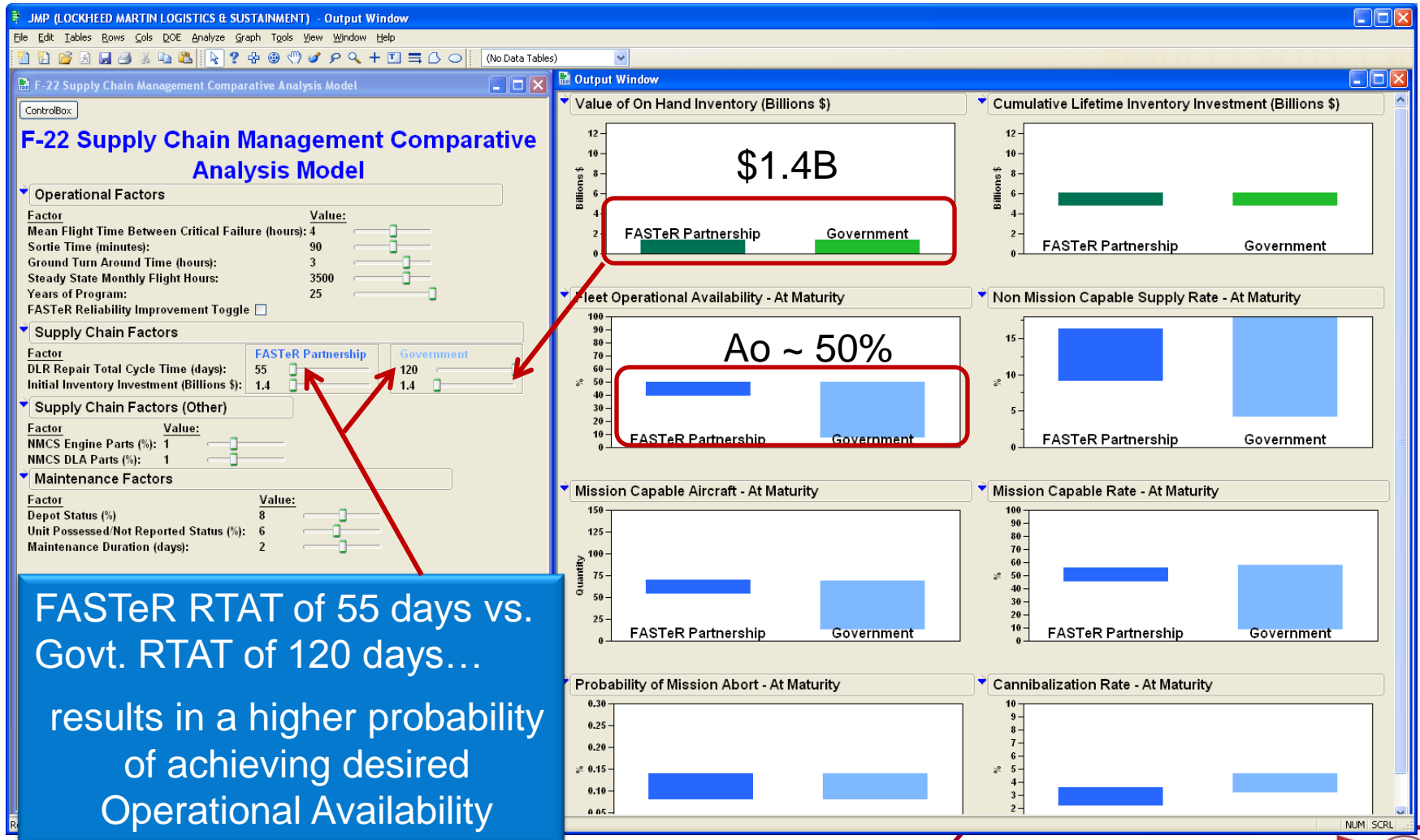
Outcomes

Critical Outcomes

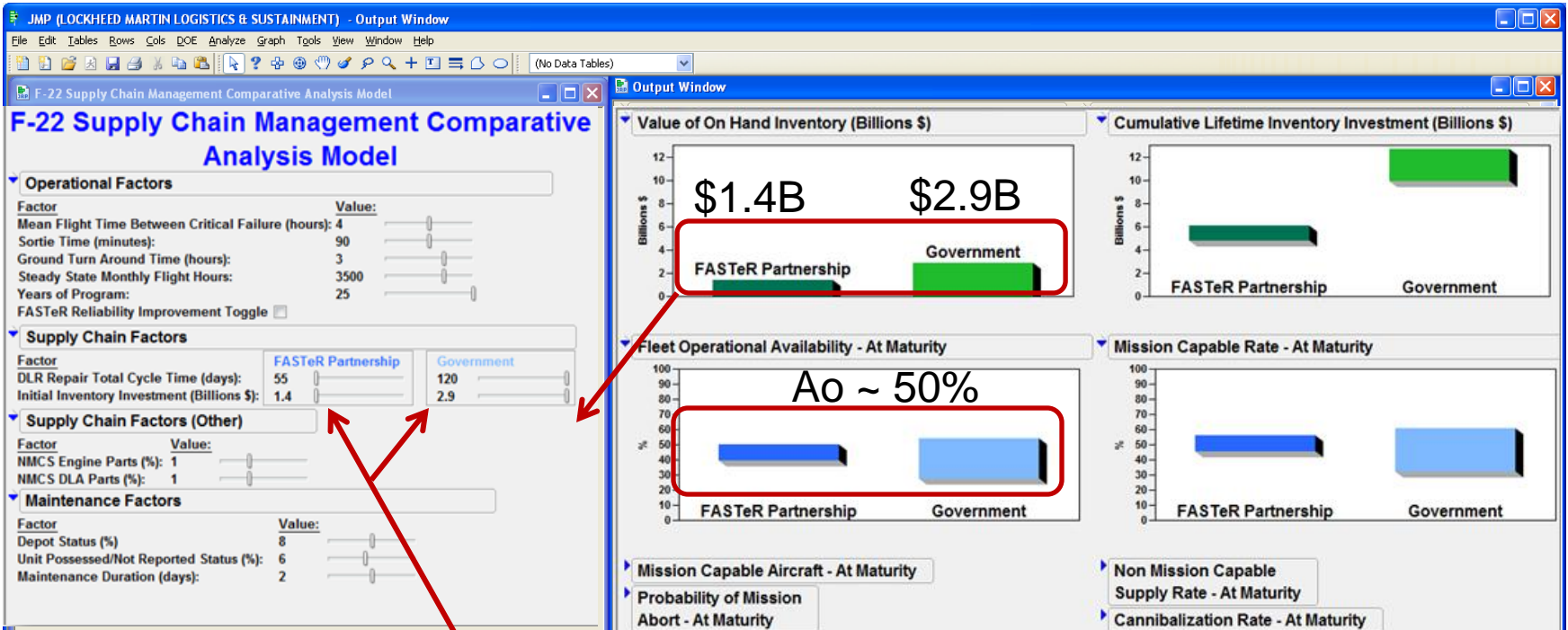


NOTE: Outcomes are portrayed as range vice point values; the tighter the range, the higher the confidence level around the values

Scenario 1: Equal Inventory Investment



Scenario 2: Add'l Inventory Investment



Raising Government Inventory investment to \$2.9B achieves ~comparable Operational Availability outcomes

Scenario 3: Reliability Growth

Management Comparative Analysis Model 2 in Management Comparative Analysis Model

Operational Factors

Factor	Value:	
Mean Flight Time Between Critical Failure (hours):	4	
Sortie Time (minutes):	90	
Ground Turn Around Time (hours):	3	
Steady State Monthly Flight Hours:	3500	
Years of Program:	25	

FASTeR Reliability Improvement Toggle

Reliability Improvement Toggle

Supply Chain Factors

Factor	FASTeR Partnership	Government
DLR Repair Total Cycle Time (days):	55	120
Initial Inventory Investment (Billions \$):	1.4	2.9

Supply Chain Factors (Other)

Factor	Value:	
NMCS Engine Parts (%):	0.5	
NMCS DLA Parts (%):	0.5	

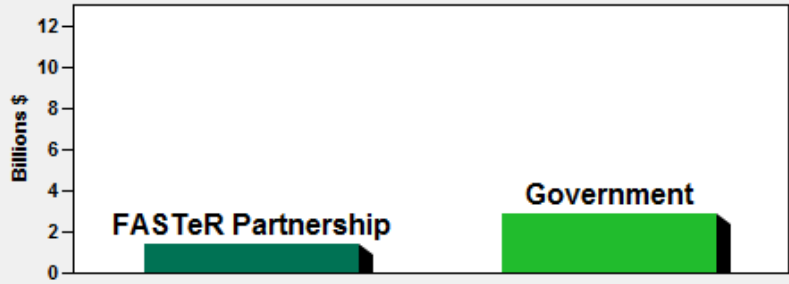
Maintenance Factors

Factor	Value:	
Depot Status (%)	6	
Unit Possessed/Not Reported Status (%):	4	
Maintenance Duration (days):	1.5	

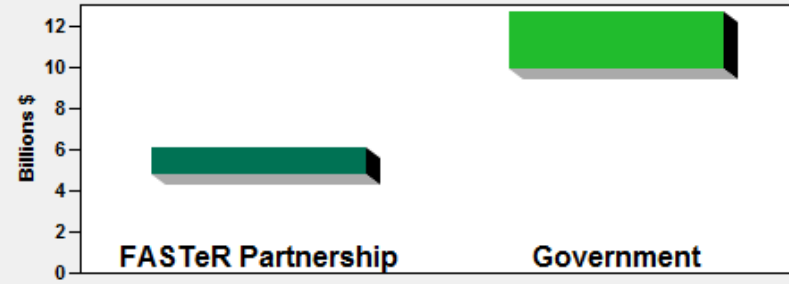
The F-22 “Program of Record” includes a reliability growth program to reduce MFHBME from ~7 hours to ~4 hours

Scenario 2: Reliability Improvement Toggle

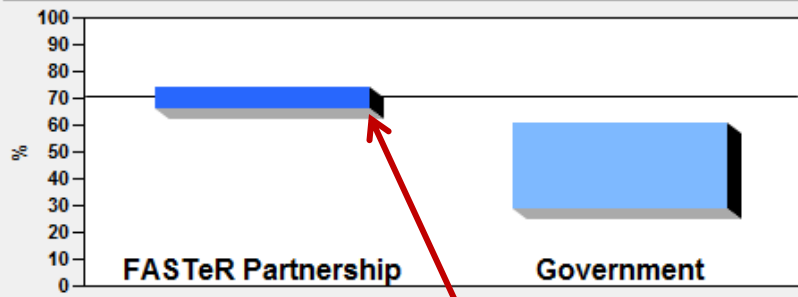
Value of On Hand Inventory (Billions \$)



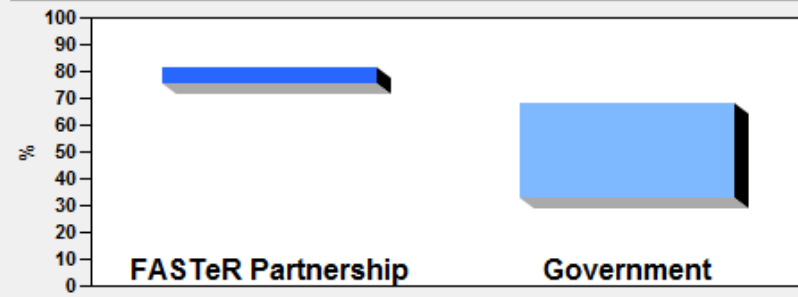
Cumulative Lifetime Inventory Investment (Billions \$)



Fleet Operational Availability - At Maturity



Mission Capable Rate - At Maturity



Reliability Improvement program achieves 70.6% target Ao

- ▶ Miss
- ▶ Pro
- ▶ Abort - At Maturity

▶ Non Mission Capable Supply Rate - At Maturity

▶ Cannibalization Rate - At Maturity

Summary

- Dynamic decision support capability
- Shows impact on operational and cost outcomes
- Enables interactive sensitivity analysis for “what if” scenarios
- Accommodates “real world” potential scenarios
- A critical tool in the analysis toolbox

Contact Information

- Jerry Cothran
- Lockheed Martin Corporation
10530 Rosehaven Street
Fairfax, VA 22030
- Email: jerry.d.cothran@ARM.com
- Phone
 - Work: 703-251-7273
 - Mobile: 703-789-7293