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GOVERNMENT CONSULTING

THE OPPORTUNITY TO MAKE A DIFFERENCE HAS NEVER BEEN GREATER

Tradespace Analysis for Capabilities, Effectiveness, and Resources (TRACER)

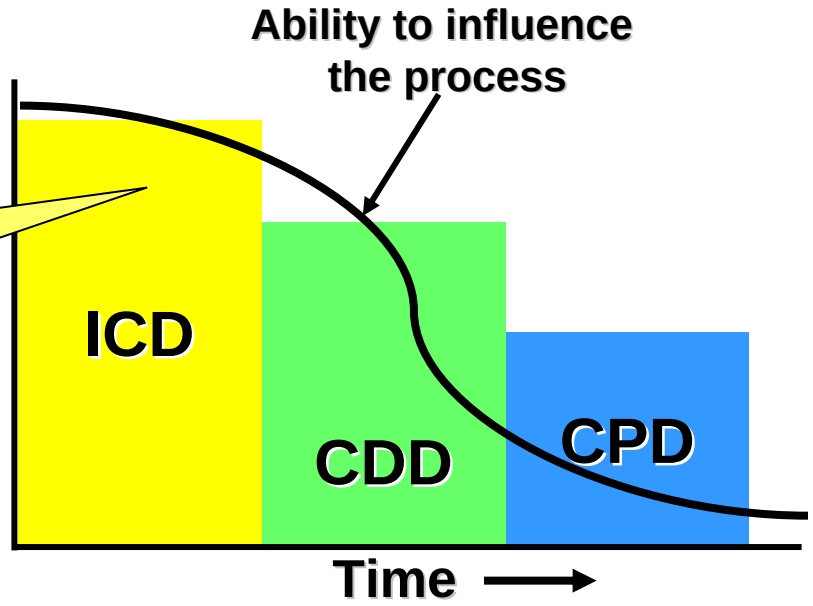
ACQUISITION • FACILITIES & ASSET MANAGEMENT • FINANCIAL MANAGEMENT • INFORMATION & TECHNOLOGY • LOGISTICS • ORGANIZATIONS & HUMAN CAPITAL

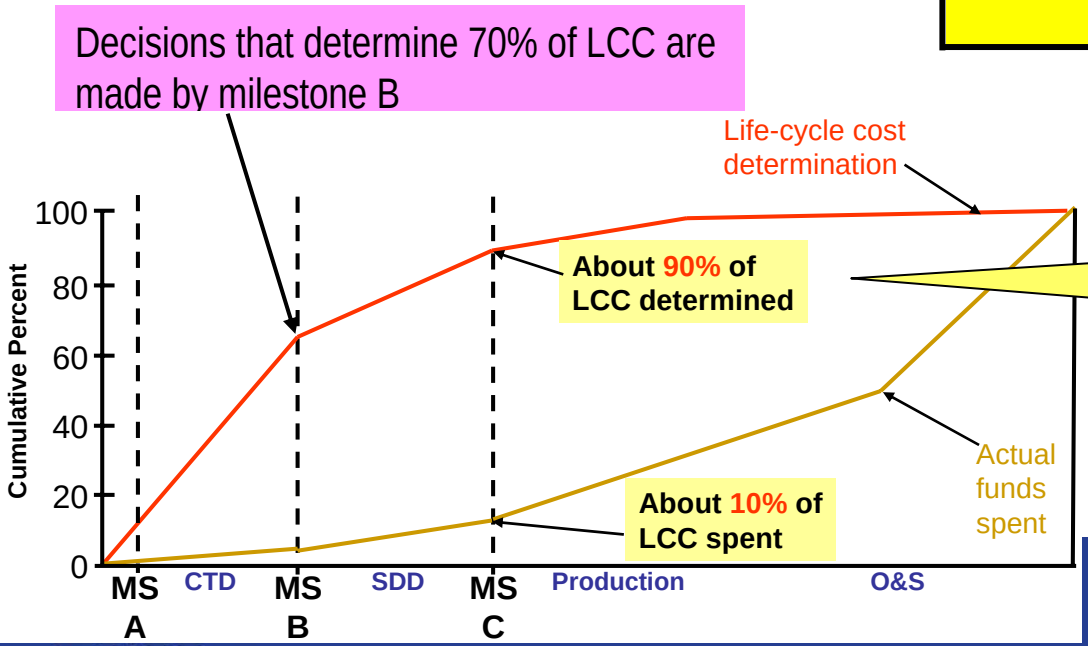
Agenda

- The Case for Integrated Analysis
- What is TRACER?
- Example TRACER Analyses
- The Way Ahead

Why Early Tradeoff Analysis?

Do tradeoff analyses while you have the ability to influence the design…

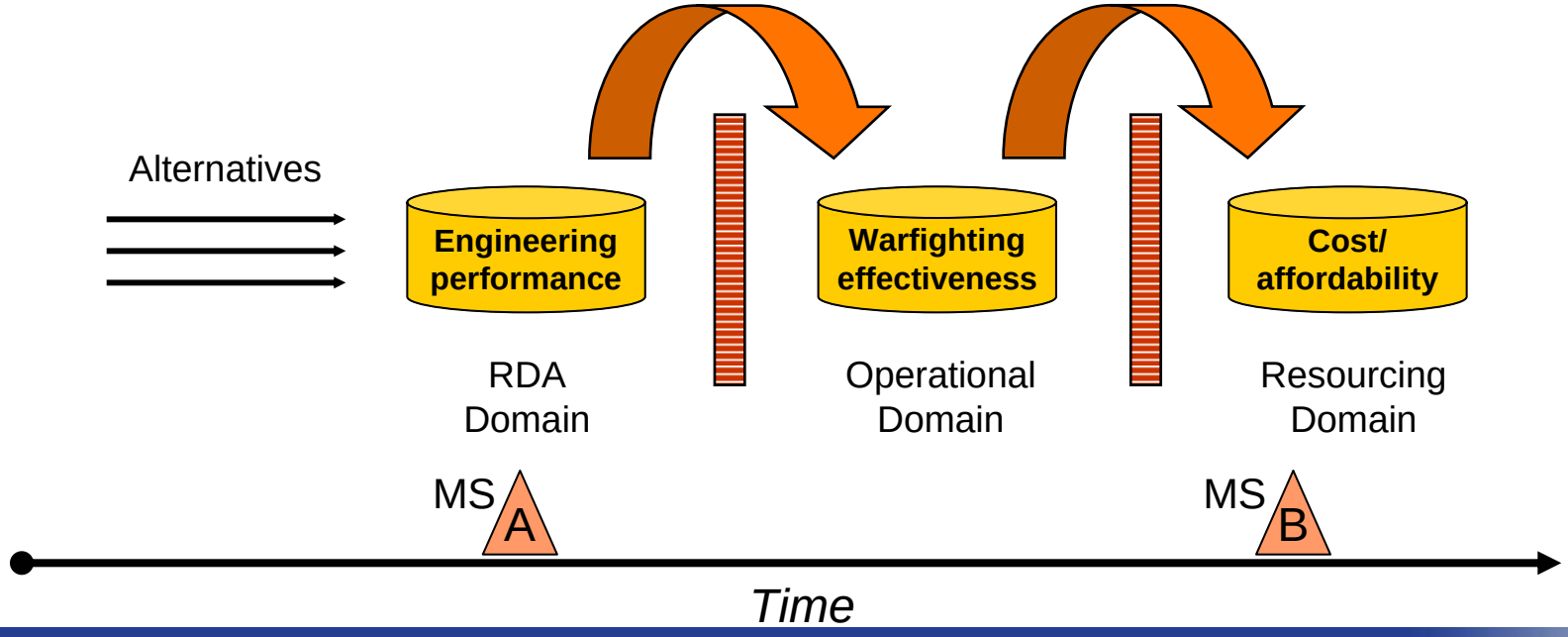




…and your influence has the greatest impact!

Traditional Alternatives Analysis Approach

- Evaluates limited number of alternatives
- Stovepipes reduce incentives to share insights across domains
- Takes lots of time and resources to evaluate each alternative
- Does not facilitate finding optimal solutions



Integrated Alternatives Analysis Approach

- Exposes the entire tradespace
- Integration enables insights to be gained through the synergy of the domains
- Greatly reduces the time and resources for comprehensive evaluation
- Embedded analytical tools facilitate finding optimum solutions

Alternatives

	Config A	Config B	Config C	Config D	Config E	Config F
Criteria 1	12.2	10.2	11.7	16	9.99	13.5
Criteria 2	12.2	10.2	11.7	16	9.99	13.5
Criteria 3	12.2	10.2	11.7	16	9.99	13.5
Criteria 4	12.2	10.2	11.7	16	9.99	13.5
Criteria 5	12.2	10.2	11.7	16	9.99	13.5

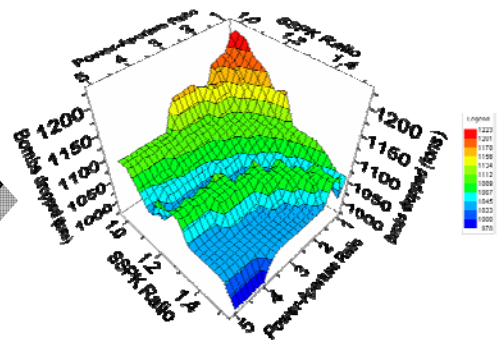
Integrated Analyses

Warfighting effectiveness

Engineering performance

Cost/ affordability

Tradespace Outcome Visualization



MS A

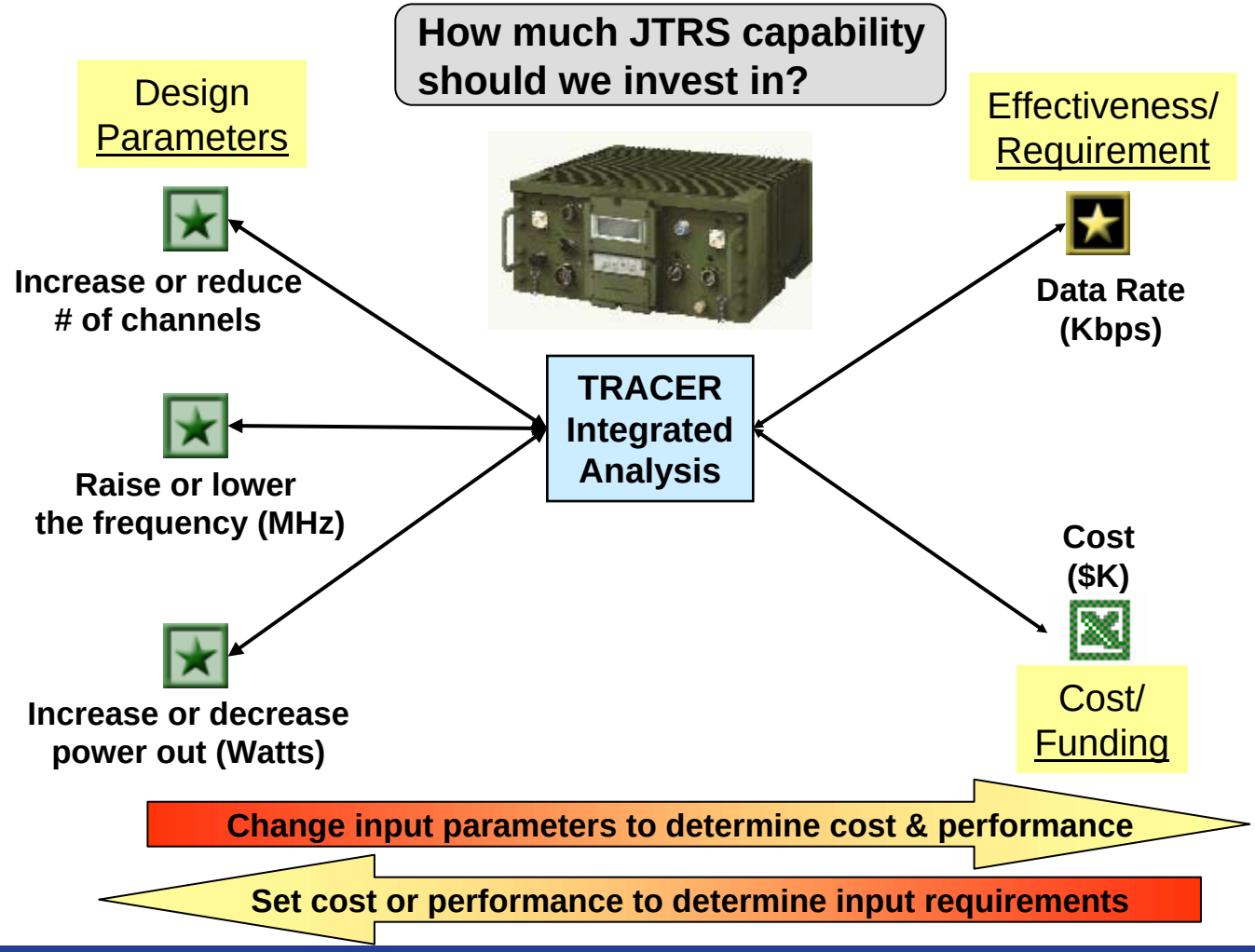
MS B

Time

What is TRACER?

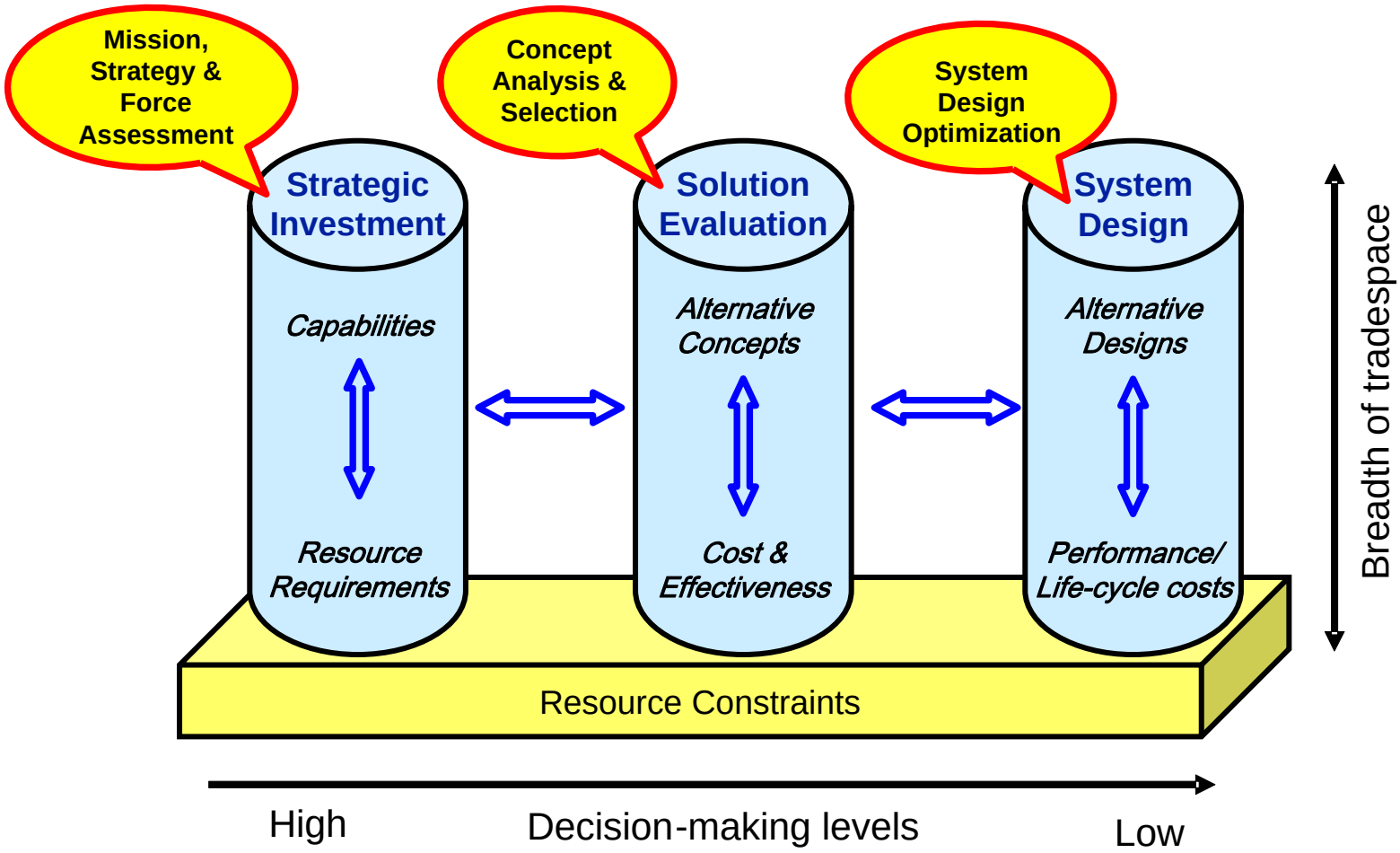
- TRACER facilitates the application of systems engineering to acquisition analysis
- TRACER implements a holistic investment analysis approach in an analytical framework that:
  - simultaneously addresses multiple evaluation disciplines including warfighting effectiveness, performance, and cost
  - can be applied at different levels in the resource analysis environment: strategic, operational/tactical, and acquisition
  - aims to explore the widest possible solution space, informing the alternatives analysis with cost tradeoffs
- TRACER enables analysts and decision makers to do Cost As an Independent Variable (CAIV) analyses
- TRACER methodology uses modeling and simulation to reduce the time, resources, and risk associated with investment decisions

Example: JTRS Tradeoff Analysis



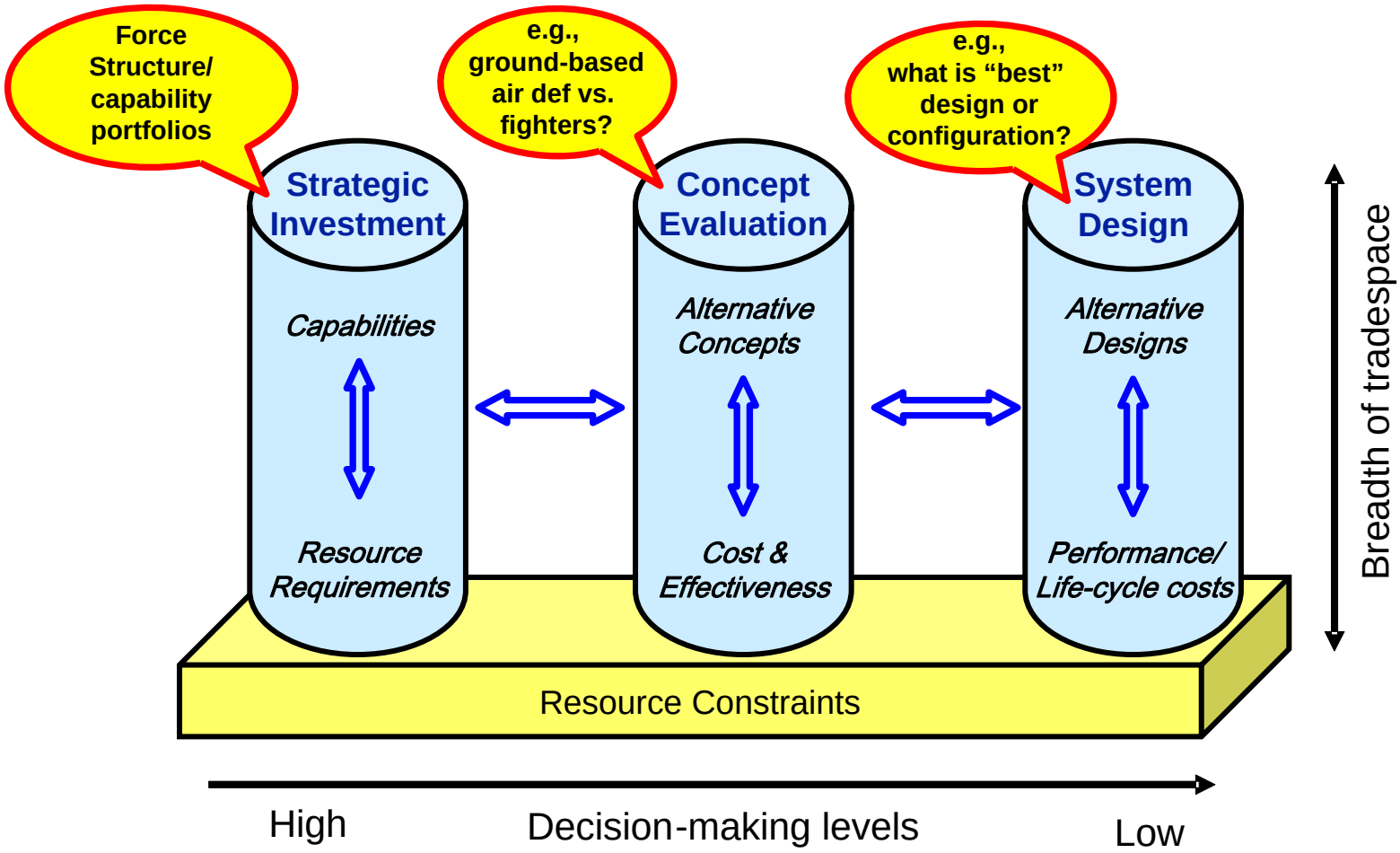
Multi-dimensional Tradespace

To maximize decision tradespace, optimize both within *and* across dimensions



Multi-dimensional Optimization Problem

To maximize decision tradespace, optimize both within *and* across dimensions



Operational Example:

Air-to-Air Campaign

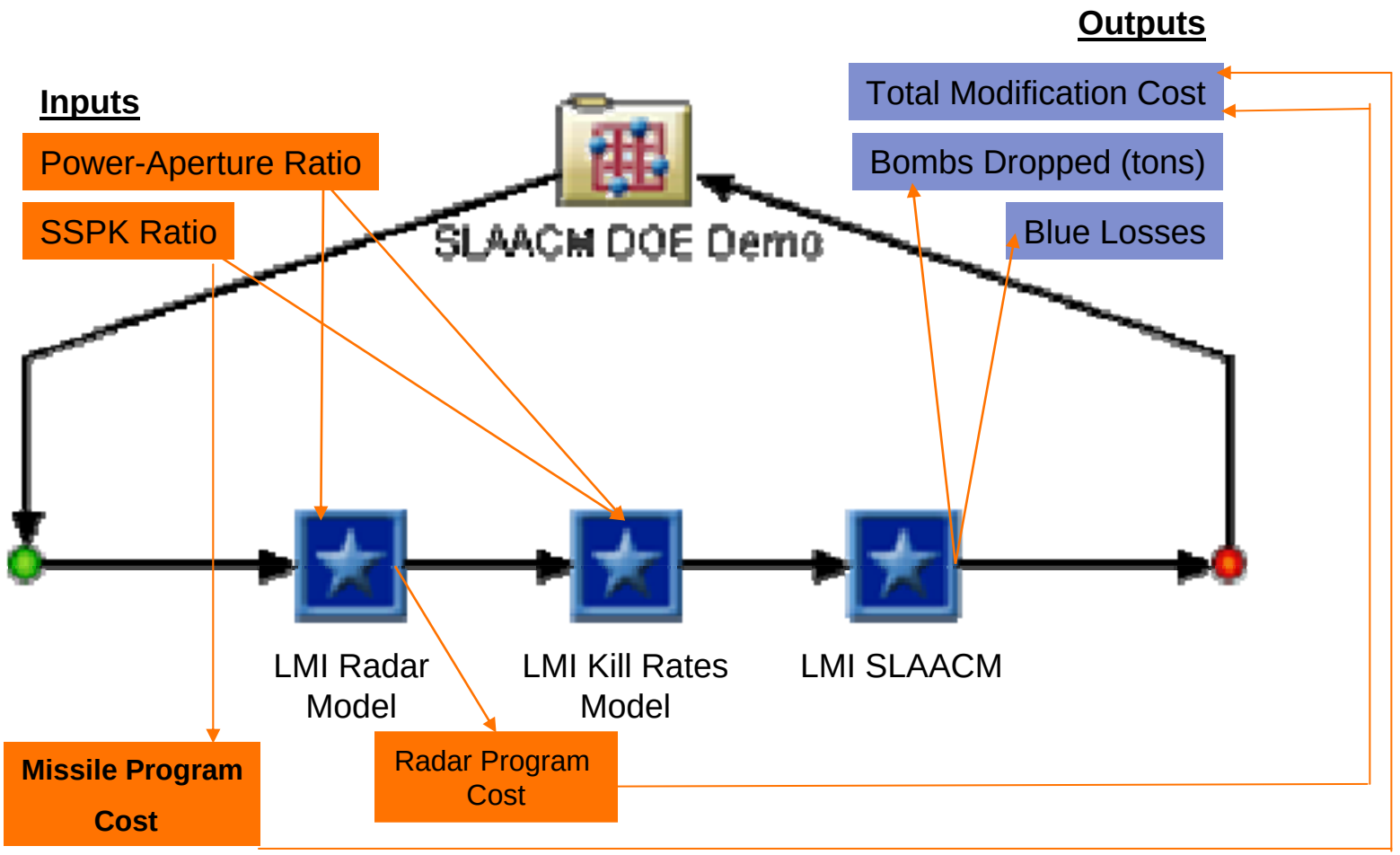
Air-to-air Campaign Analysis

- Requirement: Blue fighter fleet must defeat an optimal assault from a mix of 792 Red aircraft, allowing ***no more than 1,100 tons of bombs dropped*** by "leakers," with 80% confidence that there are ***no more than 45 Blue losses***.
- Current fighter fails: 1,200 tons dropped, 56 Blue losses
- Approach 1: Improve airframe and propulsion (at cost of $12B)
  - Result? Success! 1,067 tons dropped, 42 losses

But, how else might the requirement be met?

- Approach 2: Improve radar (cost and outcome are functions of improvement)
- Approach 3: Improve missile (cost and outcome are functions of improvement)

Air-to-air Campaign Analysis Framework



SLAACM = Stochastic Air Campaign Model

Air-to-air Analysis Design of Experiments (DOE)

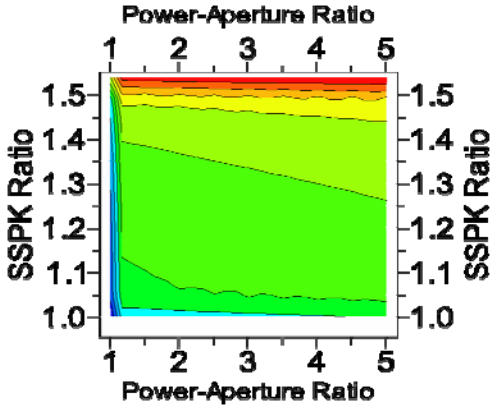
- Choose 492 randomly distributed values for Power-Aperture ratio and SSPK ratio
- P-A ratio values range between 1.0 and 5.0
- SSPK ratio (improvement over current performance level) values range between 1.0 and 1.537

TRACER Analysis

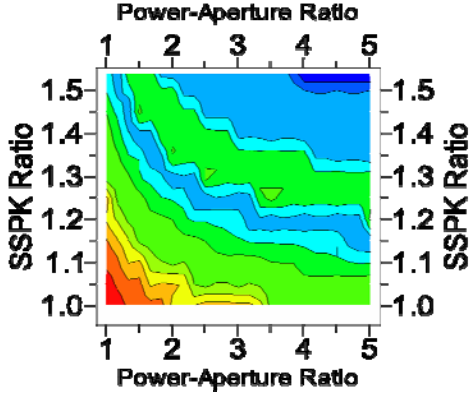
- Run all 492 cases and graph results
- Measure outcomes in blue losses and bombs dropped, and total modification/acquisition costs
- Identify best solution among the feasible outcomes

Air-to-air DOE Results

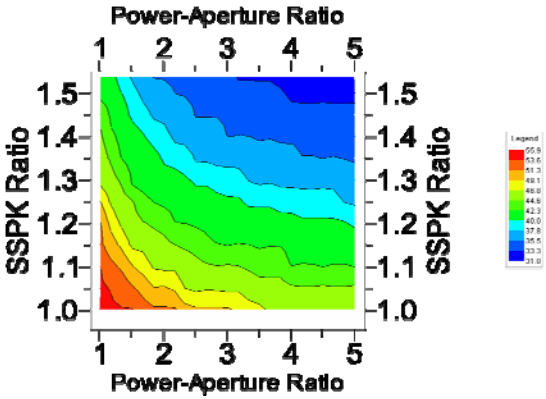
Modification Cost

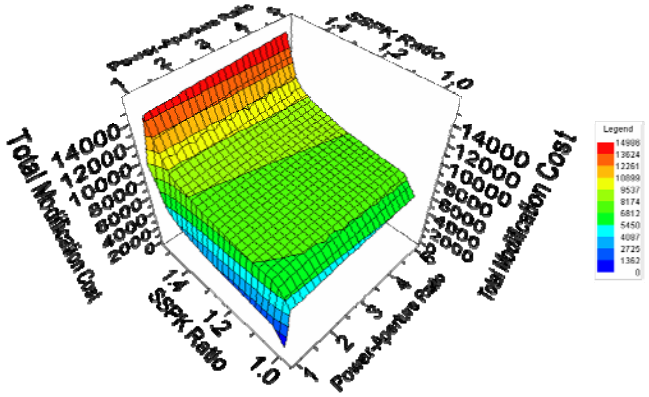


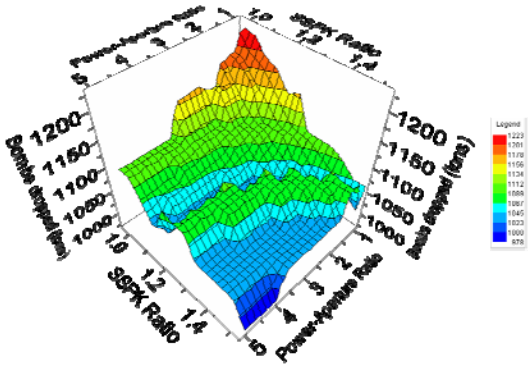
Bombs Leaked (tons)

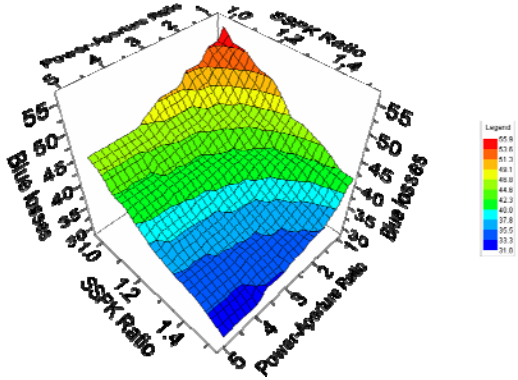


Blue losses





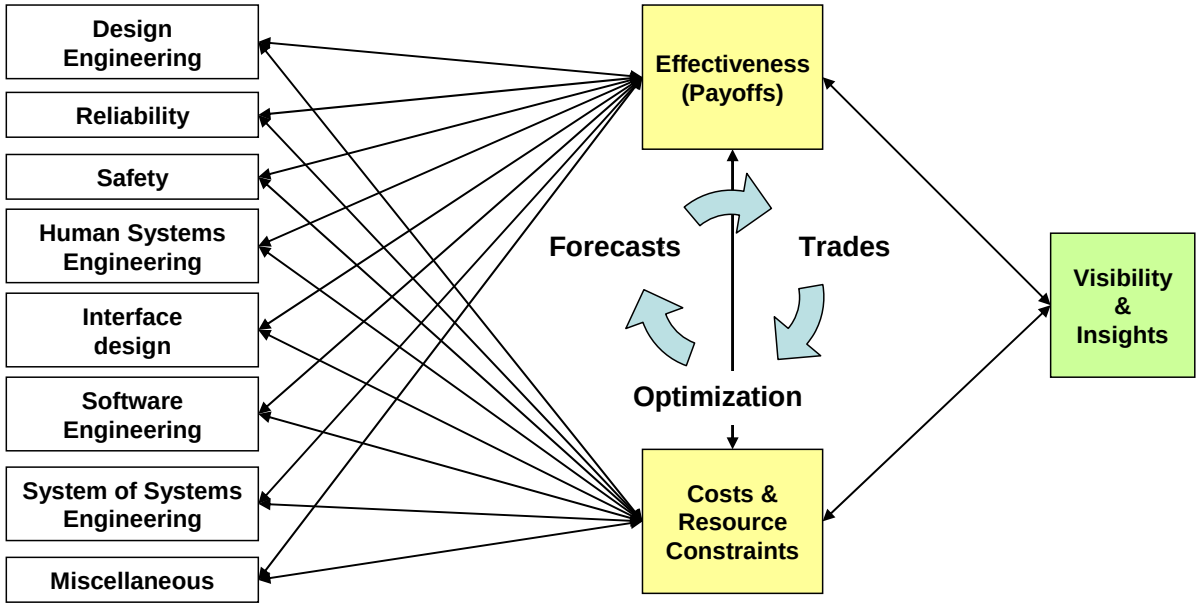




Result: Most cost-effective to improve missile!

What's Next?

- Tailor framework to assess systems engineering disciplines
  - Develop parametric cost and effectiveness relationships for each discipline
  - Use TRACER analysis approach to provide insights into the costs and effectiveness of combinations



Contacts

- Dr. Pete Kostiuk
  Program Director for Resource Analysis
  pkostiuk@lmi.org
  (703) 917-7427

- Gerry Belcher
  Program Manager for Cost Analysis
  gbelcher@lmi.org
  (703) 917-7073

- Kevin Anderson
  Technical Lead for TRACER
  kanderson@lmi.org
  (703) 917-7033

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