DISCUSSION – STATISTICAL THINKING IN DOD T&E

STATISTICAL ENGINEERING SUMMIT
Defining the Ill-Defined

The Task

FIND – IDENTFY – DESTROY
Exercise: SAR Map TD&E

INPUTS (Factors)
- Aircraft Type
- Terrain
- Standoff (Risk)
- Target Mobility
- Map Resolution

OUTPUTS (Responses)
- Time to ID
- Correct ID %
- Noise

PROCESS:
Find and ID SAM Launchers

* Bold are Hard-to-change Factors

J*K Analytics
Becoming the Experts
Picking the Right Team

- **Intelligence Officer**
  - Determine what they want us to do

- **Lead Operational Analyst (OA)**
  - Determine what we can do

- **Lead Unit Project Officer (UPO)**
  - Determine when we can do it

- **Project Manager Assistant (PMA)**
  - Track the test process

<table>
<thead>
<tr>
<th>INTEL (Problem)</th>
<th>OA (Capability)</th>
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<td>UPO (Timeline)</td>
<td>PMA (Process)</td>
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Quantifying a TD&E
Number of Runs

OA vs. UPO

\[ \text{4} \times \text{3} \times \text{3} \times \text{2} \times \text{2} = 144 \]

Split-Plot Design

\[ \text{4} \times \text{3} \times \text{3} \times \text{2} \times \text{2} = 48 \]
A Split-Plot Design
Setup Challenges

MRIBM

x 3

3 Weeks…

SRBM

x 10
Setup Challenge – Contractor Trouble

“NO!”

“NO”

“Okay, but it will cost $800,000”

“Just kidding, make that $3,000,000”
Setup Challenges
Victory!
Execution Challenges
“Natural” Causes

<table>
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<tr>
<th>DAY 1:</th>
<th>LOW RISK</th>
<th>FIXED TARGETS</th>
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<tbody>
<tr>
<td>Day 2:</td>
<td>LOW RISK</td>
<td>MOBILE TARGETS</td>
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<tr>
<td>Day 3:</td>
<td>HIGH RISK</td>
<td>FIXED TARGETS</td>
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<tr>
<td>Day 4:</td>
<td>HIGH RISK</td>
<td>MOBILE TARGETS</td>
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<td>Day 5:</td>
<td>BACKUP</td>
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“Plans are worthless… But Planning is everything.”
- Dwight D. Eisenhower
General Factorial
3x3x2 design
2-level Factorial
2^3 design
Fractional Factorial
2^3-1 design
Response Surface
Central Composite design

OVERALL RESULTS

TIME

VARIABLES

Desert  Forest  Urban

Fixed  Mobile

High  Low  High  Low  High  Low  High  Low  High  Low

JK Analytics
Results

- Accomplished all test objectives and reported 4 months early
- Spent $322,000 instead of $3,300,000
- Created 3 MRBM for future use

- Developed tactics for use in combat
- Developed training plans to prepare crews
- Modified 1 MDS with 2 new systems since publishing

- Briefed CSAF, A3, N3, and Chief of Info Dominance to comprehension
Statistical Engineering Improvement Areas

- Flexible problem-solving capability
  - Understanding the primary goals / objectives of the study
  - Knowing the restrictions, limitations and time/budget constraints
  - Adapting perfect application of methods to fit the reality of the situation – what are the best compromises?

- Statistical leadership and collaboration
  - Right kinds of skill/experience/personalities in leverage positions

- Sufficient number of practitioner SE’s in the right places
  - Not just traditional statisticians, data scientists, but prob. solvers

- Clearly defined planning process and facilitation expertise
  - Taking the time needed to understand the problem and generate a viable plan for effective solution