Temasek Defence Systems Institute

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APLLICATION OF EXECUTABLE ARCHITECTURE IN EARLY CONCEPT EVALUATION USING THE DOD ARCHITECTURE GRAMEWORK

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1 Motivation

Increasing Complexity in Weapon System

- Increase risk to development cost and time.
- Need for systematic approach in evaluating feasibility and cost effectiveness for new programs.
- System Architecting improve cognitive Understanding and decision making

Functional Reasons for Cost Overrun (Berteau et al, 2011)
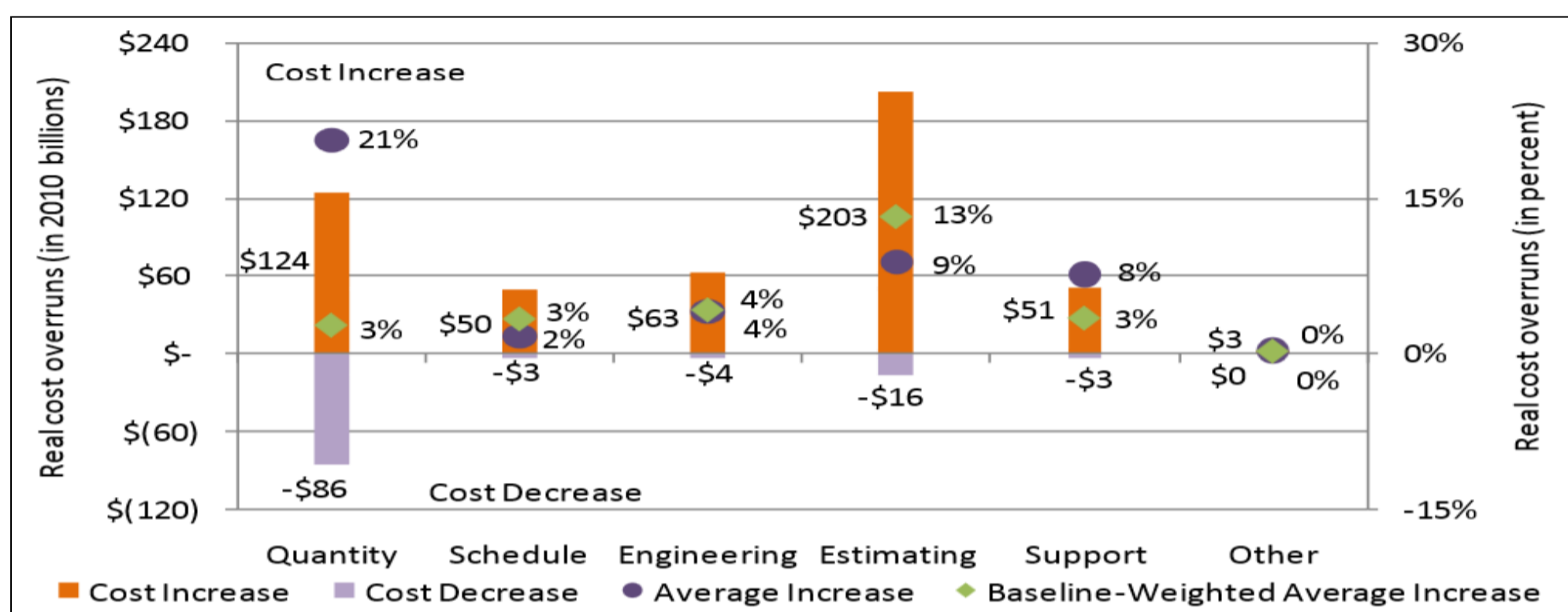

2 Research Focus

Evaluate Utility of Executable Architecture in early assessment of defense-related projects

- Which view of DoDAF are critical for effective construction of EA?

- What level of Operational or functional hierarchy of component sub-systems is required for EA to be effective?

- How can EA be used to identify and evaluate the impact of design parameters on MOEs and MOPs?

- Which are the key parameters that have significant impact to design and operational cost for the multi-tiered UAV architecture considered?

3 Overview of System-under-design
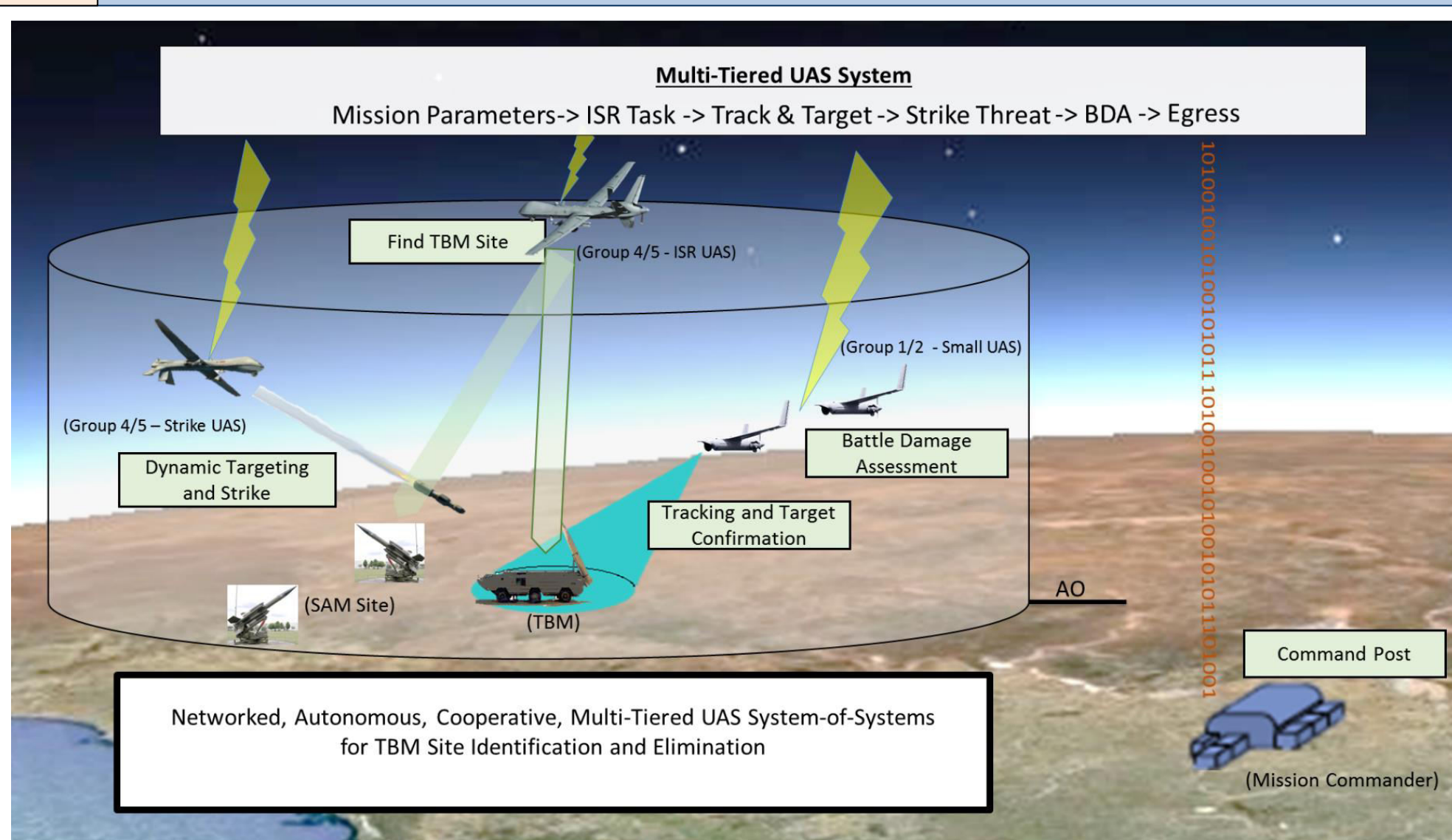
4 Research Methodology

Six Steps Methodology

1. • Understand and analyze Scope and Operational Use for System-under-design
2. • Identify key user requirements and MOEs
3. • Develop High level DoDAF architectural products
4. • Identify Architectural Variants for system evaluation
5. • Develop simulation scenario and EA models
6. • Data Collection and Analysis

5 Results

System Architecting evaluated using Innoslate

MOE	Design Parameters	Simulation Results	Pct Improvement
Target Acquisition Percentage	Type of Sensor	High: 85.5% Normal: 52.9%	61.5% improvement over Normal Sensor
False Alarm Percentage	Type of Sensor	High: 0.4% Normal: 9.6%	95.6% improvement over Normal Sensor
Time-to-Strike	Type of C2	Autonomous: 91.2 mins Manual: 100.1 min	9.8% improvement over Manual C2
	Number of Strike UAS	1 x Strike UAS: 94.6 min 2 x Strike UAS: 96.9 min	2.1% improvement over 2 x Strike UAS
Target Destruction Percentage	Type of C2	High: 75.1% Normal: 46.3%	62.2% improvement over Normal Sensor
	Number of Strike UAS	1 x Strike UAS: 54.8%	21.7% improvement over 2 x Strike UAS

6 Conclusion

- Research demonstrated the effective methodology through the use of EA in early concept evaluation.

- Provide platforms for System Architects to determine impact of design parameters to overall system requirements.

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