

73rd MORSS CD Cover Page

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712CD

For office use only 41205

21-23 June 2005, at US Military Academy, West Point, NY

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Original title on 712 A/B: **The Air Force Standard Analysis Toolkit (AFSAT)**

Revised title: **Survivability & Vulnerability Impacts on Mission and Campaign Outcomes:
The Role of the AFSAT [accepted for WG 9]**

Presented in (input and Bold one): (WG **9**, CG ___, Special Session ___, Poster, Demo, or Tutorial):

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Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE 21 JUN 2005		2. REPORT TYPE N/A		3. DATES COVERED -	
4. TITLE AND SUBTITLE Survivability & Vulnerability Impacts on Mission and Campaign Outcomes: The Role of the AFSAT				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) AFSAA/SAAT 1570 Air Force Pentagon Washington, DC 20330-1570				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited					
13. SUPPLEMENTARY NOTES See also ADM201946, Military Operations Research Society Symposium (73rd) Held in West Point, NY on 21-23 June 2005., The original document contains color images.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT SAR	18. NUMBER OF PAGES 24	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

Headquarters U.S. Air Force

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Survivability & Vulnerability Impacts on Mission and Campaign Outcomes: *The Role of the AFSAT*



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**Sharon Nichols
George Crowder (Ctr)
AFSAA/SAAT**



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Outline

- **AFSAT**
- **SURVIAC**
- **Engineering & Engagement Level Analysis for Survivability & Vulnerability (S&V)**
- **S&V Impacts on Mission Level Analysis**
- **S&V Impacts on Campaign Level Analysis**
- **Consistent Scenarios, CONOPS, and Approach**
- **AFSAT Value Added**



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AFSAT

What is it?

- **The Air Force Standard Analysis Toolkit (AFSAT)**
- **Foundational set of AF analytic community (AFAC) accepted modeling and simulation (M&S) tools**
 - Stand-alone, data driven constructive simulations
 - User picked, well understood, formally evaluated (stamp of approval)
 - Use of AFSAT tools encouraged
- **Goals**
 - Improve consistency and quality of AF analyses
 - Standardize model management, configuration management, VV&A, etc. *best practices* across the AF analytic community
 - Provide framework for analytic M&S capability investments
- **Oversight**
 - AFAC Steering Group provides direction and guidance
 - AFSAA/SAA – executive agent
 - Subject Matter Expert model managers (MM) responsible for individual models



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Background: Why Created?

Answering the Questions Without an Analysis Toolkit

Numerous Analysis Tools

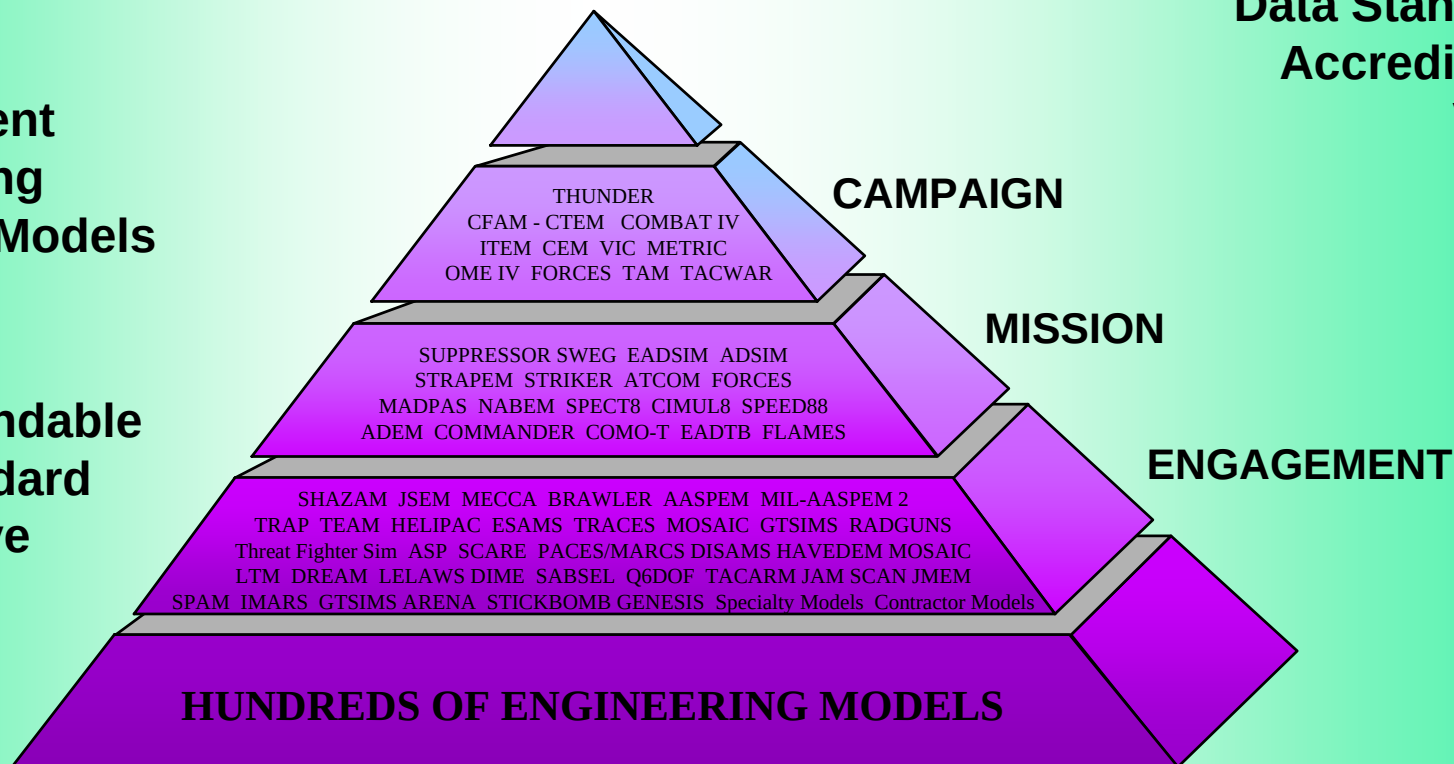
Campaign
Mission
Engagement
Engineering
Specialty Models

Mandates

Data Standards
Accreditation
VV&A

Issues

Non-Defendable
Non-Standard
Duplicative



Analysis

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AFSAT Approach

AF Analyses Benefits

**Life cycle costs lowered via
reduced duplication of cap-
ability via enabling reuse
Results analytically more
consistent**



Analysis

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SURVIAC

Survivability/Vulnerability IAC

- DoD sponsored Information Analysis Center (IAC)
- DoD's institution for collecting, analyzing, and disseminating scientific and technical information (STI) related to all aspects of survivability and lethality for aircraft, ground vehicles, ships and spacecraft, to conventional homeland security threats including chemical, biological, directed energy, and non-lethal weapons.
- Contractor operated, DoD sponsored service available to all government and industry users to provide studies, analyses, data gathering, and other operational, and logistics requirements related to survivability and lethality technologies.
- Includes maintenance and distribution of approved set of models and simulations used to evaluate survivability and vulnerability.

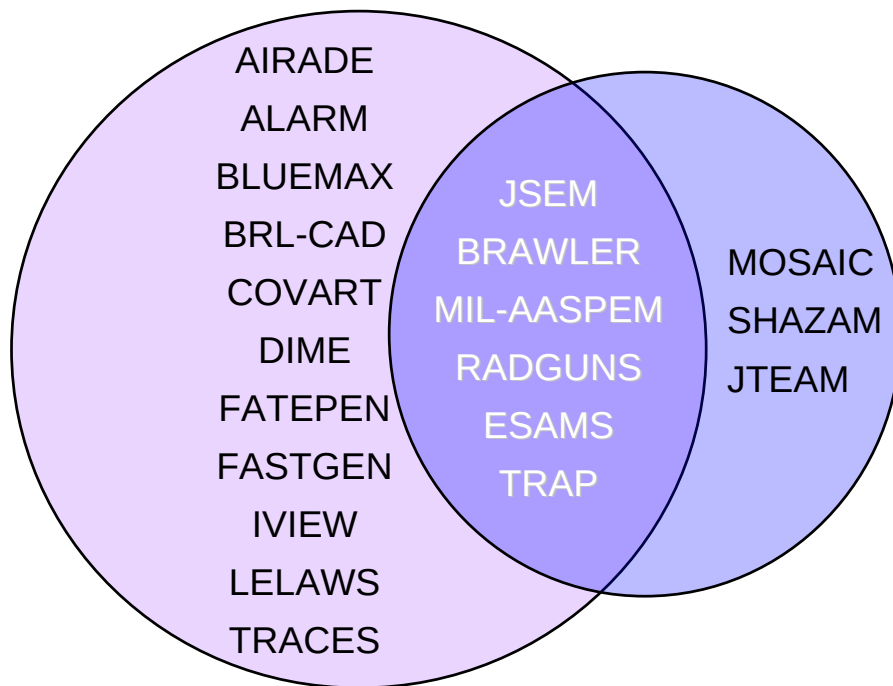


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AFSAT and SURVIAC M&S

How are they related?

SURVIAC



AFSAT
Engagement
Level Models



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Aircraft Survivability

Where the Rubber Meets the Road

Work backwards—understand the physics and effects

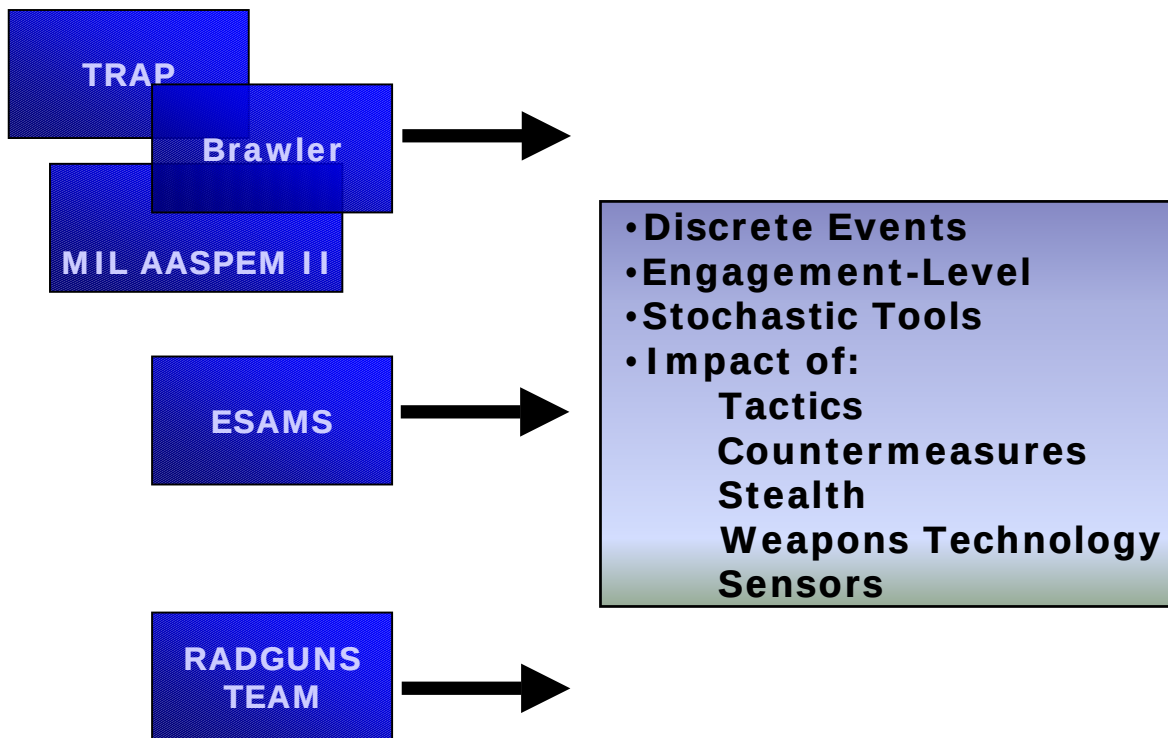




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Survivability & Vulnerability

Engineering & Engagement Level Analysis



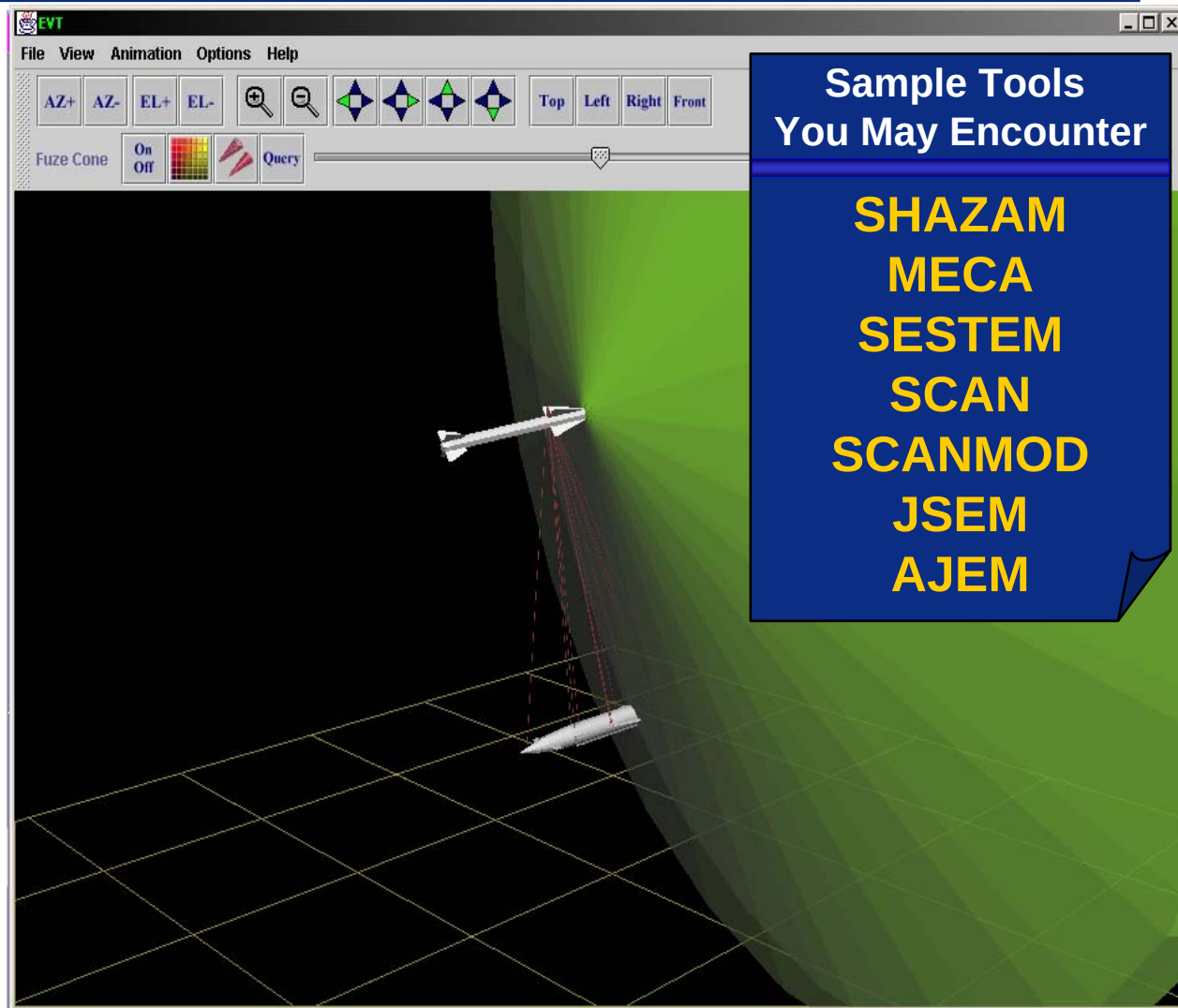


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Engineering-Level

The Munitions: Endgame

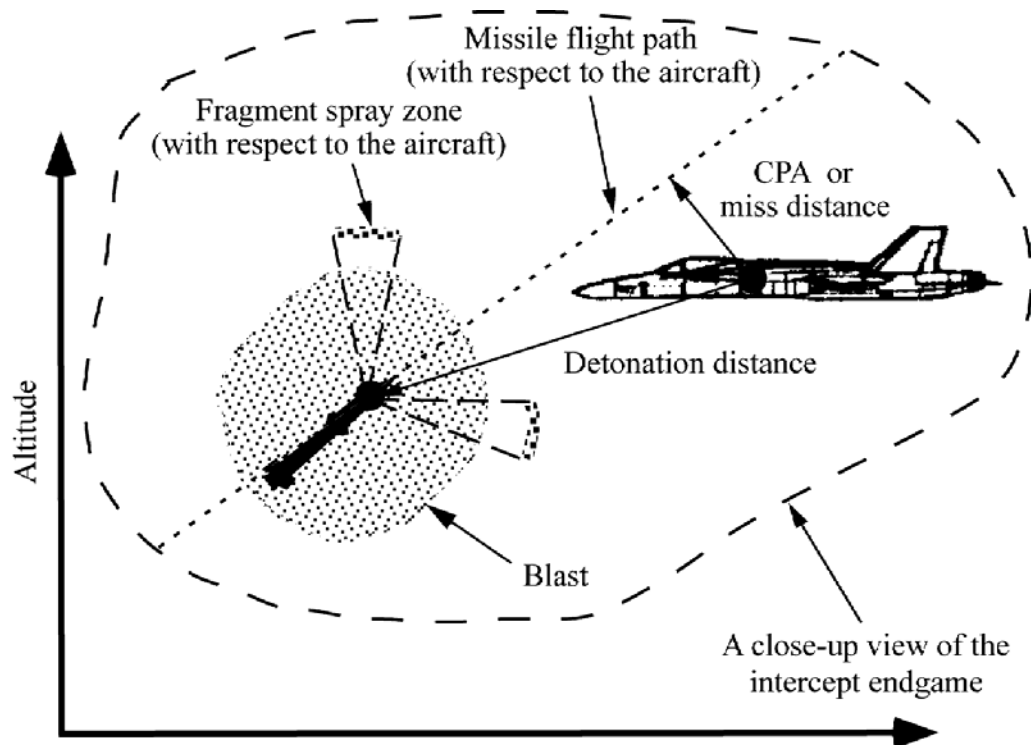
- Terminal effectiveness of fragmenting munitions
- 3D terminal-encounter simulation
 - Last few milliseconds (fuzing/warhead interaction)
- Calculates aerial target kill by threat missile (Pkss)
- Accounts For Major Damage Mechanisms
 - Direct Hit
 - External Blast
 - Warhead Frag





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Engineering-Level Summary



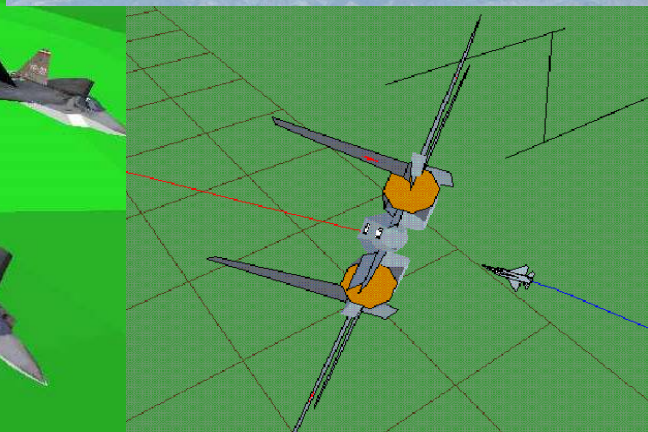
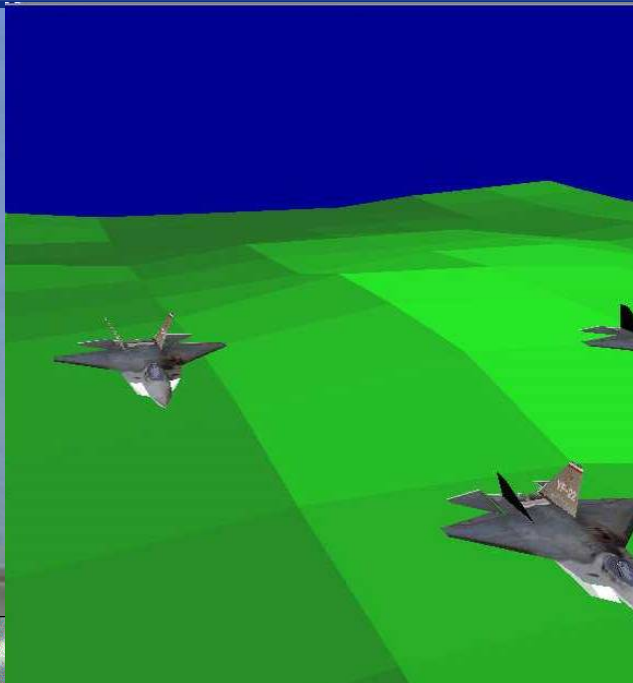
HUNDREDS OF ENGINEERING MODELS



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Engagement-Level

Aggregating Engineering-Level to Few-v-Few



wer: RED
n Scale: 16,000
to Time: Metric

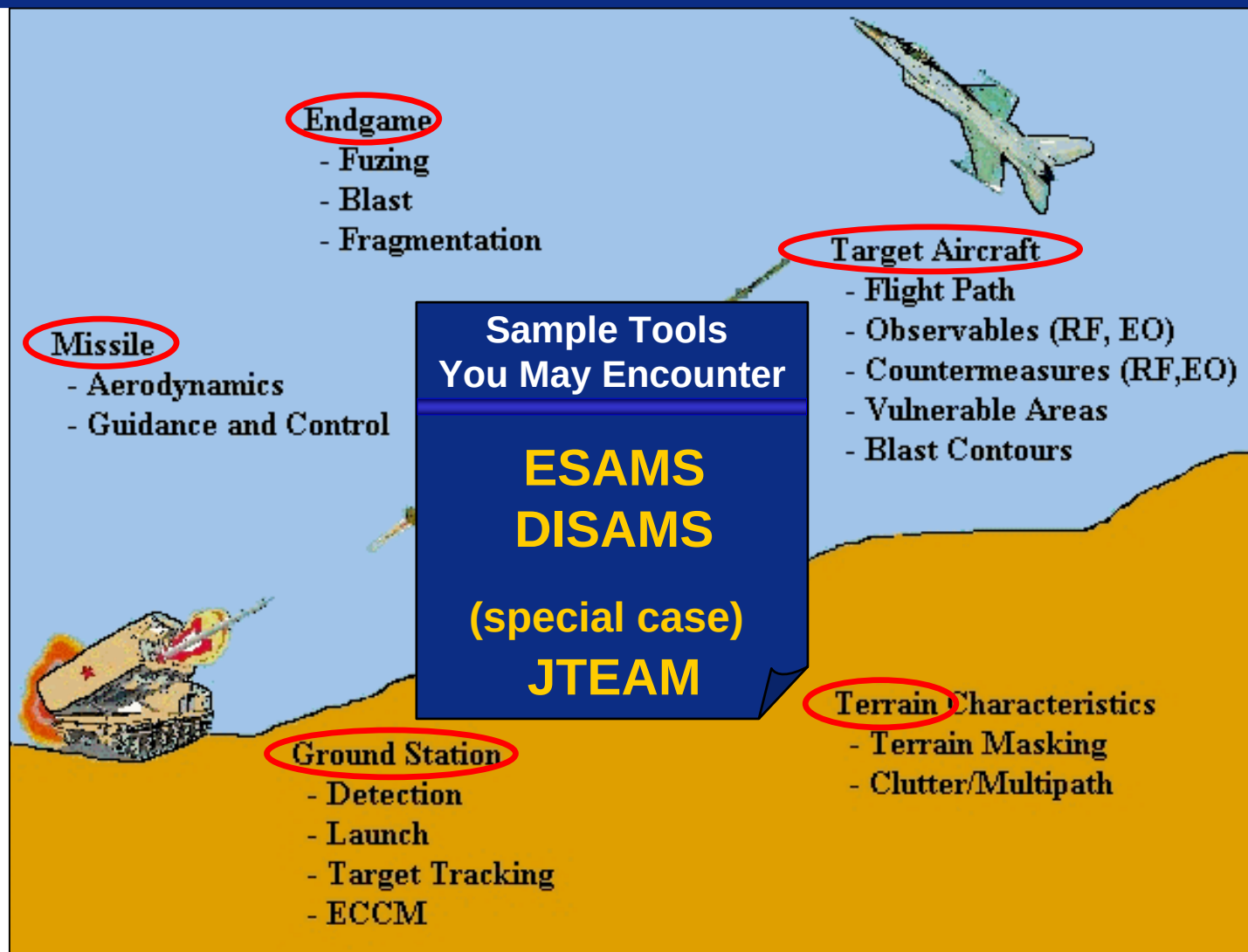
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Trail Distance: 205



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Engagement-Level

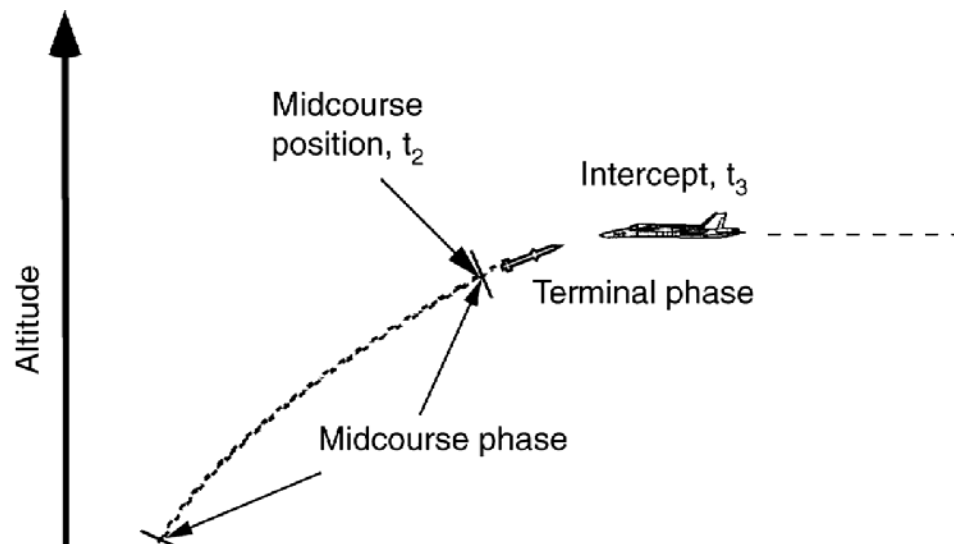
Surface-to-Air Missile





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Engagement-Level *Few-v-Few Summary*



SHAZAM JSEM MECCA BRAWLER AASPEM MIL-AASPEM 2
TRAP TEAM HELIPAC ESAMS TRACES MOSAIC GTSIMS RADGUNS
Threat Fighter Sim ASP SCARE PACES/MARCS DISAMS HAVEDEM MOSAIC
LTM DREAM LELAWS DIME SABSEL Q6DOF TACARM JAM SCAN JMEM
SPAM IMARS GTSIMS ARENA STICKBOMB GENESIS Specialty Models Contractor Models

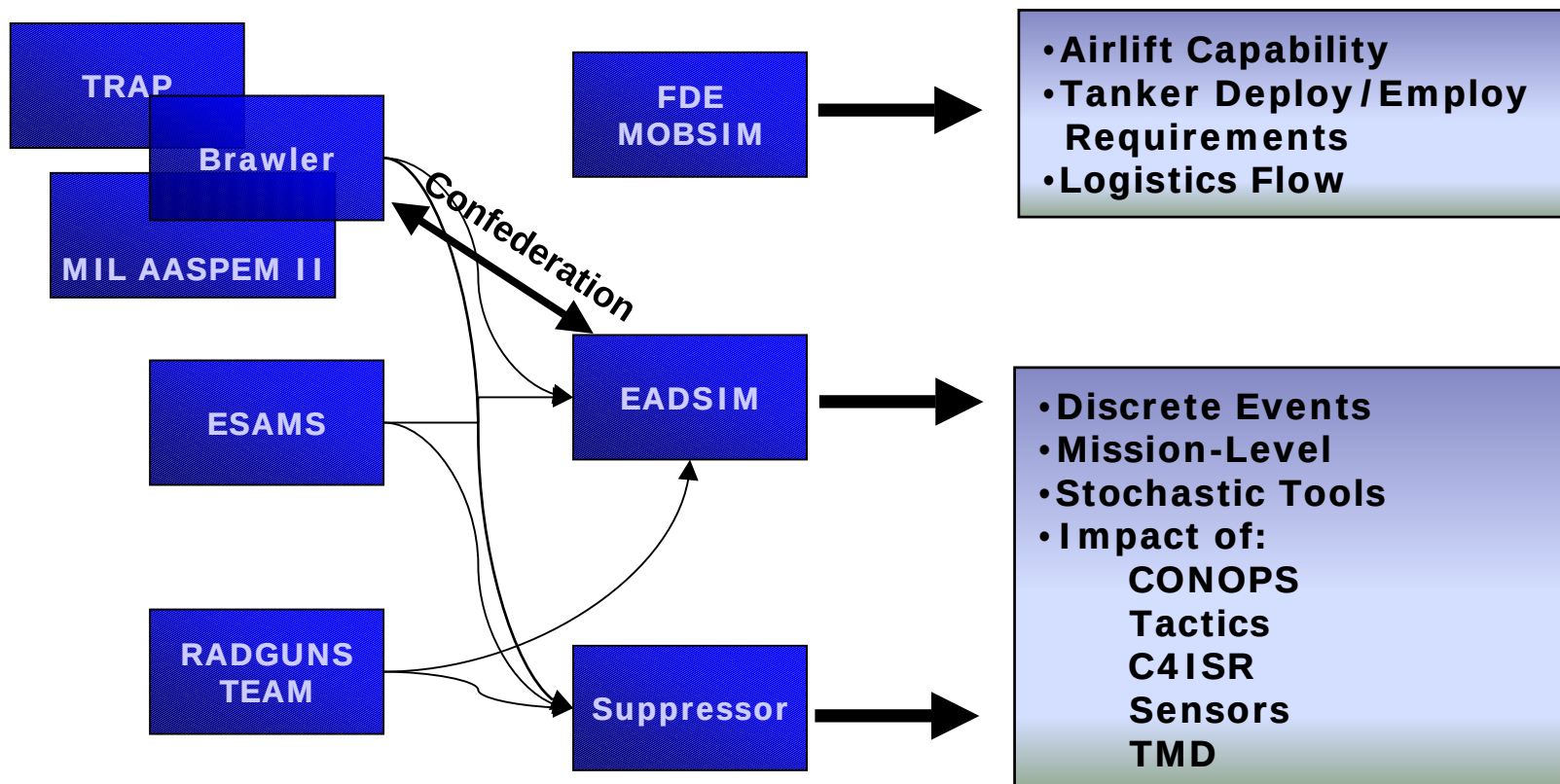
HUNDREDS OF ENGINEERING MODELS



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Survivability & Vulnerability:

Impacts on Mission Level Analysis

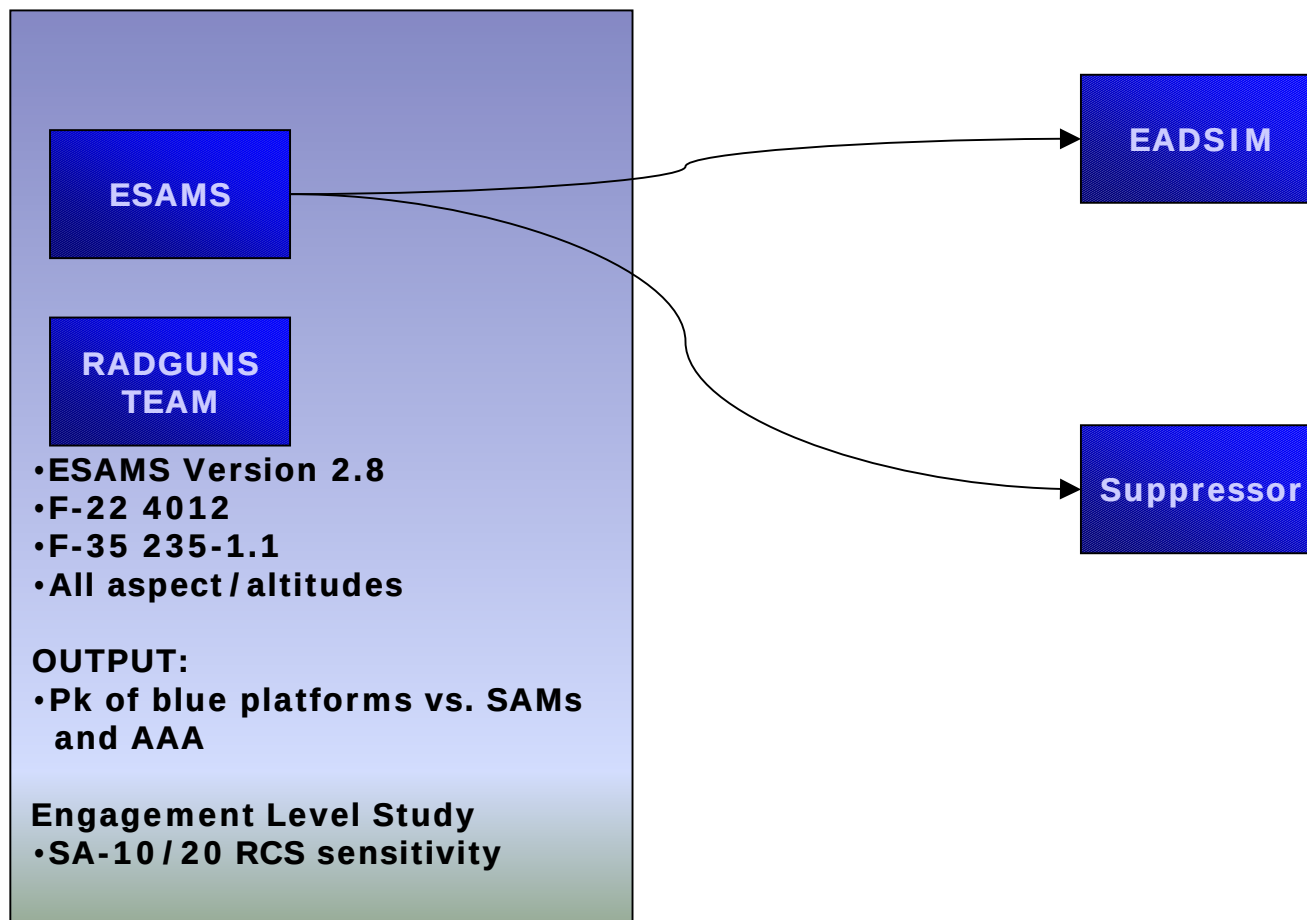




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ESAMS, RADGUNS and JTEAM

Input to EADSIM & Suppressor

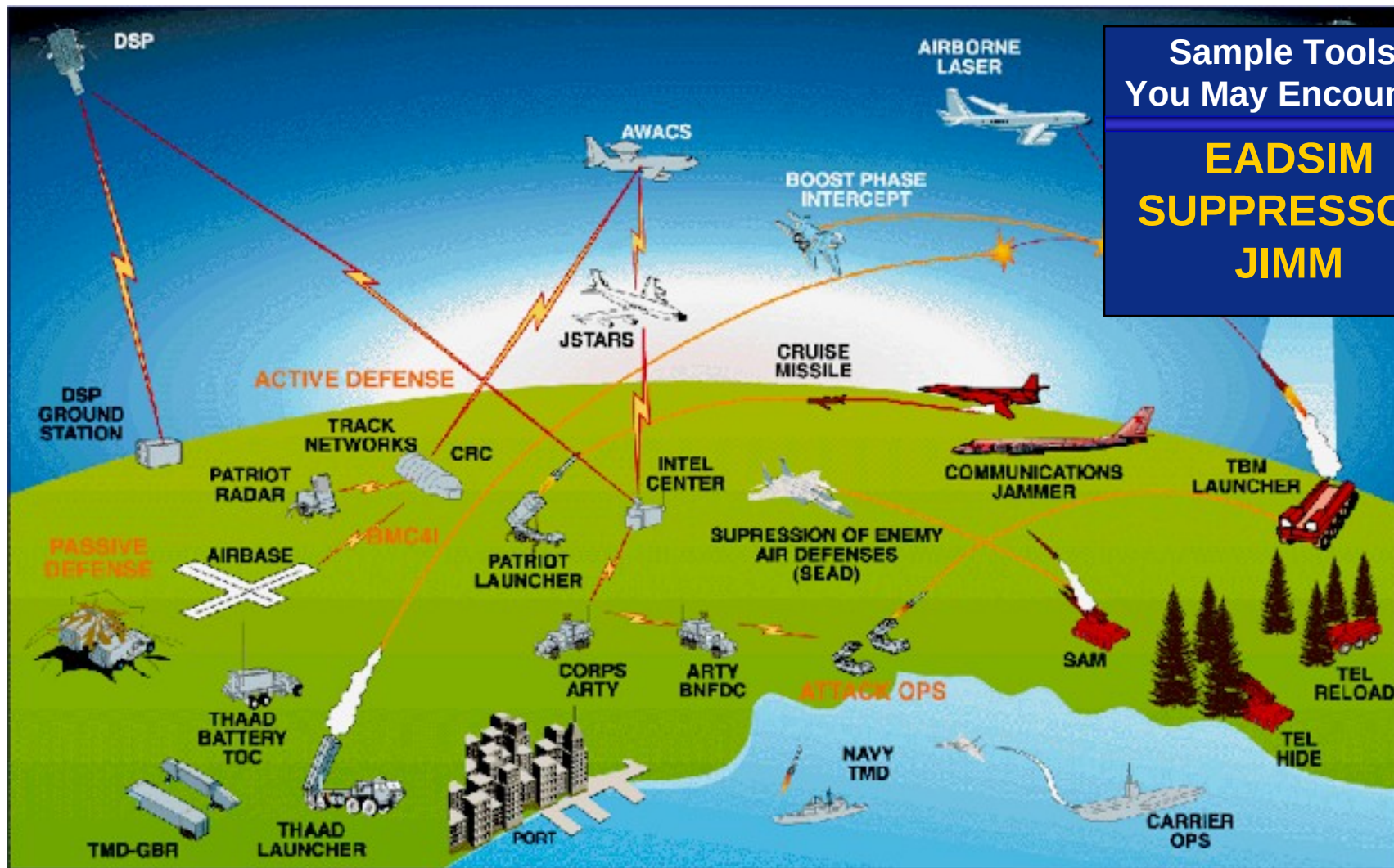




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Mission-Level

Many-on-Many



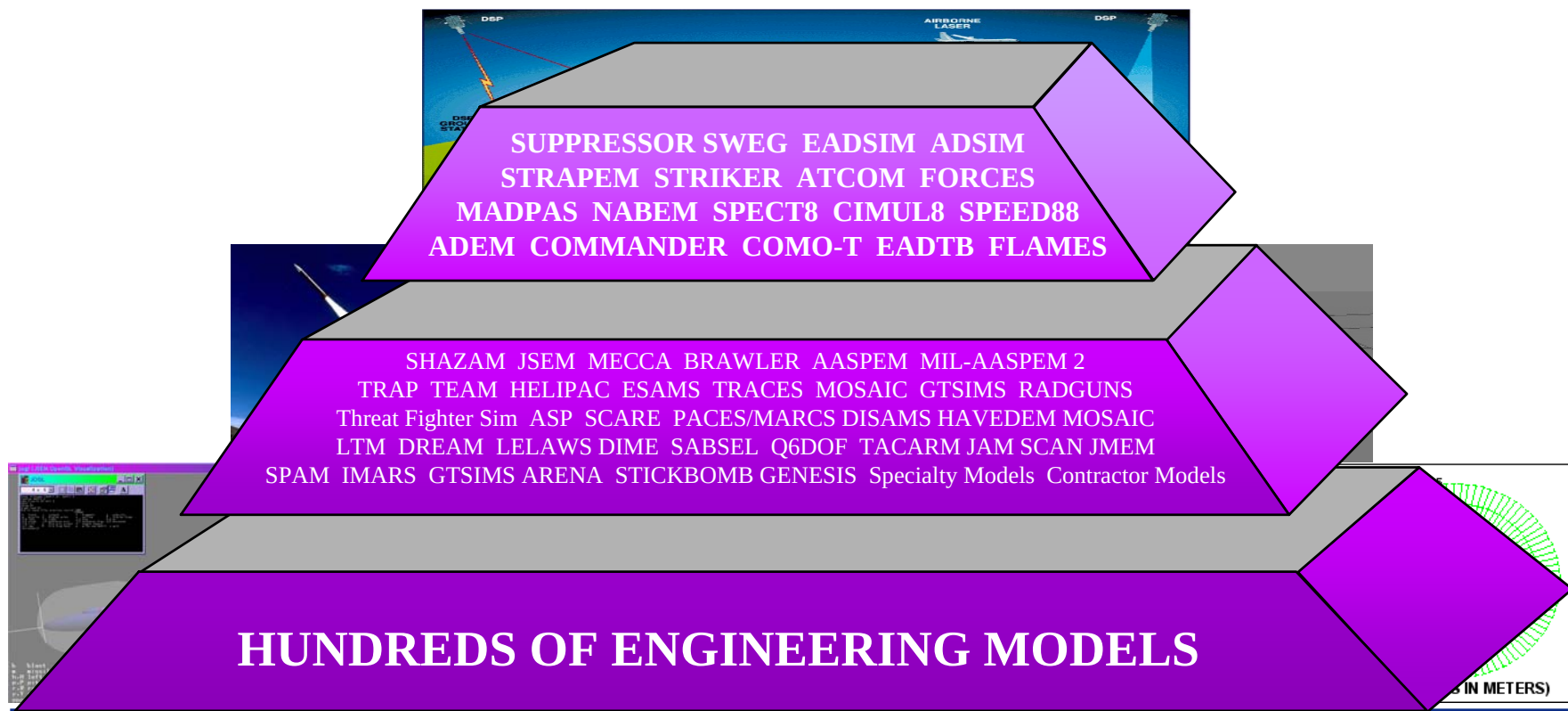
Sample Tools
You May Encounter

EADSIM
SUPPRESSOR
JIMM



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Mission-Level *Many-v-Many Summary*

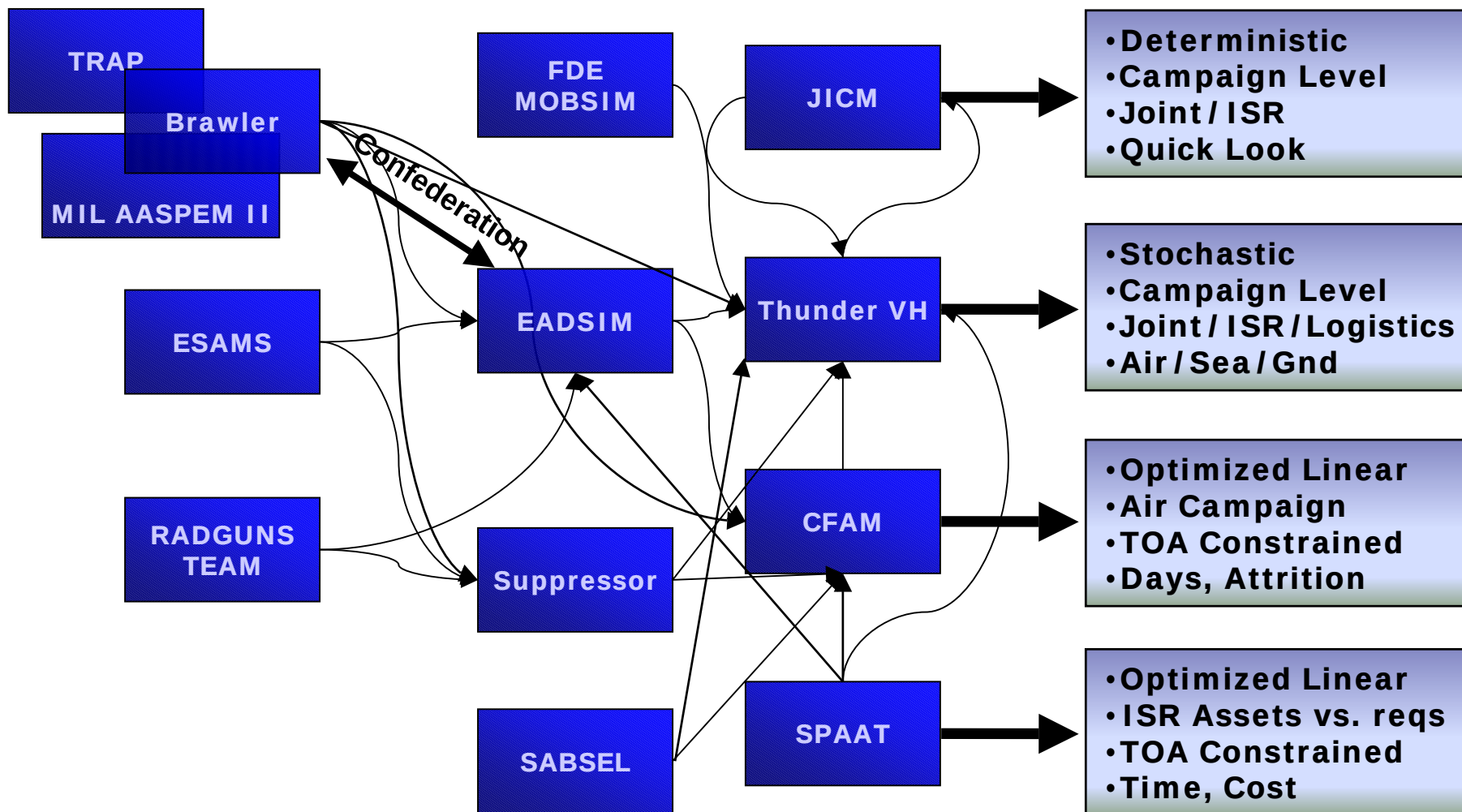




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Survivability & Vulnerability:

Impacts on Campaign Level Analysis

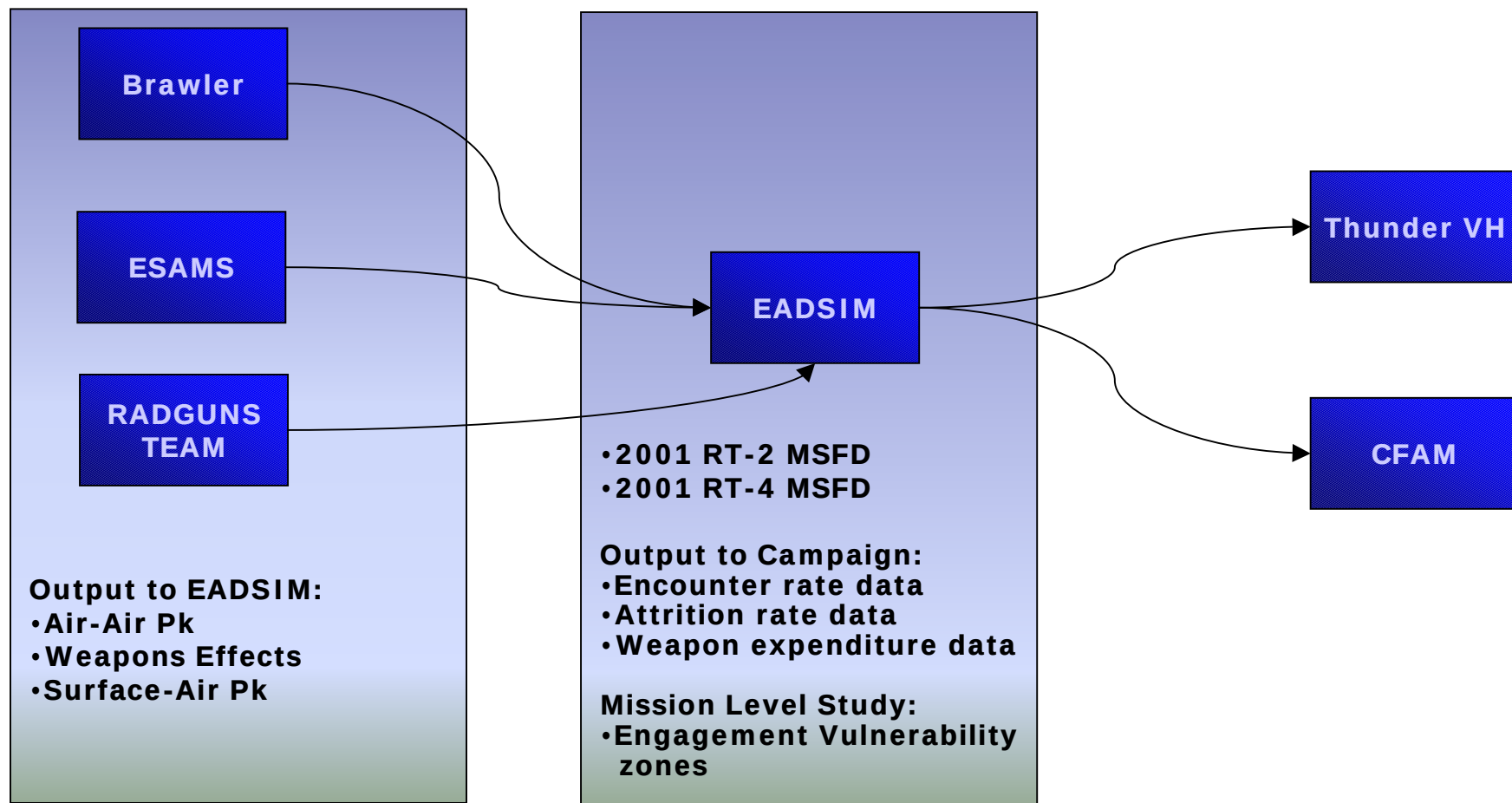




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EADSIM

Input to THUNDER & CFAM

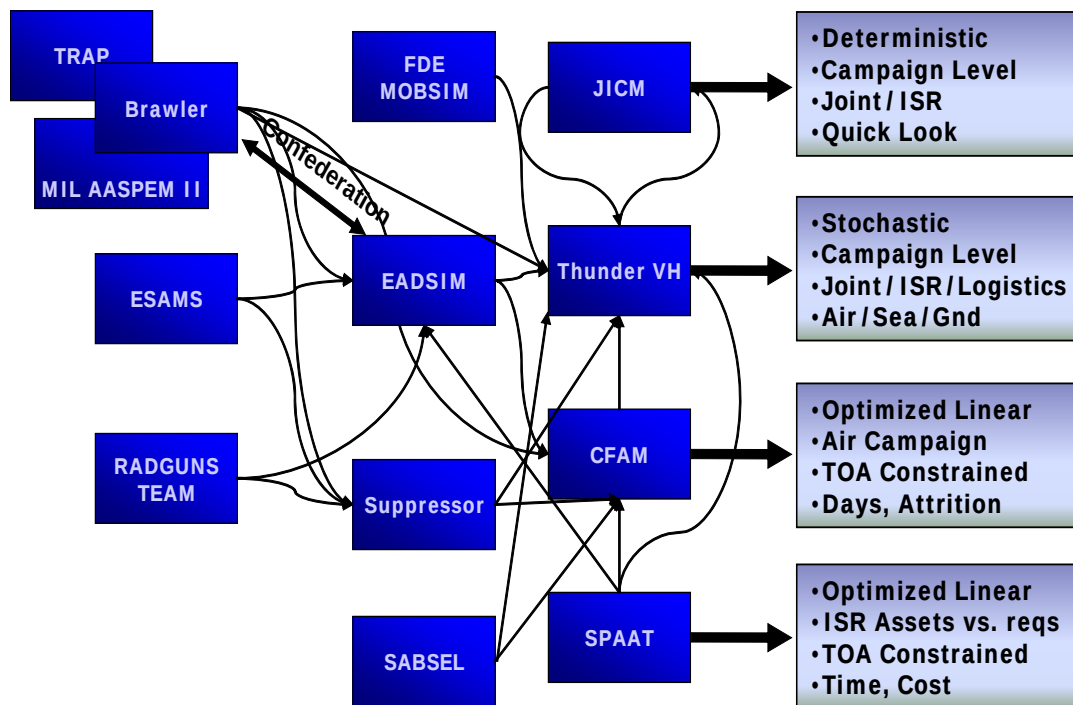




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S&V Impact Analysis

Consistent Scenario, CONOPS & Data Set



To answer high level questions to show the impact of S&V, Analyst must use

- Same scenario
- CONOPS
- Data sets

for all levels of M&S and data generation.

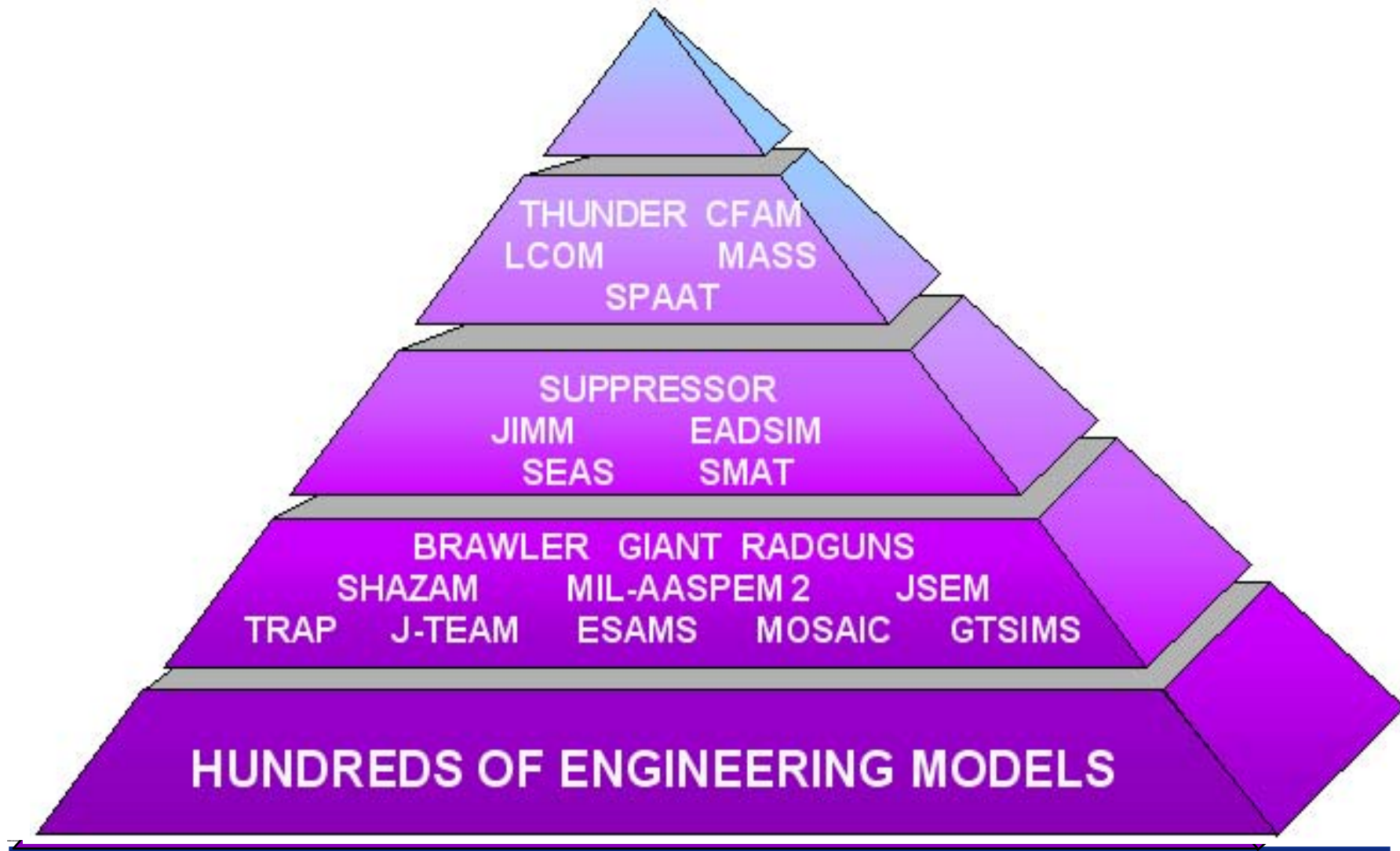


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Campaign Level *Summary*



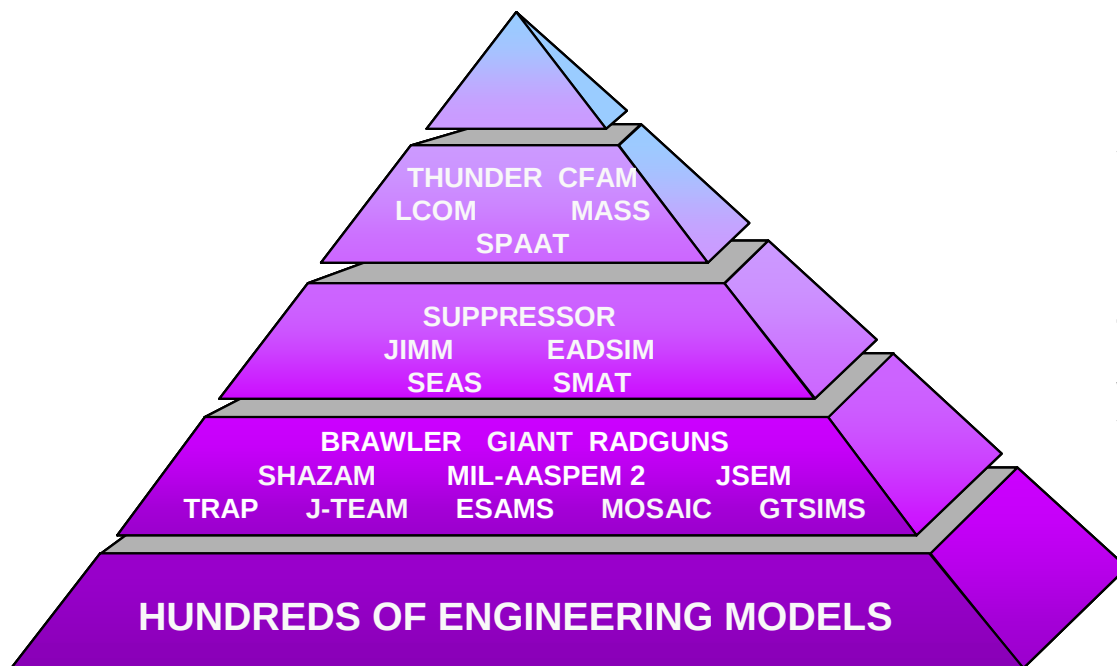
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AFSAT Value Added *Summary*

- AF Analytic Community approved set of M&S
- Ability to demonstrate S&V impacts at mission and campaign levels



Air Force Standard Analysis Tool Kit

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