

# ARIES

## Advanced Requirements Integration & Exploration System



### ARIES Overview

ARIES is a decision support tool created to provide requirements developers with an analytic capability to explore tradeoffs and gain insight to inform the requirements integration process. The ARIES capability captures a representative set of the full spectrum of potential requirement values to identify low-level requirement interactions and allows decision makers to interactively explore these interrelationships. This real-time feedback facilitates discussions to reconcile conflicts between requirements from multiple disciplines early in a program, ultimately leading stakeholders to convergence upon a set of simultaneously feasible system requirements while considering programmatic and technological constraints. This information also helps inform future technology investment decisions necessary to meet the agreed upon requirements.

The ARIES ultra-high dimensional optimization algorithm can analyze highly complex problems and identify key requirement inconsistencies early on in the acquisition/development process—supporting successful system fielding. ARIES provides strong analytical backing to requirements decisions.

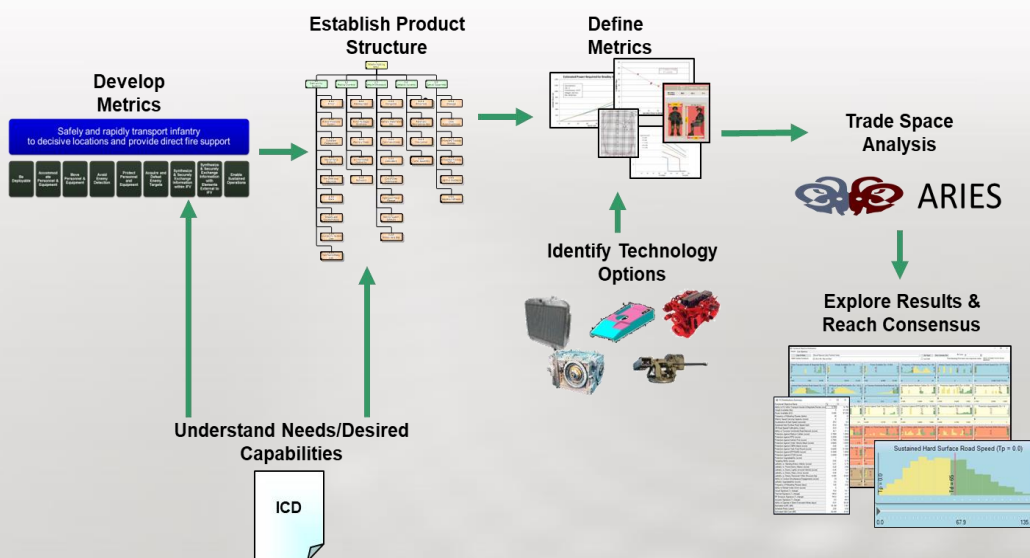
### Highlights

#### What does ARIES Enable?

- Decision support for developers of system requirements
- Analytically-backed exploration and compromise to develop an integrated set of feasible requirements
- Negotiations between stakeholders in order to reach a consensus on achievable requirements

#### Why is ARIES important?

- Reduces likelihood of inconsistent or unaffordable sets of requirements early in a program—providing a strong foundation for system design and development
- Provides insight into requirements tradeoffs/impacts
- Makes it easier to defend decisions by bringing the analytic rigor of individual requirements to the integration process



ARIES Methodology

#### Example Applications

- Integration of system requirements into a consistent, achievable set
- Early research and development investment guidance for complex systems with competing requirements and stakeholders

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## Key Features:

### Optimization Features:

- High-dimensional optimization that provides a thorough exploration of the tradeoffs between system requirements
- Does not use compromise-based objective aggregation, which would obscure the true relationships between requirements
- Accounts for budget, schedule, and technology constraints

### Input Features:

- Allows users to define a desired threshold for each requirement which is used as a reference point in the analysis process
- Users can manually define and plot sets of proposed requirements against the feasible optimal sets to begin to understand where compromises must be made

### Output Features:

- Creates distribution charts based on optimal solution values, one for each requirement, and compiles them into a grid—the collaborative workspace for requirements integration
- Advanced visualization and data exploration
  - Users can filter solutions based on specified values for each requirement and monitor changes to identify tradeoffs in other requirements as filters are applied
  - Visualize distributions for the spread of values achieved by the optimal solutions for each requirement
  - Identify requirements that satisfy desired levels and those that fall short when certain constraints are applied

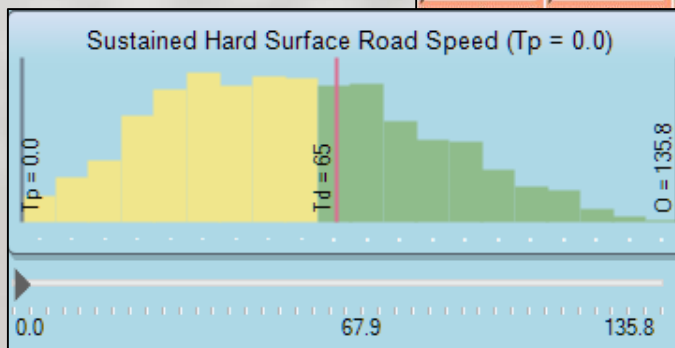
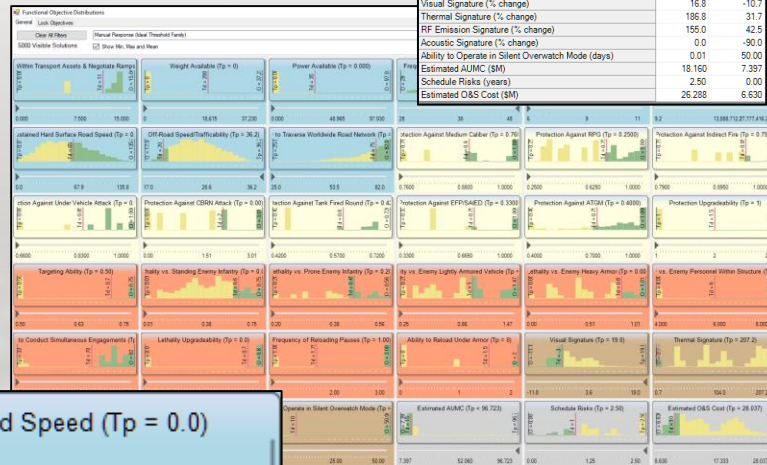
## Key Benefits:

- Provides achievable requirement values that are challenging (not infinite ways to meet target) yet robust (more than one way to meet target)
- Provides insightful results tables and charts
- Improved efficiency of acquisition programs and system development activities
- Avoids increased cost, delays, and enables system developers to get capability to their intended end user faster
- Real-time feedback that allows users to modify requirements and immediately understand impacts on other requirements

### ARIES Generated Results:

- *Threshold and Objective values for each requirement (top)*
- *ARIES Collaborative Grid (middle)*
- *Detailed Histogram for each requirement (bottom)*

| Functional Objective Name                                      | Top    | 0      |
|----------------------------------------------------------------|--------|--------|
| Ability to Fit Within Transport Assets & Negotiate Ramps (cou) | 5.750  | 14.750 |
| Weight Available (lbs)                                         | 0      | 37,230 |
| Power Available (kW)                                           | 0.000  | 97,930 |
| Frequency of Refueling Pauses (tanks)                          | 46     | 32     |
| Infantry Squad Carrying Capacity (score)                       | 6      | 11     |
| Acceleration & Dash Speed (seconds)                            | 35.0   | 9.8    |
| Sustained Hard Surface Road Speed (kph)                        | 63.4   | 135.8  |
| Off-Road Speed/Trafficability (index)                          | 33.9   | 17.8   |
| Ability to Traverse Worldwide Road Network (score)             | 34.1   | 81.8   |
| Protection Against Medium Caliber (score)                      | 0.7600 | 1.0000 |
| Protection Against RPG (score)                                 | 0.2500 | 1.0000 |
| Protection Against Indirect Fire (score)                       | 0.7900 | 1.0000 |
| Protection Against Under Vehicle Attack (score)                | 0.6600 | 1.0000 |
| Protection Against CBRN Attack (score)                         | 0.00   | 3.01   |
| Protection Against Tank Fired Round (score)                    | 0.4200 | 0.7200 |
| Protection Against EPF/SIED (score)                            | 0.3300 | 1.0000 |
| Protection Against ATGM (score)                                | 0.4000 | 1.0000 |
| Protection Upgradeability (score)                              | 1      | 2      |
| Targeting Ability (score)                                      | 0.50   | 0.75   |
| Lethality vs. Standing Enemy Infantry (score)                  | 0.01   | 0.75   |
| Lethality vs. Prone Enemy Infantry (score)                     | 0.20   | 0.95   |
| Lethality vs. Enemy Lightly Armored Vehicle (score)            | 0.25   | 1.47   |
| Lethality vs. Enemy Heavy Armor (score)                        | 0.00   | 1.01   |
| Lethality vs. Enemy Personnel Within Structure (kg)            | 4,000  | 8,000  |
| Ability to Conduct Simultaneous Engagements (score)            | 33     | 92     |
| Lethality Upgradeability (score)                               | 0.0    | 0.8    |
| Frequency of Reloading Phases (days)                           | 1.00   | 3.00   |
| Ability to Reload Under Armor (score)                          | 0      | 2      |
| Visual Signature (% change)                                    | 16.8   | -10.7  |
| Thermal Signature (% change)                                   | 186.8  | 31.7   |
| RF Emission Signature (% change)                               | 155.0  | 42.5   |
| Acoustic Signature (% change)                                  | 0.0    | -90.0  |
| Ability to Operate in Silent Overwatch Mode (days)             | 0.01   | 50.00  |
| Estimated AUMC (\$M)                                           | 18,150 | 7,397  |
| Schedule Risks (years)                                         | 2.50   | 0.00   |
| Estimated O&S Cost (\$M)                                       | 26,288 | 6,630  |



## Contact Us

**Bruce Thompson**

CSR Program Lead, Manager

Tel: (505) 284-4949

bmthomp@sandia.gov