

### Reliability-Based Design Optimization (RBDO) for Ground Vehicle Durability

This case study shows how RAMDO® software, when used in conjunction with durability analysis, provides improved reliability and mobility, reduced weight, and increased durability for U.S. Army ground vehicle components.

Using reliability-based design optimization (RBDO), decision makers can design to target reliabilities resulting in safer and more reliable ground vehicles. The stakes are high, as component failure can mean potential loss of life.



#### CHALLENGES

The U.S. Army requires ground vehicles that are durable and reliable. But enhancing component strength often leads to increased weight, resulting in decreased mobility, more fuel consumption, and additional material costs. They realized their current method for optimizing component design for durability would not generate reliable designs unless it accounted for manufacturing tolerances and variabilities in the material properties.

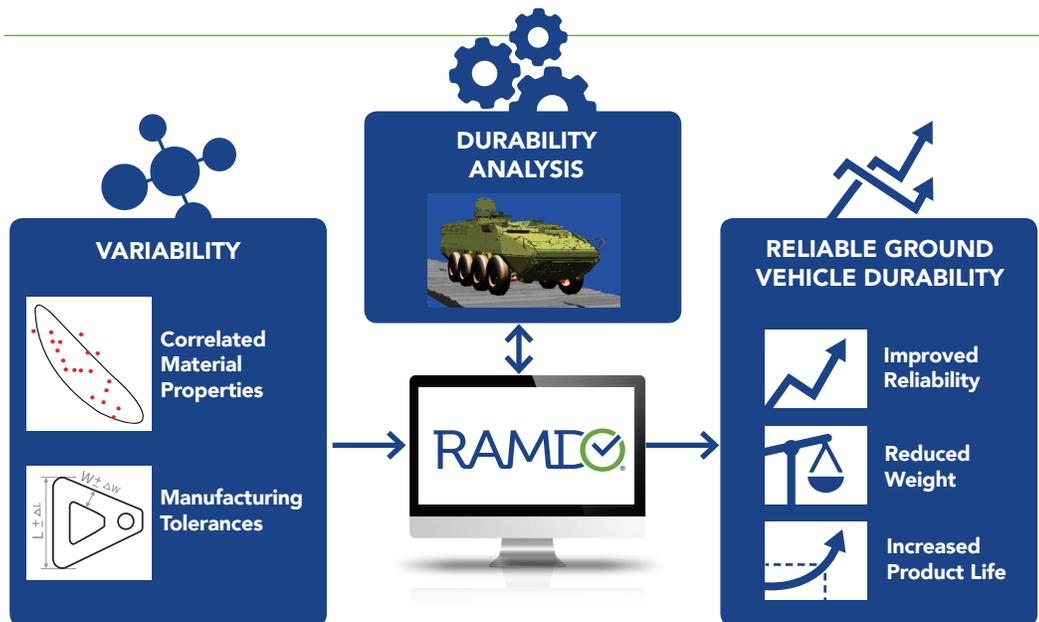
#### OBJECTIVE

Provide component designs for U.S. Army ground vehicles that satisfy target reliabilities, minimize weight, reduce costs, increase mobility, and improve durability.

#### METHOD

RAMDO works in conjunction with the simulation model, allowing engineers to define the variability of the input parameters. Instead of creating the typical surrogate model of the entire design space, RAMDO uses a unique technique, called the variance window. This method builds a surrogate model in the variance window, which is defined by using the distributions of the input parameters and the correlation between the material properties for each design iteration.

Through this process, RAMDO is able to more efficiently and accurately analyze the reliability of the design.



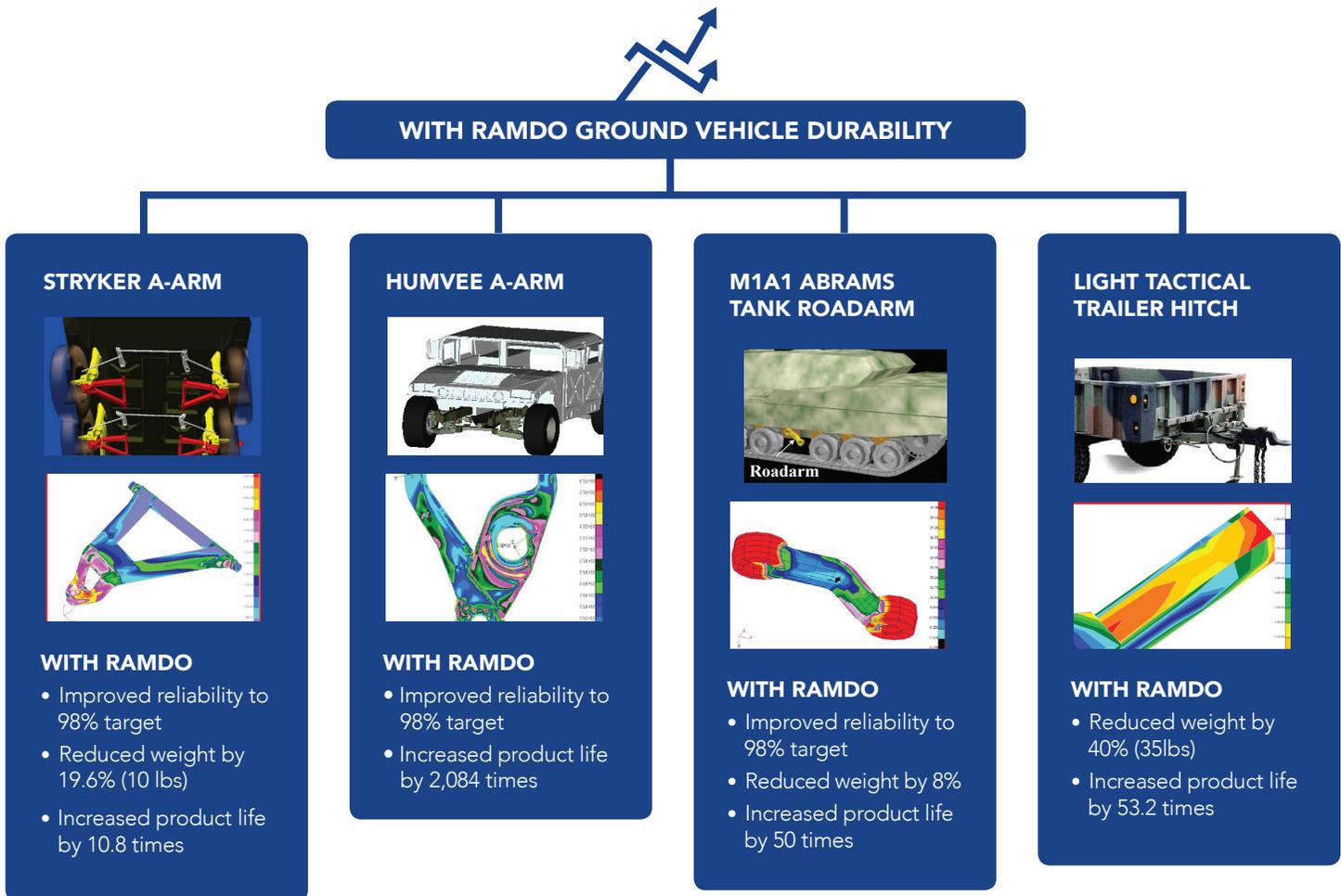
#### Reliable Ground Vehicle Durability Method Example

RAMDO worked in conjunction with a durability analysis. Input parameter variations accounted for were correlated material properties and manufacturing tolerances.

The resulting optimum component design led to improved reliability, minimized weight, reduced costs, increased mobility, and improved durability increasing mission success.

### RESULTS

RAMDO's methods produce an optimum design that satisfies the target reliabilities providing the most durable and reliable solutions at minimum cost.



### ADVANTAGE

RAMDO's unique approach for the U.S. Army's ground vehicle component designs addressed durability and reliability concerns. With RAMDO, results are accurate, reliable, and computationally affordable.

### SUMMARY

With the ability to better design reliable components, U.S. Army ground vehicles will be lighter, safer, more durable and fuel efficient, resulting in reduced costs and higher mission success.