# RMA Analysis via RBDA

**Reliability, Maintainability, Availability (RMA) Analysis**: An analysis that predicts reliability (uptime) and/or maintainability (downtime) and availability (mission readiness being a function of uptime and downtime). If a system is non-repairable, only reliability is estimated since the measures of maintainability and availability are not applicable. The Reliability Block Diagram Analysis (RBDA) method is used to estimate and analyze the reliability and availability for systems containing at least two or more elements. From a systems engineering perspective, RMA is an operating characteristic and not a technical characteristic of a system. The RMA measures and related analytical method are formally defined as:

- **Reliability** is the probability (likelihood) a system will perform its intended function with no failures during a given period of time (mission time) under specified operating conditions (environment).
- **Maintainability** is the probability a failed item will be restored or repaired to a specified condition within a given period of time.
- **Availability**, a function of reliability and maintainability (R&M), is the probability a repairable system will perform its intended function at a given point in time or over a specified period of time when operated and maintained in a prescribed manner.
- **Reliability Block Diagram Analysis (RBDA)** is a deductive (top-down) method that generates a symbolic-logic model in success space that depicts and analyzes the reliability (and/or availability) relationships between the system and system elements and/or events. A system element can be a subsystem, subassembly, component, or part. Typical RBD models are constructed of series, parallel redundancy (only one of the n active legs is required), k-out-of-n redundancy (k number of the n active legs is required), load-sharing redundancy (all legs work together to handle the same load), standby redundancy (only the minimum number of legs required for operation are active), and/or combinations of series and parallel configurations. The RBD model at the system level describes a successful operation (i.e., performs its intended function) when an uninterrupted path exists between the model's input and output. The RBD:
    - Is the result of a Functional Flow Block Diagram (FFBD) from a Functional Analysis. FFBDs and RBDs are critical to the success and creation of Failure Modes and Effects Analyses (FMEAs).
    - Provides a design baseline and serves as a means to identify weak areas and changes early in the design phase.
    - Blocks can be arranged in a manner that represent in success space how the system elements function in the system. Thus, the RBD method tends to be easier for the design engineer and systems-reliability engineer to visualize than other logic models (e.g., FMEAs and fault trees).
    - Serves as input to accomplish related analyses (e.g., FMEA, fault tree, spare, and maintenance).