Mission Assurance: A Systematic Process For Mission Success

Mission assurance focuses on operating outcomes, one of the two major characteristics of a system.

1. **Technical characteristics:** Physical characteristics (e.g., size, weight, volume, shape, accuracy, capacity, flow rate, throughput, units per time period, power output) the system when operating must exhibit to accomplish its intended function. Technical characteristics describe the system's functional capability and are typically found on the engineering drawing.
2. **Operating characteristics:** Non-physical characteristics (e.g., safety and reliability – described below) the system when operating must exhibit to accomplish its intended function. These operating behaviors and outcomes though abstract are still "design for" parameters for mission success.

Mission assurance programs typically address all or some of the following operating characteristics...

1. **Safety**
   - Freedom from accident and loss.
2. **Reliability**
   - Likelihood an item will perform its intended function with no failures (and with no scheduled or unscheduled downtime events) during a specified period of time (i.e., uptime being a continuous mission) under specified conditions (operating environment).
3. **Maintainability**
   - Likelihood an item causing downtime will be restored or repaired to a specified condition within a period of time.
4. **Availability**
   - Likelihood a repairable item has an uptime state. Availability is a function of reliability (uptime) and maintainability (downtime).
5. **Usability**
   - Interfaces between human and hardware and human and software.
6. **Supportability and Serviceability**
   - Support and service throughout the planned life cycle.
7. **Producibility**
   - Ease and economy of producing.
8. **Disposability**
   - Disassembly and disposal.
9. **Affordability**
   - Life-cycle cost or total cost of ownership and not just system acquisition cost.

Mission assurance programs have goals, a plan, work processes, and analytical products such as…

1st **Reliability Block Diagram Analysis** (RBDA) performed by Engineering. System elements are modeled in success space. Mature systems use demonstrated data more so than handbook data and expert opinion.

2nd **Failure Mode Effect Analysis** (FMEA) performed by both Engineering and Safety & Mission Assurance. A bottoms-up analysis modeled in failure space (i.e., system-element failure to effect).

3rd **Fault Tree Analysis** (FTA) performed by Safety & Mission Assurance. A top-down analysis modeled in failure space (i.e., failure-end state to system-element failures and/or other contributors).

4th **Probabilistic Risk Assessment** (PRA) performed by Safety & Mission Assurance. A comprehensive approach that identifies, analyzes, and quantifies risk using little data and the products above along with event trees, Bayesian statistics, and simulation.

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