Scalable Industry-Targeted Approach to Mission Assurance Training Curriculum

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Introduction

Mission Assurance Definition

Mission Assurance is a disciplined application of proven scientific, engineering, quality, and program management principles toward the goal of achieving mission success. We follow a general Systems Engineering framework and use risk management and independent assessment as cornerstones throughout the program life cycle. [TOR2011(8591)-21]

SDL Safety & Mission Assurance is trained to ensure

- Program quality requirements are applicable, validated and verified
- Risks are clear and mitigated as needed
- Parts and materials are appropriate for the mission and environment
- Environmental stresses are accounted for
- Needed margins are established and maintained
- Reliability is well understood and meets mission constraints
- Failure modes and effects are identified, elucidated and addressed
- Safety to both personnel and hardware is maximized
- Costing is targeted

SDL Uses Three Major Tools From Aerospace Corp for Curriculum Development

Mission Assurance Program Framework - TOR-2010(8591)-18

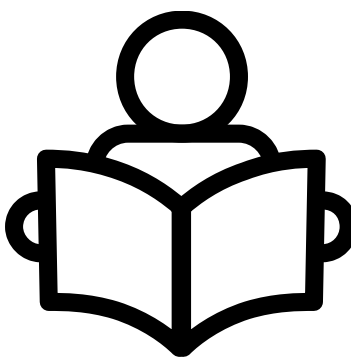
- 16 common mission assurance processes essential to provide effective mission assurance

Mission Assurance Guidelines for A-D Mission Risk Classes - TOR-2011(8591)-21

- Guidelines to define characteristic profiles for mission assurance processes as a recommended technical baseline

Mission Assurance Guide – TOR-2007(8546)-6018

- Guide is to provide practical guidance to personnel who are responsible for executing mission assurance (MA) functions that are key to achieving program and mission success.



What is a Standard S&MA Curriculum (TOR-2011(8591)-21)

- TOR-2011(8591)-21, Mission Assurance Guidelines for A-D Mission Risk Classes
  - Baseline for SDL curriculum

Category	Process
1. Program Execution	(1) Design Assurance (2) Requirement Analysis and Validation (3) Parts, Materials and Processes (4) Environmental Compatibility (5) Reliability Engineering (6) System Safety (7) Configuration/Change Management (8) Integration, Test and Evaluation
2. Risk, Oversight and Assurance	(9) Risk Assessment and Management (10) Independent Reviews (11) Hardware Quality Assurance (12) Software Assurance (13) Supplier Quality Assurance
3. Triage, Information and Lessons Learned	(14) Failure Review Board (15) Corrective/Preventative Action Board (16) Alerts, Information Bulletins

TOR2011(8591)-21

SDL Derived Program Execution Trainings

- TOR-2011(8591)-21, Mission Assurance Guidelines for A-D Mission Risk Classes
  - Baseline for SDL curriculum

Quality and Mission Assurance		
1.0 Program Execution • Safety and Mission Assurance Overview • Role of a Mission Assurance Manager	**1.1 Requirements Analysis and Validation**	• Requirements Writing/Verification/Validation • Mission Classes Defined
	1.2 Design Assurance	
	1.2.1 Parts, Materials and Processes	• Role of a EEE Parts Engineer • EEE Parts Group Testing Explained • Parts Materials & Control Boards • Creating EEE Parts SCDs • Contamination Control Overview • M&P Overview
	1.2.2 Reliability Engineering	• Role of a Reliability Engineer • Reliability Predictions • Reliability Prediction Demonstration • Windchill Training • FMEA/FMECA • Parts Stress Analysis • Worst Case Analysis • Limited Life Analysis • Critical Items List
	1.2.3 Radiation Engineering	• Radiation Effects Overview • Radiation Engineering • Radiation Testing for EEE Parts
	1.3 System Safety	• System Safety Overview • Range Safety in Practice
	1.4 Environmental Compatibility	• S&MA in the Environmental Test Campaign
	1.5 Configuration Change Management	• Change Control Boards
	1.6 Integration, Test and Evaluation	• S&MA in AI&T

SDL Derived Risk Oversight Trainings

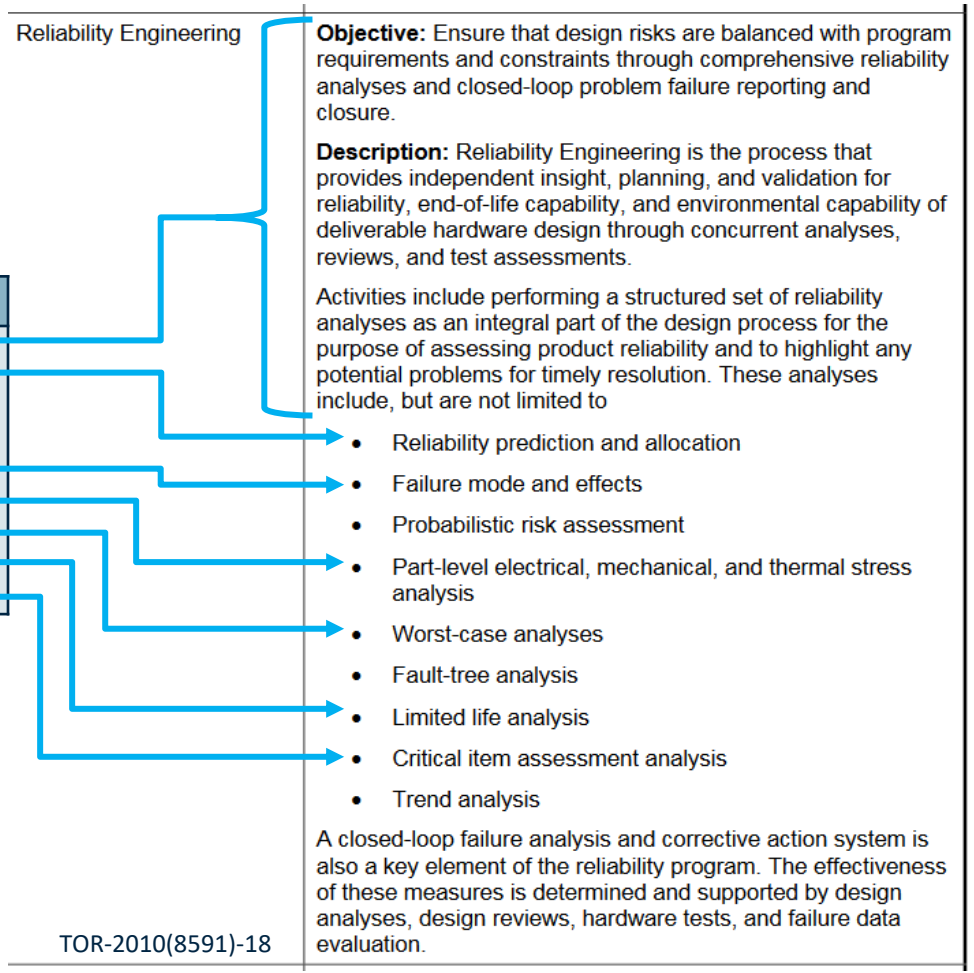
Quality and Mission Assurance		
2.0 Risk Oversight and Assurance	2.1 Risk Assessment and Management	• Risk Identification/Management
	2.2 Hardware Quality Assurance	• Quality Engineering Overview
	2.3 Software Assurance	• Software Assurance Overview
	2.4 Supplier Quality Assurance	• Critical Supplier Risk Management • SCAR Identification, Tracking and Management
	2.5 Independent Reviews	• Mission Assurance Reporting at Milestones

SDL Derived Triage Trainings

Quality and Mission Assurance		
3.0 Triage, Information and Lessons Learned	**3.1 Material Review Board**	• MRB vs. FRB
	3.2 Corrective/Preventative Action Board	• Nonconformance Training • Failure Review Boards • Corrective Actions • Lessons Learned
	3.3 Alerts, Information Bulletins	• Alert Notification and Management

Breakdown of Required Content and Subsequent Trainings (TOR-2010(8591)-18)

1.0 Program Execution	
1.2.2 Reliability Engineering	• Role of a Reliability Engineer • Reliability Predictions • Reliability Prediction Demonstration • Windchill Training • FMEA/FMECA • Parts Stress Analysis • Worst Case Analysis • Limited Life Analysis • Critical Items List



TOR-2010(8591)-18, Mission Assurance Program Framework - breaks down the specific topics that should be included as a minimum to address the topic of Reliability Engineering

Description of Tasks (TOR-2007(8546)-6018)

- TOR-2007(8546)-6018, Mission Assurance Guide defines and describes each of the “practices and tasks” that constitute “Reliability Engineering”

Chapter 11

Reliability Engineering

Roland J. Duphily
Acquisition and Risk Management Office

11.1 Introductions

Reliability engineering encompasses a set of analytical activities that include the development requirements, the analys identification and contro of probabilistic reliabilit failure rates, the use of v analysis of accelerated li recurrence prevention sy adequately driven to clos tailored) that define the r

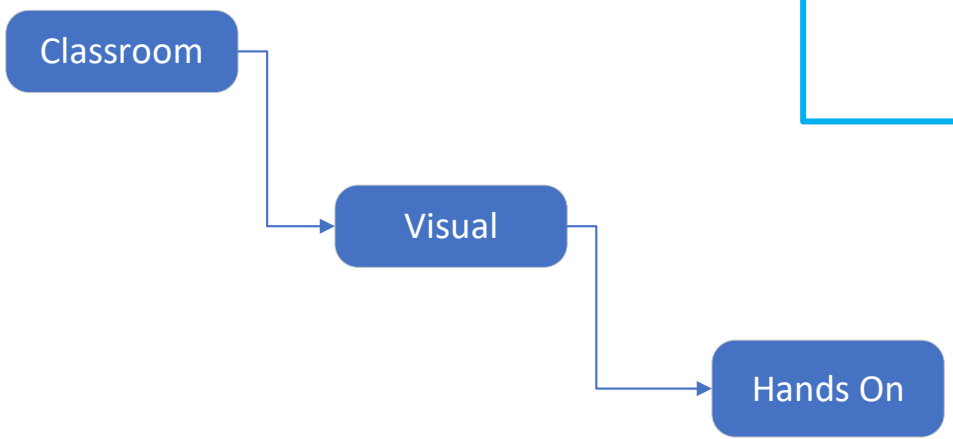
11.4.6 Parts Reliability Analysis

Electrical, electronic, optical, and mechanical part failure rates are the basic building blocks of probabilistic reliability predictions. Therefore, confidence in the predictions is very much dependent on having failure rates (MIL-HBK-217, etc.) derived from credible sources or test data with appropriate adjustments for quality, end use environment, stress levels, and temperature levels. To help validate reliability predictions, an independent evaluation is performed on part quality level, available accelerated part life test data, derating criteria (MIL-STD-1547), parts stress analysis, participation in government industry data exchange program (GIDEP) alerts, and junction temperature limits (< 105C). For new parts (e.g., heterojunction bipolar transistors (HBTs), field programmable gate arrays (FPGAs), etc.) it is especially important that the part qualification process be independently reviewed by a team consisting of experts from PM&P and reliability to validate the design.

TOR-2007(8546)-6018

SDL Training Philosophy

1.0 Program Execution	
1.2.2 Reliability Engineering	• Reliability Predictions Overview • Reliability Prediction Demonstration • Windchill Training



1st Training is to become familiar with the tasks and verbiage

2nd Training is to see someone perform the tasks

3rd Training is to perform the tasks/analyses under supervision

4th Go train others

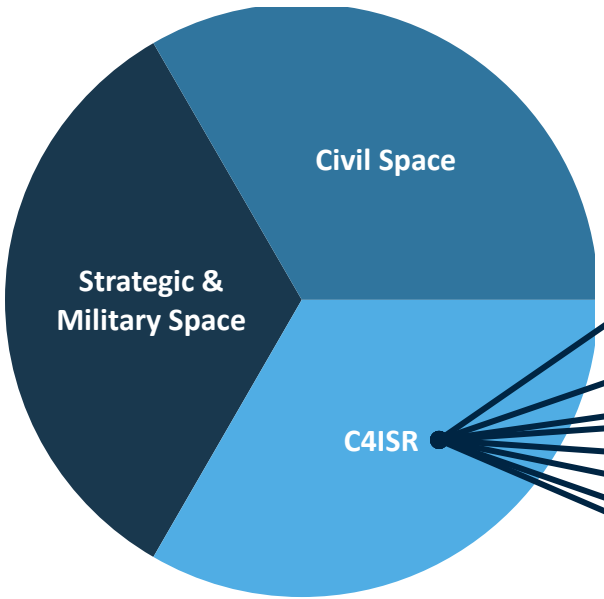
All trainings are created and delivered by subject matter experts

S&MA Tailoring

SDL's Civil Space and Strategic & Military Space include hardware and software expertise

SDL's C4ISR is largely software driven

- Tailoring training for S&MA would focus on software and de-emphasize hardware



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Quality and Mission Assurance
1.1 Requirements Analysis and Validation
1.2 Design Assurance
1.2.1 Parts, Materials and Processes
1.2.2 Reliability Engineering
1.2.3 Radiation Engineering
1.3 System (Software) Safety
1.4 Environmental Compatibility
1.5 Configuration Change Management
1.6 Integration, Test and Evaluation
2.1 Risk Assessment and Management
2.2 Hardware Quality Assurance
2.3 Software Assurance
2.4 Supplier Quality Assurance
2.5 Independent Reviews
3.1 Material Review Board
3.2 Corrective/Preventative Action Board
3.3 Alerts, Information Bulletins

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Conclusion

- The Aerospace trifecta of documents provide the backbone of SDL's S&MA curriculum
  - TOR-2010(8591)-18, Mission Assurance Program Framework
  - TOR-2011(8591)-21, Mission Assurance Guidelines for A-D Mission Risk Classes
  - TOR-2007(8546)-6018, Mission Assurance Guide
- Tailoring is achieved through the type of work performed (Software vs. Hardware), through the environment (Terrestrial vs. Space) and through the Mission Class of the individual programs (A-D Mission Classes)
- Classroom Training courses to Visual/Task Witnessing to Hands-on Training address the 3 main learning types (Auditory, Visual and Kinesthetic)
- Subject Matter Experts develop and present their expertise and then learn from other SMEs

Trained personnel pay it forward