DASD(SE) Reliability and Maintainability Engineering Initiatives

Andrew Monje

Office of the Deputy Assistant Secretary of Defense for Systems Engineering

17th Annual NDIA Systems Engineering Conference

Springfield, VA | October 30, 2014

DASD, Systems Engineering Mission

Systems Engineering focuses on engineering excellence – the creative application of scientific principles:

- To design, develop, construct and operate complex systems
- To forecast their behavior under specific operating conditions
- To deliver their intended function while addressing economic efficiency, environmental stewardship and safety of life and property

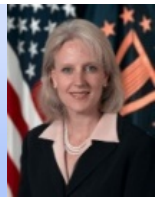
DASD(SE) Mission: Develop and grow the Systems Engineering capability of the Department of Defense – through engineering policy, continuous engagement with component Systems Engineering organizations and through substantive technical engagement throughout the acquisition life cycle with major and selected acquisition programs.

A Robust Systems Engineering Capability Across the Department Requires Attention to Policy, People and Practice

- ***US Department of Defense is the World's Largest Engineering Organization***
- ***Over 108,000 Uniformed and Civilian Engineers***
- ***Over 39,000 in the Engineering (ENG) Acquisition Workforce***

DASD, Systems Engineering

DASD, Systems Engineering
Stephen Welby
Principal Deputy Kristen Baldwin



Systems Analysis
Kristen Baldwin (Acting)

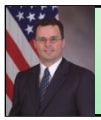
Addressing Emerging Challenges on the Frontiers of Systems Engineering

- Analysis of Complex Systems/Systems of Systems
- Program Protection/Acquisition Cyber Security
- University, FFRDC and Industry Engineering and Research
- Modeling and Simulation

Major Program Support
James Thompson

Supporting USD(AT&L) Decisions with Independent Engineering Expertise

- Engineering Assessment / Mentoring of Major Defense Programs
- Program Support Reviews
- OIPT / DAB / ITAB Support
- Systems Engineering Plans
- Systemic Root Cause Analysis



Mission Assurance
Robert Gold

Leading Systems Engineering Practice in DoD and Industry

- Systems Engineering Policy & Guidance
- Development Planning/Early SE
- Specialty Engineering (System Safety, Reliability and Maintainability Engineering, Quality, Manufacturing, Producibility, Human Systems Integration)
- Counterfeit Prevention
- Technical Workforce Development
- Standardization

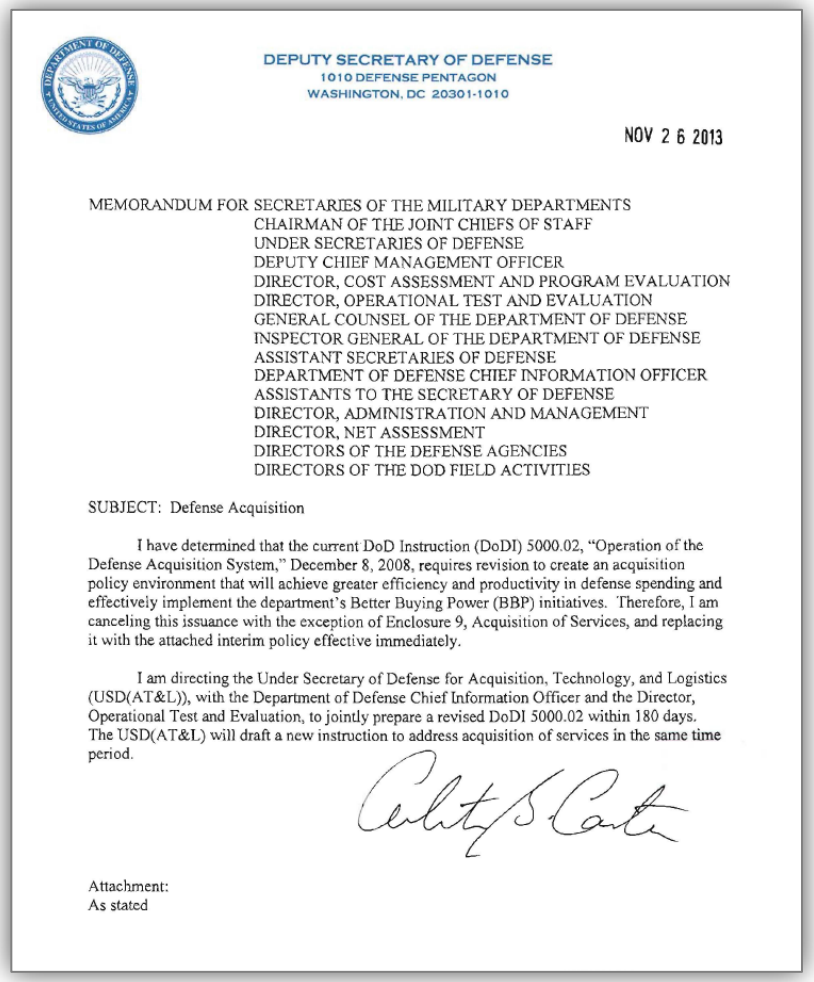
Providing technical support and systems engineering leadership and oversight to USD(AT&L) in support of planned and ongoing acquisition programs

Outline

- **Policy**
  - Interim Department of Defense Instruction (DoDI) 5000.02 Operation of the Defense Acquisition System
  - Reliability, Availability, Maintainability-Cost (RAM-C) Report Update Strategy
  - Defense Acquisition Executive Summary (DAES) Reliability Growth Curve (RGC) Reporting
- **Guidance**
  - Defense Acquisition Guidebook (DAG)
  - R&M Data Item Descriptions (DIDs) Update
- **Workforce**
  - R&M Learning Architecture
  - DAU R&M Courseware Development

Deputy Secretary of Defense Memorandum, "Defense Acquisition"

- **Issues interim DoDI 5000.02 signed Nov 26, 2013**
- **Incorporates and cancels DTM 11-003**
- **Enclosures applicable to R&M:**
  - Encl 3: Systems Engineering
  - Encl 4: Developmental Test and Evaluation
  - Encl 5: Operational Test and Evaluation
  - Encl 6: Life-cycle Sustainment Planning



DEPUTY SECRETARY OF DEFENSE
1010 DEFENSE PENTAGON
WASHINGTON, DC 20301-1010

NOV 2 6 2013

MEMORANDUM FOR SECRETARIES OF THE MILITARY DEPARTMENTS
CHAIRMAN OF THE JOINT CHIEFS OF STAFF
UNDER SECRETARIES OF DEFENSE
DEPUTY CHIEF MANAGEMENT OFFICER
DIRECTOR, COST ASSESSMENT AND PROGRAM EVALUATION
DIRECTOR, OPERATIONAL TEST AND EVALUATION
GENERAL COUNSEL OF THE DEPARTMENT OF DEFENSE
INSPECTOR GENERAL OF THE DEPARTMENT OF DEFENSE
ASSISTANT SECRETARIES OF DEFENSE
DEPARTMENT OF DEFENSE CHIEF INFORMATION OFFICER
ASSISTANTS TO THE SECRETARY OF DEFENSE
DIRECTOR, ADMINISTRATION AND MANAGEMENT
DIRECTOR, NET ASSESSMENT
DIRECTORS OF THE DEFENSE AGENCIES
DIRECTORS OF THE DOD FIELD ACTIVITIES

SUBJECT: Defense Acquisition

I have determined that the current DoD Instruction (DoDI) 5000.02, "Operation of the Defense Acquisition System," December 8, 2008, requires revision to create an acquisition policy environment that will achieve greater efficiency and productivity in defense spending and effectively implement the department's Better Buying Power (BBP) initiatives. Therefore, I am canceling this issuance with the exception of Enclosure 9, Acquisition of Services, and replacing it with the attached interim policy effective immediately.

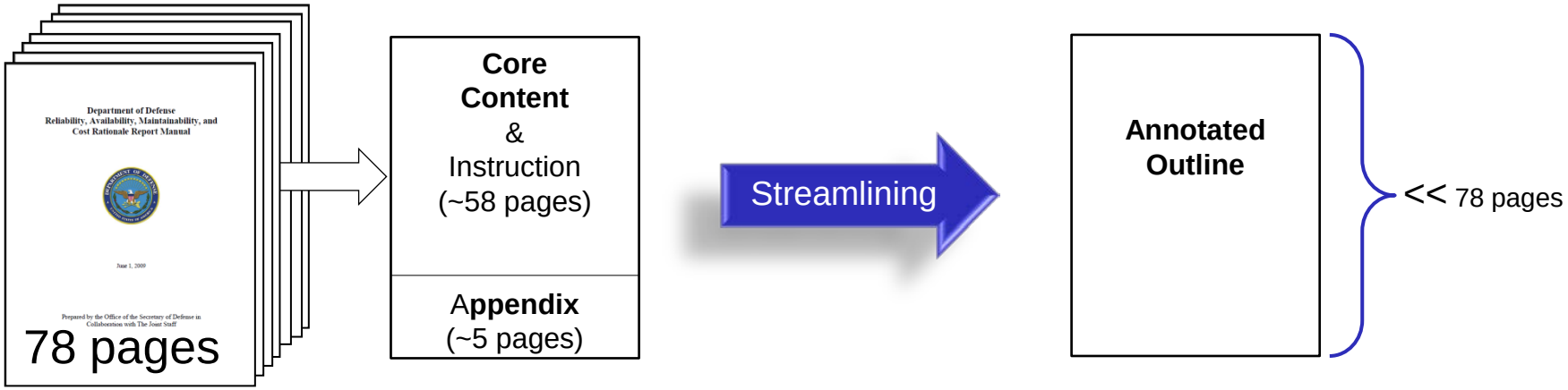
I am directing the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)), with the Department of Defense Chief Information Officer and the Director, Operational Test and Evaluation, to jointly prepare a revised DoDI 5000.02 within 180 days. The USD(AT&L) will draft a new instruction to address acquisition of services in the same time period.

Attachment:
As stated

http://www.dtic.mil/whs/directives/corres/pdf/500002_interim.pdf

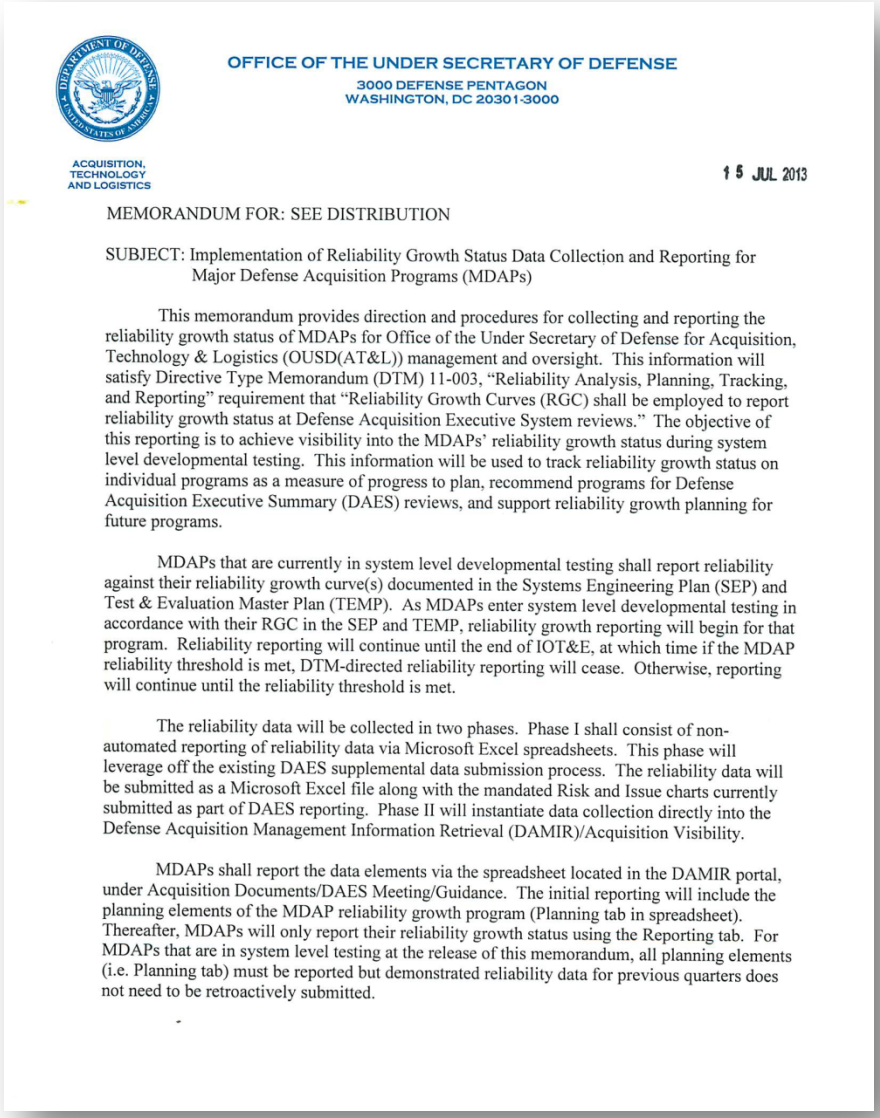
RAM-C Update Strategy

Annotated Outline link in SEP



- **Streamline the Core Content & Instruction into the Annotated Outline format**
  - Focus content on validity, feasibility, and proper balance of requirements
  - Delete example and redundant information/instruction
  - Utilize supporting policy and guidance
  - Provides direction (“Call out what is needed in the report”)
  - Allow reports to flow and get to the point

DAES Reliability Growth Curve (RGC) Reporting



OFFICE OF THE UNDER SECRETARY OF DEFENSE
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ACQUISITION, TECHNOLOGY AND LOGISTICS

15 JUL 2013

MEMORANDUM FOR: SEE DISTRIBUTION

SUBJECT: Implementation of Reliability Growth Status Data Collection and Reporting for Major Defense Acquisition Programs (MDAPs)

This memorandum provides direction and procedures for collecting and reporting the reliability growth status of MDAPs for Office of the Under Secretary of Defense for Acquisition, Technology & Logistics (OUSD(AT&L)) management and oversight. This information will satisfy Directive Type Memorandum (DTM) 11-003, "Reliability Analysis, Planning, Tracking, and Reporting" requirement that "Reliability Growth Curves (RGC) shall be employed to report reliability growth status at Defense Acquisition Executive System reviews." The objective of this reporting is to achieve visibility into the MDAPs' reliability growth status during system level developmental testing. This information will be used to track reliability growth status on individual programs as a measure of progress to plan, recommend programs for Defense Acquisition Executive Summary (DAES) reviews, and support reliability growth planning for future programs.

MDAPs that are currently in system level developmental testing shall report reliability against their reliability growth curve(s) documented in the Systems Engineering Plan (SEP) and Test & Evaluation Master Plan (TEMP). As MDAPs enter system level developmental testing in accordance with their RGC in the SEP and TEMP, reliability growth reporting will begin for that program. Reliability reporting will continue until the end of IOT&E, at which time if the MDAP reliability threshold is met, DTM-directed reliability reporting will cease. Otherwise, reporting will continue until the reliability threshold is met.

The reliability data will be collected in two phases. Phase I shall consist of non-automated reporting of reliability data via Microsoft Excel spreadsheets. This phase will leverage off the existing DAES supplemental data submission process. The reliability data will be submitted as a Microsoft Excel file along with the mandated Risk and Issue charts currently submitted as part of DAES reporting. Phase II will instantiate data collection directly into the Defense Acquisition Management Information Retrieval (DAMIR)/Acquisition Visibility.

MDAPs shall report the data elements via the spreadsheet located in the DAMIR portal, under Acquisition Documents/DAES Meeting/Guidance. The initial reporting will include the planning elements of the MDAP reliability growth program (Planning tab in spreadsheet). Thereafter, MDAPs will only report their reliability growth status using the Reporting tab. For MDAPs that are in system level testing at the release of this memorandum, all planning elements (i.e. Planning tab) must be reported but demonstrated reliability data for previous quarters does not need to be retroactively submitted.

- **DAES RGC reporting to begin Oct 2014 per Director, ARA memorandum**
  - **Requires reliability data from MDAPs in system-level Developmental Testing (~20 MDAPs required to report)**
  - **Captures planned and demonstrated data**
  - **Phase 1 – Manual submission of data via spreadsheets**
  - **Phase 2 – Automated submission directly into DAMIR (implementation TBD)**

Defense Acquisition Guidebook

- **Defense Acquisition Guidebook (DAG)**
  - Participated in DAG Ch 4 Rewrite as primary R&M Section Author*
  - R&M Engineering Section (4.3.18.19) is written to describe R&M engineering activities by phase (MSA Phase example below)

Table 4.3.18.19.T1. R&M Activities by Acquisition Phase

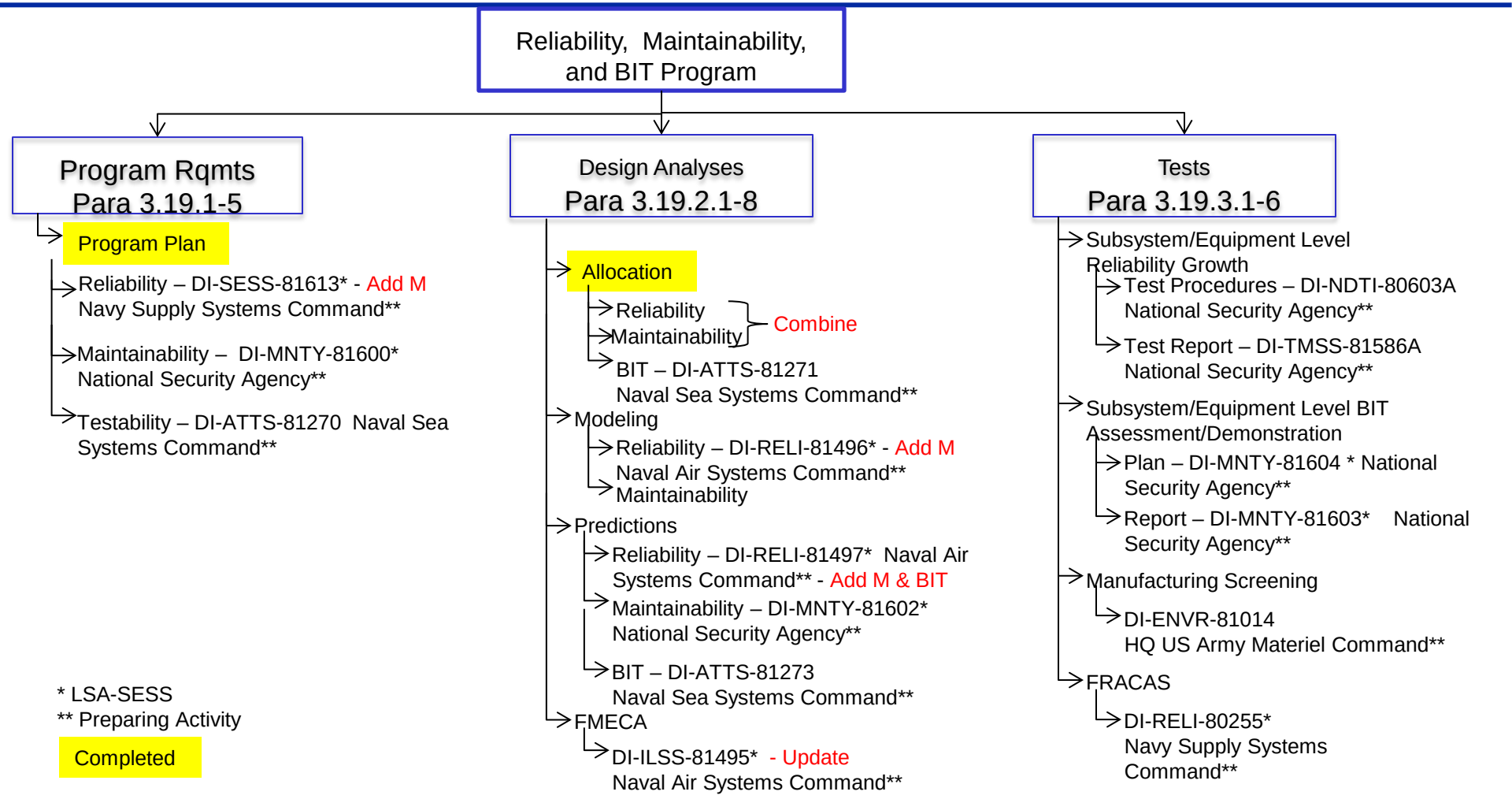
Acquisition Phase	R&M Activities
Materiel Solution Analysis (MSA) Phase. During the Materiel Solution Analysis Phase, the R&M engineer, as part of the program SE team, should:	• Analyze conceptual design approaches and estimate the feasibility with respect to R&M ICD performance capabilities • Perform AoA trade-off studies among R&M, availability, and other system performance parameters to arrive at a preferred system alternative. The studies should be performed in conjunction with product support, cost, and design personnel, using the DoD RAM-C Rationale Report Manual • Prepare the Reliability, Availability, Maintainability, and Cost (RAM-C) Rationale Report and attach it to the SEP • Translate ICD performance capabilities and draft CDD thresholds to R&M specification requirements based on system use conditions, mission profile, failure definitions, and utilization rates • Define contractor R&M engineering activities in the RFP and contract Statement of Work for the TD phase, which should include: a. Allocations b. Block diagrams and modeling c. Predictions d. Failure Mode, Effects, and Criticality Analysis (FMECA) e. Subsystem and system-level reliability growth planning activities f. R&M tests and demonstrations g. Failure Reporting, Analysis, and Corrective Action System (FRACAS)

* https://acc.dau.mil/dag4.3.18.19

R&M DIDs Update

- **Current DIDs do not reflect current R&M policy and guidance; programs are prohibited from "adding" to the DIDs when tailoring**
  - DIDs outdated
    - Current Maintainability Program Plan DID references cancelled MIL-STD
  - DIDs missing information
    - Current Reliability Block Diagrams and Math Models DID does not contain any maintainability or BIT requirements
  - DID does not exist
    - Mission Profile Definition, Environmental Effects Analysis, and R&M Allocations currently only reference a MISC DID
- **One DID is program-specific**
  - Current R&M Program Plan DID references LCAC Class craft program
- **This update provides an opportunity to combine some DIDs (Program Plan, Allocations, Predictions) and cancel DIDs containing outdated material**
- **Resulting DIDs will allow programs to effectively tailor to their specific needs**

Current DID Status



R&M Engineering Learning Architecture

- **Purpose: to provide career development guidance for the R&M Engineer**
- **R&M Learning Architecture – consolidation of desired:**
  - **Education**
  - **Experiences**
  - **Associated Training Available to the DoD community**
- **Defined set of guidance for each DAWIA Level**
- **Organizes desired experiences and training within each DAWIA level IAW DoD Engineering Subcompetency #33, R&M Engineering**
  - **R&M Engineering / Acquisition**
  - **R&M Design Analysis**
  - **R&M Product Support Planning**
  - **R&M Test**
  - **R&M Procurement**

CLE-301 Reliability & Maintainability Draft Module Design

Course Objective

Understand upper level (DAWIA II/III) R&M Engineering planning related to requirements, strategies, integration and implementation activities

CLE-301 Reliability & Maintainability Draft Module Design

Modules	1	2	3	4	5
Titles	R&M Requirements	R&M Planning	R&M Design Analysis	Program & Technical Reviews	Evaluate R&M Effectiveness
Tasks	ICD, CDD, CPD, TDS, SEP, TEMP analyze and provide input	Plans, DIDs, Test Results review and monitor	Develop Specs, FRACAS, FMECA, FDSC	MS A, B, & C, Tech Reviews	Data to analyze design change or corrections, and future increments

RAM-C Rationale Report Process Course

Course Objective

Demonstrate the development process for a RAM-C Rationale Report

Initial Design Concept

- Combination of online synchronous and asynchronous instruction
- Students complete lessons at their own schedule
- 2 to 3 case studies worked by student teams
- Case studies presented to instructor and other students in a online classroom at a scheduled time

R&M Topic Studies Course

Course Objective

Understand R&M engineering implementation examples aligned to each of the five R&M competency elements, i.e. project management, engineering, product support, procurement, test & evaluation

Topics:

1. Review Reliability & Maintainability (R&M) Engineering Planning in Acquisition Documentation
2. Reliability & Maintainability (R&M) Engineering Design Support
3. Monitor Reliability & Maintainability (R&M) Engineering During EMD, PD and O&S Acquisition Phases
4. Reliability & Maintainability (R&M) Engineering Reviews
5. Reliability & Maintainability (R&M) Engineering Considerations During Test & Evaluation

For Additional Information

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Systems Engineering: Critical to Defense Acquisition










Defense Innovation Marketplace
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DASD, Systems Engineering
http://www.acq.osd.mil/se