



wyle
laboratories

Reliability Information Analysis Center



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Report Documentation Page

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What is the Reliability Information Analysis Center (RIAC)?

RIAC is one of 10 DoD **Information Analysis Centers (IACs)** managed by the Defense Technical Information Center (DTIC). RIAC's charter includes **Reliability, Maintainability, Quality, Supportability, and Interoperability (RMQSI)**.





RIAC Quick Facts

| Attribute | Metric |
|-----------------------------------|---|
| Technologies | Reliability, Maintainability, Quality, Supportability, and Interoperability (RMQSI) |
| Library | 120,000 Documents (~30,000 are electronic) |
| User Base | >20,000 |
| Products | 85 (15 new ones since 2006, 10 under development) |
| Training | 25 Off-the-Shelf Courses Regular Quarterly Open-Presentation Courses |
| Research Projects Underway | 6 new reliability engineering tools under development |
| | ~60 Subscription Accounts in process |
| | ~140 Technical Area Tasks in process |
| Staff | ~2000 Staff Members (SMEs) Available |
| Impact | Data, Tools, and Guidelines Used on International Level |

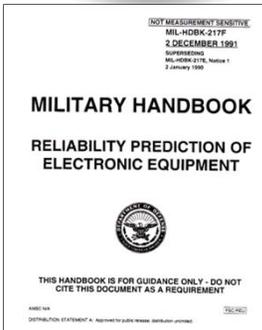
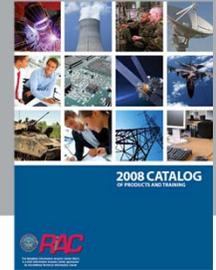


RIAC Resources

| Team Member | Testing | Library | Laboratories | Supporting Centers |
|------------------------------------|-----------------------------|------------------------|------------------|--|
| Wyle Laboratories | Many Locations in CONUS | Company | Failure Analysis | Total Ownership Cost, RCM/Aging Systems, Life Sciences |
| UMD Center of Risk and Reliability | Many at UMD Including CALCE | Major University | Failure Analysis | CALCE, Risk, SW Rel, Structures |
| PSU Applied Research Lab | Prognostics and Mechanical | Major University | Failure Analysis | iMAST, Reptech, Supply Chain, Mgmt |
| SUNY Institute of Technology | SUNY 64 Campus Network | SUNY 64 Campus Network | Computer Related | Nanotechnology, Electronics Packaging, Sensors |

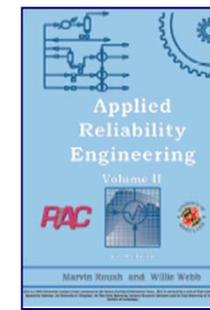
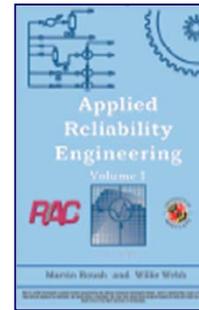
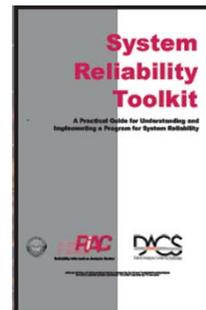
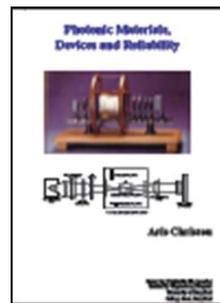
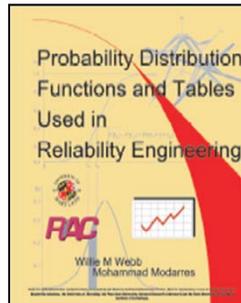
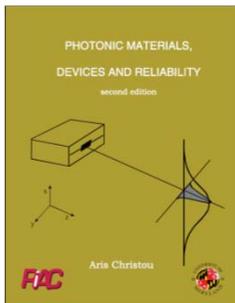
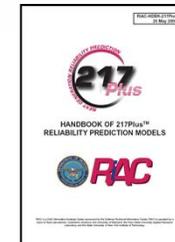


Some Accomplishments



Major Product Releases :

- “217Plus” software tool
- “Handbook of 217Plus Reliability Models”
- 15 New textbooks
- 16 New journals





New RIAC Product Initiatives

MS Excel®-Based Products

Microsoft Excel - Calculator for Root Cause Analysis TLCC Penalty - Example.xls

Combined Summary of Net Total Life Cycle Cost of Extending Root-Cause Failure Analysis (FA) and Corrective Action (CA) Implementation & Verification

| | FA | CA | PROB | LW |
|---|-----|-----|------|----|
| Number of items to inspect by CA every period (N) | 100 | | | |
| Number of items to inspect by FA every period (M) | | 100 | | |
| Combined estimated # of failures every period based on CA (FAC) | 100 | 1 | 10 | 10 |
| Combined estimated # of failures every period based on FA (FAM) | | 100 | 1 | 10 |
| Number of Combined Failures Threshold Due to FA & CA | 100 | 100 | 10 | 10 |

COMBINED TOTAL NET LCC BY PERFORMING ROOT-CAUSE FA AND CA IMPLEMENTATION & VERIFICATION

COMBINED NET IMPACT ON TOTAL LIFE CYCLE COST OF PERFORMANCE ROOT-CAUSE FAILURE ANALYSIS AND CORRECTIVE ACTION IMPLEMENTATION & VERIFICATION

There is an estimated TLCC benefit to perform root-cause failure analysis and corrective action implementation & verification.

On-Line and DVD-Based Interactive Training

Course: REPETOIRE DEMO COURSE - Windows Internet Explorer

REPETOIRE DEMO COURSE

Topic outline

1 REPETOIRE DEMO COURSE

REPETOIRE Training Tools DEMO QUIT

Welcome to REPETOIRE

REPETOIRE Desktop Edition

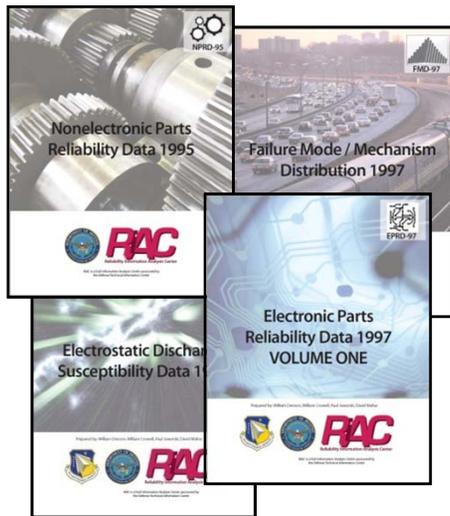
REPETOIRE Outline

| Section | Topic |
|--|--|
| Section 1 - Reliability Management | |
| 1A | Strategic Management |
| 1B | Reliability Program Management |
| 1C | Product Safety And Liability |
| Section 2 - Probability and Statistics for Reliability | |
| 2A | Probability Concepts And Statistical Terms |
| 2B | Statistical Inference And Parameter Estimation |
| Section 3 - Reliability in Design and Development | |
| 3A | Reliability Modeling |
| 3B | Reliability Predictions |
| Section 4 - Reliability Modeling and Predictions | |
| 4A | Reliability Modeling |
| 4B | Reliability Predictions |
| Section 5 - Reliability Testing | |
| 5A | Reliability Test Planning |
| 5B | Development Testing |
| 5C | Product Testing |



RIAC Product “Stalwarts”

RIAC Databooks



NPRD-95:

- 13 Years Old
- NPRD-08 in Progress
- 100,000 failure rates
- 10,000 failure mechanisms
- 2 billion test hours

RIAC Toolkits

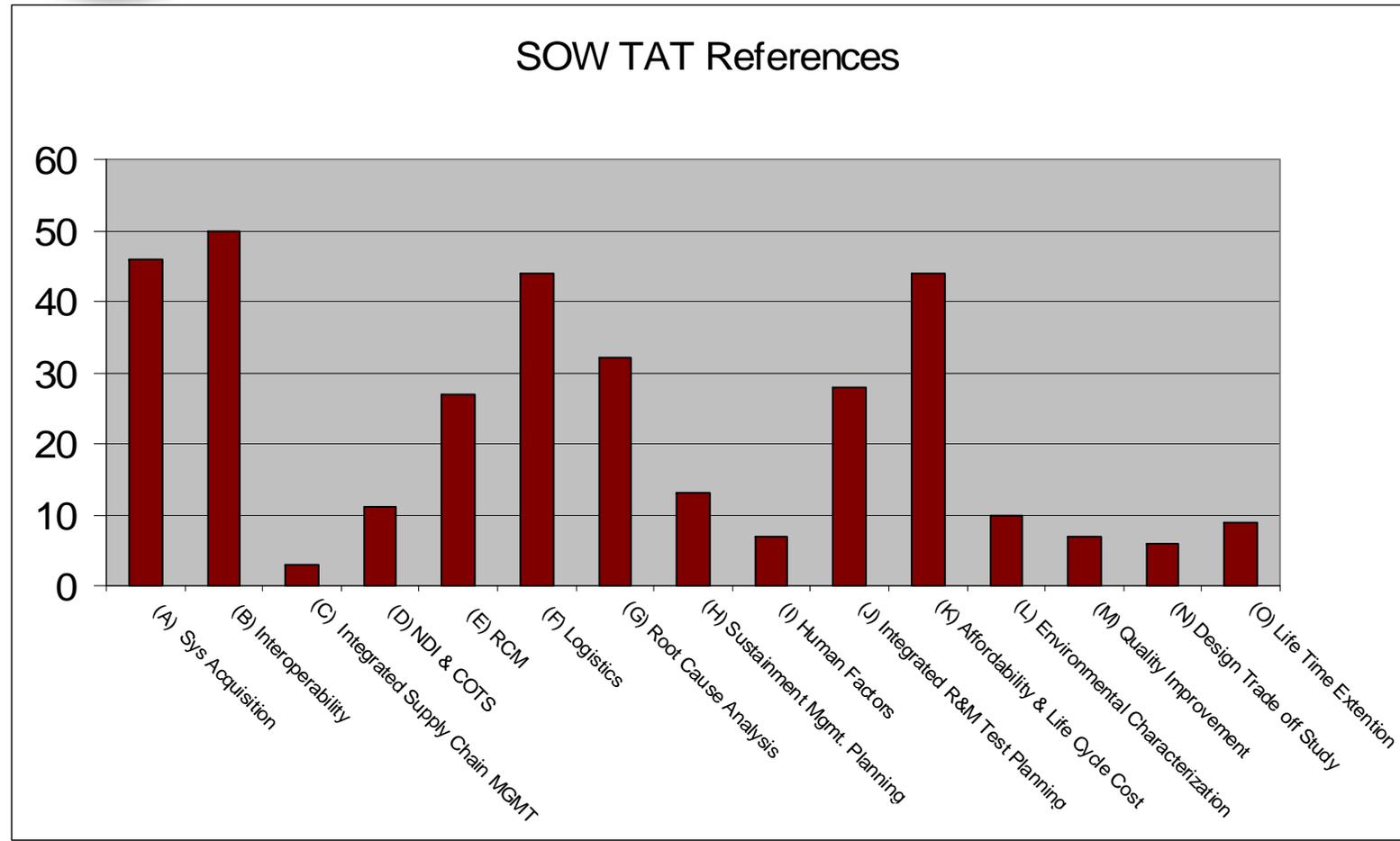


Thousands Distributed:

- SRKIT > 850 pages of HW, SW, Human & System Reliability Guidelines
- SRKIT Provided to Training Course Students
- Interoperability Guidebook just released

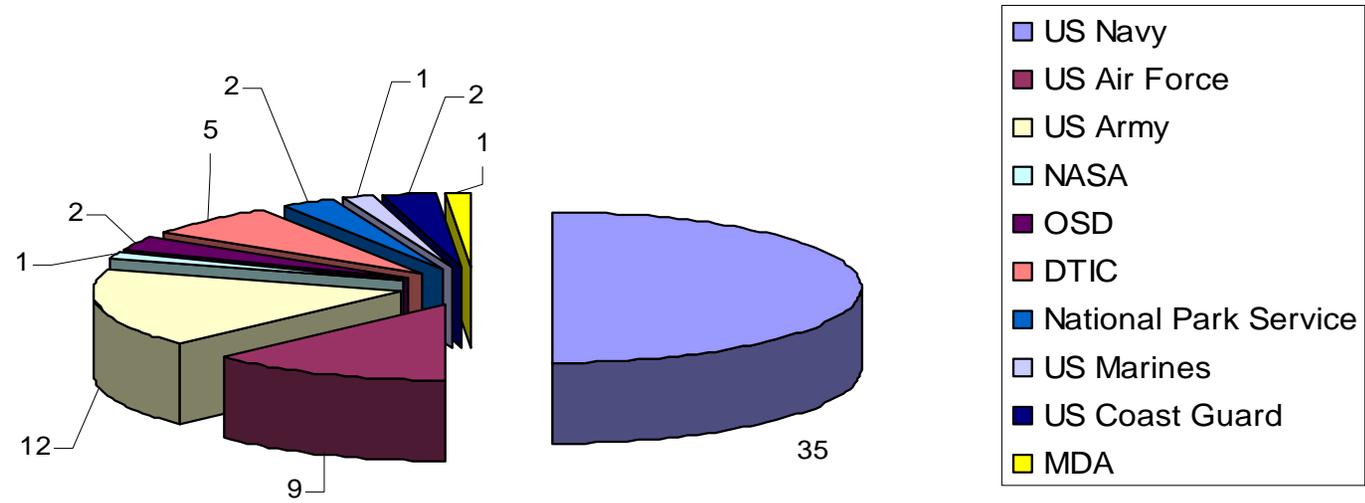


How RIAC is being used



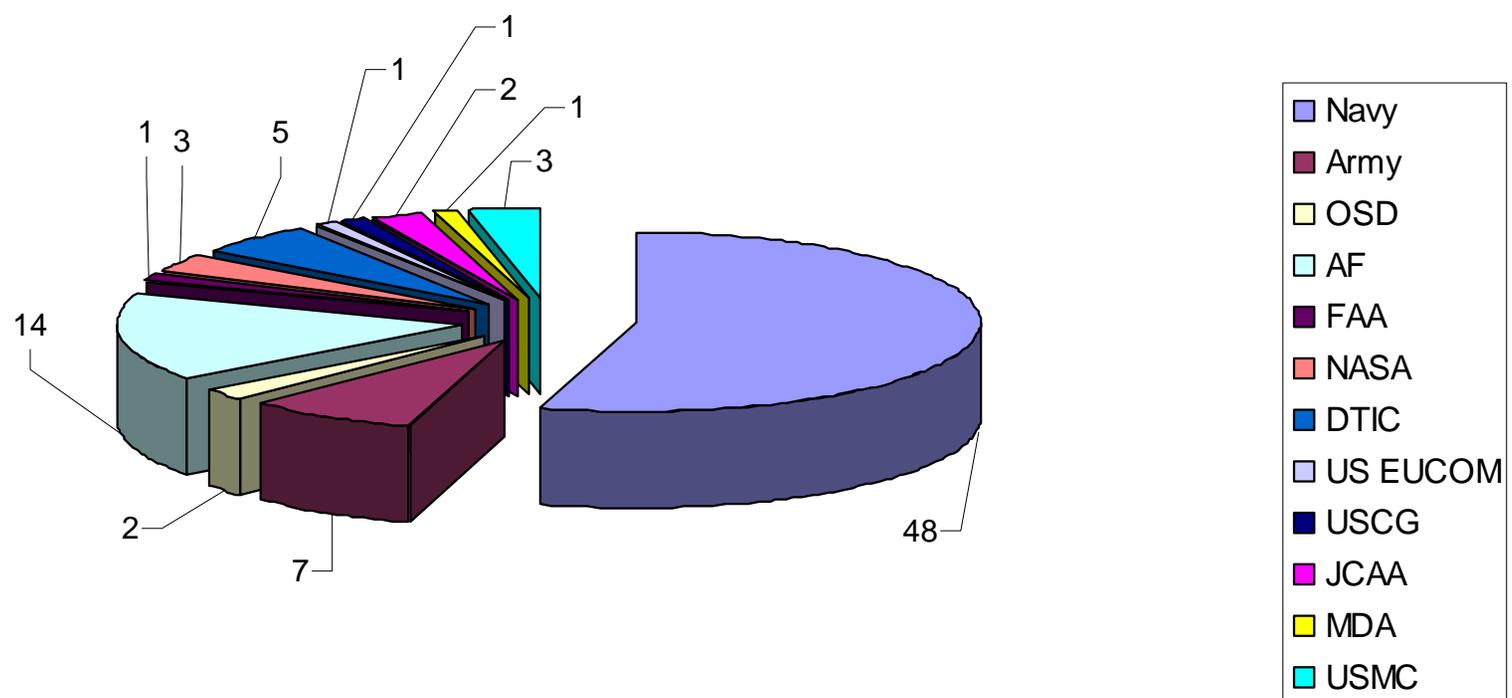


SA Customer Base





TAT Customer Base





RIAC RCM Projects





RIAC TAT Example Capability

The Problem

The operations in Operation Iraqi Freedom and Operation Enduring Freedom encountered a new threat called the Improvised Explosive Device (IEDs). IEDs are specifically designed to destroy mobile vehicles. In response to this threat over 10,800 Mine Reinforce Armor Protected (MRAP) vehicles were designed, built and fielded in less than 18 months. Sustainment of the fleet was deferred until the threat was neutralized.

The Solution

RIAC Subject Matter Experts are being used in conjunction with the Original Equipment Suppliers (BAE, FPI, GDLS and Navistar), the in-theater field service representatives and engineers from the MRAP Joint Project Office to perform Reliability Centered Maintenance (RCM) evaluations on each variant on the fleet of vehicles, by system, to optimize the maintenance and sustainment of the fleet. .

The Payoff

The MRAP RCM Plan has been written and the RCM evaluations are underway starting with the Cougar vehicles. Typically, RCM programs result in availability improvements of 5-10% and maintenance savings of \$100K-1M per system per year for a fleet the size of MRAP. **If these metrics hold true over the next 3 years, this program will result in savings of Billions of dollars a year in this \$24B acquisition.**





RIAC TAT Example Capability

The Problem

The mission effectiveness of the USAF AN/ALQ-184 (V) EA Pod is degraded due to the frequent failures of the Reprogrammable Low Band Standard Processor Printed Wire Assembly (RLB PWA).

The Solution

The RIAC performed a Causal and Failure Elimination and Control Analysis. The analysis included visual inspections, electrical circuit modeling, environmental & vibration testing and maintenance & training evaluations.



The Payoff

University of Maryland and **Wyle** engineers provided specific options for government to consider for root failure mitigation and long term sustainment of the system. Follow-on work is planned to either re-design the chip or the PWA to eliminate the failure. **This will ensure that the USAF can continue to fly the AN/ALQ-184 Jammer Pods well into the next decade.**



RIAC TAT Example Capability

The Problem

The US Navy was lubricating the jackscrew for the P3 Orion on a daily basis because the lubricant washed off during flights.

The Solution

Wyle engineers on the Aging Aircraft Integrated Product Team in conjunction with the **JCAA** Program Office analyzed the lubricant and determined that one used by the USAF had better lubrication and corrosion control characteristics.



The Payoff

Use of the new lubricant was implemented. The **lubrication cycle was reduced to 28 days** which increased availability and reduced maintenance costs while providing better corrosion control.



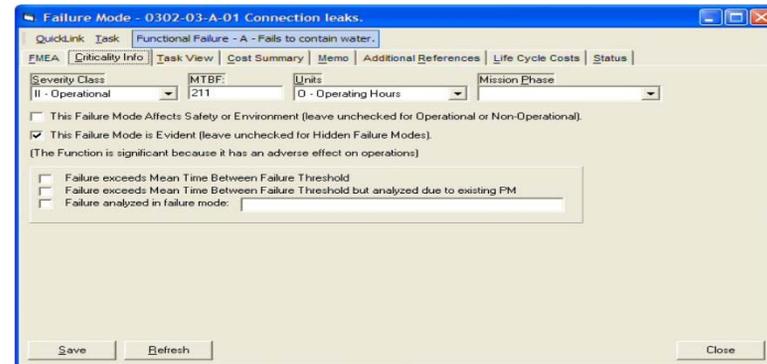
RIAC TAT Example Capability

The Problem

NAVAIR determined that EA-6B aircraft reliability was lower than required. The aircraft had long depot visits, a lower than acceptable availability and the overall condition of the aircraft was not right.

The Solution

Wyle utilized our versatile reliability centered maintenance system (VRCM) to perform a structured analytical process for the maintenance of the aircraft.



The Payoff

As a result of the VRCM analysis conducted and implementation of the new maintenance plan on the EA-6B:

- **Availability was increased by 25%**
- **Maintenance man-hours were reduced by 30,000/yr/squadron**

A new software tool was developed that is now used by the USAF.



RIAC TAT Example Capability

The Problem

MSFC is developing a design tool for nuclear thermal propulsion (NTP) engine systems in order to generate conceptual designs and perform trade studies on one potential propulsion source for the Manned Mission to Mars. NASA required a detailed Failure Modes and Effects Analysis (FMEA) on the NERVA Reactor.

The Solution

RIAC Subject Matter Experts were utilized to complete a detailed Failure Modes Effects and Analysis (FMEA) for the nuclear reactor and the associated sub-systems. This reactor, NERVA, has the largest thermal output of any nuclear system ever developed.

The Payoff

The FMEA includes details on the component importance, failure prediction likelihood and the failure probability **which will guide NASA in the design and construction of the advanced NERVA** which will be a critical element in the first manned space flight to Mars.





RIAC TAT Example Capability

The Problem

The USAF was evaluating the scheduled maintenance on the F-15 Eagle fleet of aircraft.

The Solution

RIAC Subject Matter Experts were utilized to complete a detailed Reliability Centered Maintenance (RCM) evaluation of the aircraft.



The Payoff

The RCM analysis determined that the 200 hour phased maintenance could be extended to 400 hours without impacting safety or reliability. **The reduced maintenance resulted in a 400,000 man-hour per year savings and a \$70M per year cost avoidance.**



RIAC TAT Example Capability

The Problem

Hellfire missiles returning from the OEF theater were experiencing a higher failure rate than expected.

The Solution

RIAC Subject Matter Experts were utilized to complete a detailed Failure Analysis of the missile and found that the seeker unit stator was deforming causing the gyroscope armature to freeze.



The Payoff

The failure was apparently due to high temperature experienced on the tarmac and during storage. RIAC recommended the use of the missile covers **which will allow the missile to avoid the radiant heat from the sun and keep the stator temperature within design limits.**





For more information

RIAC phone: (315) 351-4200

RIAC website: <http://theRIAC.org>

IAC Program Office at DTIC website: <http://iac.dtic.mil>



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