



U.S. ARMY COMBAT CAPABILITIES DEVELOPMENT COMMAND AVIATION & MISSILE CENTER

Electronic Wiring Interconnect System (EWIS) Work Unit Code and Data Scoring

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Distribution Statement: A

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REFERENCES



- SAE AS50881 Wiring, Aerospace Vehicle
- MIL-STD-1798D Mechanical Equipment and Subsystems Integrity Program
- MIL-HDBK-522D Guidelines for Inspection of Aircraft Electrical Wiring and Interconnect Systems
- MIL-HDBK-525_Ch1 Electrical Wiring
 Interconnect System (EWIS) Integrity Program
- TM 1-1500-323-24-1 Aircraft Electric and Electronic Wiring
 - -NAVAIR 01-1A-505-1
 - -T.O 1-1A-14

RAM ENGINEERING & SYSTEM ASSESSMENT DIVISION: WHAT WE DO





Aviation Systems

Missile Systems

RAM Technology

- Supports All PEO Aviation PMOs
- Aviation RAM Support
 - Analyses / Assessments
 - Models
 - Design for Reliability & Maintainability (R&M)
- Aviation System Assessment Program (ASAP) Analyses / Assessments
- Reliability Centered Maintenance (RCM)
- Reliability Improvement Projects (RIP)
- Foreign Military Sales (FMS) RAM Analyses

- All PEO M&S PMOs and MDA
- Materiel Release RAM Certification
- Missile and Ground Support Equipment RAM Support
- Stockpile Reliability Programs (Army & FMS)
- Sustainability Support for Missile Operations
- Missile Health Monitoring
- Supportability Analysis
- Logistics Assessments

- AvMC Energy Lab (AEL) and
- Reliability, Availability, Maintainability Analysis
- Failure Reporting and Corrective Action System (FRACAS)
- Science &Technology (S&T)
 Development & Support
- Data Driven Analytics/Machine Learning/Artificial Intelligence
- Policies and Procedures







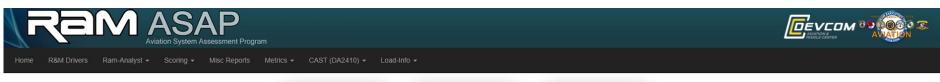
Improved Reliability, Availability, and Maintainability

Ensuring System Readiness

AVIATION SYSTEM ASSESSMENT PROGRAM (ASAP)









WHAT IS ASAP?

- The Aviation System Assessment Program (ASAP) is a U.S. Government organically developed software tool used by the Reliability, Availability, and Maintainability (RAM) Aviation Branches to quickly analyze and display a host of reliability/maintainability metrics.
- The U.S. Army ASAP tool contains scored data for rotary wing platforms and was developed over 20 years with millions
 of records scored
- Permissions/Access are vetted by the customer/platform PMO.

WHAT DOES RAM ASAP DO?

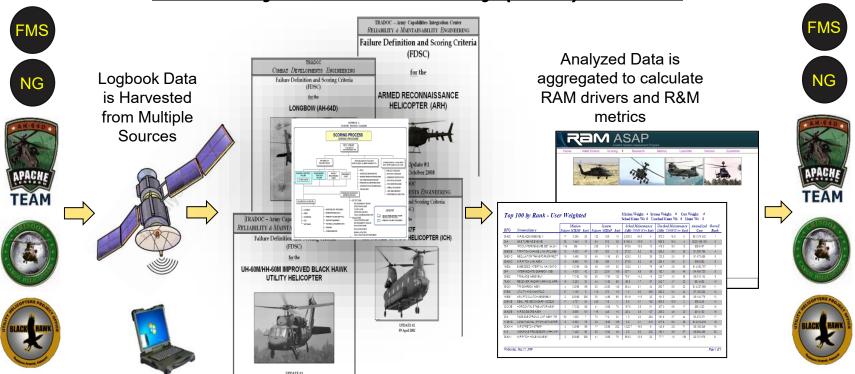
- RAM ASAP is the recognized source for U.S. Army Aviation systems data, analysis, and interpretation throughout their life cycle.
- The ASAP RAM team scores a sample of each army aircraft platform's maintenance records (DA FORM 2408-13-1) and uploads data for analysis and presentation via the ASAP Tool.

HOW DATA IS SCORED





ASAP is a U.S. Army Program that Turns <u>Aircraft Logbook Data</u> into <u>Reliability & Maintainability (R&M) Metrics</u>



Program Managers Identify the Required Sample Data is Analyzed Against FDSC Criteria. Work Unit Codes (WUC) and Malfunction Effect Codes are Assigned These Drivers Identify
Candidates for
Upgrade, Monitoring or
Improvement as Well
as Follow-up Post
Implementation

ANALYSIS PROCESS





Part / **Component RAM Metrics**

- Mission Abort Rate
- Mission Affecting Failures
- Maintenance Man hours
- Maintenance Time
- System Failures



Fleet Drivers

- Operational Tempo
- Environmental Factors
- Age Related Failures
- Trending
- Potential Failures

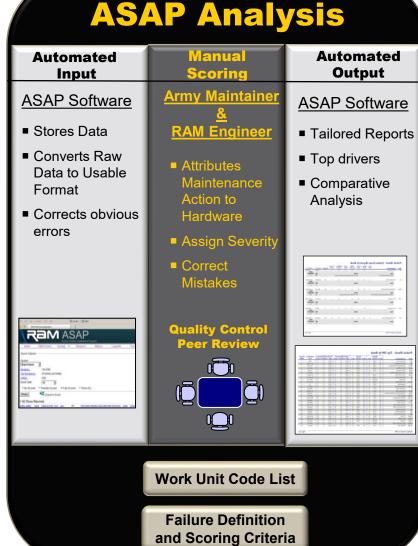
Fact Based Decision Making

- Component Upgrades
- Maintenance Changes
- Resource Allocation
- Business Case Analysis

ASAP Analysis



- **Aircraft Data**
- Maintenance event data
- Corrective Actions
- Life limited Items



MIL-HDBK-525 ELECTRICAL WIRING INTERCONNECT SYSTEM (EWIS) INTEGRITY PROGRAM



PURPOSE

- To establish Mechanical Equipment and Subsystems Integrity Program (MECSIP) tasks for an aircraft Electrical Wiring Interconnect System.
- FAA developed programs to address EWIS integrity concerns in the late 1990's.
 - These programs culminated in FAA EWIS Advisory Circulars and programs to address service life of aircraft wiring in transport aircraft.
- MIL-HDBK-525 leverages FAA EWIS AC's and applies them in a tailored form to military aircraft electrical systems. (Ref 1.2 pg1)
- Section 4 identifies tailorable "Core Process Tasks" that can be used to assess EWIS
 condition, support service life extensions, and establish or sustain airworthiness.
 - Task 1 Overall EWIS Documentation
 - Task 2 Data Analysis
 - Task 3 Physical Aircraft Inspection
 - Task 4 Component Assessment
 - Task 5 Risk Assessment
 - Task 6 Action Plan
- How can we implement an effective data analysis program for EWIS faults?



EWIS WUC AND DATA SCORING





MIL-HDBK-525 EWIS PROGRAM CORE PROCESS TASK 2

- Data Mining
- US Army uniquely positioned with ASAP tool and defined scoring methods.

IMPORTANCE OF EWIS WUC FOR RAM DATA SCORING

- RAM ASAP sorts scored data by Work Unit Code (WUC).
 - With no EWIS WUC, EWIS faults scored to parent component or system.
 - Artificially inflates component system failures.
 - Hides EWIS failures in other aircraft systems.
- Dedicated EWIS WUC would allow for EWIS failures to be identified on their own merit.
 - Allows for accurate and timely EWIS failure analysis.

IMPORTANCE OF COMMON EWIS WUC STRUCTURE

- All Army aircraft electrical systems built to standard SAE-AS50881 (Previously MIL-W-5088).
- Common EWIS WUC structure would allow for multi-platform EWIS failure identification.
- EWIS faults are not necessarily platform specific.
 - Identification of these faults can improve training and reduce EWIS related aircraft downtime.









INTRODUCING WUC 59



WUC 59 Electrical Wiring Interconnect System

- WUC 59 was selected by AMCOM as the EWIS WUC.
- In January 2024 WUC 59 builds were implemented for all Army model aircraft.
 - This includes all MDS of CH-47, H-60, AH-64, UAS, and fixed wing aircraft.
- WUC 59 structure is the same for all Army aircraft at the three-digit level.

EWIS WUC 59 STRUCTURE



59	ELECTRICAL WIRING INTERCONNECT SYSTEM
59A	WIRES, HARNESSES AND CABLES
59B	TERMINATION POINTS ON ELECTRICAL WIRES
59C	CIRCUIT PROTECTION DEVICES
59D	CONNECTORS
59E	SHIELD TERMINATION DEVICES
59F	ELECTRICAL GROUNDING AND BONDING DEVICES
59G	ELECTRICAL SPLICES AND TERMINATION DEVICES
59H	WIRE PROTECTION DEVICES
59J	SHIELDS AND BRAIDS
59K	CLAMPS AND ROUTING SUPPORT DEVICES
59L	SECONDARY WIRE RESTRAINT DEVICES
59M	LABELS AND IDENTIFICATION MARKERS
59N	ENVIRONMENTAL SEPARATION PRESSURE SEALS
59P	EWIS COMPONENTS FOR RACKS, PANELS AND SHELVES



SCORING IMPLEMENTATION



- Scoring procedures implemented for CH-47 and H-60 data Spring of 2024.
- All data faults dated 1/1/2024 and onward scored with WUC 59 methodology.
- Will allow for a 'point in time' to determine EWIS fault scoring.
- Older data in current scoring efforts will be scored with WUC 59 to ease burden on data analysts.
- Initial data will be scored with three-digit WUCs.
- Does not require rescoring of previously scored data.



CHALLENGES OF IMPLEMENTATION



- EWIS is a system hidden in systems.
- Defining LRU/WRU components vs EWIS system components.
- Training analysts to new scoring methodologies.
- Retraining of machine learning assistance tools.
- Discussing scoring methodologies with OEM manufacturers.
- Continuous updates of EWIS components for systems via field data.
- Fidelity of field data to accurately score EWIS faults.
 - -Platform specific vernacular.

EXPECTED OUTCOMES



- Capture EWIS data required to establish and execute an effective EWIS data analysis program.
- Assess EWIS faults in support of Program Offices for sustainment of current aircraft.
 - –Identify EWIS 'bad actors' and perform failure analysis to identify core issues of EWIS faults.
 - Recommend EWIS improvement programs based on failure analysis.
 - Reduce unneeded LRU replacements by soldiers during unscheduled maintenance.
- Allow current EWIS data to assist in establishing EWIS requirements for future aircraft.
- Shift in MTBF 'bad actors' over time as EWIS scoring process is implemented.



QUESTIONS?





THANK YOU.



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