

Reliability Initiatives: US Air Force

Major General Richard F. Gillis, USAF
Commander
Air Force Acquisition Logistics Center
Wright-Patterson Air Force Base

Key Words: Reliability and Maintainability, R&M 2000

I am sure that by now many of you have heard of the Air Force initiative called R&M 2000. The purpose of this initiative is to make R&M a normal business practice in Air Force weapon system acquisition and support. The driving reasons are embodied in the five major goals:

1. Increase Combat Capability
2. Increase Survivability of Combat Support Structure
3. Decrease Mobility Requirements
4. Decrease Manpower Requirements
5. Decrease Costs

In spite of the fact that R&M 2000 has been in operation for over 2 years now, and has had many successes, the need for the emphasis on R&M is greater today than when R&M 2000 started. The DOD budget is steadily shrinking, putting even more pressure on manpower and life cycle costs. In addition to the efforts on new systems, the need for R&M improvements on the existing force structure is even greater. Over 80 percent of the aircraft we will have in the year 2000 are on the ramp now, and their R&M must be improved drastically if R&M 2000 is to have a significant impact on the Air Force's ability to fight. The 4600 items costing over \$93 million in the F-15's War Readiness Spares Kit; the 5.5 C-141 equivalents needed to deploy the F-15's Avionics Intermediate Shop; and the 16 man-hours required to assemble the F-16 330 gallon external fuel tank (it cannot be done at all in chemical, bacteriological, and radiation suits or Arctic gear) are just a few examples of the limitations imposed by the low R&M of existing systems.

All this brings me to the topic I want to discuss, what are we in the Air Force, especially AFLC, and AFALC, doing to improve the R&M of Air Force weapon systems and accomplish the goals of R&M 2000? What are our initiatives? Where have we been successful so far? What does the future hold?

Under R&M 2000, four broad initiatives have been identified for the Air Force—Communications, Delegation, R&M 2000 Process, and Technology Insertion. The Communications initiative is meant to sidetrack the cry of "If it's not in the contract, it ain't..." Procurement professionals will be involved at all levels to make sure that improved R&M is ensured by contractual language that is enforceable, warranted, and motivating. Delegation refers to the institutionalization of R&M throughout the Air Force, ensuring that improved R&M comes as naturally as improved performance. This involves the operating commands demanding improved R&M clearly in requirements documents, acquisition commands delivering systems that meet or exceed the user's needs, and the supporting command improving existing systems to maximize the impact of improved R&M. The term "R&M 2000 Process" refers to a collection of successful practices and techniques for delivering improved R&M. This collection of 21 building blocks must remain a living collection, constantly updated, removed and replaced as better techniques are found. Finally, technology insertion refers to the significant improvements in the

R&M of fielded systems that can be made by using the advanced technologies available today. Productivity, Reliability, Availability and Maintainability (PRAM) is an example of one program with a 10-year history of successful technology insertion leading to significantly improved R&M in fielded systems. Reliability and Maintainability Technology Insertion Program (RAMTIP) is now showing success in injecting technology in acquisition programs for supportability.

Within the Air Force Logistics Command (AFLC) there are a number of initiatives aimed at accomplishing the broader Air Force objectives. The Weapon System Master Plan (WSMP) is a contract between the user and AFLC on management of an operational weapon system. Even though it is not strictly an R&M plan, a significant portion deals with current R&M deficiencies, identifying user requirements and AFLC plans to satisfy them. The WSMP is a key element in supporting and managing AFLC R&M improvements efforts. The Modification Enhancement Program is specifically designed to incorporate R&M factors into the budget/decision process, along with tactical and budget considerations. This change will help R&M improvements compete in the DOD budget process by showing R&M impact on war-fighting capabilities, as well as life cycle costs. As support for the Communications initiative, AFLC developed the Competition Engineering Program. This program is designed to support the development of new, high-reliability spare parts by reverse engineering the design of sole-source spares. AFLC has four engineering firms on contract to reverse engineer selected spares and develop procurement data packages. These packages can be used for competitive bids, to acquire lower cost, higher reliability spares for the Air Force.

The Air Force Acquisition Logistics Center (AFALC) has begun a number of initiatives in support of R&M 2000. AFALC is sponsoring an effort by the Rome Air Development Center (RADC) to develop a data base on field failures of microelectronic parts. RADC has looked at over 47 different part types submitted by our Air Logistics Centers from fielded hardware. Specific corrective actions resulting from this hard failure data have been implemented in 13 cases. These changes will result directly in improved reliability of the fielded systems. The Air Force chartered an AFALC led R&M Data Deficiencies Tiger Team to look at Air Force data collection systems, identify deficiencies, formulate recommendations, and establish corrective actions. This team has Air Force-wide membership and has made 15 specific suggestions to increase the quality and accuracy of R&M data while simplifying the data collection process. Another AFALC initiative is to improve the consideration of supportability and R&M in the research and development community. Last year we collocated a number of engineers from AFALC into Air Force laboratories to improve our influence over the R&M aspects of Air Force research projects. In addition, AFALC engineers are actively involved in reviewing contractor independent research and development efforts to ensure proper consideration of R&M elements in these earliest stages of system development. Finally, AFALC has formed a Technology Transition Support Office (TTSO) to accelerate the transition of new technology into fielded systems. From our position as acquisition logisticians, we see new technology in developing systems sooner than the rest of AFLC. The primary focus of the TTSO is to identify for AFLC technology that can markedly improve the supportability of our fielded systems.

Having looked at some of the Air Force initiatives, I would now like to discuss where R&M 2000 has been applied and look at some of its successes. One weapon system acquisition program that is benefiting from R&M 2000 is the Short Range Attack Missile II (SRAM II). The user's logistics requirements are coequal with

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operational needs. The R&M requirements exceed the Air Force baseline of double-R, half-M. The missile contractors participated in a Blue Two visit and modified the SRAM II design to avoid the maintenance headaches of its predecessor. Not tied to any one program, but still in the weapon system acquisition arena is R&M in Computer Aided Design (RAMCAD). This DOD-sponsored effort is designed to integrate the "-ilities" into the computer aided design environment. This will improve the supportability of future systems by actively helping the system designer to consider the R&M impact of his design choices. In support of existing systems, AFLC has had a number of successes in improving R&M significantly. The Central Air Data Computer (CADC) is a black box on every Air Force aircraft which translates sensor information into flight information, such as air speed, for the pilot. The old CADC had 19 configurations, an average mean time between failure (MTBF) of 200 hours, and cost \$56,900. The new standard CADC, using digital technology, will have only four configurations, an MTBF in excess of 1200 hours, and cost less than \$32,000. This will result in a \$43 million savings on spares for the C-141 alone. The F-111's Digital Flight Control System is another example. The old system had an MTBF of 31 hours, required support equipment for system checkout, and required three levels of maintenance. The new system has an MTBF of 1750 hours, can perform a complete self check, and only requires two levels of maintenance.

We can be proud of the great strides we've made in reliability but, in my judgment, we haven't been equally successful in the maintainability area. We still field weapon systems which do not live up to our expectations. They're too hard to repair or they take too long to repair. We're not getting the expected utility from our on-board diagnostic systems, components are too hard to access and are impossible to repair in the protective equipment our people must use in a combat environment. The cause of this lack of maintainability in our weapons systems is basically two fold. First, the people doing the maintainability design do not have sufficient field experience to appreciate the environment. The feedback from contractors participating in our "Blue Two" program illustrates that quite graphically. Secondly, the Air Force organizations involved in the acquisitions are manned by officers and general schedule civilians who have never maintained equipment in the field either. The first time someone responsible for the maintenance gets his hands on a system, the design is already complete. Since there is no practical way for the contractor's design team to gain the field experience necessary to appreciate all that is involved in the field repair, the solution to the maintainability problem is to bring the experience to the contractor. This means injecting highly qualified noncommissioned officers (NCOs) into the Air Force acquisition process. I'm convinced that the Air Force needs to make this change and we intend to take the lead.

With these initiatives and successes what does the future hold for us? The Advanced Tactical Fighter (ATF) is the first new Air Force fighter in over a decade. R&M was the highest rated item during its source selection and a major factor in the selection of the competing designs. The ATF will have less than one-half the manpower requirements, less than one-half the airlift requirements, and less than one-half the turnaround time of the existing F-15. Future avionics systems, such as the Integrated Electronic Warfare System and the Common Signal Processor, must be fault tolerant with graceful degradation modes allowing minimum system function even after the failure of significant numbers of components. They must be capable of significant self-test, greater than 95 percent fault detection and isolation to a single line replaceable module, to allow efficient use of two-level maintenance. In addition we must develop the ability to predict failures allowing repair before operational mission failures. In order to ensure that the ATF is also maintainable, we have already staffed that program

office with NCOs.

These are all great challenges which R&M 2000 is designed to meet. R&M 2000 has created an environment designed to institutionalize good R&M practices in both the Air Force and industry. In the Air Force, it starts when the user states R&M performance requirements in his own terms, winning the long war as well as the battle. R&M funding to accomplish these improvements in R&M is becoming a part of the normal budget process for both new systems and upgrades. Our contract experts are developing new ways to motivate you, the contractors, to deliver ever higher levels of R&M while giving you the freedom to develop innovative designs. Success in improving R&M will ensure the continued success of participating contractors and is the key to increasing the combat capability of tomorrow's Air Force.