AD-A158 086 WARTIME AUTOMATION REQUIREMENTS FOR MAINTENANCE(U) AIR FORCE LOGISTICS MANAGEMENT CENTER GUNTER AFS AL D A DIETSCH ET AL. OCT 82 AFLMC-800402 SBI-AD-F630 423 1/2

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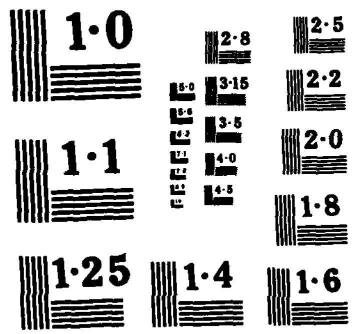

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AIR FORCE LOGISTICS MANAGEMENT CENTER

AD-A158 086

WARTIME AUTOMATION REQUIREMENTS
FOR MAINTENANCE

FINAL REPORT

By

Lt Col David A. Dietsch
Major Clarence T. Lowry

AFLMC Report 800402
October 1982

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ABSTRACT

This report documents the requirement for Automated Data Processing (ADP) support for aircraft maintenance activities in a combat environment. It describes the environment in which such systems can be expected to function, and ADP requirements in terms of systems already in being and those projected to be implemented in the future. It describes which portions of peacetime ADP systems are required for wartime, and makes recommendations for beginning the process of satisfying those requirements.

EXECUTIVE SUMMARY

The objective of this report is to determine maintenance requirements for Automated Data Processing (ADP) in a deployed/wartime situation. The approach taken was to examine the variables which impacted Air Force Operations in such a situation and describe those which needed to be taken into account when assessing the use of ADP.

Once those variables were described the major air commands were asked to provide their requirements for ADP support for maintenance. Conclusions were drawn based on the commonality of requirements among commands. The most serious and immediate requirement was capability for engine component tracking with the F-100 and TF-34 engines which power the F-15, F-16, and A-10 aircraft. Tactical Air Command projected a requirement for this capability immediately upon deployment; regardless of force size or potential duration of the conflict. This requirement was driven by the necessity to make real time operational decisions about employment of aircraft based on information provided by the automated engine tracking system. Implementation of the Comprehensive Engine Management System (CEMS) will cover other aircraft and engines, thereby compounding the problem. Dependence of base level engine maintenance management on the automated engine tracking system contained in MMICS dictates that ADP is required very early in a contingency and at very low force levels to adequately support modular engines and On-Condition-Maintenance (OCM). With the operational deployment of CEMS, the

capabilities represented by that engine tracking system will be exported to many more engines, and potentially to all USAF engines. Consequently the mobile requirement for engine maintenance ADP support will also expand.

Beyond engine tracking, MAJCOMs identified a requirement to have other portions of MMICS available between 15 and 30 days into the conflict or deployment. The portions of the system required were associated with aircraft status and condition. At 30 days into the deployment/conflict the commands indicated they see the situation transitioning into a "business-as-usual" operation, requiring full MMICS support.

The MAJCOM inputs and conclusions drawn from them dictated that the Air Force explore available technology to provide, in the near term, a small rugged ADP system capable of being deployed with units to any location. Among alternatives considered were manual data manipulation and use of minicomputers using new software. Manual data manipulation is not a viable alternative due to the very complex aircraft subsystems in use today, such as modular engines with their large numbers of individually tracked components. For example, the F-100 and TF-34 engines have more than 500,000 components presently being managed by CEMS. The adoption and use of minicomputers, which could perform the engine tracking functions, would not meet the total MMICS requirement because of the limited capability available in most minicomputers. In addition, use of minicomputers would require new software development which is the most expensive and time consuming aspect of ADP system development.

Based on the above, this report recommends the AFLMC continue to assist AFDSDC in developing a deployable ADP system capable of providing minimum essential maintenance information support. Additionally, HQ USAF/LEY and MAJCOM's should determine the number of systems required and initiate programming and budget action through HQ USAF/ACD for a deployable ADP system in the Phase IV environment to support the current engine tracking system, CEMS and the other MMICS functions required by the MAJCOMs. And finally, the CEMS Program Manager must formally document the requirement for mobility as a part of the CEMS development process, and deployability must be one of the evaluation criteria.

PREFACE

I would like to thank the many personnel in the Major Air Commands who gave me timely and thorough assistance in my research, as well as Major Raymond J. Hauck AFLMC/LGM and Captain Robert Smith HQ MAC/LGMM who assisted me in collecting, organizing and presenting the data.

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CHAPTER 1

THE PROBLEM

SECTION A - BACKGROUND

1-1 Since the implementation of the Maintenance Management Information and Control System (MMICS) in the early 1970's, maintenance operations in the Air Force have become increasingly dependent upon Automated Data Processing (ADP) for management support. During this time, increasing concern has existed among the tactical forces whether ADP support will be available when needed during combat. Early in the life of MMICS, this problem was deemed not to be of a particularly serious nature since the functions of MMICS were largely historically oriented and quite rudimentary; therefore, reversion to a manual system of recordskeeping was not a major task. Recently however, the situation has become more complex. The introduction of the F-100 and TF-34 engines required use of MMICS to monitor the status of scores of components and modules against a number of different failure indices that are electronically recorded during engine operation. This technique has made ADP essential in assessing the condition of these engines and in making decisions about engine employment and serviceability. Projected future applications of such technology dictated another review of wartime automation requirements in maintenance.

SECTION B - STATEMENT OF THE PROBLEM

1-2 Increased use of automation to manage aircraft maintenance has led to a situation which requires automated support in a wartime environment. This situation dictated an evaluation of automated systems and processes in maintenance so those which are critical can be made available to combat forces.

SECTION C - FACTORS BEARING ON THE PROBLEM

1-3 In order to appropriately determine the requirement for data processing support in a deployed environment, one first has to define expectations in that environment. AFM 1-1, Basic Air Force Doctrine, defines mobility as one of the basic qualities of Air Force forces. Gen David C. Jones, said in 1977:

> What we have lost in military matters in this generation is time. Time has been our solvent, our teacher, and our friend in all the wars of our history. It's no longer there and, in its place, we must substitute a readiness composed of several ingredients...modern weapons...autonomous mobility...thinking and planning... interoperability...and professionalism.

More precisely, AFM 1-1 describes the characteristics of mobility as follows:

> Our forces can move across natural boundaries to accomplish their missions anywhere in the world. The mobility of our warfare systems allows our forces to project aerospace power worldwide. This power projection can be maintained by employing highly mobile weapon and support systems. Mobility systems are used to position and resupply United States as well as allied and other friendly forces. The mobility of these systems enables our forces to be flexible, ready, and responsive.

1-4 Mobility then is a basic attribute which we seek to preserve in our forces. In looking at the deployed environment, however, we must look beyond the legitimacy of the requirement for mobility, and examine the physical circumstances under which we expect this characteristic of our forces to be applied.

1-5 This examination is necessary to provide an appreciation of the environment in which mobile ADP systems might be employed. The approach taken in this study was to describe particular variables which might contribute to the environment, rather than taking the conventional approach of developing potential mobility scenarios. The task of describing potential mobility scenarios, if it were done thoroughly, would be virtually impossible due to the variety of situations which could occur. Certainly, there are many current planning documents which describe the "most likely" scenarios as the authors of those documents view the threat. To be really valuable, however, a discussion of the deployed environment should include all possible situations. An effort to devise such a description using the conventional scenario-based approach would be time consuming, and fall short of the mark. The Support of Mobility ADP Requirements Study (SOMARS) spent some five months defining a scenario to use in identifying the mobility ADP requirements as they were perceived in 1975/6, only to have the results of this effort challenged over the validity of the hypothetical scenario. The intent was simply to use the scenario as a point of departure to illustrate requirements and add credibility. In fact, the technique backfired and caused a loss of credibility for the entire effort. This report avoids postulation of specific scenarios and concentrates instead on a description of the basic factors which are present in any scenario and which impact ADP support in a deployed environment. The factors discussed are a result of a complete review of USAF planning documents including, but not limited to, the USAF Planning Guide and the Global Assessment.

1-6 The circumstances which face Air Force units in a mobile environment are dictated by four significant variables; location, duration, force composition, and mission. The following paragraphs describe the nature of these four variables as they relate to the potential employment of forces.

1-7 Location:

a. The geographic and climatic characteristics of an operating location have significant impact upon methods of employment; geography, as it relates to the proximity of the force to existing lines of communication; and climate, because of its impact on equipment and personnel. Current planning guidance indicates that Air Force forces must be prepared to operate in geographic locations distant from any existing lines of communication. Additionally, those forces may be faced with the full range of climatic conditions, from sub-artic through tropical to desert climates.

b. Another characteristic associated with location is the type of installation from which the forces will operate. For this report, installations will be separated into three distinct method of sending raw data to the home base for processing is unacceptable because this requires that aircraft identified for deployment must have large amounts of cyclic life remaining to prevent an overfly during the processing time of raw utilization data. Since each F-100 engine consists of over 90 tracked items, it is not feasible to track cyclic accumulation manually. The hand picking of aircraft and engines which meet deployment requirements severly restricts the readiness and capability of TAC units.

2. Status and Inventory, Operational Events and Time Change. These three subsystems are interrelated, and therefore they are required at the 30 day point when 30% of the deployed fleet has arrived. All three subsystems could be maintained for a short period of time using manual products generated at the home base immediately preceding the deployment; however, large numbers of sorties (operational events) will make manual updating of life limited (time change) items extremely difficult and time consuming after a relatively short period. MMICS automatically posts sortie duration in the computerized files and makes mathematical calculations to determine life remaining. Several additional people would be required if we were to resort to manual record keeping for an extended period of time. Present procedure is to send raw data to the home base for processing which necessitates hand picking of aircraft which will not have time change items come due during the deployment.

3. TCTO. Accurate and timely TCTO information is required to determine aircraft weapons system capabilities and aircraft restrictions. MMICS provides a printed listing for deployment; however, manually updating this listing for an extended period would be time consuming, as would extracting data for mission planning. MMICS also provides detailed and summarized reports which indicate manhours consumed and manhours backlogged, in addition to detailed reports of each aircraft affected by a particular TCTO. Large numbers of transactions would require additional people to manually update and compile TCTO data.

4. Equipment Transfer. The status and inventory subsystem is complemented by the equipment transfer procedures. Once aircraft and other equipment files are initialized in MMICS, the equipment transfer subsystem provides a rapid method for selective or mass transfer of equipment. Manual extraction and loading of equipment in the MMICS files is complicated and time consuming. This subsystem provides deployed units the capability to rapidly gain and transfer equipment with minimal impact on the availability of real time information.

5. Maintenance Personnel and Personnel Transfer Procedures. These two subsystems also work together to provide the unit commander management data which facilitates effective

described in Appendix A. Additionally, subsystems 1 and 2 provide for automated avisurs reporting while subsystems 1 and 3 are required to support the scheduling process vital to sustained high sortie rates.

3. Deployments of more than 30 days should include subsystem 4 (delayed discrepancies) for scheduling purposes. The number of personnel involved with full squadrons of aircraft will require management of training data supported by subsystems 9 and 10.

4. Small deployments (five to eight aircraft) can continue to manually manage training data for up to 90 days. Beyond that period full support is required for all categories.

5. Operational impacts of not having automated capabilities are:

   a. Excessive supply support required to permit safe operation of engine tracked aircraft.

   b. Less than optimum maintenance performance because of lack of adequate scheduling and monitoring capability.

   c. Requirement for massive manual update of home station automated systems upon return from deployment.

   d. High probability of not having adequate data upon which to evaluate the deployment and provide ways to improve deployment mechanics.

6. The success of deployable MMICS will depend, in large measure, on the reliability and timeliness of the system. Only when a system can be depended upon to consistently respond in a timely manner will personnel trust the system and use it to full advantage. System reliability should be above 99% and response time should be within 2-4 seconds with up to six remotes operating.

7. Although we have shown what we feel are minimum requirements for various size and length deployments, the most efficient way to operate would be to deploy with full system capability for any size deployment package. Recommend that this be made the ultimate objective of deployable MMICS.

TAC

1. Engine Tracking. During deployment, modular engines will rapidly accrue many more cycles than during peacetime. Cycle accrual is not totally predictable because averages of past engine performance may not apply in a wartime scenario. The accurate accounting of accumulated cycles is necessary to prevent catastrophic failure of modular engines. The present

USAFE

1. As noted in previous letters, USAFE has limited MMICS mobility requirements. However, we expect major problems with MMICS during wartime, i.e., extensive computer outages resulting in a total loss of MMICS computer support.

2. With the loss of the computer, we would have to fall back on manual record keeping. Current unit authorizations are not large enough to cope with an extended computer outage. The impact of a computer outage becomes even more significant when we add automated engine tracking and the Comprehensive Engine Management System (CEMS). Engine tracking in the manual mode would become impossible.

3. Our requirements can be viewed as a complement to any MMICS mobility requirement. We envisage the use of minicomputers (1-3 per unit) which are MMICS - compatible as a desirable approach to computer support problems during peacetime and wartime. The small size would allow placement in a Tab Vee or another hardened/protected shelter. One minicomputer could be used to handle the Status and Inventory, Operational Events, Inspection and Time Change, Delayed Discrepancies, and TCTO subsystems. An additional minicomputer could be used for engine tracking (TF34 and F100 engines) and a third minicomputer for the Personnel and Training subsystem. The third could be used as a backup for the first two in wartime. Additionally, data links to the B3500 would be desirable to meet peacetime requirements, as well as a data link to the Central Data Bank for engine tracking.

4. Timely and available MMICS/computer access is extremely critical to the USAFE maintenance community. Although our mobility requirements are minimal, we feel our needs, particularly in wartime, closely parallel those of a mobile system.

PACAF

1. Deployments of five aircraft for 10 days or less permit selection of aircraft and personnel to ensure that the probability of extensive records actions are minimized.

2. With eight or more aircraft or for periods of more than 10 days, the volume of records to be maintained for engine tracking dictates automated records keeping, particularly in view of accelerated sortie rates which may be required. Subsystem 8 (engine tracking) requires support from subsystems 1, 3 and 7. NOTE: Subsystems are

personnel, in proportion to the improvements which are made in management. This is to be expected since the only rational reason for improving our management techniques is to do the assigned task better or with fewer resources. However, as we do this, we must keep in mind that we have to provide ourselves with the capability to do these tasks whenever and wherever forces may be employed. In many cases, it may be possible to revert to manual procedures in the event of an emergency. Certainly we need to always retain the ability to do so; however, it is a far different matter to have the capability to do so than it is to plan on reverting to manual procedures. Reversion to manual methods for any length of time beyond a few hours results in significantly reduced effectiveness.

CURRENT REQUIREMENTS

2-8 The requirements outlined in this section were obtained through conversation and correspondence between the AFLMC and the MAJCOMs. The formal correspondence which supports the requirements is attached in Appendix B. In an effort to lend some sort of structure to the requirements, AFLMC proposed a format to the MAJCOMs which resulted in the construction of a matrix using the length of deployment and the percentage of assigned aircraft which are deployed as the indices of the matrix. Before outlining specific requirements, it is necessary to provide general comments made by several MAJCOMs in responding to our request. The following are specific quotes submitted by several commands qualifying their responses.

SECTION B - RESULTS

2-6 This section of the report will discuss maintenance functions which must be automated when deployed. Generally, there are two reasons for automating management functions in a deployed environment: one, the use of automation improves the effectiveness with which the task can be performed because of volume, speed and complexity of the process through which information must be moved. For example, in airspace control the volume of data would be virtually impossible to handle without automation. The second reason for automation is somewhat less objective and precise and more philosophical in nature, however it is no less important. Much has been said and written during the latter half of the 70's about the concept of "training like we will fight." Several significant new programs, among them notably Red Flag and the Production Oriented Maintenance Organization (POMO), are direct results of this philosophy. But there is a corollary which must also be considered if that philosophy is to succeed. If we "train like we fight," so we don't negate that training, we must also plan to "fight like we train." The importance of this second philosophy is sometimes overlooked. We often adopt new methods of doing business, involving ADP, to be more efficient and effective in peacetime; therefore, we must also operate that way in wartime.

2-7 As we have developed management systems to make our forces more efficient, there has been considerable pressure to reduce expensive inventories of resources, equipment, material and

PERCENT OF FORCE DEPLOYED

DEPLOYMENT DURATION (DAYS)

	10	20	30	40	50	60	70	80	90	100
1- 9										
10-19										
20-29										
30-39										
40-49										
50-59										
60-69										
70-79										
80-89										
90+										

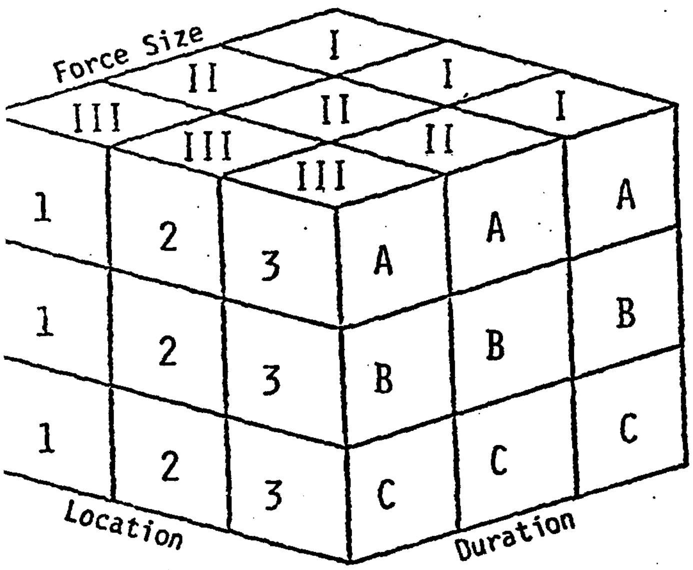
Force Size vs Duration Matrix

FIGURE 1-2

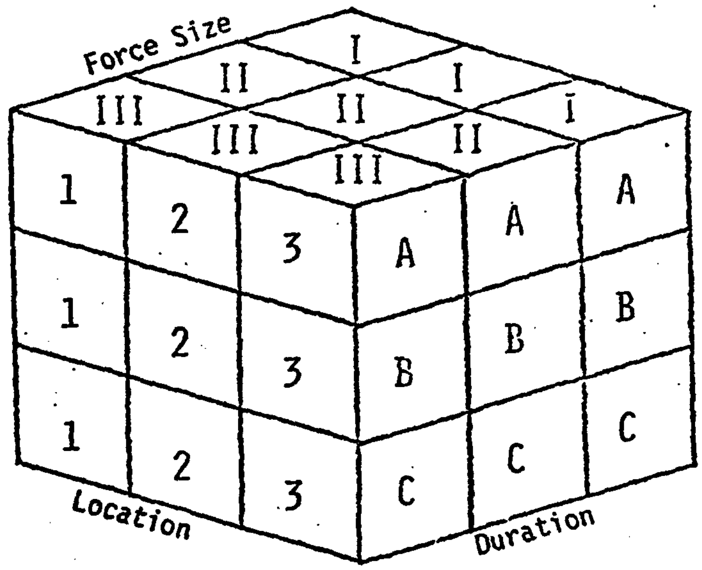
the process. The ADP support system can be engineered to function equally well despite the type of base at which it is employed. Therefore, that variable can be eliminated. The type of mission for which the force is deployed is often impossible to predict ahead of time. With the exception of training and humanitarian missions, it is difficult to distinguish between levels of conflict, which may vary due to escalation and de-escalation. This makes modular design to respond to mission very difficult. For this reason, it is preferable to design the system for worst-case ADP requirements (not necessarily corresponding with worst-case conflict). Therefore, this variable can be eliminated, reducing the problem to two variables as depicted in Figure 1-2.

2-4 As a result, the mobility requirements can be depicted against these two variables for any potential scenario. This allows a requirements statement which is independent of hypothetical scenarios.

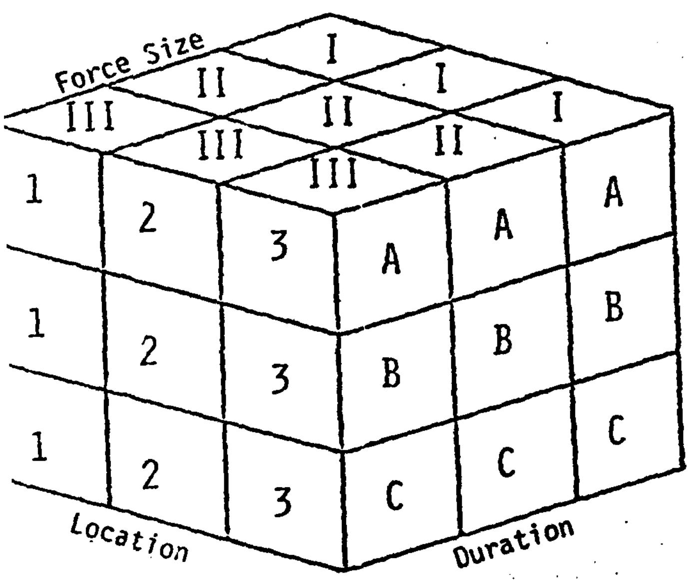
2-5 This statement of current ADP requirements will employ the two variables indicated in Figure 1-2 as an index against which requirements are stated.



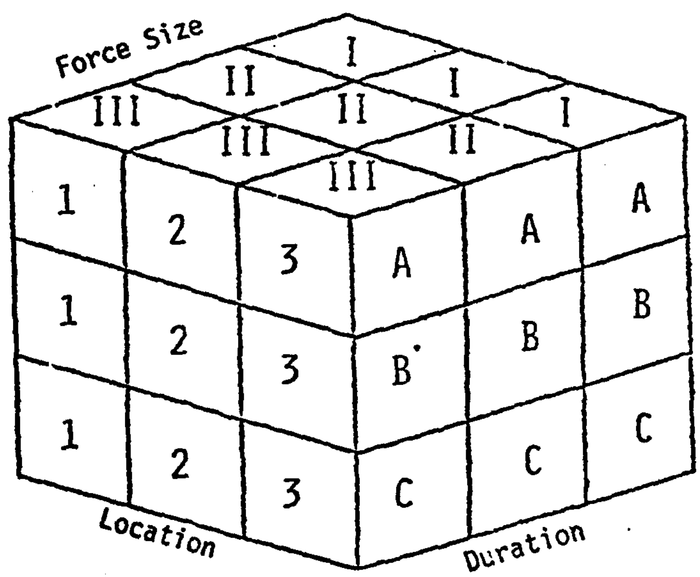
1. TRAINING/HUMANITARIAN



2. SHOW OF FORCE



3. LIMITED WAR



4. GENERAL WAR

Fig 1-1

CHAPTER 2

RESEARCH

SECTION A - APPROACH

2-1 To summarize all the variables which may occur in any potential scenario, it is useful to have some sort of visual aid portraying their relationship. Given the variables discussed in Chapter 1, a matrix presentation is appropriate. A summary of those variables is as follows:

LOCATION	DURATION
1. Bare Base	a. Short Range (Less than 30 days)
2. Limited Base	b. Medium Range (30-90 days)
3. Main Base	c. Long Range (More than 90 days)

FORCE SIZE	MISSION
I 10-30% of assigned A/C	1. Training/Humanitarian
II 30-60% of assigned A/C	2. Show of Force
III 60-100% of assigned A/C	3. Limited War
	4. General War

2-2 With four variables, it is difficult to portray all possible combinations on one matrix diagram. To simplify the problem, the potential combinations represented by the above variables have been described by four three-dimensional matrices in Figure 1-1.

2-3 Obviously, designing a system to respond to an environment with 108 potential combinations of variables is a very complex task. Fortunately, some of these variables can be removed from readiness posture which will also demand sophisticated management.

1-13 For these reasons, it is necessary that the Air Force develop the capability to carry automated data processing capability to any deployed location. We cannot depend on in-garrison ADP systems to support the critical aircraft maintenance management function given the expected very heavy load on communications facilities during contingencies.

During training deployments, significant ADP support was needed, while during conflict very little, if any, was required. This was true as long as only simple non-direct mission support applications such as automated maintenance training were considered. However, recent more complex applications, most notably the F-100 and TF-34 engine tracking systems provide direct logistics support to the aircraft and are critical to the maintenance effort. As the conflict becomes more intense, resources become increasingly scarce. Since applications such as engine tracking are designed to allow commanders and managers to accomplish their objectives with minimum resources, the consequence of their unavailability becomes more severe as available resources are depleted, making an automated tracking capability imperative. Oftentimes the mission is subject to evolution during a contingency also making definition of requirements based on mission more difficult. Based on currently approved planning guidance, it is prudent to assume that in most cases a period of tension and build-up would precede actual hostilities. During this build-up phase or an extended show of force, certain ADP applications are necessary since this is a time when the force is being fine-tuned for combat, and maintenance management is critical to a high state of readiness. If a conflict occurs, it is improbable all deployed forces would return to their home bases after the fighting ends. It is more likely a requirement would exist for a residual force to remain in the area to insure against further hostilities. This period will be characterized by a rebuilding and reestablishment of managers to be able to distinguish when one phase ends and another begins, even as they happen.

1-11 Force Size: The ability to deal with certain management processes manually is, to some degree, proportional to the size of the force. When dealing with small forces data requirements are less complex. This is particularly true where the ADP system is used in a basic record-keeping type of function rather than more complex applications requiring considerable data manipulation. Engine tracking is a complex system and returning to manual methods is at best expensive from a manpower standpoint and at worst virtually impossible. It is, however, still reasonable to say that for some types of forces, small numbers of aircraft deployed for a short period of time require less ADP support than larger numbers of aircraft. As noted in deployment duration, the ability to define small forces versus large force is difficult. However, we must conclude that requirements correlate to force size.

1-12 Mission: Mission can dictate the level of ADP activity required during a deployment. As in duration and size, missions may range from routine training to general war. All deployments can be placed (in terms of mission) in four major categories: (1) training/humanitarian; (2) show of force; (3) limited conflict; and (4) general war. Past efforts to study the situation described ADP support requirements declining in direct correlation with the increasing intensity of the conflict.

of the art electronic data communication may not be available in all potential locations to which deployments may take place, the ability to communicate data may have to be provided through a technique of retrieval and physical transfer of media such as magnetic tape. While electronic communication is obviously preferable from the standpoint of timeliness of data, it will generally be far more expensive and to some extent more vulnerable; consequently, it should be reserved for those circumstances where data transmission is absolutely time critical.

1-10 Duration: Future deployments may range from short training exercises to a lengthy general war. The duration of a deployment influences what sort of management processes require automation. Therefore, a system to satisfy mobile ADP requirements must be capable of expansion from those minimum requirements for the shortest most austere exercise to the large scale requirements of a sustained show of force or long-term conflict. The ability to distinguish clearly definable points in time when a deployment changes from short to medium duration or from medium duration to full in-garrison operations is questionable. Planning for such phase points is not practical in a real world situation. Previous ADP studies in the deployed environment have attempted to divide deployments into discrete phases to categorize certain functional requirements as necessary immediately and others as long term. This may be useful from a planning viewpoint, but from a practical standpoint, it is unrealistic to expect crisis categories:

(1) main bases, those already supporting permanent USAF forces;

(2) limited bases, those with some existing facilities, but no permanently assigned USAF units; and

(3) bare bases, those with only a runway, aircraft parking space, and water which can be made potable. Forces must be capable of operating at any one of these types of installations to support currently planned employments or any unplanned situations requiring response by the Rapid Deployment Joint Task Force.

c. A third function of location is the support structure of the employing command. Deployed units must be capable of interfacing with various support concepts. In the Pacific theater for instance, intermediate repair is centralized at one location and only organizational level maintenance is accomplished at field level. Conversely, in Europe, a mixture exists (depending upon weapon system) of the classical organizational and intermediate capability at every site, and a new concept of limited bases called Forward Operating Locations (FOL's) supported by a Main Base. Support concepts must have sufficient flexibility to adapt to changes in the level of repair and other facets of the logistics support concept. To accommodate such changes, the support system must have the capability to extract and communicate data from one location to another to be usable in situations where organizational and intermediate maintenance are not collocated. Recognizing state utilization of his personnel resources. MMICS will provide many useful products which identify AFSCs and skill level of assigned personnel. Once a unit reaches its deployed location, the timely identification of its personnel resources in comparison to sister units within the same theater will be extremely important to the rapid repair and maintenance of aircraft and other equipment.

6. Delayed Discrepancies. At the 60 day point, we visualize the number and type of delayed discrepancies will have a significant effect upon the capabilities of the deployed aircraft and upon the decisions of how to use individual aircraft in combat. The delayed discrepancy subsystem provides rapid displays of specific discrepancies for individual aircraft. Additionally, it provides the status of parts on order to repair those discrepancies. Manual tracking of discrepancies and parts will become confusing and will require the maintaining of lengthy lists by a central agency within the deployed unit after the 60 day point.

7. Training Management. At the 180 day point, we believe the deployment will become of "unknown duration." This would require MMICS to function as if in garrison. Training of replacement troops and the identification of current qualifications would require the implementation of the training subsystem.

MAC

1. The MAC logistics environment is significantly different from other commands due to the nature of the airlift mission. It would be misleading to precisely define essential MMICS subsystems without first defining the MAC logistics environment and discussing certain assumptions concerning MMICS.

2. During contingencies and mobilization Aerospace Rescue and Recovery Service (ARRS) and tactical airlift aircraft will be operationally assigned to, and logistically supported by, the Air Force component of the theatre command. Therefore, MAC and the Air Force component command's requirements for information and the supporting system must be compatible to minimize peace to war transition. The ARRS mission profile is similar to tactical fighter aircraft, i.e., the point of departure is most often the point of return with few, if any, intermediate stops. During actual deployment, aircraft maintenance information must be available at the operating location.

3. The tactical airlift mission is somewhat different. Tactical airlift aircraft, including Reserve Forces, will often deploy units, or parts of units, to main operating bases, collocated operating locations, or forward operating bases. Operating out of these locations, tactical airlift aircraft make numerous sorties to different bases before returning to their unit's location. Any maintenance performed on these aircraft at en route locations must be made known to the owning organization.

4. The strategic airlift mission operates in a unique logistics environment. There is no planned unit deployment of strategic airlift aircraft. These aircraft will be maintained primarily at CONUS locations; after departing home station, these aircraft normally will not return for several days. During this time, maintenance and servicing will be performed at a variety of locations, some of which will not have U.S. support forces. Additionally, during periods of increased mobilization, strategic airlift forces may not return to their home base. Depending on airlift requirements, aircraft requiring maintenance will be routed through the nearest MAC base having the necessary repair capability. Therefore, during periods of increased mobilization, aircraft data must be retained with the aircraft or be readily available to the unit performing maintenance.

5. The logistics information requirements for both airlift missions are similar. If aircraft maintenance information must flow constantly between locations, communications requirements increase significantly. Unless aircraft maintenance data stay with the aircraft, any ADP configuration and supporting communications network will be both complex and expensive.

6. Wartime logistics information requirements were recently studied by a MAC Command and Control Information Flow Study. As a result, we believe only a limited number of subsystem transaction identification codes (TRICs) provide most of the essential information needed by our logistics people in the field. Information provided by other TRICs may be helpful but is not essential and should not be part of the wartime MMICS. We assume, therefore, MMICS subsystems can be subdivided or differentiated into individual TRICs which can operate independently of the parent subsystem. We also assume an on-board aircraft-data-storage capability will not be available in the near future. Therefore, aircraft-related data must be available on demand to various locations to support MAC aircraft. We assume this capability is technologically feasible and available.

2-9 Using the MAJCOM views on the requirement for MMICS subsystems in a deployed environment, we have depicted the most stringent requirements in figure 2-1. In addition, several subsystems have been added to the first blocks based on the fact they are required for proper functioning of the engine tracking subsystem.

2-10 The requirements stated for status and inventory, inspection and time change, TCTO, and engine tracking (subsystems 1, 3, 5, 8) are necessary early in the deployment since they provide automated aids in tracking the accomplishment of critical maintenance events on deployed aircraft. While some of these processes could initially be accomplished manually, anticipated high sortie rates dictate that this would be the case only for a very short period, probably not exceeding 15 days. For those aircraft requiring engine tracking, the need for automated support is immediate unless the severity of the contingency allows both considerable prior "grooming" of aircraft and the use of a small highly select fleet. In fact, the experience of the 1st Tactical Fighter Wing deployment to Saudia Arabia in the late 1970's indicates that even when selectivity and "grooming" are possible, the absence of engine tracking capability seriously hampers operational support. If engine tracking is required, subsystems 1, 2 (operational events), 3 and 5 must also be available due to the manner in which the subsystems interrelate within the MMICS structure.

2-11 Requirements can be broken into two major categories.

Prior to D+30 with 50% or less of the unit aircraft and corresponding personnel and equipment deployed, requirements consist of engine tracking and associated subsystems. Additionally, a requirement has been stated by MAC for delayed discrepancy and training management subsystems for all deployments involving 30% or more of unit aircraft. For deployments in excess of 30 days with 50% or more of unit aircraft deployed, full MMICS capability is required. As can be seen from the matrices in figures 2-2 through 2-6, these requirements are generally agreed upon by each of the MAJCOMs polled.

2-12 Since engine tracking and associated subsystems represent a substantial portion of the entire MMICS software, it appears deployed units will require virtually full MMICS capacity very early. Since this is the case, and the technical capacity of machines has improved considerably in recent years, it would seem prudent to consider providing a system which is capable of running the full MMICS system, and let the individual manager determine which subsystems are required based upon the particular circumstances in each individual deployment. This would eliminate the necessity to make difficult forecasts before the fact concerning the potential duration of deployments in actual contingencies.

FUTURE REQUIREMENTS

COMPREHENSIVE ENGINE MANAGEMENT SYSTEM (CEMS)

2-13 Background. The following background concerning the

PERCENT OF AIRCRAFT DEPLOYED

Duration (Days)	10	20	30	40	50	60	70	80	90	100
1–9	* 1,3,5,8	1,3, 5,8	1,2,3,5 7,8,10	1,2,3,5 7,8,10	1,2,3,5 7,8,10	1,2,3,4, 5,7,8,10	1,2,3,4, 5,7,8,10	1,2,3,4, 5,7,8,10	1,2,3,4, 5,7,8,10	1,2,3,4, 5,7,8,10
10–19	1,2,3,5 8	1,2,3,5 8	1,2,3,5 7,8,10	1,2,3,5 7,8,10	1,2,3,4, 7,8,9,10	ALL	ALL	ALL	ALL	ALL
20–29	1,2,3,5 8	1,2,3,5 7,8	1,2,3,5 7,8,10	1,2,3,5 7,8,9,10	1,2,3,4, 7,8,9,10	ALL	ALL	ALL	ALL	ALL
30–39	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL
40–49	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL
50–59	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL
60–69	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL
70–79	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL
80–89	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL
90+	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL

1. Status and Inventory
2. Operational Events
3. Inspection and Time Change
4. Delayed Discrepancies
5. TCTO
6. Location
7. Equipment and Personnel
8. Engine Transfer Tracking
9. Maintenance Personnel
10. Training

*Subsystems 1, 2, 3 and 5 are required to support subsystem 8.

FIGURE 2-1

SAC

PERCENT OF AIRCRAFT DEPLOYED

Duration (Days)	10	20	30	40	50	60	70	80	90	100
1-9										
10-19								1,2,3	1,2,3	1,2,3
20-29	1,2,3	1,2,3	1,2,3	1,2,3	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4
30-39	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10
40-49	1,2,3 4,5	1,2,3 4,5	1,2,3 4,5	1,2,3 4,5	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10
50-59	1,2,3,4 5,7	1,2,3,4 5,7	1,2,3,4 5,7	1,2,3,4 5,7	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10
60-69	1,2,3,4 5,7	1,2,3,4 5,7	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10
70-79	1,2,3,4 5,7	1,2,3,4 5,7	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10
80-89	1,2,3,4 5,7	1,2,3,4 5,7	1,2,3,4 5,7,9,10	1,2,3.4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10
90+	1,2,3,4 5,7	1,2,3,4 5,7	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10	1,2,3,4 5,7,9,10

1. Status and Inventory
2. Operational Events
3. Inspection and Time Change
4. Delayed Discrepancies
5. TCTO
6. Location
7. Equipment and Personnel
8. Engine Transfer Tracking
9. Maintenance Personnel
10. Training

FIGURE 2-2

PACAF

PERCENT OF AIRCRAFT DEPLOYED

Duration (Days)	10	20	30	40	50	60	70	80	90	100
1-9			1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8
10-19			1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8
20-29		1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8
30-39	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	ALL	ALL	ALL
40-49	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	ALL	ALL	ALL
50-59	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	ALL	ALL	ALL
60-69	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	ALL	ALL	ALL	ALL	ALL
70-79	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	ALL	ALL	ALL	ALL	ALL
80-89	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	1,2,3,5 7,8	ALL	ALL	ALL	ALL	ALL
90+	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL

1. Status and inventory
2. Operational Events
3. Inspection Time Change
4. Delayed Discrepancies
5. TCTO
6. Location
7. Equipment and Personnel
8. Engine Transfer Tracking
9. Maintenance Personnel
10. Training

FIGURE 2-3

USAFE

PERCENT OF AIRCRAFT DEPLOYED

Duration (Days)	10	20	30	40	50	60	70	80	90	100
1-9			1,2,3 5,8	1,2,3 5,8	1,2,3 5,8	1,2,3, 4,5,8	1,2,3 4,5,8	1,2,3 4,5,8	1,2,3 4,5,8	1,2,3 4,5,8
10-19			1,2,3 5,8	1,2,3 4,5,8	1,2,3 4,5,8	1,2,3 4,5,8	1,2,3 4,5,8	1,2,3 4,5,8	1,2,3 4,5,8	1,2,3 4,5,8
20-29		1,2,3 5,8	1,2,3,4 5,8	1,2,3 4,5,8	1,2,3,4 5,8,9	1,2,3,4 5,8,9	1,2,3,4 5,8,9	1,2,3,4 5,8,9	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10
30-39	1,2,3 5,8	1,2,3 5,8	1,2,3,4 5,8	1,2,3,4 5,8	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10
40-49	1,2,3 5,8	1,2,3 5,8	1,2,3,4 5,8	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10
50-59	1,2,3 5,8	1,2,3 5,8	1,2,3,4 5,8	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10
60-69	1,2,3 5,8	1,2,3 5,8	1,2,3,4 5,8	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10
70-79	1,2,3 5,8	1,2,3 5,8	1,2,3,4 5,8	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10
80-89	1,2,3 5,8	1,2,3 5,8	1,2,3,4 5,8	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10
90+	1,2,3 5,8	1,2,3 5,8	1,2,3,4 5,8	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10	1,2,3,4 5,8,9,10

1. Status and Inventory
2. Operational Events
3. Inspection and Time Change
4. Delayed Discrepancies
5. TCTO
6. Location
7. Equipment and Personnel
8. Engine Transfer Tracking
9. Maintenance Personnel
10. Training

FIGURE 2-4

TAC

PERCENT OF AIRCRAFT DEPLOYED

Duration (Days)	10	20	30	40	50	60	70	80	90	100
1-9	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8
10-19	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8
20-29	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8	1,2,3, 5,8
30-39	1,2,3, 5,8	1,2,3, 5,8	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,5 7,8,9
40-49	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,5 7,8,9
50-59	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9
60-69	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9
70-79	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9
80-89	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9
90+	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9

1. Status and Inventory
2. Operational Events
3. Inspection and Time Change
4. Delayed Discrepancies
5. TCTO
6. Location
7. Equipment and Personnel
8. Engine Transfer Tracking
9. Maintenance Personnel
10. Training

FIGURE 2-5

MAC

PERCENT OF AIRCRAFT DEPLOYED

Duration (Days)	10	20	30	40	50	60	70	80	90	100
1-9			1,2,7,10	1,2,7,10	1,2,7,10	1,2,7,10	1 2,7,10	1,2,7,10	1,2,7,10	1,2,7,10
10-19	1,2	1,2	1,2,7,10	1,2,7,10	1,2,3,4 5,7,9,10	ALL	ALL	ALL	ALL	ALL
20-29	1,2	1,2	1,2,7,10	1,2,7,10	1,2,3,4 5,7,9,10	ALL	ALL	ALL	ALL	ALL
30-39	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL
40-49	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL
50-59	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL
60-69	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL
70-79	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL
80-89	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL
90+	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL

1. Status and Inventory
2. Operational Events
3. Inspection and Time Change
4. Delayed Discrepancies
5. TCTO
6. Location
7. Equipment and Personnel
8. Engine Transfer Tracking
9. Maintenance Personnel
10. Training

Figure 2-6

development of the Comprehensive Engine Management System was extracted from the CEMS functional description dated 22 August 1980. The needs for the base level portions of Increments I and II of the Comprehensive Engine Management System (CEMS) arise from two major situations which currently exist regarding management of Air Force jet engines:

a. The Air Force is adopting a policy of On-Condition Maintenance (OCM) for its engines. This means that engines under OCM are no longer sent to overhaul based on Maximum Operating Time (MOT) of the engine, nor are engines removed for inspection at the unit level based on Time Since Overhaul. Instead, components and modules of engines are sent to the depot for overhaul based on the component's or module's operating time(s). Likewise, engine components and modules are inspected at the unit level based on operating time(s). A further complication of this process is the fact that engines under OCM [particularly engines of new technology (e.g., TF34, F100) and problem engines] have parts that are each "tracked" for removal for overhaul or inspection using different usage factors. For example, certain parts on an engine may be tracked for removal using Engine Operating Time; other parts may be tracked on the basis of amount of time at certain temperature levels; and still others may be tracked using cycles (throttle advancements) or sorties. Furthermore, the potential exists for a part to be "multiple-tracked,"--i.e., using two or more tracking methods, with the first tracking method that exceeds the pre-selected maximum operating time or time since overhaul being what "drives" that component out of an engine for inspection or overhaul. The volume of engine-related information to be monitored and used at the base level is multiplying. Instead of tracking one hundred or, at the most, two hundred engines, base level engine personnel, under OCM, will be required to individually track approximately thirteen thousand parts, (more than 500,000 AF wide for F-100 and TF-34 engines) using several tracking methods rather than flying time as was done before OCM.

b. To accurately maintain usage information to identify modules and components needing inspections and time changes, and to report the current status and usage of engines, modules, and components to Air Force Logistics Command would be an impossible task if done manually at the unit level. The result would be inaccurate and lost information, with the related impacts on the usage life of parts and engines and, most importantly, on safety of flight. Two new Air Force engines have been brought into the inventory under OCM--the F100 engine (used on the F-15 and F-16) and the TF34 (used on the A-10). The need to automatically track the parts on these engines forced development and implementation of base level and central data base tracking systems (one at Oklahoma City ALC and one at the General Electric Plan at Lynn Massachusetts). However, these systems are one-time programming efforts designed specifically to support these engines on an interim basis until CEMS is implemented. In addition, these systems do not meet all the requirements of CEMS, providing only those minimum capabilities required to keep up with engine and parts usage. Finally, a number of older engines (specifically the TF33 and J85 engines) have also gone under On-Condition Maintenance without supporting data systems. Manually tracking these engines has become very difficult at both the base and depot levels. For a summary of the CEMS Functional Description, see Appendix C.

AUTOMATED MAINTENANCE SYSTEM (AMS)

2-14 The Automated Maintenance System being tested by Military Airlift Command at Dover AFB, Delaware is an on-line, real-time, computer system that ensures efficient maintenance by positive control of physical assets, personnel, and maintenance records. This control is accomplished by a number of software programs that interact with the C-5A Malfunction Detection, Analysis and Recording Subsystems (MADARS) and Ground Processing System. AMS has provided significant improvement in peacetime maintenance management at Dover and demonstrates potential for expansion into other weapon systems. Such expansion could substantially increase the requirement for automation during contingencies. A detailed description of AMS is at Appendix D.

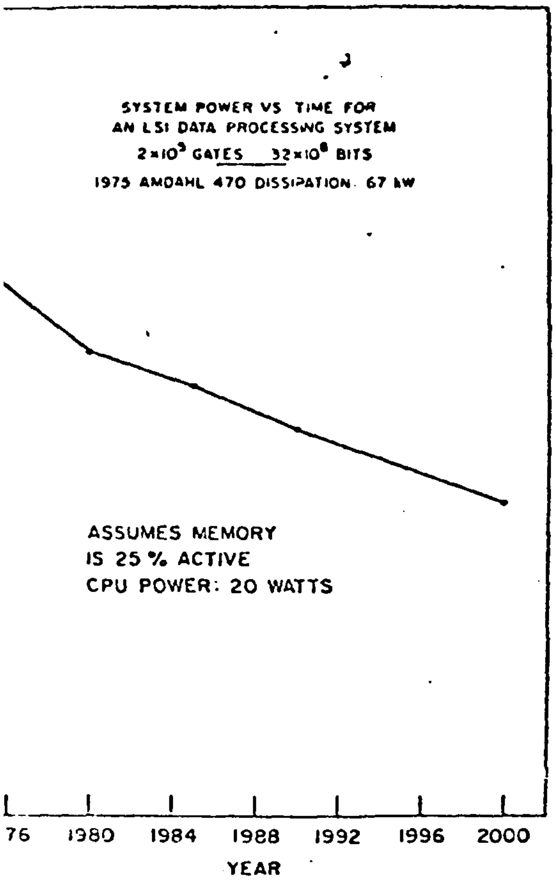
TABLE 1

AMS PROCESSES

PROCESS	NUMBER
Work Order Generation	1
Work Order Close-Out	2
Debriefing	3
Personnel Availability	4
Job Following - Job Control	5
Job Following - Major Equipment Inspections	6
Job Following - AGE	7
Maintenance Pre-Plan	8
Designed Operational Capability	9
Engine Tracking	10

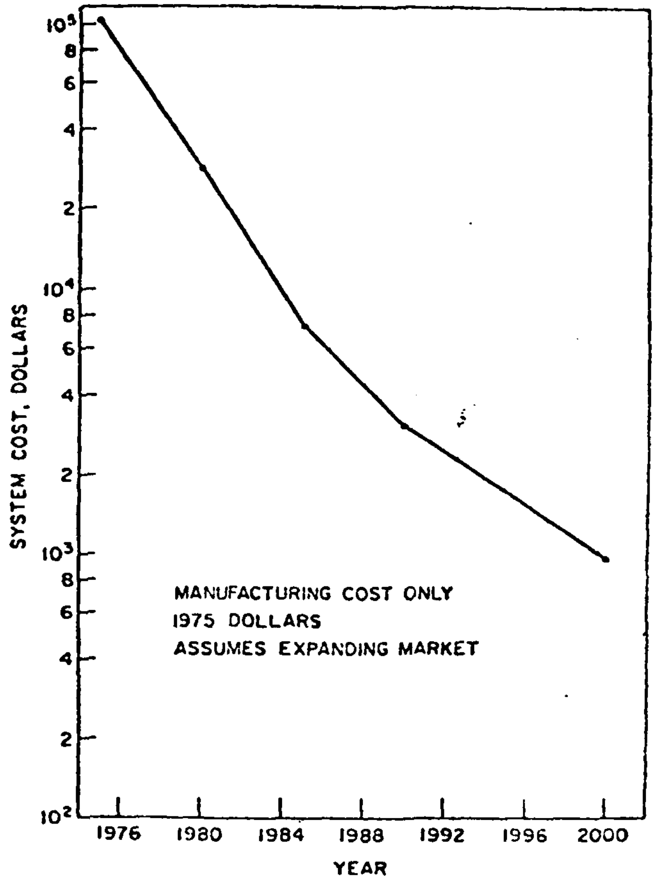
2-15 Three CONUS MAJCOMs (in addition to MAC) are currently in the process of planning for prototype AMS systems to determine the applicability of the AMS processes to various operational environments. These commands are TAC, SAC, and ATC. Part of this effort must also be to determine which parts of the system are required in a deployed environment. An initial attempt has been made here, with the help of the participating MAJCOMs, to identify portions of AMS currently considered for deployment. These requirements should be used only for broad planning purposes until the MAJCOMs have more specifically defined what the AMS should look like to support each command's mission. Responses to the AFLMC query on wartime essentiality for AMS (described in Table 1) are contained in Figures 2-7 through 2-9. Generally, however, wartime requirements for AMS arise as the system is employed to replace current information systems such as flightline radio communication, manual forms and other such non-automated media. As it is currently constructed, the system would be difficult if not impossible to dismember into component parts, even if a determination could be made that certain portions were wartime essential while others were not.

3-7 The nature of modern warfare will also dictate that ADP be used more extensively than in the past to aid commanders in effectively employing their forces. A good deal of thinking and planning has been done recently with respect to the environment on the modern battlefield, and what the logistic support system will have to be like to support operations in such an environment. Chapter 1 discussed the fact that the employment of military force in the next two decades may take any number of forms and could conceivably take place in almost any location on the globe. The consensus of today's planners however, is that the most severe test of US military capabilities short of global war would come in a confrontation with the Warsaw Pact in Central Europe. On such a battlefield, survivability of ground elements of the Tactical Air Forces would be in great jeopardy. The situation would be one of great fluidity, with battle lines changing by the minute, and the advantage to the side most readily able to concentrate its power at the right place at the right time. In such a situation it will be essential to be able, not only to communicate to force commanders what the status of a given unit is at any time, but also to communicate what the unit status is projected to be at some future time. The ability to make such projections will give us the capability to move resources from one place to another in time to have an impact on the outcome of the battle. Making such projections with reasonable accuracy is dependent upon ADP. Spares and people are in short supply and this is projected to deteriorate by the year



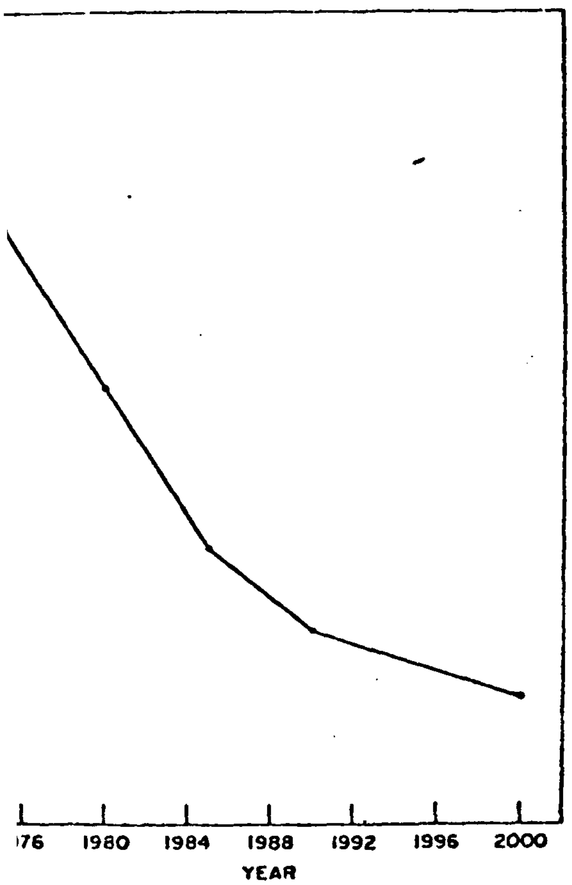
System power for the ground-based data processing system.

Figure 3-1



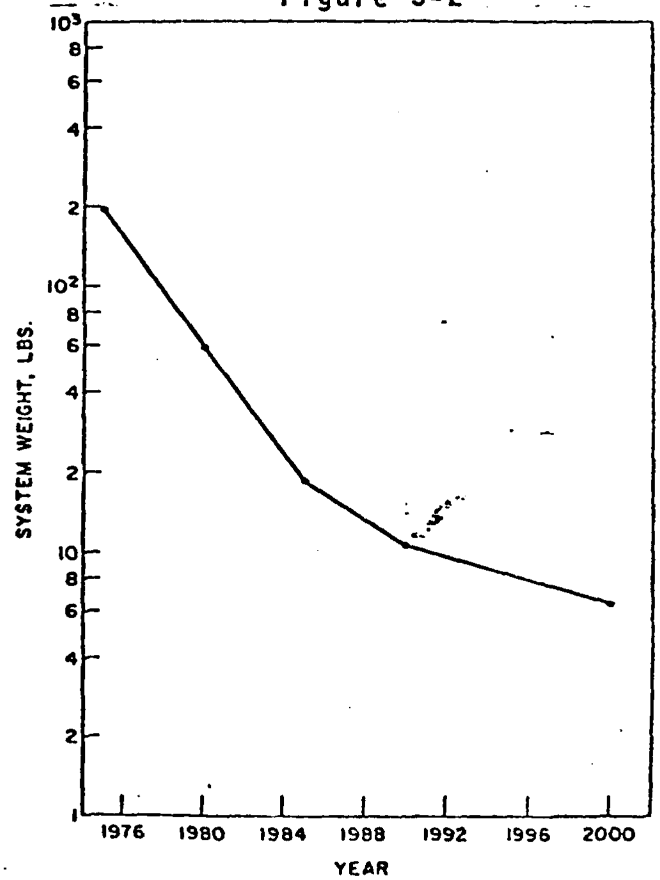
Cost for the VLSI data processing system as a function of the year of its implementation.

Figure 3-2



Data processing system size.

Figure 3-3



Data processing system weight.

Figure 3-4

system is feasible without the traditional requirement for excessive stockage. The alternative to a system which has spares in place in case they are needed, is one which is able to have the asset arrive just before it is needed.

3-6 It is also essential we recognize that technology, in the electronics field especially, has changed by several orders of magnitude over the past 10 years. The importance of this change, insofar as the above concept is concerned, is that we need no longer think in terms of large fixed sensitive hardware when we think of ADP management systems. Industry has the capability to deliver very powerful ADP systems in extremely small rugged packages. We have been putting such systems in our aircraft for many years. Additionally, the change in cost of these systems has approximately paralleled that of the hand-held calculator and the electronic timepiece. All have dropped in price dramatically as very large scale integrated circuits became commonplace. Figures 3-1 through 3-4 indicate a forecast of the capabilities of microcomputers through the year 2000. These figures graphically illustrate the fact we expect small, low cost, very high powered computers to become commonplace by the year 2000. This will mean we will be entering a period when the computer will become as commonplace as the copy machine in the normal office environment.[2]

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[2] Wise, Kensall D., Chen, Kan, and Yokely, Ronald E. Microcomputers: A Technology Forecast and Assessment to the Year 2000. John Wiley & Sons, New York, 1980, pp 28-65.

vulnerability or varying sortie rates or uncertain environments, but the fact that we may not have the time in the next conflict to use our industrial mobilization capability as we have in the past, but will have to "come as we are". Reverting to a "push" system in wartime will still appear to be the most logical approach, but that system has traditionally required excessive quantities of materiel so that we can push adequate supplies to all locations. Unfortunately, it is not likely that we will be able to justify buying those quantities in peacetime for a war that might happen.

3-4 This leaves us with three equally unpleasant choices: (1) abandon the traditional "push" system in war in favor of a "pull" system with its attendant delays; (2) attempt to justify in an austere budget climate the tremendous stocks required to operate a traditional "push" system in the event of war; or (3) adopt a "push" system without the requisite overstockage and suffer the loss of capability when precious assets are pushed to the wrong location.

3-5 None of these are palatable and, as Rand has said, we must devise new support strategies. Information management holds the key to solving the problem. That solution is to develop a logistics support system which can accurately forecast where and when assets will be needed. The on-condition maintenance system supported by the F-100 and TF-34 engine tracking systems is the first step in this process. If the system can accurately forecast when and where spares will be needed, then a "push"

> "Conventional wisdom holds that the combat commander at the lowest possible level ought to have all the resources within his command to perform his mission. This notion led to the attempt to make each base largely self-sufficient. This goal is likely to become more and more difficult, perhaps impossible to achieve. The uncertainties of future wartime environments, variations in flying rates and repair capabilities across bases, and very grave vulnerability to airbase attack will make it virtually impractical to buy enough stock to guarantee base self-sufficiency."[1]

3-3 At first glance those statements may appear unrelated to the subject of this report; however, they are in fact directly related. The four factors which Rand gives as reasons for the move away from self-sufficiency are genuine. However, these factors have always existed to some degree regardless of which conflict one wishes to examine. The real reason for the gravitation away from base self-sufficiency is simply dollars. In past conflicts, even up through Vietnam, the United States was able to mobilize vast industrial resources to produce large stocks of wartime materiel. In an attempt to ensure the combatant in the field experienced a minimum of lag time due to lack of materiel, we have always abandoned our peacetime "pull" logistics system for a wartime "push" system. The philosophy inherent in this change is that we can keep the pipeline full of materiel and offset costly requisition and transportation time. The one situation which has changed today is not airbase

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[1] Rich, Michael D., and Drezner, Stephen M. An Integrated View on Improving Combat Readiness, Rand Corporation, Santa Monica, California, February 1982, pp. 10,11.

> "The implementation of MMICS and its loss of personnel must be balanced with an effective system for accompanying use at deployed locations. Although this capability is important for Increments I and II, its impact on Increment III becomes critical."

The fielding of the F-100 and TF-34 engines advanced the use of ADP one step further. With these systems, we now use ADP to make operational decisions about aircraft based on continuously tracked parameters. This has moved ADP out of the "record keeping" mode and into a genuine role of aiding decision-making. The development of the Comprehensive Engine Management System (CEMS) will result in the export of engine component tracking to additional engines. It is reasonable to assume that continuing inflation and rising materials prices will drive the price of components even higher, and on-condition maintenance (OCM) will become an economic necessity on more than merely engine components. As this occurs, the use of ADP to track components against OCM limits will undoubtedly increase. This means ADP will become an even more integral part of the day to day business of fixing airplanes and making operationally oriented decisions about those airplanes. It is essential that the maintenance community in the Air Force recognize this trend as a fact of life. In a Working Note, Number N-1797-AF, Rand has stated:

> "...our work has shown that high states of readiness need not be beyond the reach of very sophisticated or complex weapon systems, although new development strategies and improved support systems are probably necessary to achieve those levels."

Later in the note, the authors indicate the following:

CHAPTER 3

SUMMARY

3-1 Maintenance in the Air Force has entered a new era in its use of ADP as a management tool. Prior to the early 1970s ADP in the maintenance environment was confined to large batch-oriented systems primarily aimed at feeding data up-channel to AFLC and higher echelons of command. These systems were also oriented toward historical data used by the wholesale logistics community to make large scale logistics and budget decisions and by intermediate and major command headquarters to assess force status and readiness. Use of those systems at base level was largely limited to circumstances associated with answering queries from AFLC or MAJCOM as opposed to routine day to day management. With the advent of the Maintenance Management Information and Control System (MMICS), this situation began to change. While MMICS is still largely historically oriented, it provides information which is more germane to the day to day business of fixing airplanes. To this extent, use of ADP at base level has increased dramatically.

3-2 The effect of increased reliance on ADP for deployed/wartime operations was recognized as early as 1975. In a letter to Lt Gen William W. Snavely, HQ USAF/LG, Lt Gen Robert F. Hails, TAC/CV said:

to weed out and fix or dispose of those items would vastly improve our capability to maintain aircraft effectively and inexpensively. Additionally, the ability to track a particular aircraft's capability in performing various kinds of operational tasks could greatly improve our success at selecting the right aircraft for the right mission. Good maintenance personnel have traditionally done this with their "little black books" however an automated capability could provide much more valuable information.

2-22 The foregoing are but a few capabilities which, if realized could significantly improve the combat effectiveness of the maintenance organization. There are no doubt others which have not surfaced, and the continued evolution of the maintenance system is crucial to the ability to sustain effective combat capability.

traditionally been answered using intuition. A good portion of the data required to build an effective model to answer these questions in a more structured fashion already exists in the maintenance management information system. What needs to be done is the development of simple, yet effective, algorithms to forecast the capability of the unit at some future point in time given a finite supply of resources. This would also give commanders and their staffs the capability to do sensitivity excursions aimed at identifying which resources could have the greatest impact on capability. In a situation where winning or losing the battle depends upon concentrating maximum force in the right place at the right time, such a capability is crucial.

2-21 Finally, maintenance needs to integrate component and system historical performance into its current system. To some extent the Automated Maintenance System is capable of doing this, but at the components level the system tracks only those components identified as Advanced Configuration Management System (ACMS) components. The current maintenance system treats each component with a given stock number the same. That is, all F-4E TACAN receiver transmitter units (R/T) are identical. We track the reliability of the TACAN R/T in the aggregate, but we do not analyze the performance of one R/T versus another. We assume they are identical. They are not. Components (particularly electronic components) and systems have personalities as surely as people and airplanes do. In every group there are a few which account for an inordinate share of maintenance. The capability strategic airlift forces, for a method of capturing and saving maintenance condition and discrepancy data on those aircraft which operate away from their primary support base for extended periods of time. Currently, the Air Force relies on a manual system to accomplish this.

2-19 In the area of software, the maintenance management information system needs to provide several additional capabilities to be an effective wartime tool. The system needs to provide a capability for automated scheduling of aircraft. Forecasting and scheduling of aircraft to meet a specific future requirement is an exceptionally complex task due to the many influences on the system. Currently we require the scheduler to accomplish this effort in an almost totally manual environment. The result is that building a weekly schedule can take two to three man days. In a wartime scenario this is unrealistic since schedules change on an hourly basis. Automation holds the key to speeding the process by doing the difficult relationship calculations quickly and freeing the scheduler to evaluate the results and formulate innovative techniques to solve scheduling conflicts.

2-20 A capability is also needed to do some simple forecasting at base level using either analytical or simulation modeling techniques. In a combat situation, maintenance must be rapidly responsive to the demands of command and control. In a fluid fast moving environment these demands often surface in the form of "what if" or "how much can we do" questions which have

BEYOND THE AUTOMATED MAINTENANCE SYSTEM

2-16 The Automated Maintenance System as it is currently envisioned is designed to be an evolutionary program. While it has finite milestones and goals at this juncture, additional goals and milestones will be added as new technology emerges, giving maintenance the capability to further improve its operation. There are several capabilities which need to be acquired to make the maintenance operation more effective in the long run. Two of those are hardware oriented capabilities. The remainder are software system capabilities.

2-17 First, some capability is required to capture maintenance condition and discrepancy data at its source and input that data into the maintenance management information system. Currently, the initialization of maintenance data is done manually either through forms or radio transmission. As more of the maintenance cperation is automated, some method is required to allow the mechanic on the flightline to more easily enter and acquire information from the system. This requirement can be met by a variety of handheld/mobile devices. However, one characteristic which is essential is that the device be sufficiently "user friendly" so as not to be difficult for the average mechanic to use. This means the requirement exists for tutorial capability to avoid every mechanic having to learn a complicated series of transaction codes.

2-18 Second, there exists a requirement, particularly for

TAC

NUMBER OF AIRCRAFT DEPLOYED*
(24 Aircraft AMU)

DURATION (DAYS)	6	12	18	24
1-9	10	10	10	10
10-19	10	10	10	10
20-29	10	10	10	10
30-39	10	10	1,2,3, 6,7,10	1,2,3, 6,7,10
40-49	10	10	1,2,3, 6,7,10	1,2,3, 6,7,10
50-59	10	10	1,2,3, 6,7,10	1,2,3, 6,7,10
60-69	1,2,3, 6,7,10	1,2,3, 6,7,10	1,2,3, 6,7,10	1,2,3, 6,7,10
70-79	1,2,3, 6,7,10	1,2,3, 6,7,10	1,2,3, 6,7,10	1,2,3, 6,7,10
80-89	1,2,3, 6,7,10	1,2,3, 6,7,10	1,2,3, 6,7,10	1,2,3, 6,7,10
90+	1,2,3, 6,7,10	1,2,3, 6,7,10	1,2,3, 6,7,10	1,2,3, 6,7,10

*Format modified to accommodate number of aircraft deployed rather than percent of aircraft.

Figure 2-9

SAC

PERCENT OF AIRCRAFT DEPLOYED

Duration (Days)	10	20	30	40	50	60	70	80	90	100
1-9	NONE	1,2,3, 4,5,8, 9	1,2,3, 4,5,8, 9	1,2,3, 4,5,8, 9	1,2,3, 4,5,8, 9	1,2,3, 4,5,8, 9	1,2,3, 4,5,8, 9	1,2,3, 4,5,8, 9	1,2,3, 4,5,8, 9	1,2,3, 4,5,8, 9
10-19	1,2,3, 4,5,8, 9	1,2,3, 4,5,8, 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9
20-29	1,2,3, 4,5,8, 9	1,2,3, 4,5,8, 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9
30-39	1,2,3, 4,5,8, 9	1,2,3, 4,5,8, 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9
40-49	1,2,3, 4,5,8, 9	1,2,3, 4,5,8, 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9
50-59	1,2,3, 4,5,8, 9	1,2,3, 4,5,8, 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9
60-69	1,2,3, 4,5,8, 9	1,2,3, 4,5,8, 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9
70-79	1,2,3, 4,5,8, 9	1,2,3, 4,5,8, 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9
80-89	1,2,3, 4,5,8, 9	1,2,3, 4,5,8, 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9
90+	1,2,3, 4,5,8, 9	1,2,3, 4,5,8, 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9	1,2,3 4,5,8 9

Figure 2-8

MAC

PERCENT OF AIRCRAFT DEPLOYED

Duration (Days)	10	20	30	40	50	60	70	80	90	100
1- 9	NONE	NONE	NONE	1,3	1,3	1,3	1,3	1,3	1,3	1,3
9-15	NONE	NONE	NONE	1,3	1,3	1,3	1,3	1,3	1,3	1,3
16-29	1,3	1,3	1,3	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9
30-39	1,3	1,3	1,3	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9
40-45	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9
46-59	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9
60-69	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9
70-79	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9
80-89	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9
90+	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	1,3,5, 7,9	ALL	ALL	ALL

Figure 2-7

2000. We must have the ability to manage those precious commodities and forecast requirements far enough ahead to allow our overtaxed transportation system enough time to move them to the right place at the right time. The only way to retain flexibility and capability in an environment of shrinking resources and constrained airlift is to forecast accurately and as far ahead as possible what the requirement is and where it will be needed. Rapid ability to manipulate information is crucial to this capability, and it will be needed right down at the combat unit.

CHAPTER 4

Conclusions

4-1 The MAJCOMs see a requirement for engine tracking capability (for those airplanes with tracked engines) immediately upon deployment. This requirement appears to exist regardless of force size and duration. Additionally, they see a need for the other aircraft status oriented portions of MMICS (TCTO, Time Change, Inspection) between 15 and 30 days into the engagement. At 30 days into the engagement, the MAJCOMs see a transition to an environment much like "business as usual." The Comprehensive Engine Management System (CEMS) phasing is much the same; engine tracking an immediate requirement, followed by TCTO, Time Change and diagnostics between D+15 and D+30. The requirements for the Automated Maintenance System (AMS) are also similar, however, it is difficult to be specific about AMS since the nature of the peacetime system has yet to be determined. These requirements are necessarily hypothetical in nature, and the actual use of automated management systems would be determined by actual circumstances during a conflict. For that reason it is dangerous to make assumptions about the nature of the next conflict, its intensity, duration, location or other characteristics. Rather, it would seem more prudent to provide the individual maintenance manager with the capability to deploy and use the entire system (whether it be MMICS, CEMS, AMS or a combination thereof) and let him decide which portions of the system are applicable to a given set of circumstances. In the past, this would have been prohibitive both in cost and required transportation. However, as noted earlier in Chapter 3, the cost and size of systems are moving rapidly in directions which make this not only a viable strategy, but probably the appropriate one. The next chapter will provide some recommendations as to how to proceed.

CHAPTER 5

RECOMMENDATIONS

5-1 Recommend the AFLMC continue to assist AFDSDC in developing a deployable ADP system capable of providing minimum essential maintenance information processes. (OPR: AFDSDC OCR: AFLMC)

5-2 Recommend HQ USAF/LEY and MAJCOMs determine the number of systems required and initiate programming and budget action through HQ USAF/ACD to establish the requirement for a deployable ADP system in the Phase IV environment to support the current engine tracking system, CEMS, and the other MMICS functions indicated by the MAJCOMs in this report. (OPR: AF/LEY; MAJCOM/LGs)

5-3 Recommend the CEMS Program Manager formally document the requirement for mobility as a part of the CEMS development process, and that deployability be one of the evaluation criteria for CEMS. (OPR: AFLC/LO(CEMS))

APPENDIX A

ABBREVIATIONS

ACMS - Advanced Configuration Management System

ADP - Automated Data Processing

AGE - Aerospace Ground Equipment

AMS - Automated Maintenance System

AUTODIN - Automatic Digital Network

BLEMS - Base Level Engine Management System

CAMMIS - Command Aircraft Maintenance Manpower Information System

CDB - Central Data Base

CEMS - Comprehensive Engine Management System

COMO - Combat Oriented Maintenance Organization

DAR - Data Automation Requirement

DOC - Designed Operational Capability

DPD - Data Project Directive

DPI - Data Processing Installation

DPP - Data Project Plan

EDS - Engine Diagnostic System

EOT - Engine Operating Time

ETIC - Estimated Time In Commission

FOB - Forward Operating Base

MADARS - Maintenance Analysis Detection and Recording

MDC - Maintenance Data Collection

MICAP - Mission Capability

MMICS - Maintenance Management Information and Control System

MOB - Main Operating Base

OAP - Oil Analysis Program

OCM - On-Condition Maintenance

SOMARS - Support of Mobility Automation Requirements Study

TACAN - Tactical Air Navigation

TCI - Time Change Item

TCTO - Time Compliance Technical Order

TEMS - Turbine Engine Monitoring System

TNB - Tail Number Bin

UND - Urgency of Need Designator

APPENDIX B

DATA AND DATA SOURCES

DEPARTMENT OF THE AIR FORCE
AIR FORCE LOGISTICS MANAGEMENT CENTER
GUNTER AIR FORCE STATION, ALABAMA 36114

2 1 MAY 1980

TO OF LGM

ECT Logistics Research Project - Wartime Automation Requirement for Maintenance - AFLMC Project No. 800402

TO HQ MAC/LG HQ TAC/LG HQ PACAF/LG
HQ SAC/LG HQ USAFE/LG

1. The Air Force Logistics Management Center (AFLMC) has been tasked by HQ USAF/LEY to undertake a study to define the requirements for automated data processing (ADP) capability and the maintenance management ADP configuration in a wartime scenario. The expanded integration of the Maintenance Management Information and Control System (MMICS) in daily operations, the application of on-condition maintenance, and the growth and importance of engine component tracking and the Comprehensive Engine Management System (CEMS) dictate a need to reevaluate the role of ADP in the deployed environment. For these reasons, AFDSDC has been advised that MMICS is identified as a wartime essential system for protracted deployments.

2. The MMICS was developed essentially as a peacetime managment system. For this reason certain functions/processes have little or no applicability in some scenarios. Therefore, a requirement exists to identify which maintenance management functions/processes are required to support the various levels of deployment/conflict. In particular, we view the period just prior to conflict as the most demanding since forces will be deployed to their employment bases for a period of time during which intense readiness must be maintained. The duration of this period would be impossible to predict in terms of days, but would probably last from several weeks to a few months. This time frame is the primary focus for a deployable ADP requirement. It is important to keep in mind that the goal of this project is to identify deployment ADP requirements whether or not an actual conflict is involved.

3. In order to articulate MAJCOM needs, request your staff provide projected deployment requirements for MMICS using Atch 1. To expedite our response to HQ USAF/LEY, we would appreciate your input NLT 30 Jun 80. We would also appreciate a point of contact for future coordination. If you need further clarification or assistance, please contact our project manager, Capt Raymond J. Hauck, AFLMC/LGM, AUTOVON 921-4581.

WILLIAM L. WORTHINGTON, JR.
Lt Colonel, USAF
Director of Maintenance

2 Atch
1. Worksheet
2. Sample Worksheet

Cy to: HQ USAF/LEY
HQ AFLC/LOL
AFDSDC/LGM

Applying Research to Strengthen Logistics

DEPLOYABLE MMICS WORKSHEET

1. This worksheet was designed to permit each command to chose what MMICS subsystem will be required at various stages of deployment scenarios for their particular mission requirements. These requirements must be known before hardware and communication requirements can be identified.

2. Do not concentrate on the needs of each of your units' unique requirements, or on the interrelationships of MMICS subsystems, but provide a list of management requirements formulated to meet your deployment requirements. Each square represents a fixed time frame of days for a given number of deployed aircraft. Fill in each empty square with the numbers (bottom of worksheet) representing the MMICS subsystems desired to support those numbers of aircraft deployed for each time frame. NOTE: We recognize that MMICS is a system which deals with not only aircraft, but personnel and support equipment. The percent aircraft deployed column indirectly accounts for manpower and support equipment requirements, assuming that the amount of personnel and support equipment required to generate sorties is proportional to the number of aircraft supported. Although some overhead will be required to establish a FOB, increases to the number of aircraft deployed will generate a corresponding increase of manpower and equipment until 100 percent of aircraft deployed will require a full complement of manpower and equipment.

3. If the worksheet is not adaptable to your particular needs, modify the worksheet as applicable to provide as much information as possible.

4. Again, the purpose of this worksheet is to identify MMICS subsystems for a deployable ADP system. Hardware and communication requirements are dependent on your information.

Attachment 1

...ircraft Deployed

...d	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	1,2,8	1,2,8	1,2,7,8,10	1,2,8,10	1,2,3,4,7,8,10	1,2,3,4,7,8,10	→			
	1,2,8	1,2,8	1,2,7,8,10	1,2,3,4,7,8,10	1,2,3,4,5,7,8,10	ALL	→			
9	1,2,3,8	1,2,3,7,8	1,2,3,4,5,7,8,10	1,2,3,4,5,7,8,10	1,2,3,4,5,7,8,9,10	ALL	→			
10 94	1,2,3,4,7,8,10	1,2,3,4,7,8,10	1,2,3,4,5,7,8,9,10	1,2,3,4,5,7,8,9,10	ALL	→				
9	1,2,3,4,5,7,8,9,10	1,2,3,4,5,7,8,9,10	ALL	→						
9	1,2,3,4,5,7,8,9,10	1,2,3,4,5,7,8,9,10	ALL	→						
9	ALL	→								
9	↓									
9										

MMICS Subsystems

Subsystem	No.	Subsystem
Status and Inventory	(6)	Location
Operational Events	(7)	Equipment and Personnel Transfer
Inspection & Time Change	(8)	Engine Tracking (TF-34 & F-100 Engines)
Delayed Discrepancies	(9)	Maintenance Personnel
Time Compliance Technical Orders	(10)	Training Management

d	% Aircraft Deployed									
	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
	NONE	NONE	NONE	NONE	1,2,8	1,2,8	1,2,8	1,2,8	1,2,8	1,2,8
	NONE	NONE	1,2,8	1,2,8	1,2,8	1,2,8	1,2,8	1,2,8	1,2,8	1,2,8
	1,2,8	1,2,8	1,2,8	1,2,8	1,2,8	1,2,8	1,2,8	1,2,8	1,2,8	1,2,8
	1,2,8	1,2,8	1,2,8	1,2,8	1,2,8	1,2,3 5,8	1,2,3 5,8	1,2,3 5,8	1,2,3 5,8	1,2,3 5,8
	1,2,8	1,2,8	1,2,8	1,2,8	1,2,3 5,8	1,2,3 5,7,8	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,4 5,7,8,9	1,2,3,4 5,7,8,9
	1,2,8	1,2,8	1,2,8	1,2,8 5,8	1,2,3 5	1,2,3 5,7,8	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,5 7,8,9	1,2,3,5 7,8,9
	1,2,8	1,2,8	1,2,8	1,2,3 5,8	ALL	ALL	ALL	ALL	ALL	ALL
	1,2,8	1,2,8	1,2,8	ALL	ALL	ALL	ALL	ALL	ALL	ALL
	1,2,8	1,2,8	1,2,3 8	ALL	ALL	ALL	ALL	ALL	ALL	ALL
	1,2,3 5,8	1,2,3 5,8	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL
	1,2,3 5,8	1,2,3 5,8	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL
	1,2,3 5,8	1,2,3 5,8	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL
	1,2,3 5,8	1,2,3 5,8	ALL	ALL	ALL	ALL	ALL	ALL	ALL	ALL

MMICS Subsystems

Subsystem

Status and Inventory
Operational Events
Inspection & Time Change
Delayed Discrepancies
Time Compliance Technical Orders

No. Subsystem

(6) Location
(7) Equipment and Personnel Transfer
(8) Engine Tracking (TF-34 & F-100 Engines)
(9) Maintenance Personnel
(10) Training Management

SAMPLE

Attachment 2

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCES IN EUROPE
APO NEW YORK 09012

24 JUN 1980

GMP (MSgt Chambers/6762)

ogistics Research Project - Wartime Automation Requirement for Maintenance
FLMC Project No. 800402 (Your Ltr, 21 May 80)

FLMC/LGM

. Attached is the worksheet requested in subject letter.

. Considering our location, figures were derived for units currently in lace with some limited deployment. We did not consider units deployed to his theater as we assume the parent MAJCOM will provide that data.

IAN BILIUNAS, Colonel, USAF
f, Maintenance Management Division
ctorate of Maintenance, DCS/Logistics

Atch
Worksheet

% Aircraft Deployed

10%	20%	30%	40%	50%	60%	70%	80%	90%
None	None	1,2,8	1,2,8	1,2,3, 8	1,2,3, 4,8	1,2,3, 4,8	1,2,3, 4,8	1,2,3, 4,8
None	None	1,2,8	1,2,3, 4,8	1,2,3 4,8	1,2,3 4,8	1,2,3 4,8	1,2,3 4,8	1,2,3 4,8
None	1,2,8	1,2,3 4,5,8	1,2,3 4,5,8	1,2,3 4,5,8,9	1,2,3 4,5,8,9	1,2,3 4,5,8,9	1,2,3 4,5,8,9	1,2,3 4,5,8, 9,10
1,2,8	1,2,8	1,2,3 4,5,8	1,2,3 4,5,8	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10
1,2,8	1,2,8	1,2,3 4,5,8	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10
1,2,8	1,2,8	1,2,3 4,5,8	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10
1,2,8	1,2,8	1,2,3 4,5,8	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10
1,2,8	1,2,8	1,2,3 4,5,8	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10
1,2,8	1,2,8	1,2,3 4,5,8	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10
1,2,8	1,2,8	1,2,3 4,5,8	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10
1,2,8	1,2,8	1,2,3 4,5,8	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10
1,2,8	1,2,8	1,2,3 4,5,8	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10
1,2,8	1,2,8	1,2,3 4,5,8	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10	1,2,3 4,5,8 9,10

No.	Subsystem
(1)	Status and Inventory
(2)	Operational Events
(3)	Inspection & Time Change
(4)	Delayed Discrepancies
(5)	Time Compliance Technical Orders
(6)	Location
(7)	Equipment and Personnel Transportation
(8)	Engine Tracking (TF-34 & F-10 Engines)
(9)	Maintenance Personnel
(10)	Training Management

DEPARTMENT OF THE AIR FORCE

HEADQUARTERS TACTICAL AIR COMMAND
LANGLEY AIR FORCE BASE, VA 23665

9 JAN 1981

ꞁP

:CS Subsystem Requirements for Mobility

ıMC/LGM

The attached brief description of our MMICS subsystem re- .rements is provided as requested by telecon with Capt Smith, ıMC/LGM.

We have also attached an information copy of a similar ꞁuirements package which we developed for AFLMC Project ꞁ0402.

For further information, our POC is MSG Diaz, LGQP, AV -4465.

N D. GOODE, Colonel, USAF
ector, Maint Tng & Management

2 Atch
1. MMICS Subsystem Requirements
2. Requirements Package

Readiness is our Profession

(2) Provide capability to forecast training requirements.
(3) Provide capability to produce class rosters.
(4) Provide capability to monitor the progress of the on-the-job training program.

- An automated system can provide a data base from which training needs can be determined and validated.

- Equipment and Personnel Transfer - Comply with AFR 66-1 requirements.

- (1) Provide a capability to track and maintain equipment and personnel.
  (2) Eliminate manual files.
  (3) Provide capability to transfer all or part of any one unit from one location to another.

- Without the transfer subsystem all transfers would have to be accomplished manually, which is time consuming and awkward.

THEODORE OSTOVICH, Colonel, USAF
Deputy Director of Aircraft Maintenance
DCS/Logistics

b. (1) Eliminate dual records keeping.
   (2) Produce statistical information concerning equipment schedule.

c. Life sustaining items may go past expiration date.

a. Delayed Discrepancies - Fulfill AFR 66-1 requirements.

b. (1) To increase the effectiveness of the AFTO Form 781 review and records reconciliation.
   (2) Enhance the accuracy and reliability of the DDF by eliminating the need for manual file search.
   (3) Immediate awaiting parts and estimated delivery date status.

c. Requires additional personnel because of the manual records keeping.

a. Time Compliance Technical Order - Fulfill AFR 66-1 requirements.

b. (1) Capability to schedule TCTO accomplishment by providing data for preparation of workorders for the affected workcenters.
   (2) The need to produce a list of scheduled TCTO requirements.
   (3) Capability to produce an output which gives complete status of all TCTOs for a specific piece of equipment.
   (4) Increase the speed of data collection and report generation.

c. An orderly compliance of TCTOs which, if not accomplished, could end in grounding of equipment.

a. Maintenance Personnel - Comply with AFR 66-1 requirements.

b. (1) Provide the capability to maintain personnel records containing information required by the maintenance organization.
   (2) Provide the capability to produce listings which make comparisons between authorized and actual personnel assigned.

c. All analytical data in regard to manpower would have to be manually accomplished.

a. Training Management - To comply with AFR 66-1 requirements.

b. (1) Provide the capability to maintain up-to-date training information on all people assigned to the maintenance complex.

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS STRATEGIC AIR COMMAND
OFFUTT AIR FORCE BASE, NEBRASKA, 68113

18 DEC 1980

LGM (MSgt Chalupnik, 44974)

Logistics Research Project - Wartime Automation Requirements for Maintenance - AFLMC Project No. 800402 (Your Ltr, 3 Dec 80)

AFLMC/LGM

The following is submitted as requested in para 3 of your letter:

1a. Status and Inventory Subsystem - To comply with AFR 65-110.

b. (1) Speed data collection.
(2) Enhance control function through computer use.
(3) Eliminate manual files.
(4) Provide products beneficial to management and analysis functions.

c. Additional personnel will be required to maintain a manual system.

2a. Operational Events Subsystem - To comply with AFR 65-110.

b. (1) Need capability to produce statistical information concerning equipment schedule.
(2) Capability to print operational schedule information.
(3) Produce operational accomplishment reports.

c. I.A.W. AFM 66-278, Vol I, C11, page 5-1. The use of reporting operational events subsystem for reporting utilization to appropriate MAJCOMs is mandatory for all units to comply with AFR 65-110. Presently, no manual means are available to comply with this regulation.

3a. Inspection and Time Change - To comply with AFR 66-1 requirements.

Peace . . . . is our Profession

'NE

IGINE TRACKED AIRCRAFT.
2) LESS THAN OPTIMUM MAINTENANCE PERFORMANCE BECAUSE OF LACK OF IATE SCHEDULING AND MONITORING CAPABILITY.
3) REQUIREMENT FOR MASSIVE MANUAL UPDATE OF HOME STATION IATED SYSTEMS UPON RETURN FROM DEPLOYMENT.
4) HIGH PROBABILITY OF NOT HAVING ADEQUATE DATA UPON WHICH TO IATE THE DEPLOYMENT AND PROVIDE WAYS TO IMPROVE DEPLOYMENT INICS.
'HE SUCCESS OF DEPLOYABLE MMICS WILL DEPEND, IN LARGE MEASURE, IE RELIABILITY AND TIMELINESS OF THE SYSTEM. ONLY WHEN A SYSTEM IE DEPENDED UPON TO CONSISTENTLY RESPOND IN A TIMELY MANNER WILL INNEL TRUST THE SYSTEM AND USE IT TO FULL ADVANTAGE. SYSTEM IBILITY SHOULD BE ABOVE 99 AND RESPONSE TIME SHOULD BE WITHIN IECONDS WITH UP TO 6 REMOTES OPERATING.
ILTHOUGH WE HAVE SHOWN WHAT WE FEEL ARE MINIMUM REQUIREMENTS FOR IUS SIZE AND LENGTH DEPLOYMENTS, THE MOST EFFICIENT WAY TO ITE WOULD BE TO DEPLOY WITH FULL SYSTEM CAPABILITY FOR ANY SIZE IYMENT PACKAGE. RECOMMEND THAT THIS BE MADE THE ULTIMATE ITIVE OF DEPLOYABLE MMICS.

I)

ENE

NE

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YUW RUHOSGG8280 3660735-UUUU--RUCLMXA.
UUUU
200Z DEC 80
PACAF HICKAM AFB HI//LGM//.
CLMXA/AFLMC GUNTER AFS AL//LGM//

AFLMC 310200Z

(12)

S!
LOGISTICS RESEARCH PROJECT - WARTIME AUTOMATION REQUIREMENTS
AINTENANCE - AFLMC PROJECT NO. 800402
A. YOUR LTR, SAME SUBJECT, DATED 21 MAY 80 :
B. YOUR LTR, SAME SUBJECT, DATED 3 DEC 80
C. HQ PACAF/LG LTR, SAME SUBJECT, DATED 23 JUNE 80 :
ER TELECON WITH LT COL DIETSCH ON 19 DEC 80 WE ARE ADDRESSING
'STEMS AS REQUESTED IN REF A AND NOT TRICS AS INDICATED IN REF B.
LEASE CHANGE THE MATRIX ATTACHMENT TO REF C TO ADD SUBSYSTEM 3,
CTION AND TIME CHANGE SUBSYSTEM, TO ALL MATRIX POSITIONS WHICH
SUBSYSTEM NUMBERS. THIS SUBSYSTEM IS REQUIRED TO SUPPORT THE
IE TRACKING SUBSYSTEM.
LSO CHANGE "ALL" IN THE "18" AND "24 " COLUMNS OF THE "20 DAYS"
'O SHOW SUBSYSTEMS 1, 2, 3, 7 AND 8. PERSONNEL, TRAINING,
'ED DISCREPANCIES AND TCTO SUBSYSTEMS CAN BE MAINTAINED MANUALLY
'ERIODS OF 30 DAYS OR LESS.
02 RUHQSGG8280 UNCLAS
'ER REF B REQUEST, RATIONALE FOR SUBSYSTEMS AND THEIR PLACE IN
.TRIX IS:
EPLOYMENTS OF 5 AIRCRAFT FOR 10 DAYS OR LESS PERMIT SELECTION
RCRAFT AND PERSONNEL TO ENSURE THAT THE PROBABILITY OF EXTENSIVE
OS ACTIONS ARE MINIMIZED.
ITH 8 OR MORE AIRCRAFT OR FOR PERIODS OF MORE THAN 10 DAYS, THE
E OF RECORDS TO BE MAINTAINED FOR ENGINE TRACKING DICTATES
ATED RECORDS KEEPING, PARTICULARLY IN VIEW OF ACCELERATED SORTIE
WHICH MAY BE REQUIRED. SUBSYSTEM 8 REQUIRES SUPPORT FROM SUB-
MS 1, 3 AND 7. ADDITIONALLY SUBSYSTEMS 1 AND 2 PROVIDE FOR
ATED AVISURS REPORTING WHILE SUBSYSTEMS 1 AND 3 ARE REQUIRED TO
RT THE SCHEDULING PROCESS VITAL TO SUSTAINED HIGH SORTIE RATES.
EPLOYMENTS OF MORE THAN 30 DAYS SHOULD INCLUDE SUBSYSTEM 4 FOR
ULING PURPOSES. THE NUMBER OF PERSONNEL INVOLVED WITH FULL
RONS OF AIRCRAFT WILL REQUIRE MANAGEMENT OF TRAINING DATA
RTED BY SUBSYSTEMS 9 AND 10.
MALL DEPLOYMENTS (5 OR 8 AIRCRAFT) CAN CONTINUE TO MANUALLY
E TRAINING DATA FOR UP TO 90 DAYS. BEYOND THAT PERIOD FULL
RT IS REQUIRED FOR ALL CATEGORIES.
PERATIONAL IMPACTS OF NOT HAVING AUTOMATED CAPABILITIES ARE:
03 RUHQSGG8280 UNCLAS
1) EXCESSIVE SUPPLY SUPPORT REQUIRED TO PERMIT SAFE OPERATION

.E PAGE 1

file
15C-36
7-2

DEPARTMENT OF THE AIR FORCE
AIR FORCE LOGISTICS MANAGEMENT CENTER
GUNTER AIR FORCE STATION, ALABAMA 36114

3 DEC 1980

LGM

Logistics Research Project - Wartime Automation Requirements for Maintenance - AFLMC Project No. 800402

HQ MAC/LGX	HQ TAC/LGQ	HQ USAFE/LGM
HQ SAC/LGM	HQ PACAF/LGM	

LGM COORD CY

1. Your response (Atch 1) to our letter dated 21 May 80, same subject as above, provided us your mobility requirements for MMICS functions identified by Transaction Identification Code (TRIC). We have integrated your requirements to form a total picture of MMICS mobility requirements.

2. Our next step will be to enunciate these requirements to HQ USAF so they can be formalized and an effort can begin to satisfy them. In order to justify our requirements and defend our requests for funding, we will have to present detailed rationale for our ADP requirements. While we could provide such justification based on our own expertise, we believe it would carry significantly more weight and credibility coming from the operating commands.

LGM READ CY

3. Accordingly, request you provide us a short narrative on each of the TRICs you indicated as requirements. The purpose of this narrative is to indicate the following:

a. What functional process is foreseen during a deployment which necessitates each particular TRIC requirement?

b. Why does the particular requirement occur at the point in time/force level indicated on the matrix?

c. What is the operational impact of not having the particular capability?

CC READ CY

4. As previously stated, we have sufficient expertise to provide such information from in-house resources, however, your participation will add credibility and provide a valuable cross-check to our own thinking.

5. Your expert assistance is most appreciated. In order to meet our suspense to HQ USAF, request your reply NLT 20 Dec 80. Point of contact is Lt Col David A. Dietsch, AFLMC/LGM, AUTOVON 921-4583.

WILLIAM L. WORTHINGTON, JR.
Lt Colonel, USAF
Director of Maintenance

1 Atch
Response to AFLMC/LGM Ltr, 21May80

Applying Research to Strengthen Logistics

·oyed	Number Aircraft Deployed 20% 5	40% 8	60% 12	80% 18	100% 24+
s	None	1,2,7,8	1,2,7,8	1,2,7,8	1,2,7,8
s	1,2,7,8	1,2,7,8	1,2,7,8	ALL	ALL
s	1,2,4,7,8	1,2,4,7,8	1,2,4,7,8	ALL	ALL
's	1,2,4,5,7,8	1,2,4,5,7,8	ALL	ALL	ALL
+ 's	ALL	ALL	ALL	ALL	ALL

MMICS SUBSYSTEMS

SUBSYSTEM

- Status and Inventory
- Operational Events
- Inspection & Time Change
- Delayed Discrepancies
- Time Compliance Technical Orders

NO. SUBSYSTEM

(6). Location
(7). Equipment and Personnel Transfer
(8). Engine Tracking (TF-34 & F-100 Engines)
(9). Maintenance Personnel
(10). Training Management

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS PACIFIC AIR FORCES
HICKAM AIR FORCE BASE, HAWAII 96853

23 JUN 1980

REPLY TO ATTN OF: LG

SUBJECT: Logistics Research Project-Wartime Automation Requirement For Maintenance-AFLMC Project No. 800402 (Your letter, dated 21 May 80)

TO: AFLMC/LGM

1. Attached is our response to your request. We modified the worksheet as you suggested, to reflect numbers of aircraft rather than percentages. We have large variations in unit size and believe requirements are more appropriately tied to specific numbers of aircraft rather than percent of total aircraft. We also eliminated time periods in which we feel requirements will not change.

2. MMICS point of contact for PACAF is CMS Charles A. Krueger, HQ PACAF/LGMM, Autovon 449-9802.

Victor R Hollandsworth

VICTOR R. HOLLANDSWORTH, Colonel, USAF
Asst Deputy Chief of Staff, Logistics

1 Atch
Worksheet

PERCENT PAA MOBILIZED/DEPLOYED

Deployment Period Days	10	20	30	40	50	60	70	80	90	100
1-9	None	None	1,2,7, 10	1,2,7, 10	1,2,7, 10	1,2,7, 10	1,2,7, 10	1,2,7, 10	1,2,7, 10	1,2,7, 10
10-19	1,2	1,2	1,2,7, 10	1,2,7, 10	1,2,3, 4,5,7, 9,10	All	All	All	All	All
20-29	1,2	1,2	1,2,7, 10	1,2,7, 10	1,2,3, 4,5,7, 9,10	All	All	All	All	All
30-39	All	All	All	All	All	All	All	All	All	All
40+	All	All	All	All	All	All	All	All	All	All

MMICS SUBSYSTEMS REQUIRED[1]

1. Status and Inventory only TRIC EPI and STH
2. Operational Events only TRICs ESI, OTU, DSC, AUR
3. Inspection and Time Change only TRICs JDC, PRA, COT, TDI
4. Delayed Discrepancies only TRICs DOM, EVL, ARC
5. Time Compliance Technical Orders only TRICs ITI, TCI, TJS, WTR, TCD, TCS, DCR, STL, TIL
7. Personnel and/or Equipment Transfer Procedures
9. Maintenance Personnel, TRIC MPL (ARRS Requirement Only)
10. Training Management only TRICs MPQ, SCR

[1]See Assumptions and Requirements on cover page.

5. The logistics information requirements for both airlift missions are similar. If aircraft maintenance information must flow constantly between locations, communications requirements increase significantly. Unless aircraft maintenance data stay with the aircraft, any ADP configuration and supporting communications network will be both complex and expensive.

6. Wartime logistics information requirements were recently studied by a MAC Command and Control Information Flow Study. As a result, we believe only a limited number of subsystem transaction identification codes (TRICs) provide most of the essential information needed by our logistics people in the field. Information provided by other TRICs may be helpful but is not essential and should not be part of the wartime MMICS. We assume, therefore, MMICS subsystems can be subdivided or differentiated into individual TRICs which can operate independently of the parent subsystem. We also assume an on-board aircraft-data-storage capability will not be available in the near future. Therefore, aircraft-related data must be available on demand to various locations to support MAC aircraft. We assume this capability is technologically feasible and available.

7. You have a difficult task to accommodate and support each command's unique requirements. If we can be of any further assistance, please contact Capt Ferraro, HQ MAC/LGXAS, AUTOVON 638-5633.

C. N. Evgenides

C. N. EVGENIDES, Col, USAF
Director of Logistics Plans
DCS/Logistics

1 Atch
Percent PAA Mobilized/Deployed

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS MILITARY AIRLIFT COMMAND
SCOTT AIR FORCE BASE, ILLINOIS 62225

23 JUN 1980

REPLY TO ATTN OF: LGX

SUBJECT: Logistics Research Project--Wartime Automation Requirement for Maintenance--AFLMC Project No. 800402 (Your Ltr, 21 May 80)

TO: AFLMC/LGM

1. Attached is a matrix showing portions of the maintenance management information and control system (MMICS) subsystems required to support deployment of MAC aircraft. The MAC logistics environment is significantly different from other commands due to the nature of the airlift mission. It would be misleading to precisely define essential MMICS subsystems without first defining the MAC logistics environment and discussing certain assumptions concerning MMICS.

2. During contingencies and mobilization Aerospace Rescue and Recovery Service (ARRS) and tactical airlift aircraft will be operationally assigned to, and logistically supported by, the Air Force component of the theatre command. Therefore, MAC and the Air Force component command's requirements for information and the supporting system must be compatible to minimize peace to war transition. The ARRS mission profile is similar to tactical fighter aircraft, i.e., the point of departure is most often the point of return with few, if any, intermediate stops. During actual deployment, aircraft maintenance information must be available at the operating location.

3. The tactical airlift mission is somewhat different. Tactical airlift aircraft, including Reserve Forces, will often deploy units, or parts of units, to main operating bases, collocated operating locations, or forward operating bases. Operating out of these locations, tactical airlift aircraft make numerous sorties to different bases before returning to their unit's location. Any maintenance performed on these aircraft at en route locations must be made known to the owning organization.

4. The strategic airlift mission operates in an unique logistics environment. There is no planned unit deployment of strategic airlift aircraft. These aircraft will be maintained primarily at CONUS locations; after departing home station, these aircraft normally will not return for several days. During this time, maintenance and servicing will be performed at a variety of locations, some of which will not have U.S. support forces. Additionally, during periods of increased mobilization, strategic airlift forces may not return to their home base. Depending on airlift requirements, aircraft requiring maintenance will be routed through the nearest MAC base having the necessary repair capability. Therefore, during periods of increased mobilization, aircraft data must be retained with the aircraft or be readily available to the unit performing maintenance.

Days Deployed	% Aircraft Deployed									
	10%	20%	30%	40%	50%	60%	70%	80%	90%	100
5 ays	None	None	None	None	None	None	None	None	None	None
10 Days	None	None	None	None	None	None	None	1,2,3	1,2,3	1,2,3
20 Days	1,2,3	1,2,3	1,2,3	1,2,3,	1,2,3, 4	1,2,3, 4	1,2,3, 4	1,2,3, 4	1,2,3, 4	1,2,3 4
30 Days	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4, 5,9,10	1,2,3,4, 5,9,10	1,2,3,4, 5,9,10	1,2,3, 4,5,9, 10	1,2,3, 4,5,9, 10	1,2,3, 4,5,9, 10
40 Days	1,2,3,4, 5	1,2,3,4, 5	1,2,3,4, 5	1,2,3,4, 5	1,2,3,4, 5,7,9, 10	1,2,3,4, 5,7,9, 10	1,2,3,4, 5,7,9, 10	1,2,3, 4,5,7, 9,10	1,2,3, 4,5,7, 9,10	1,2,3, 4,5,7, 9,10
50 Days	1,2,3,4, 5,7	1,2,3,4, 5,7	1,2,3,4, 5,7	1,2,3,4, 5,7	1,2,3,4 5,7,9,10	1,2,3,4, 5,7,9, 10	1,2,3,4, 5,7,9, 10	1,2,3, 4,5,7, 9,10	1,2,3, 4,5,7, 9,10	1,2,3, 4,5,7, 9,10
60 Days	1,2,3,4, 5,7	1,2,3,4, 5,7	1,2,3,4, 5,7,9,10	1,2,3,4, 5,7,9, 10	1,2,3,4 5,7,9, 10	1,2,3,4, 5,7,9, 10	1,2,3,4, 5,7,9, 10	1,2,3, 4,5,7, 9,10	1,2,3, 4,5,7, 9,10	1,2,3, 4,5,7, 9,10
70 Days	1,2,3,4, 5,7	1,2,3,4, 5,7	1,2,3,4, 5,7,9, 10	1,2,3,4, 5,7,9, 10	1,2,3,4 5,7,9, 10	1,2,3,4, 5,7,9, 10	1,2,3,4, 5,7,9, 10	1,2,3, 4,5,7, 9,10	1,2,3, 4,5,7, 9,10	1,2,3, 4,5,7, 9,10
80 Days	1,2,3,4, 5,7	1,2,3,4, 5,7	1,2,3,4, 5,7,9, 10	1,2,3,4, 5,7,9, 10	1,2,3,4 5,7,9, 10	1,2,3,4, 5,7,9, 10	1,2,3,4, 5,7,9, 10	1,2,3, 4,5,7, 9,10	1,2,3, 4,5,7 9,10	1,2,3, 4,5,7, 9,10
90 Days	1,2,3,4, 5,7	1,2,3,4, 5,7	1,2,3,4, 5,7,9, 10	1,2,3,4 5,7,9, 10	1,2,3,4 5,7,9, 10	1,2,3,4, 5,7,9, 10	1,2,3,4 5,7,9, 10	1,2,3, 4,5,7, 9,10	1,2,3, 4,5,7, 9,10	1,2,3, 4,5,7, 9,10
100 Days	1,2,3,4, 5,7	1,2,3,4, 5,7	1,2,3,4, 5,7,9, 10	1,2,3,4, 5,7,9, 10	1,2,3,4 5,7,9, 10	1,2,3,4, 5,7,9, 10	1,2,3,4 5,7,9, 10	1,2,3, 4,5,7, 9,10	1,2,3, 4,5,7, 9,10	1,2,3, 4,5,7, 9,10
110 Days	1,2,3,4, 5,7	1,2,3,4, 5,7	1,2,3,4, 5,7,9,10	1,2,3,4, 5,7,9, 10	1,2,3,4 5,7,9, 10	1,2,3,4, 5,7,9, 10	1,2,3,4 5,7,9, 10	1,2,3, 4,5,7, 9,10	1,2,3, 4,5,7 9,10	1,2,3, 4,5,7, 9,10
120 Days	1,2,3,4, 5,7	1,2,3,4, 5,7	1,2,3,4, 5,7,9, 10	1,2,3,4, 5,7,9, 10	1,2,3,4 5,7,9, 10	1,2,3,4, 5,7,9, 10	1,2,3,4 5,7,9, 10	1,2,3, 4,5,7, 9,10	1,2,3, 4,5,7, 9,10	1,2,3, 4,5,7, 9,10

MMICS Subsystems

No.	Subsystem	No.	Subsystem
(1)	Status and Inventory	(6)	Location
(2)	Operational Events	(7)	Equipment and Personnel Transfer
(3)	Inspection & Time Change	(8)	Engine Tracking (TF-34 & F-100 Engines)
(4)	Delayed Discrepancies	(9)	Maintenance Personnel
(5)	Time Compliance Technical Orders	(10)	Training Management

ATCH 1

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS STRATEGIC AIR COMMAND
OFFUTT AIR FORCE BASE, NEBRASKA, 68113

26 JUN 1980

PLY TO ATTN OF: LGM

SUBJECT: Logistics Research Project - Wartime Automation Requirement for Maintenance - AFLMC Project No. 800402

TO: AFLMC/LGM

1. The attached logistics research project worksheet is provided per your AFLMC letter, dated 21 May 1980.

2. Our point of contact for this subject is MSgt Chalupnik LGMMD, AUTOVON 271-4974/6420.

AL[illegible] G. PETRANICK, Colonel, USAF
Director of Aircraft Maintenance
DCS/Logistics

1 Atch
Worksheet

Peace . . . . is our Profession

MMICS SUBSYSTEM REQUIREMENTS

1.

	A	B	C
MMICS Subsystem	Yes/No	Yes/No	Yes/No
Status & Inventory	Yes	Yes	No
Operational Events	Yes	Yes	No
Inspection & Time Change	Yes	Yes	No
Documented Discrepancies	Yes	Yes	No
TCTO	Yes	Yes	No
Location	Yes	No	No
Equip Transfer	Yes	Yes	No
Engine Tracking	Yes	Yes	Yes
Maint Personnel	Yes	Yes	No
Training Management	Yes	Yes	No
Personnel Transfer	Yes	Yes	No

2. Apply the following key to the requirements table:

A. Required in garrison at an established base.

B. Required for a long term mobility (over 30 days).

C. Required for short term mobility (less than 30 days).

WARTIME DATA AUTOMATION REQUIREMENTS

1. Engine Tracking. During deployment, modular engines will rapidly accrue many more cycles than during peacetime. Cycle accrual is not totally predictable because averages of past engine performance may not apply in a wartime scenario. The accurate accounting of accumulated cycles is necessary to prevent catastrophic failure of modular engines. The present method of sending raw data to the home base for processing is unacceptable because this requires that aircraft identified for deployment must have large amounts of cyclic life remaining to prevent an overfly during the processing time of raw utilization data. Since each F-100 engine consists of over 90 tracked items, it is not feasible to track cyclic accumulation manually. The hand picking of aircraft and engines which meet deployment requirements severely restricts the readiness and capability of TAC units.

2. Status and Inventory, Operational Events and Time Change. These three subsystems are interrelated, and therefore they are required at the 30 day point when 30% of the deployed fleet has arrived. All three subsystems could be maintained for a short period of time using manual products generated at the home base immediately preceding the deployment; however, large numbers of sorties (operational events) will make manual updating of life limited (time change) items extremely difficult and time consuming after a relatively short period. MMICS automatically posts sortie duration in the computerized files and makes mathematical calculations to determine life remaining. Several additional people would be required if we were to resort to manual record keeping for an extended period of time. Present procedure is to send raw data to the home base for processing which necessitates hand picking of aircraft which will not have time change items come due during the deployment.

3. TCTO. Accurate and timely TCTO information is required to determine aircraft weapons system capabilities and aircraft restrictions. MMICS provides a printed listing for deployment; however, manually updating this listing for an extended period would be time consuming, as would extracting data for mission planning. MMICS also provides detailed and summarized reports which indicate manhours consumed and manhours backlogged, in addition to detailed reports of each aircraft affected by a particular TCTO. Large numbers of transactions would require additional people to manually update and compile TCTO data.

4. Equipment Transfer. The status and inventory subsystem is complimented by the equipment transfer procedures. Once aircraft and other equipment files are initialized in MMICS, the equipment transfer subsystem provides a rapid method for selective or mass transfer of equipment. Manual extraction and

loading of equipment in the MMICS files is complicated and time consuming. This subsystem provides deployed units the capability to rapidly gain and transfer equipment with minimal impact on the availability of real time information.

5. Maintenance Personnel and Personnel Transfer Procedures. These two subsystems also work together to provide the unit commander management data which facilitates effective utilization of his personnel resources. MMICS will provide many useful products which identify AFSCs and skill level of assigned personnel. Once a unit reaches its deployed location, the timely identification of its personnel resources in comparison to sister units within the same theater will be extremely important to the rapid repair and maintenance of aircraft and other equipment.

6. Delayed Discrepancies. At the 60 day point, we visualize the number and type of delayed discrepancies will have a significant effect upon the capabilities of the deployed aircraft and upon the decisions of how to use individual aircraft in combat. The delayed discrepancy subsystem provides rapid displays of specific discrepancies for individual aircraft. Additionally, it provides the status of parts on order to repair those discrepancies. Manual tracking of discrepancies and parts will become confusing and will require the maintaining of lengthy lists by a central agency within the deployed unit after the 60 day point.

7. Training Management. At the 180 day point, we believe the deployment will become of "unknown duration." This would require MMICS to function as if in garrison. Training of replacement troops and the identification of current qualifications would require the implementation of the training subsystem.

2

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS MILITARY AIRLIFT COMMAND
SCOTT AIR FORCE BASE, ILLINOIS 62225

23 JUN 1980

REPLY TO ATTN OF: LGX

SUBJECT: Logistics Research Project--Wartime Automation Requirement for Maintenance--AFLMC Project No. 800402 (Your Ltr, 21 May 80)

TO: AFLMC/LGM

1. Attached is a matrix showing portions of the maintenance management information and control system (MMICS) subsystems required to support deployment of MAC aircraft. The MAC logistics environment is significantly different from other commands due to the nature of the airlift mission. It would be misleading to precisely define essential MMICS subsystems without first defining the MAC logistics environment and discussing certain assumptions concerning MMICS.

2. During contingencies and mobilization Aerospace Rescue and Recovery Service (ARRS) and tactical airlift aircraft will be operationally assigned to, and logistically supported by, the Air Force component of the theatre command. Therefore, MAC and the Air Force component command's requirements for information and the supporting system must be compatible to minimize peace to war transition. The ARRS mission profile is similar to tactical fighter aircraft, i.e., the point of departure is most often the point of return with few, if any, intermediate stops. During actual deployment, aircraft maintenance information must be available at the operating location.

3. The tactical airlift mission is somewhat different. Tactical airlift aircraft, including Reserve Forces, will often deploy units, or parts of units, to main operating bases, collocated operating locations, or forward operating bases. Operating out of these locations, tactical airlift aircraft make numerous sorties to different bases before returning to their unit's location. Any maintenance performed on these aircraft at en route locations must be made known to the owning organization.

4. The strategic airlift mission operates in an unique logistics environment. There is no planned unit deployment of strategic airlift aircraft. These aircraft will be maintained primarily at CONUS locations; after departing home station, these aircraft normally will not return for several days. During this time, maintenance and servicing will be performed at a variety of locations, some of which will not have U.S. support forces. Additionally, during periods of increased mobilization, strategic airlift forces may not return to their home base. Depending on airlift requirements, aircraft requiring maintenance will be routed through the nearest MAC base having the necessary repair capability. Therefore, during periods of increased mobilization, aircraft data must be retained with the aircraft or be readily available to the unit performing maintenance.

5. The logistics information requirements for both airlift missions are similar. If aircraft maintenance information must flow constantly between locations, communications requirements increase significantly. Unless aircraft maintenance data stay with the aircraft, any ADP configuration and supporting communications network will be both complex and expensive.

6. Wartime logistics information requirements were recently studied by a MAC Command and Control Information Flow Study. As a result, we believe only a limited number of subsystem transaction identification codes (TRICs) provide most of the essential information needed by our logistics people in the field. Information provided by other TRICs may be helpful but is not essential and should not be part of the wartime MMICS. We assume, therefore, MMICS subsystems can be subdivided or differentiated into individual TRICs which can operate independently of the parent subsystem. We also assume an on-board aircraft-data-storage capability will not be available in the near future. Therefore, aircraft-related data must be available on demand to various locations to support MAC aircraft. We assume this capability is technologically feasible and available.

7. You have a difficult task to accommodate and support each command's unique requirements. If we can be of any further assistance, please contact Capt Ferraro, HQ MAC/LGXAS, AUTOVON 638-5633.

C. N. Evgenides

C. N. EVGENIDES, Col, USAF
Director of Logistics Plans
DCS/Logistics

1 Atch
Percent PAA Mobilized/Deployed

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCES IN EUROPE
APO NEW YORK 09012

24 DEC 1980

PLY TO TN OF: LGM

SJECT: Logistics Research Project - Wartime Automation Requirements for Maintenance - AFLMC Project No. 800402 (Your Ltr, 3 Dec 1980)

TO AFLMC/LGM

1. As noted in previous letters, USAFE has limited MMICS mobility requirements. However, we expect major problems with MMICS during wartime, i.e., extensive computer outages resulting in a total loss of MMICS computer support.

2. With the loss of the computer, we would have to fall back on manual record keeping. Current unit authorizations are not large enough to cope with an extended computer outage. The impact of a computer outage becomes even more significant when we add automated engine tracking and the Comprehensive Engine Management System (CEMS). Engine tracking in the manual mode would become impossible. Atch 1 further depicts the USAFE situation during wartime and peacetime.

3. Our requirements can be viewed as a complement to any MMICS mobility requirement. We envisage the use of minicomputers (1-3 per unit) which are MMICS - compatible as a desirable approach to computer support problems during peacetime and wartime. The small size would allow placement in a Tab Vee or another hardened/protected shelter. One minicomputer could be used to handle the Status and Inventory, Operational Events, Inspection and Time Change, Delayed Discrepancies, and TCTO subsystems. An additional minicomputer could be used for engine tracking (TF34 and F100 engines) and a third minicomputer for the Personnel and Training subsystem. The third could be used as a backup for the first two in wartime. Additionally, data links to the B3500 would be desirable to meet peacetime requirements, as well as a data link to the Central Data Bank for engine tracking.

4. Timely and available MMICS/computer access is extremely critical to the USAFE maintenance community. Although our mobility requirements are minimal, we feel our needs, particularly in wartime, closely parallel those of a mobile system. HQ USAFE POC is LGMPA, MSgt Chambers and Capt Diener, AV 424-6762/6949.

Albert P. Nichols

ALBERT P. NICHOLS, Colonel, USAF
Deputy Director of Maintenance
DCS/Logistics

1 Atch
Impacts of Extended Computer Outages

IMPACTS OF EXTENDED COMPUTER OUTAGES

1. We have assessed the impact of extended computer outages with the Burroughs B3500 computer during both a peacetime and wartime scenario.

2. Prior to assessing any impact caused by outages, we must first identify our B3500 MMICS sites and the units they service:

Site	Units Serviced
Ramstein	86 TFW, 26 TRW, 601 TCW and CE, 608 MAS, 1964 CG
Bitburg	36 TFW with CEMS and 52 TFW
Bentwaters	81 TFW with CEMS and four FOLs
CNA	32 TFS with CEMS and EPG F-16 MOTE with CEMS
Hahn	50 TFW
Torrejon	401 TFW and 406 TFTW, approximately 1 Jul 1981
Lakenheath	48 TFW, 513 TAW and support for ROTE MAC and SAC aircraft
Upper Heyford	20 TFW and 11 SG
Alconbury	10 TRW

3. As you can see, the multiple dependency for MMICS and CEMS support from single sites is significant.

4. With the loss of the computer, we would have to fall back on manual record keeping. Current unit authorizations are not large enough to cope with a protracted computer outage. It must be noted that MMICS was paid for with four to five maintenance authorizations per unit in USAFE. The impact of a computer outage becomes more significant when we couple CEMS with MMICS. Engine tracking in the manual mode would become impossible. Each F-15 F-100 engine has 91 trackable items and each A-10 TF-34 engine has 140 trackable items. In addition to this, the engines require seven to nine variables also to be tracked.

5. During peacetime without computer support, we can expect status problems to occur within five to seven days at non-CEMS units. Status problems will occur in as little as three days at CEMS units.

6. During wartime with the loss of MMICS/computer support, aircraft and engine status will become unknown within three to seven days. Within fifteen to thirty days, delayed discrepancy status will become unknown. In addition to this, time change, inspection, TCTO and personnel training will be unknown after thirty to ninety days.

Requirements?

Atch 1

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON, D.C.

LEY 19 MAY 1980

Automated Maintenance Systems (AMS) Test Program

AFLMC/CC

1. Increased use and integration of automated data systems into daily base-level maintenance procedures has produced a dependence on automation for efficient operations. This realization led to our 16 Apr 1980 letter to AFDSDC/LGM which declared the Maintenance Management Information and Control System (MMICS) to be a wartime essential system for sustained operations. Future programs such as the Comprehensive Engine Management System (CEMS) can only increase the wartime essentiality of our standard automated systems.

2. Incorporation of AMS Test Program processes into Air Force base-level systems, while improving operational efficiency, will further automate previous manual procedures. An assessment of wartime and mobility criticality would be useful to formulate implementation plans for post Phase IV development. As a separate effort (apart from the basic evaluation plan) request you provide a general assessment of the AMS processes in various wartime scenarios. Each process should be placed into one of four categories: (a) not required for wartime operations; (b) required for sustained, in-garrison wartime operations; (c) required for long-term mobility operations; or, (d) required for short term mobility operations (must be carried with the unit). If possible, this assessment should be accomplished simultaneously with incremental evaluations.

3. Request your comments by 6 June 1980. Our point of contact is Captain Graham, AF/LEYM, AV 227-1493.

FOR THE CHIEF OF STAFF

CHARLES P. [illegible]
Colonel, USAF
Dep Director
Dir of Maintenance & Supply

DEPARTMENT OF THE AIR FORCE

HEADQUARTERS MILITARY AIRLIFT COMMAND
SCOTT AIR FORCE BASE, ILLINOIS 62225

.GX 8 DEC 1980

:valuation of AMS Test Program Processes

AFLMC/LGM

1. The MAC logistics environment is significantly different from other commands due to the nature of the airlift mission. It would be misleading to precisely define essential automated maintenance systems (AMS) test program processes without first defining the MAC logistics environment.

2. Strategic airlift operations are unique because there is no planned unit deployment. After departing home station, aircraft normally do not return for several days. During this time, minimum maintenance and servicing are performed at a variety of locations, some of which do not have U.S. support forces. Additionally, during periods of increased mobilization, strategic airlift forces may not return to their home base. Aircraft requiring maintenance will be routed through the nearest MAC base having the necessary repair capability. In this environment, all maintenance management processes tested at Dover are applicable and could be used immediately. We have initiatives in progress to expand the C-5 ground processing system (GPS) capabilities to include all AMS test program processes, and later to include C-141 aircraft data in the expanded GPS.

3. The tactical airlift mission is somewhat different. Tactical airlift wings, including Air Reserve Forces, will often deploy units, or parts of units, to main operating bases, collocated operating locations, or forward operating bases. All AMS test program processes are applicable to the home station maintenance environment. The requirement for deployed automated capabilities depends on the relative size of the deployed unit and the period of time these units will be deployed. The attached table shows automated capabilities desired with varying size or length of deployment.

4. Refer questions to Ca[illegible] Ferraro, HQ MAC/LGXAS, AUTOVON 638-5633.

C. N. Evgenides

C. N. EVGENIDES, Colonel, USAF
Director of Logistics Plans
DCS/Logi[illegible]

1 Atch
Table

GLOBAL IN MISSION — PROFESSIONAL IN ACTION

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS TACTICAL AIR COMMAND
LANGLEY AIR FORCE BASE, VA 23665

2 MAR 1981

LGQP

Wartime Requirements for Automated Maintenance System (AMS) Processes - AFLMC Project No. 760720 (Your Ltr, 5 Feb 81)

AFLMC/LGM

1. The attached worksheet is returned as requested in subject letter. We have modified the format to better reflect the TAC organization and mission.

2. We have indicated deployments of 6, 12, 18 and 24 aircraft rather than percentages of fleet because this better displays our current wartime/contingency taskings. It is important to realize that we consider each Aircraft Maintenance Unit (AMU) independently when discussing deployment issues of this nature.

3. We have added a tenth category, engine tracking, to your list of AMS processes. Engine tracking is the primary fundamental process required for the newest weapons systems maintained by TAC. This requirement has been emphasized repeatedly in correspondence to TAC/AD and the LMC. We must develop this subsystem before we can use AMS.

4. Conversely, we have deleted reference to the personnel availability and job following subsystems. We do not visualize requirement for these features during deployment and little requirement in garrison.

5. AMU autonomy and engine tracking dictate our requirement for an automated system which is distributive and easily transportable.

6. We are extremely interested in the results of your AMS assessment. Please furnish us with a copy of your results.

7. Our POC is SMS Diaz, LGQP, AV 432-4465.

FOR THE COMMANDER

William B. James

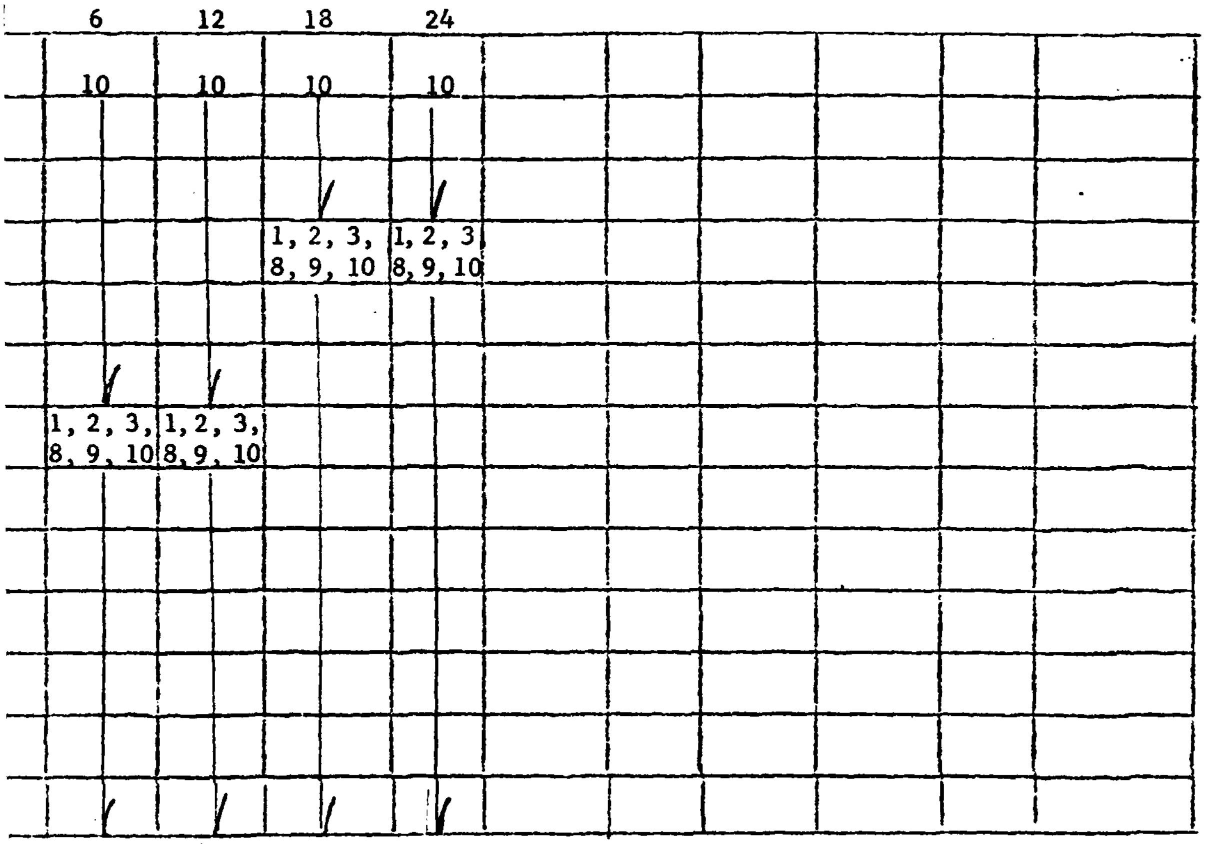
WILLIAM B. JAMES, Lt Col, USAF
Acting Director, Maint Tng & Management

1 Atch
AMS Worksheet

Cy to: TAC/LGQZ

Readiness is our Profession

PERCENT AIRCRAFT DEPLOYED
24 AIRCRAFT AMU
F15, F16 or A10



AMS PROCESSES

)) PROCESS

Work Order Generation

Work Order Close-Out

Debriefing

Personnel Availability

Job Following-Job Control

(NO) PROCESS

(6) Job Following - MEI

(7) Job Following - AGE

(8) Maintenance Pre-Plan

(9) Designed Operational Capability

(10) Engine Tracking

Attachment 1

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS STRATEGIC AIR COMMAND
OFFUTT AIR FORCE BASE, NEBRASKA, 68113

27 OCT 1980

ƷMM

ɜrtime Requirement for Automated Maintenance System
ⱯMS) Processes

ɪr Force Logistics Management Center/LGM

ɫthough it is somewhat premature for us to make a com-
ɾehensive assessment of which processes we would require
ɿ a wartime environment, the following inputs are sub-
ɫtted as our "best estimate" requirements.

Category	Process
ɔt essential for wartime	Job Following - Major Equipment Inspections Job Following - AGE

: is our opinion at this time that all other processes
ɿutomated work order generation, on-line work order
ɫose-out, automated aircraft debriefing, personnel avail-
ɔility, job following-job control, maintenance preplan,
ɿd designed operational capabilities) will be required
ɔr wartime in garrison, long term mobility, and short
ɜrm mobility.

Ɛ. M. HARTUNG-SCHUSTER, Lt Col, USAF
Ɔep Chief, Maint Management Division
ƆCS/Logistics

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Period Days	10	20	30	40	50	60	70	80	90	100
1-9	None	None	1,2,7, 10	1,2,7, 10	1,2,7, 10	1,2,7, 10	1,2,7, 10	1,2,7, 10	1,2,7, 10	1,2,7, 10
10-19	1,2	1,2	1,2,7, 10	1,2,7, 10	1,2,3, 4,5,7, 9,10	All	All	All	All	All
20-29	1,2	1,2	1,2,7, 10	1,2,7, 10	1,2,3, 4,5,7, 9,10	All	All	All	All	All
30-39	All	All	All	All	All	All	All	All	All	All
40+	All	All	All	All	All	All	All	All	All	All

MMICS SUBSYSTEMS REQUIRED[1]

1. Status and Inventory only TRIC EPI and STH
2. Operational Events only TRICs ESI, OTU, DSC, AUR
3. Inspection and Time Change only TRICs JDC, PRA, COT, TDI
4. Delayed Discrepancies only TRICs DOM, EVL, ARC
5. Time Compliance Technical Orders only TRICs ITI, TCI, TJS, WTR, TCD, TCS, DCR, STL, TIL
7. Personnel and/or Equipment Transfer Procedures
9. Maintenance Personnel, TRIC MPL (ARRS Requirement Only)
10. Training Management only TRICs MPQ, SCR

[1]See Assumptions and Requirements on cover page.

Period of Deployment \ Unit Deployed	Less Than 40%	40 to 79%	More than 80%
1-15 Days	None	1* - All 3 - All	1 - All 3 - All
16-45 Days	1* - All 3 - All	1 - All 3 - All 5 - a, c, e, g, i 7 - All 9 - All	1 - All 3 - All 5 - a, c, e, g, i 7 - All 9 - All
45-90 Days	1 - All 3 - All 5 - a, c, e, g, i 7 - All 9 - All	1 - All 3 - All 5 - a, c, e, g, i 7 - All 9 - All	1 - All 3 - All 5 - a, c, e, g, i 7 - All 9 - All
More Than 90 Days	1 - All 3 - All 5 - a, c, e, g, i 7 - All 9 - All	1 - All 3 - All 5 - a, c, e, g, i 7 - All 9 - All	All Processes are Applicable

* Number and letters refer to specific processes and objectives for each increment identified in para 4b of the AMS Test Program Data Project Plan, 19 May 1977, Change 4, Dated 15 Sep 79.

AD-A158 086 WARTIME AUTOMATION REQUIREMENTS FOR MAINTENANCE(U) AIR FORCE LOGISTICS MANAGEMENT CENTER GUNTER AFS AL D A DIETSCH ET AL. OCT 82 AFLMC-800402 SBI-AD-F630 423 2/2

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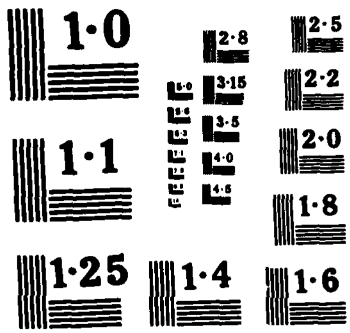

NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

APPENDIX C

COMPREHENSIVE ENGINE MANAGEMENT SYSTEM

EXTRACTS FROM THE FUNCTIONAL DESCRIPTION

C-1 The current method of tracking engine related Time Compliance Technical Orders (TCTOs) in the base level MMICS provides the capability for "real-time" TCTO status. The mechanized (batch system) method for off-base reporting to users of this TCTO data is not timely, resulting in out-of-date information. As currently configured, engine related TCTO reporting is accomplished as described in the following paragraphs.

a. TCTO status information is initiated and updated in the base level MMICS (DSD: G073) data base. Status changes are accomplished in the data base as they occur, and a corresponding Maintenance Data Collection (MDC, DSD: G001B) transaction is programmatically produced and output as a punched card.

b. The base level MDC system processes the TCTO action with all other MDC base level actions for transmission to AFLC. In most cases, this conglomerate data is transmitted to AFLC on a daily basis. At AFLC this data is stored as received and then imput to the HQ AFLC Maintenance Data Collection System (DSD: D056) at the end of the week.

c. After all base level data is input into D056, all engine related TCTO data is extracted and transmitted through AUTODIN to OC-ALC for input to the D024 system.

d. The D024 system updates its master files with TCTO status received from D056 and, once a month, produces engine TCTO status reports which are forwarded to the appropriate ALC Technical Repair Centers (TRCs). These listings, theoretically, are used to identify TCTO accomplishments against engines, modules, and subassemblies. However, the existing flow of information from batch computer systems at various levels of command, across commands, and at geographically widely dispersed sites creates such time delays that the information is always out-of-date. Engines and assemblies frequently arrive at the TRCs with TCTO accomplishments not recorded on the D024 products used by the ALCs.

C-2 Objectives. The following are the objectives of CEMS as described by the CEMS functional description.

a. Maintain removal and installation actions of engines, modules, or components and report these actions for the F100, TF34, TF41, TF30, TF33, J60, and J85 engines.

b. Update and create records of time accrued on engines, modules or components in terms of tracking cycles, total operating time, total flying time and/or time-at-temperature for the engines listed above.

c. Maintain time change standards and notify Plans and Scheduling when engines, modules or components have expended their time remaining or are projected to exceed their limits.

d. Provide query capability for part number, serial number and/or part number/serial number combinations.

e. Determine equipment requiring a particular TCTO for all engines.

f. Provide current time change and TCTO data for accident investigation boards.

g. Strive for a goal of one hundred percent accuracy for the objectives above.

h. Develop and implement the base level portion of CEMS in MMICS in such a way that additional engines can be placed under OCM with the absolute minimum possible changes in the system software, procedures, and documentation. Additional engines should be able to be added to the base level CEMS within six months of notification to the AFDSDC that an engine is to be added.

i. Automate Engine Management Reporting from Base Level to MAJCOM and AFLC,

(1) Will eliminate current keypunch requirements.

(2) Will reduce errors through editing at time of input.

(3) Automatically AUTODIN engine status reports to OC-ALC.

j. Automate Accountable Engine Shipping Devices Management/ Reporting.

(1) Maintain cumulative total of shipping devices on-hand.

(2) Maintain total of serviceable shipping devices.

(3) Reduce or eliminate most of the command directed shipping device reports.

k. Completely mechanize the base engine managers records/ operation, i.e., sequence control, transaction register, engine intransit X number of days (exception reports), etc.

l. Provide management products for each of the base engine managers responsibilities identified in AFM 400-1.

m. Provide engine condition indicators which can support the "on condition maintenance" (OCM) process of the RCM Program.

n. Provide diagnostic indicator information for engines, derived from the engines' performance data.

o. Provide health condition indicators for all engines monitored by CEMS.

p. Provide access to the results of non-destructive inspection (NDI) procedures, to include the oil analysis program (OAP) and borescope inspections.

q. Provide engine maintenance management information in the deployed environment.

r. Provide maintenance management information for all jet propulsion engines, tailored to the amount of data available for each engine type.

s. Provide base level data collection to satisfy CDB data requirements.

t. Provide for automatic collection of time, temperature, and cycle data for engines equipped with automatic in-flight monitoring systems.

u. Provide an engine maintenance management information system with the following specific capabilities:

(1) To establish and maintain a local data base for the accumulation and update of performance, health and NDI data for engines, modules and components. The data base will be tailored to the needs of the particular engines supported by the local

maintenance organization.

(2) To provide access to the local data base for required diagnostic and trending algorithms, and to execute analysis programs on the data within the data base.

(3) To provide on line interactive access to the information within the data base so that programs may be executed by the user and the results received are within specified limits.

(4) To accept data directly from engines equipped with automatic inflight monitoring system.

(5) To receive input directly from the OAP laboratory with oil analysis results.

(6) To interface with other base level systems as required to receive and transfer data.

(7) To operate in an austere forward deployed location.

C-3 Proposed System. The following is a description of the proposed methods and procedures which will constitute base level CEMS.

a. The Base Level CEMS will provide improvements, through automated support, of the following engine related maintenance processes:

(1) Maintaining base level control and visibility of the configuration, down to the tracked part serial number, of engines being managed under the On-Condition Maintenance concept.

(2) Base level tracking of the usage of Increments I/II engines down to the tracked part serial number. Usage will be tracked according to the various tracking methods applicable to a particular engine.

(3) Base level forecasting of Increments I/II engine time change and inspection requirements, down to the tracked part serial number. Forecasting will be both in terms of the methods tracked and in terms of flying hours (Non-Increments I/II engines will use existing MMICS forecasting logic).

(4) Base level reporting of engines' configuration (removal and installation) changes and usage to the CDB. Engine, module, and tracked component usage will be reported to the CDB according to the methods tracked.

(5) Base level monitoring of engine related TCTO status (for both Increments I/II engines and non-Increments I/II engines) and reporting of that status to the CDB.

(6) Production and status tracking of forecasted parts and TCTO kit requirements with the Standard Base Supply System.

(7) CEMS will automate the status reporting of engines/modules to the CEMS CDB through an on-line system to permit the monitoring of the status and location of engines/modules and tracked components, auxililary and gas turbine support equipment in the Propulsion or AGE shops or their equivalents. BLEMS will eliminate much of the present paperwork and will totally eliminate the requirement for the AF Form 1534 to be keypunched and handcarried to the Communications Center. After the equivalent AF Form 1534 data is entered into the remote terminal, the information will be automatically transmitted to the CEMS CDB if required. This will greatly increase the accuracy of the data.

(8) CEMS will maintain a cumulative record of engine

shipping devices managed by the Base Engine Manager.

b. The base level CEMS, Increment IV will provide maintenance management support for not only the newer, high-technology modular engines but for all jet engines in the Air Force inventory. An exception will be TF39 engine, which will continue to be supported by MADARS, a data system exclusively associated with the C-5A aircraft. The intent of Increment IV is to provide the maintenance activity with engine performance and diagnostic information required to make the decisions that affect engine maintenance. There are 3 general decisions; does the engine require maintenance; if it does, what depth of maintenance is required; and last, if removed for shop level maintenance, can the repair be accomplished locally or will it require shipment to a central repair facility (Queen Bee) or depot. The process of making these decisions and supplying resources required to carry them out constitute the overall function of maintenance management. In addition to the overall maintenance management function, the system will also support the base level operation units. This support will allow operations personnel to select the best aircraft/engine combination available to meet mission requirements.

c. CEMS, Increment IV uses engine condition monitoring as the basis for supporting maintenance management. Engine condition is the individual engine's profile consisting of OAP, borescope life expenditures, and performance information. These data, coupled with past maintenance actions/maintenance history will provide a condition profile data base for an engine, which will be a major determinant of required actions associated with that engine. An engine is removed from the aircraft and replaced with a serviceable asset when performance has degraded, the engine has failed, or some predetermined maximum allowable operating time/cycle has been reached. Once an engine has been removed, a decision must be made whether the engine can be repaired at the local base level facility or if shipment to the depot will be required. If returned to the depot or sent to a Queen Bee, the engine is stripped of the quick engine change (QEC) kit, packaged and shipped. If repair is possible at base level (Jet Engine Intermediate Maintenance (JEIM)), the engine is scheduled into the local shop. Once repaired, the serviceable engine is sent to central supply ready to be shipped when the need arises.

d. CEMS, Increment IV must provide comprehensive support to base level maintenance management throughout the Air Force. This support capability must consider all the different types of engines and their peculiar maintenance requirements, the different maintenance procedures corresponding to various mission requirements, the different levels of repair and data processing capability at operational bases, and the different sources of input data. To address the divergent scope of requirements, CEMS, Increment IV will have three levels of capability. These levels, called Level A, Level B, and Level C, are nested so that each higher level includes all the capabilities of lower levels. The basic level is Level A and it has capabilities for directly gathering and trending OAP and borescope data. The second level,

Level B, includes capabilities for gathering and trending manually recorded in-flight performance data in addition to the OAP and borescope capabilities of Level A. The third level, Level C, includes capabilities for gathering and trending automatically recorded in-flight performance data as well.

C-4 Improvements. The general description of the improvements to be made to current engine management is as follows:

a. Under CEMS, base level engine parts tracking and TCTO management will provide the following improvements:

(1) Unit level engine maintenance activities will be able to update, monitor, report and forecast configuration and usage of engines which have been placed under On-Condition Maintenance.

(2) Engine related TCTO status for all engines will be reported automatically to the CEMS CDB, eliminating all of the steps currently required.

(3) Additional engines can be placed under the On-Condition Maintenance concept and can be supported by MMICS with minimum changes to the MMICS programs, procedures, and documentation.

b. BLEMS (CEMS III) will facilitate the management of engine/module and shipping device assets for the BEM by using an on-line system rather than the present grease board, punch card and manual document files. It will also improve the accuracy and timeliness of the data and report all of the information required by AFM 400-1 automatically after input of data without further action by the BEM. BLEMS will improve engine management at base level by providing as much management flexibility as possible while eliminating many tedious tasks, such as proofing punch cards, as is now done.

c. Many of the current base level system deficiencies will be eliminated under CEMS, Increment IV. The performance monitoring capabilities will enhance the maintenance management of engines, and help realize the full benefits of "on-condition maintenance."

C-5 Mobility Impacts

a. Based upon the projected improvements in current engine management represented by CEMS, the system will have considerable impact on both mobile ADP requirements and data communications requirements. Section A of Chapter 2 has already indicated that the dependence of base level engine maintenance management on the automated engine tracking system contained in MMICS dictates that ADP is required very early in a contingency and at very low force levels to adequately support modular engines and On-Condition Maintenance (OCM). With the operational deployment of the CEMS system, the capabilities represented by that engine tracking system will be exported to many more engines, and potentially to all USAF engines. Consequently, the mobile requirement for ADP support for engine tracking will likewise expand.

b. It can be postulated that under severe combat conditions certain TCTO actions might be suspended. It is almost certain that circumstances during any conflict will dictate an immediate necessity to modify aircraft to correct safety of flight conditions or improve operational capabilities. The necessity will also exist for Major Commands, AFLC and other command levels to know the status of completion of those modifications, and the materiel status of parts and supplies to complete them. Consequently, the TCTO improvements made by CEMS should be included in any mobile ADP system to support Air Force forces.

c. It will also be necessary to provide a deployed capability to forecast time change and inspection requirements as proposed by CEMS because CEMS represents a change to current management philosophy. This change will result in a requirement for fewer spare assets since the automated system will provide more timely information on forecast consumption, enabling AFLC to manage spares centrally, and reduce the requirement for stockpiling spares at unit level. This concept is theoretically sound, however, it must be recognized that it creates a situation in which the ADP and communications capabilities are critical to effective support of the force. If and when spares levels are reduced, the capability to forecast the requirement for these assets is crucial to the continued operation of the unit.

d. An automated engine management function is not critical in and of itself for contingencies lasting less than 30 days. Since intermediate repair currently is not planned until on or about D+30, the engine management task is confined to managing those few engines which are deployed as spares with the unit, and to ordering and tracking additional spares as required. After D+30 however, the task of engine management becomes more complex, and the capabilities of CEMS are necessary. Additionally, the deployment of this capability may be necessary and adviseable early-on in a contingency if the ultimate design of the system is such that engine management is inextricably tied to other CEMS capabilities.

e. The mobile requirement for the engine diagnostic capability represented by Increment IV of CEMS is contingent on several factors. First, it is dependent upon the target level of maintenance which Increment IV is to serve. If, as is indicated by the Functional Description this capability will serve both flightline troubleshooting and Jet Engine Intermediate Maintenance (JEIM), then the capability is required at the outset of the conflict. If, however, this capability is oriented only toward JEIM, then it is required concurrent with the establishment of JEIM capability.

f. The intent of this paragraph is to address in one single paragraph the entire issue of the transmittal of data from deployed lcoations to the Central Data Base (CDB). Many of the proposed improvements in CEMS are contingent upon the ability of the unit to transmit data to the CDB. This includes tracking data, TCTO data, engine management data, and diagnostic data. In a peacetime configuration this requirement does not represent particularly significant difficulty. However, there are many potential deployment situations in which the communications capability does not readily exist to accomplish timely transfer

APPENDIX E

BIBLIOGRAPHY

Department of Defense. Rapid Deployment Force Joint Task Force Capability Study, Government Printing Office, Washington, D.C., 31 Dec 1980.

Department of Defense. Bright Star 81, After Action Report, United States Readiness Command, MacDill AFB, Florida, 7 Feb 1981.

Department of the Air Force. Functions and Basic Doctrine, AFM 1-1, Government Printing Office, Washington, D.C., 14 Feb 1979.

Department of the Air Force. A Study of the Automation of Logistics at the Base Level, Government Printing Office, Washington, D.C., 30 Jun 1973.

Department of the Air Force. Support of Mobility Automation Requirements Study, Government Printing Office, Washington, D.C., March 1976.

United States Congress, House Committee on the Budget. Military Readiness and the Rapid Deployment Joint Task Force, Hearings, 96th Congress, 2nd Session, Government Printing Office, Washington, D.C., 1980.

Wise, Kensall D., Chen, Kan, and Yokely, Ronald E. Microcomputers: A Technology Forecast and Assessment to the Year 2000, John Wiley & Sons, New York, 1980.

Rich, Michael D., and Dresner, Stephen M. An Integrted View on Improving Combat Readiness, Rand Corporation, Santa Monica, California, February 1982.

MAINTENANCE PROCESSES TO BE TESTED

	INCREMENT	TITLE
PHASE 1 EVALUATION	1	*Automated Work Order Generation *On-Line Work Order Close Out
	2	*Automated Aircraft Debriefing
	3	*Personnel Availability Reporting/ Forecasting Subsystem
	4	*Job Following and Suspense System *Job Following (Major Equipment Inspections) *Job Following (AGE) *Maintenance Preplan (Job Standards/ Averages)
	5	*Designed Operational Capability
	6	*Production Control and Component Scheduling *PMEL Component Scheduling
PHASE 2 EVALUATION	7	*Supply Interface for Parts Ordering *Automated Tail Number Bin (TNB) Inventory *Maintenance/Supply Interface for Time Change Item (TCI) Ordering *Supply Interface for Forecasting Time Change Requirements *Supply Interface for TCI Status and Update *On-Line TCTO Kit Ordering and Status *Maintenance/Supply Interface for Item Status *On-Line Cannibalization Suspense and Control File *Automated Cannibalization Verification *Automated Part Number/Stock Number Cross-Referencing
	8	*Source Data automation devices used to provide flightline data entry

Table D-1

(h) Eliminate the requirement for the U1050-II to produce Due Out Cancellation (DOC) and issue (ISU) cards.

(i) Eliminate/reduce dependence on U1050-II produced reports such as the Daily Document Register (D04) and Priority Monitor Report (D18).

A summary of AMS processes being tested is on the following Table D-1.

(m) Interface with AMS Increment VII to provide real-time tracking of reparable assets from time of requisition to time of turn-in.

(n) Reduce inventories of reparable spares by reducing repair times.

(9) Maintenance/Supply Computer Interface (Increment 7):

(a) Provide the capability to order parts through remote terminals located throughout the maintenance complex.

(b) Provide the capability to determine component and part availability/status via VDT.

(c) Create automated files for recording parts ordered by workcenter and verification information which will reduce dependency upon AF Forms 2005 (Issue Turn-in Request), 2413 (Supply Control Log), and 2414 (NORS Verification Checklist).

(d) Eliminate the need for AFTO Forms 223 (Time Change Requirements Forecasts), by providing the capability to generate a forecast of time change requirements.

(e) Provide computer assisted capability for the verification of Urgency of Need Designator (UND) "A" and "B" requirements.

(f) By providing on-line capability for inventorying Tail Number Bins (TNBs), reduce the amount of time spent physically checking the bins for needed items.

(g) Provide a central item data bank containing stock numbers, enabling parts ordering from remote terminals in the maintenance complex.

data base in which all reparable asset status information is stored.

(b) Provide an on-line information system with the capability to monitor the level of an individual asset as to status and location.

(c) Reduce the time required for due-in-from-maintenance (DIFM) listing reconciliation, and when interfaced with AMS Increment VII, eliminate the listing altogether.

(d) Provide asset inventory control through automated record creation when the reparable asset enters the system.

(e) Provide an inquiry system for obtaining summary manhour backlog data for in-shop work based on the Job Average subsystem in AMS Increment IV.

(f) Provide a suspense system to insure time lines for repair actions are met.

(g) Eliminate manual production control board for scheduling and status information.

(h) Provide immediate response on status of assets in the repair cycle during MICAP verification process.

(i) Reduce manual documentation required to track the flow of reparables.

(j) Edit repair cycle data at the source.

(k) Produce automated AFTO Forms 349 for in-shop work.

(l) Automate AFTO Form 350, Reparable Item Processing Tag.

predetermined periods prior to scheduled job start times.

2 Reduce the frequency with which work orders are printed for jobs which, although scheduled, are never started due to higher priority work.

3 Eliminate the requirement for Specialist Dispatchers in Job Control to maintain an AFTO Form 349 file.

(k) Provide Specialist Dispatchers in Job Control the capability to determine (via visual display terminal (VDT)) the number of personnel engaged in a specific event.

(6) Maintenance Preplan (Increment 4):

(a) Provide a machine-resident file of "repetitive task" standards for calculation of repair times and estimated time incommission (ETICs).

(b) Provide the capability to display, via VDT, the personnel, equipment and tool requirements for frequently performed high manhour-consuming jobs. This information will be contained in a machine resident file and utilized by Job Control and Plans and Scheduling for scheduling resources to support scheduled and unscheduled maintenance activity.

(7) Designed Operational Capability (Increment 5):

(a) Provide computer assistance to Job Control for monitoring the status of critical aircraft subsystems.

(b) Provide a display of operational capabilities for the assigned weapon system(s).

(8) Production Control and PMEL Component Scheduling (Increment 6):

(a) Provide schedulers with a single, integrated

(c) Provide computer assistance for control and close out of work orders by Job Control and the monitoring of weapon system/equipment status and configuration.

(d) Provide computer assistance for monitoring and controlling inspection and corrective actions associated with an aircraft undergoing a major inspection.

(e) Provide a reduction in manual data recording requirements for Job Control and Inspection Workcenters.

(f) Provide computer production and storage of inspection schedules for powered AGE including work order generation for applicable inspection packages.

(g) Provide a computer resident file of current AGE status. The capability to display this status will eliminate the requirement to manually initiate AF Forms 2431 (Aerospace Ground Equipment Status Log).

(h) Provide optional computer notification to Job Control, Inspection Docks and AGE branch personnel that scheduled (estimated) event start/stop times have expired and notification of the event initiation or termination has not been received.

(i) Create a machine-resident file containing the Daily Maintenance Plan for scheduled activity. This file will provide the basic source data for on-line event monitoring and allocation/commitment of available resources.

(j) By interfacing with the Automated Work Order Generation Process (Increment 1), the following objectives can be satisfied.

1 Enable computer generation of work orders at

permit interface with the Automated Work Order Generation process through the data base discrepancy files.

(b) Provide computer assisted identification of discrepancies.

(c) Eliminate the requirement to maintain manual debriefed discrepancy logs for identification of repeat discrepancies.

(4) Personnel Availability Reporting (Increment 3):

(a) Provide on-line personnel availability reporting of both current and projected status.

(b) Eliminate the need to manually complete and distribute handscribed copies of the AF Form 2405 (Personnel Availability Forecast).

(c) Provide the capability for workcenters to input personnel availability changes via remote terminals.

(d) Provide roll call rosters for shop supervisors and to shop schedulers.

(5) Job Following and Suspense System for Job Control, Major Equipment Inspections and Aerospace Ground Equipment (AGE) (Increment 4):

(a) Provide computer assisted monitoring or event start/stop times to Job Control for controlling daily scheduled maintenance activities.

(b) Enhance the capability of Job Control (through an expanded terminal network) to direct generation of work orders for applicable production workcenters in response to unscheduled maintenance requirements.

handcarry maintenance preplans (AF Forms 2406) to and from the Plans and Scheduling Section.

(f) Provide notification of on-equipment maintenance requirements to owning/performing workcenters by means of computer generated AFTO Forms 349.

(g) Reduce the requirement for AFTO Forms 349 to be passed and/or filed within Job Control.

(2) On-line Work Order Close Out (Increment 1):

(a) Provide the capability for maintenance workcenters to input close out data via branch level remote terminals.

(b) Provide on-line editing of close out data.

(c) Eliminate the need for supervisor checks of AFTO Forms 349.

(d) Eliminate the requirement to keypunch AFTO Forms 349 information for on-equipment maintenance.

(e) Reduce the need to manually distribute completed AFTO Forms 349 within the maintenance complex.

(f) Eliminate the requirement for the base level Data Processing Installation (DPI) to process punched cards pertaining to AFTO Forms 349 for on-equipment maintenance. Note: DPI card input to MDC and the Command Aircraft Maintenance Manpower CAMMIS will be required.

(3) Automated Aircraft Debriefing (Increment 2):

(a) Provide the capability to enter debriefed discrepancy data and operational information (i.e., flying hours, gear cycles, etc) into the maintenance data base. This will these capabilities worldwide. This test program will not provide for worldwide implementation of the AMS test processes contained in the DAR. Rather, it will provide the preliminary analysis that will ultimately lead to developing Programmed Automation Requirements (PAR) for individual processes, portions of processes or groups of processes for incorporation into the Air Force Standard Maintenance Management System. Specific objectives for each test process/increment will be addressed and quantified in the following paragraphs:

(1) Automated Work Order Generation (Increment 1).

(a) Provide computer generation of on-equipment AFTO Forms 349 (Maintenance Data Collection Record) and AF Forms 2406 (Maintenance Preplans) on branch level maintenance terminals. This capability will reduce the use of handscribed work orders and the requirement to manually initiate duplicate AFTO Forms for on-equipment maintenance.

(b) Enable production of multiple work orders (packages) by means of a single input for known maintenance requirements (i.e., inspections, time changes, etc).

(c) Reduce the time expended by Field Maintenance Squadron (FMS), Organizational Maintenance Squadron (OMS) and Avionics Maintenance Squadron (AMS) line supervisors picking up and distributing work orders and work order packages.

(d) Eliminate the need for the Plans and Scheduling (P&S) and Debriefing Sections to manually sort and separate work orders for distribution.

(e) Eliminate the need for OMS personnel to interactions to determine the viability of each process and the entire system as designed.

(2) Estimating the value added through the introduction of the AMS processes into the current Air Force Maintenance Management System. Dover AFB test results will be analyzed and the corresponding improvement, if any, experienced for each process will be established. Where baseline data exists, the improvement will be measured directly. If baseline data does not exist, estimates of improvement for each process based on professional judgment will be formulated. These potential improvements will be extrapolated to the Air Force maintenance environment to the maximum extent possible based on the validated process/system description.

(3) Determining the follow-on action necessary to support process/system implementation Air Force-wide. Based on the estimated value to be added by implementing the process or selected processes, a determination will be made of how, where, and to what degree the processes should be applied. Areas of uncertainty will be identified and an estimate of further study or follow-on implementation costs will be formulated. At this time, a determination of the impact on current/projected programs will be made.

b. The AMS Test Program is limited to a level of effort necessary to validate the individual process concepts, estimate the cost effectiveness of these processes in the test environment, and determine those actions that are necessary to ascertain the technical and economic feasibility of providing

These processes were segregated into eight increments to permit an orderly development effort and a realistic test evaluation from Aug 1977 - Jul 1981. The maintenance functions identified include such processes as automated work order generation and close out via remote maintenance terminals, automated debriefing, on-line work monitoring for Job Control, Major Equipment Inspections and Aerospace Ground Equipment (AGE) as well as a Maintenance/Supply computer interface for automated parts ordering, on-line status inquiry capability for supply requisitions and MICAP verification. The development schedule, associated cost factors and evaluation requirements were consolidated into a revised Data Automation Requirement which received formal Air Staff approval on 14 Feb 1977. A subsequent Data Project Directive (DPD) was issued by HQ USAF, Directorate of Data Automation (AF/ACD) on 10 May 1977, directing the development of a Data Project Plan (DPP). This DPP specifies the detailed development actions associated with the test program.

D-2 Objectives.

a. The primary objective of the AMS Test Program is to establish the value of applying the AMS capabilities Air Force-wide. The general approach for achieving this objective includes:

(1) Using the 436 MAW, Dover AFB, with the C-5 GPS system to determine operational and technical feasibility. Each of the processes will be introduced into the maintenance environment at Dover AFB to examine process interfaces and

APPENDIX D

AUTOMATED MAINTENANCE SYSTEM (AMS)

D-1 Background.

a. The AMS Test Program consists of developing and testing several automated maintenance management processes on the existing C-5 Aircraft Ground Processing System at Dover AFB, Delaware. It is intended that the more beneficial and cost effective features of each function, once evaluated, be incorporated into future standard system design.

b. The C-5 Aircraft Ground Processing System consists of a Malfunction, Detection, Analysis and Recording Subsystem (MADARS) for recording in-flight discrepancies. The tape is downloaded, processed on the base level IBM 1130 computer and the discrepancy data transmitted via high speed communication lines to the central data bank (CDB) at Tinker AFB, Oklahoma. The CDB utilizes three IBM 360-65 computers to process the information. From this analysis, discrepancies are identified and computer records established. The CDB then directs the remote terminals, located in the Maintenance Job Control and Plans and Scheduling activities at Dover AFB, to generate applicable work orders.

c. During February 1975, MAC submitted a Data Automation Requirement (DAR) recommending standard Air Force application(s) of the C-5 Ground Processing System. In response to the MAC DAR, three Air Staff directed conferences were held during the first quarter of 1976 which resulted in identification of the processes to be tested and establishment of a basic development plan.

of such data. In a contingency situation, it is probable that the timing requirements for such data could be relaxed to the extent that some form of non-real time media could be used to move data to the CDB (i.e., cards, tape, etc.). However, the base level CEMS functional description does not give sufficient information about the precise uses of the data at AFLC to enable a catagorical statement about this situation. The requirement for direct communications between deployment sites and off site activities (including MAJCOM and AFLC) is an issue which requires additional evaluation as CEMS is developed.

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