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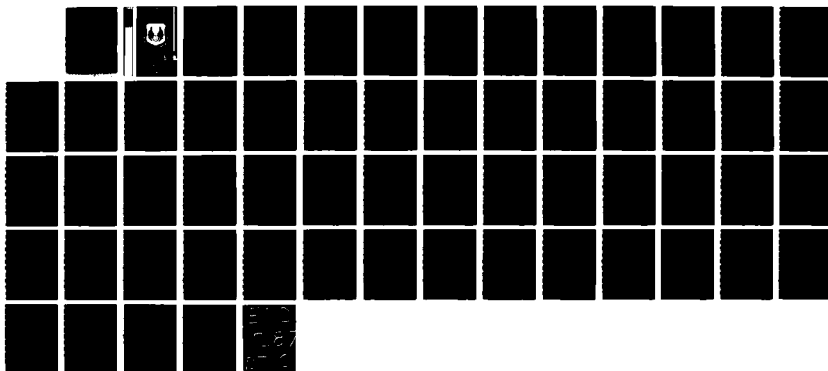COMMAND WRIGHT-PATTERSON AFB OH DIRECTORATE OF
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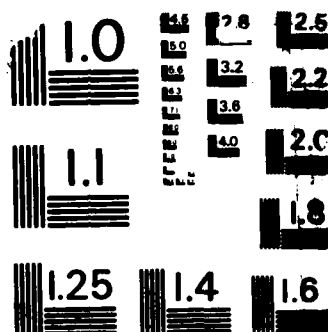
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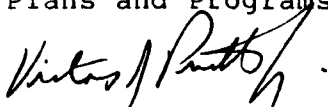### WPAFB, OHIO 45433

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FOREWORD

The Directorate of Management Sciences (XRS) conducts and spon-
sors studies and research of significant logistics issues.

In 1986 we concentrated on assisting the rest of the staff with
analyses that relate logistics resource alternatives to the
peacetime readiness and wartime sustainability of AFLC's
customers--the operating commands. That focus will continue in
1987 and beyond.

In this, our third Annual Report, we will discuss the capabili-
ties of the XRS organization, some specific accomplishments in
1986, and our program for 1987.

We encourage you to contact us regarding our past, current, and
future efforts. If you have a problem, maybe we can help.

MICHAEL R. LACEY, LT COL, USAF
Dep Dir, Management Sciences
DCS/Plans and Programs

VICTOR J. PRESUTTI, JR.
Director, Management Sciences
DCS/Plans and Programs

EDWARD R. BRACKEN
Brigadier General, USAF
DCS/Plans and Programs

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The Directorate of Management Sciences (AFLC/XRS) is comprised of three Divisions: the Assessment Applications Division (XRSA), the Concept Development Division (XRSC), and the Consultant Services Division (XRSM). We conducts and sponsors studies and research of significant logistics issues. We use, modify, and develop new or improved methods, models, and tools to manage logistics resources.

In our 1984 and 1985 Annual Reports we described our goal as the development of a capability to quantify the relationship between logistics resource decisions and operational effectiveness. Our goal has not changed. Comparison of our actual achievements against planned accomplishments, as noted in this, and previous, Annual Reports, however, indicates that we were overly optimistic about what we could achieve in a few years.

In 1987 we intend to concentrate on four major objectives. We want to have our algorithm that relates aircraft spares investment to peacetime aircraft availability ready for implementation in AFLC's recoverable spares requirements determination system (D041) by the end of the year. In order to help AFLC move toward more responsive logistics support to the operating forces in the early part of a war, we intend to demonstrate the effect of a specific change in depot maintenance scheduling policy on operational effectiveness. We intend to begin quantifying the relationship among investments in Stock Fund Items (repair parts), maintenance awaiting parts items, and aircraft downtime. We will continue to enhance the ability of AFLC's Weapon System Management Information System (WSMIS) to project the number of aircraft available to generate sorties on a daily basis during the first 30 days of war.

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I. THE DIRECTORATE OF MANAGEMENT SCIENCES

The Directorate of Management Sciences (AFLC/XRS) is comprised of three Divisions: the Assessment Applications Division (XRSA), the Concept Development Division (XRSC), and the Consultant Services Division (XRSM). We conduct and sponsor studies and research of significant logistics issues. We use, modify, and develop new or improved methods, models, and tools to manage logistics resources. We emphasize operational capability as the measure of effectiveness rather than the older, traditional measures of item related efficiency, such as fill rate. We keep current on logistics research, developments, and studies both internal and external to the Command. Because of our analytical and technical expertise, we act as technical consultants for organizations throughout AFLC, the Air Force, and the defense community.

We have twenty civilian and military operations research analysts. Three-fourths of our analysts have advanced academic degrees in technical areas (e.g., mathematics, engineering, management sciences). Each new XRS analyst is expected to have, or obtain within his/her training period (normally three or four years), an advanced degree. Our analysts work with both analytical and Monte Carlo simulation computer models. We have developed outstanding capabilities in determining requirements for recoverable items (items that are repaired, as opposed to thrown away, when they fail), relating recoverable item assets to the number of aircraft available to accomplish the mission, and relating jet engine maintenance shop resources to aircraft availability.

The Directorate works closely, and shares results, with other governmental and private analysis organizations such as the Air Force Institute of Technology, Air University, the AF Office of Scientific Research, the AF Business Research Management Center, the AF Logistics Management Center, the AF Coordinating Office of Logistics Research, the Human Resources Laboratory, the Rand Corporation, and the Logistics Management Institute.

During the past year we continued our practice of working very closely with a study sponsor's action officer and having the action officer interact with AFLC's senior staff. On a number of occasions, however, we also found it productive to work directly with the senior staff.

In our 1984 and 1985 Annual Reports we described our goal as the
development of a capability to quantify the relationship between
logistics resource decisions and operational effectiveness.
Those two reports also included our interpretation of the inter-
relationships between operational effectiveness and four major
areas of logistics investments: line replaceable units (LRUs),
maintenance, distribution, and procurement. Our goal has not
changed. Comparison of our actual achievements against planned
accomplishments, as noted in this, and previous Annual Reports,
however, indicates that we were overly optimistic in what we
thought we could achieve in a few years, premature in our
conclusions regarding some of the Command's major initiatives,
and overextended in the range of issues with which we thought we
could deal. That is, we bit off more than we could chew.

In 1987 we intend to focus our work on shorter range goals and
concentrate more on "implementability" issues to assure that we
can maintain steady progress toward our longer range goal of more
effectively allocating logistics resources to improve operational
effectiveness.

We have assigned one or two projects of overriding importance to
each of our three divisions. Obviously, each division will also
accomplish other projects, but the primary emphasis will be on
these special projects. These special projects will concentrate
on relating our Peacetime Operating Stock (POS) and War Reserve
Material (WRM) requirements, for both recoverable and consumable
spare parts, to operational effectiveness, and examining smarter
ways of scheduling the repair of recoverable assets.

The Assessment Applications Division will have two priority
projects: to help AFLC move toward more responsive logistics
support to the operating forces in the early part of a war by
demonstrating the effect of a specific change in depot
maintenance scheduling policy on operational effectiveness; and
to continue to enhance the ability of AFLC's Weapon System
Management Information System (WSMIS) to project the number of
aircraft available to generate sorties on a daily basis during
the first 30 days of a war. The Concept Development Division
will have as its primary 1987 goal the successful resolution of
several issues currently delaying the implementation (in D041) of
an algorithm that relates aircraft spares investment to peace-
time aircraft availability. The Consultant Services Division's
priority is to quantify the relationships among investments in
Stock Fund items, maintenance awaiting parts times, and aircraft
downtime. By highlighting these four projects we expect to
achieve major improvements in the Command's ability to relate
investments in spares (and a portion of our investment in
maintenance) to operational effectiveness. This area of intended
concentration represents, for the most part, the area in which we

have already made the most progress. But we have found that the implementation of some of the concepts which we worked on is lagging (for some very good reasons). Therefore, our emphasis will be on insuring that our "theoretical" progress results in actual implementation. While our research into other areas will be curtailed, we are still including some projects in the distribution and maintenance areas, and we also anticipate devoting a significant amount of time to assisting other headquarters offices address specific problems which require our expertise. The following sections provide more details on each Division's accomplishments during 1986 and its plans for 1987. Also included is a summary of our contract studies program.

III.   THE ASSESSMENT APPLICATIONS DIVISION

A.   INTRODUCTION

The Assessment Applications Division consists of five operations research analysts, a logistics staff officer, a computer assistant, a junior fellowship student, and a co-op student. Our primary emphasis has been on estimating force effectiveness in wartime surges as a function of currently available recoverable item spares. We have worked closely with the Logistics Management Systems Center (LMSC) developers and the Logistics Operations Center (LOC) users of the Weapon System Management Information System (WSMIS) to provide technical direction, resolve a variety of technical implementation issues, and ensure the overall effectiveness and validity of this assessment system. The entire Division is involved in one or more aspects of weapon system capability assessments. We are the Air Force technical OPR for Dyna-METRIC, the official Air Force model for capability assessments of weapons systems as a function of recoverable items. We have worked closely with Dyna-METRIC users, establishing expertise throughout the Air Force and in other agencies to ensure a continuing ability to use the model in a valid and responsible manner.

In addition to our efforts directly in support of Air Force weapon system capability assessments, we are working in another, even more important, development area. We are providing concept development as well as technical direction and support for the AFLC initiatives incorporated in CLOUT (Coupling Logistics to Operations to Meet Uncertainties and the Threat). This project is defining the importance of AFLC support for both peacetime and wartime operations and includes several initiatives to increase the flexibility and responsiveness of depot maintenance and distribution. Our recent work has concentrated on a service test of a CLOUT maintenance scheduling algorithm. We have worked with Ogden Air Logistics Center (ALC) and the Pacific Logistics Support Center (PLSC) to test this new, highly responsive depot repair prioritization system.

As we refocus our efforts in concert with the updated goals of the Directorate, these two areas will receive most of our attention in 1987.

B.   ACCOMPLISHMENTS IN 1986

In our 1985 Annual Report, we defined 14 projects in our program for 1986. We added three additional projects during the year. Of the 17 total projects, we completed 8, and 5 can be categorized as continuing projects (WSMIS support, CLOUT development, support to LOC capability assessments, distribution, and using Dyna-METRIC to accomplish weapon system analyses). Of the

4 projects that were not completed, we actively worked two and deferred work on the other two because of higher priorities. Specifics on each project follow.

B.1.   TITLE: Support To Development And Implementation Of WSMIS

CUSTOMER: LMSC/SMW and LOC/XO

OBJECTIVE: Provide technical direction on WSMIS development and implementation issues.

RESULTS: We evaluated the WSMIS system (both the conceptual framework and many of the finer details) by reviewing input data, system processing, and output reports, and suggested numerous improvements in each of these areas.   The recommendations we provided were implemented and improved the understanding of the system, as well as the credibility of the products.   Without our support, WSMIS would not have developed to the level necessary to provide credible assessments of weapon system capability.

ANALYSTS: Ms Virginia Williamson,
Mr Michael Niklas; (513) 257-6920; AV 787-6920

B.2. TITLE: Uncertainty Project (renamed Coupling Logistics To Operations To Meet Uncertainties And The Threat - CLOUT)

CUSTOMER: AFLC/XR and HQ USAF/LE

OBJECTIVE: Develop an operating concept that ties Air Force logistics support at all echelons directly to operational requirements; demonstrate the concept; develop models and decision tools; coordinate development activities in AFLC and MAJCOMs needed to prove and market the concept.

RESULTS: We made substantial progress on this project in the past year.   A general officer steering group was formed to act on AFLC policy issues to achieve more responsive wholesale logistics support for operational needs.   We briefed personnel from the Air Staff (HQ USAF/LE) on the concept, obtained their approval, and proposed an organizational structure composed of an Air Staff steering group and theater group to incorporate theater operating concepts. We chaired an AFLC working group with representatives from the functional logistics areas and produced a Master Plan that identified the major issues and required actions for institutionalizing CLOUT in AFLC.   Based on our recommendation, a Program Office was established in XR to manage the execution of the Master Plan and free us to work on the technical/analytic issues.   A service test demonstration of the DRIVE   (Dynamic Repair Induction in a Variable Environment)

algorithm was started in three avionics repair shops at Ogden ALC. This algorithm keys repair prioritization to operationa'. needs based on current asset status at individual units, projected near-term flying programs, and aircraft availability goals. CLOUT is an overarching logistics operating concept that provides the rationale for future logistics management system design and resourcing decisions because it relates logistics operations directly to operational needs. The concept is beginning to be embraced by logistics support activities throughout the Air Force.

ANALYST: Mr Curtis Neumann; (513) 257-6920; AV 787-6920

B.3. TITLE: Lateral Resupply Modeling For Strategic Airlift Assessments

CUSTOMER: LMSC/SMW, LOC/AT, HQ MAC

OBJECTIVE: Develop a method for determining the impact of a lateral resupply policy upon aircraft availability. Solve problems associated with implementing strategic airlift modeling into WSMIS.

RESULTS: We analyzed a proposed concept developed by the WSMIS contractor and identified serious problems associated with its implementation into WSMIS. Additionally, we developed our own concept and are now in the process of evaluating its effectiveness. Work will continue in 1987.

ANALYSTS: Mr Michael Niklas,
Mr Richard Moore; (513) 257-6920; AV 787-6920

B.4. TITLE: Dyna-METRIC 4

CUSTOMER: LMSC/SMW, LOC

OBJECTIVE: Continue with validation of Dyna-METRIC 4. Ensure this version of the model is ready for incorporation into WSMIS by the end of 1986.

RESULTS: We completed validation of the capability assessment feature of Dyna-METRIC 4 so that it may now be used in WSMIS. During this validation process, we discovered and corrected several software errors. We also enhanced both the problem parts report and the performance report to have them highlight and summarize the information of greatest interest to managers and analysts. Dyna-METRIC 4 is presently being used to generate WSMIS strategic airlift assessments. It is scheduled to totally replace Dyna-METRIC 3 in WSMIS/SAM in July 1987.

ANALYSTS: Mr Michael Niklas,
            Mr Richard Moore; (513) 257-6920; AV 787-6920

B.5.   TITLE: Inclusion Of Test/Support Equipment In WSMIS/SAM

CUSTOMER: LMSC/SMW, LOC/CF

OBJECTIVE: The objective of this project is to develop within WSMIS/SAM the capability for assessing the impact of test/support equipment on operational capability.

RESULTS: We have continued experimenting with and debugging the test equipment feature in Dyna-METRIC. We have also continued our search for test equipment data across all weapon systems.   However, we did not devote as much time to this project as we anticipated because of higher priority work and the fact that the WSMIS program office, LMSC/SMW, slipped the schedule until 1987 for even a feasibility study for including test equipment in WSMIS/SAM.   See our program for 1987 for the future of this project.

ANALYSTS: Ms Barbara Wieland,
            Capt Douglas Stemp; (513) 257-6920; AV 787-6920

B.6.   TITLE: Distribution

CUSTOMER: AFLC/DS

OBJECTIVE: The initial objective of this continuing project is to gain an understanding of the distribution process in order to determine the factors that affect order and ship times and what actions can be taken that affect the movement of parts.   We have acted as analysis consultants to the DS CONUS Cargo Movement Requirements Study in support of this objective.

RESULTS: The second part of the DS CONUS Cargo Movement Requirements Study, which entails further analysis of the collected Air Force shipment data, formulation of alternative LOGAIR routings, and application of cost analysis and modeling techniques to test these alternatives against the current system, began this year. We became familiar with several models that could have value in evaluating alternative LOGAIR routes.   They are Dr Nygard's ALLOCATE model, the Leaseway Corporation's ROUTEASSIST model, the Logistics Composite Model (LCOM), and the DØ65 model DS already uses for a related purpose.   DS used DØ65 extensively this year to evaluate alternative LOGAIR routings. On our recommendation, Dr Nygard has been working on an extension to his ALLOCATE model which will make it useful for this same purpose. We also began developing a model of a possible "single hub-spoke" LOGAIR route structure using LCOM so that DS could

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experiment with tentative cargo loading and aircraft schedules. Both the LCOM and ALLOCATE models have the capability to give more detailed information than the D065 model. See the program for 1987 for the future of this project.

ANALYST: Ms Barbara Wieland; (513) 257-6920; AV 787-6920

B.7. TITLE: Maintenance

CUSTOMER: Internal Study

OBJECTIVE: To gain a better understanding of the maintenance process in order to determine the major factors that affect throughput time and what actions could reasonably be taken to reduce this time.

RESULTS: No formal work was accomplished on this project this year. We had anticipated obtaining the Dyna-SCORE model from Rand to begin judging its usefulness for understanding how factors such as resource availability and priority scheduling of individual repair actions impact throughput time. We have, however, increased our knowledge of maintenance processes with our CLOUT project and the testing of the DRIVE model in three avionics shops at Ogden ALC.

ANALYST: Mr Curtis Neumann; (513) 257-6920; AV 787-6920

B.8. TITLE: Support To LOC Capability Assessment Modeling

CUSTOMER: LOC

OBJECTIVE: This is an umbrella project that covers overall capability assessment modeling support to the Logistics Operations Center (LOC). Major assessment issues are covered by other projects.

RESULTS: We worked closely with the LOC to find and resolve several problems with current assessment methodology and techniques. We helped LOC personnel develop new rationale and support software for broadening their assessment capabilities. We also helped increase the knowledge and capabilities of LOC analysts in understanding the importance of input data relationships to Dyna-METRIC model assumptions and logic. Some specific accomplishments were: (1) we helped LOC/AT obtain MAC-peculiar performance measures (maximum achievable utilization rate) for WSMIS C-130 products; (2) we identified an error in the WSMIS contractor's software which had been causing WSMIS assessments to use erroneous base repair time data; and (3) we worked extensively with HQ PACAF to resolve PLSC modeling issues.

ANALYSTS: Mr Michael Niklas,
            Ms Virginia Williamson; (513) 257-6920; AV 787-6920

B.9. TITLE: Air Defense (AD) Aircraft Competition Logistics Cost Panel Support

CUSTOMER: AFALC/OAT

OBJECTIVE: Provide Dyna-METRIC modeling support for the AD competition in the War Readiness Spares Kit (WRSK) area.

RESULTS: This was the first time WRSK costs had been included in a source selection process, so considerable effort was spent ensuring that the current AFLC WRSK procedures were followed as much as possible so that the costs would be realistic. We worked closely with the other logistics model analysts and the using commands to ensure scenarios were correctly developed and wrote specifications for information bidding contractors were to supply. We reviewed the contractors' proposals in the WRSK area for completeness and accuracy and requested additional information or resubmissions where needed. We used Dyna-METRIC in the assessment mode to see if the WRSK scenario could be adequately supported by the contractor-supplied WRSK parts lists and stock levels. We also used it in the requirements mode to recompute adequate stock levels where necessary. The cost of the stock needed for all AD squadrons' authorized WRSK was submitted as the government's most probable cost. Lessons learned from this use of Dyna-METRIC to assess and compute WRSK in the source selection process were documented to ease future efforts.

ANALYST: Ms Barbara Wieland; (513) 257-6920; AV 787-6920

B.10. TITLE: WSMIS Quality Control System

CUSTOMER: LMSC/SMW, LOC

OBJECTIVE: Continue our efforts to establish a formal WSMIS quality control system which includes guidelines and procedures to review WSMIS products to ensure high quality.

RESULTS: With the help of the LOC and the Program Office, we established a formal WSMIS quality control system. It includes weekly meetings to evaluate products and improve WSMIS. Also, the guidance we provided as a member of this group improved error detection, shortened the error resolution time, and ultimately provided better capability assessment products.

ANALYSTS: Ms Virginia Williamson,
            Mr Michael Niklas; (513) 257-6920; AV 787-6920

B.11. TITLE: Munitions Assessment Modeling

CUSTOMER: LMSC/SMW, LOC/CF

OBJECTIVE: Investigate methods of integrating munitions assessment products with WSMIS/SAM capability assessments of aircraft spares and engines.

RESULTS: We recommended an integration technique that gave visibility to theater assets so shortfalls in munitions could be detected even when a unit's assets were not stored at that unit's location. This made the integrated assessments useful to LOC/CF and showed the relative importance of munitions versus aircraft spares.

ANALYSTS: Ms Virginia Williamson,
Mr Michael Niklas; (513) 257-6920; AV 787-6920

B.12. TITLE: Dyna-METRIC Users Group

CUSTOMER: HQ USAF/LEY

OBJECTIVE: Establish a Dyna-METRIC Users Group to provide a continuing forum for users to share or exchange information concerning analyses, findings, and problems related to the Dyna-METRIC model and its applications.

RESULTS: The Group has been established. XRSA personnel helped develop the Dyna-METRIC Users Group charter. In addition, we maintained versions 3.04 and 4.4 of Dyna-METRIC, and implemented software corrections and enhancements as they became available. We also distributed copies of the models on magnetic tapes and made ourselves available as technical consultants for issues dealing with the models and their applications.

ANALYSTS: XRSA Staff; (513) 257-6920; AV 787-6920

B.13. TITLE: Verification Of The Mini-Dyna-METRIC Model For Use On The Z-100

CUSTOMER: HQ USAF/LEY

OBJECTIVE: Verify that output from the AFLMC Z-100 Mini-Dyna-METRIC computer program is compatible with the Honeywell mainframe Dyna-METRIC 3.04 when common scenarios are used.

RESULTS: When smaller input files are used, i.e., five LRUs and three SRUs, the model gave results very close to those of Dyna-METRIC 3.04. However, when a larger input file was used,

i.e., 30 LRUs and 36 SRUs, the model would not produce a capability assessment. This problem has been referred to AFLMC/LGY, since our efforts to isolate and rectify the problem without a copy of the source code were fruitless. We are also requesting a copy of the source code for our future reference. See the program for 1987 for the future of this project.

ANALYST: Capt Douglas Stemp; (513) 257-6920; AV 787-6920

B.14. TITLE: TEAM SPIRIT Analysis

CUSTOMER: LOC/CC, LOC/XO

OBJECTIVE: Analyze the variance-to-mean ratio (VTMR) calculated from the TEAM SPIRIT exercise and compare it with the default VTMR used in WSMIS/SAM. Compare actual flying program and results to WSMIS/SAM results to gain an understanding of differences between a WSMIS/SAM forecast and an actual outcome.

RESULTS: We could not conclude that significant differences existed between default VTMRs and actuals from TEAM SPIRIT. We did gain additional understanding of WSMIS/SAM forecasts when comparing these forecasts to actual outcomes from the TEAM SPIRIT exercise. We designed forms that were used in this exercise to collect all the right data to perform analyses. These forms were tested with TEAM SPIRIT, proved successful, and will be used in future exercises.

ANALYSTS: Ms Virginia Williamson,
Ms Tamara Evans; (513) 257-6920; AV 787-6920

B.15. TITLE: Dyna-METRIC CREATE Preprocessor

CUSTOMER: All CREATE Dyna-METRIC Users

OBJECTIVE: Maintain the Dyna-METRIC 3.04 D029 preprocessor on CREATE. Also, maintain copies of the D029 WRSK/BLSS data files to facilitate unclassified WRSK/BLSS sensitivity analyses. This is essential for continuing effectiveness in our support to WSMIS implementation (this preprocessor can also produce input for Dyna-METRIC 4.4) and for accomplishing weapon system analyses using Dyna-METRIC.

RESULTS: The CREATE Dyna-METRIC preprocessor reconfigures D029 data into the proper format for input to the model. D029 is the AFLC data system used to compute War Readiness Spares Kits (WRSK) and Base Level Self-Sufficiency Spares (BLSS) for 30 day logistics support for deployed and in-place units, respectively. We modified the preprocessor to allow optional inclusion of parts previously automatically dropped and to compute demand rates for

the non-optimized parts. We also replaced our copies of each weapon system's WRSK/BLSS files as the annual update files were made available to us.

ANALYST: Ms Barbara Wieland; (513) 257-6920; AV 787-6920

B.16. TITLE: **Weapon System Analysis Using Dyna-METRIC**

CUSTOMER: AFIT/LS, ASD/C-17L, HQ USAF/SAGP, LOC/XO

OBJECTIVE: Provide Dyna-METRIC modeling expertise and/or consultation support to others in the Air Force using the Dyna-METRIC model to perform special weapon system analyses.

RESULTS: As usual, many groups in the Air Force desired to use Dyna-METRIC to perform various weapon system analyses and required our help to some degree. Two AFIT students performed studies for their masters theses with our help; one study concerned Special Forces' weapon system status and the other concerned using Dyna-METRIC for initial provisioning.   We provided extensive support to personnel from the C-17 DPML office when they applied Dyna-METRIC both to engine parts and to parts that require automatic test equipment to be repaired in order to determine the differences in recoverable spares pipeline costs as the support scenario was varied. We helped HQ USAF/SAGP use the model to quantify the effects of increased aircraft attrition which results from inadequate support of Electronic Counter Measures (ECM) equipment. For the LOC's benefit, as well as our own, we used Dyna-METRIC to examine the impact of War Reserve Material (WRM) funding changes.

ANALYSTS: XRSA Staff; (513) 257-6920; AV 787-6920

B.17. TITLE: **Dyna-METRIC Research Model**

CUSTOMER: Internal Study

OBJECTIVE: Develop a stripped-down research version of Dyna-METRIC 4.4 to be used for validation and testing of several planned enhancements.

RESULTS: Using only the mathematical descriptions of Dyna-METRIC logic, we developed a structured computer program which emulates the capability assessment feature of Dyna-METRIC 4.4 for the single base, single depot case. An explicit step-by-step design permitted us to model certain real-world logistics/operational processes which Dyna-METRIC does not presently address. This software was also of significant value in the validation of Dyna-METRIC 4.4.

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ANALYSTS: Mr Michael Niklas,
            Mr Richard Moore,
            Mr David Forshaw; (513) 257-6920; AV 787-6920

C. OTHER DIVISION ACTIVITIES

We serve as technical consultants to all AFLC personnel
attempting to use the Logistics Composite Model (LCOM). LCOM is
a large computer model widely used to simulate the Air Force base
level functions of operations, maintenance, and supply. We also
represented AFLC interests at the 1986 LCOM Tiger Team meeting
where logistics requirements were determined for a future model
and a policy for logistics analysis was drafted (a policy with
which we have serious problems).

We represented AFLC at the first Worldwide Wargaming Conference
hosted by HQ USAF/XOOO. This meeting fostered crosstalk among
war- gamers.   Even though AFLC has no wargamers, our
participation was quite useful since there is a critical need for
better representation of logistics in the games that people play.

We are the primary representatives for XRS in matters dealing
with our use of mainframe computers. We provide a great deal of
software expertise to other divisions in XRS, other XR
directorates, AFIT students, and others.

We are the Air Force experts on Dyna-METRIC (a Rand developed
model that predicts wartime weapon system capability as a
function of recoverable spare parts). We gave many briefings on
this model to interested parties, including AFIT classes and
representatives of the British Royal Air Force.

D. THE PROGRAM FOR 1987

As noted earlier in this report, we intend to shift our emphasis
somewhat this year and concentrate on our two priority super
projects: CLOUT and some priority WSMIS development and
implementation issues. Although we are including other projects
in the plan for 1987, we intend to measure our success primarily
by evaluating our performance in the two priority areas. Under
the CLOUT umbrella there are three sub-projects; under the
priority WSMIS umbrella there are five sub-projects.   The
secondary projects (projects 3 through 7) are listed afterwards
in priority order.

Our approach this year will be to emphasize the implementation
issues in both CLOUT and WSMIS projects. While we have
conceptually defined many CLOUT issues, there are still several
far-reaching policy and procedural issues that we have not yet
completely developed. However, we believe that demonstration of

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the connection between increased aircraft availability and DRIVE's new repair and distribution prioritization methodology is imperative. Accordingly, we will be working to quantify that relationship. Within the WSMIS program, we intend to implement an effective technique for modeling lateral resupply in strategic airlift assessments.

D.1. TITLE: Coupling Logistics To Operations To Meet Uncertainties And The Threat (CLOUT)

D.1.a. Implementation Of DRIVE

CUSTOMER: OO-ALC/MM/MA, AFLC/MM/MA/XR, USAF/LE

OBJECTIVE: Provide technical support for implementation of DRIVE into three avionics repair shops at Ogden ALC in order to demonstrate the connection between this maintenance and distribution scheduling algorithm and increased operational effectiveness.

ANTICIPATED BENEFITS: DRIVE is a RAND-developed model that prioritizes repair requirements and distribution decisions about where an item should be shipped to gain the greatest improvement in aircraft availability. Incorporating this model within AFLC will result in significant improvements in depot responsiveness to operational needs. We also plan to tailor the model for theater repair applications, with a first test projected for the Pacific Logistics Support Center in PACAF.

ESTIMATED COMPLETION DATE: December 87

ANALYSTS: Mr Richard Moore,
Mr Curtis Neumann,
Mr Michael Niklas; (513) 257-6920; AV 787-6920

D.1.b. Concept Development Support For CLOUT

CUSTOMER: AFLC/XRC, USAF/LE

OBJECTIVE: Provide technical direction and detailed modeling support to the AFLC CLOUT Program Office (XRC), various AFLC organizations, MAJCOMs, and the Air Staff for developing, testing, and implementing a logistics concept and supporting management processes that tie the responsiveness of logistics activities at all echelons to operational needs.

ANTICIPATED BENEFITS: CLOUT is an overarching logistics operating concept that provides the rationale for future logistics management system design and resourcing decisions because it relates logistics operations directly to operational

needs. Implementation of CLOUT concepts will enable theater commanders to benefit from the significant logistics support advantages available through responsive depot repair and distribution actions.

ESTIMATED COMPLETION DATE: A range of policy issues needing revision to fully incorporate CLOUT will be identified by Dec 87. The remainder of this project will extend into 1988 and beyond.

ANALYST: Mr Curtis Neumann; (513) 257-6920; AV 787-6920

D.1.c. Combat Support Command, Control, And Communications (C3)

CUSTOMER: AFLC/XR, LOC/XO

OBJECTIVE: Define the essential ingredients of a combat support (logistics) C3 system that provides theater information to the depot so appropriate support action can be taken, and provides supportability estimates back to the theater so operational planning can be adjusted to be consistent with expected logistical support.

ANTICIPATED BENEFITS: This project will enable a workable C3 system to be developed that supports the close coupling of depot and theater logistics support to combat operations. It will define consistent, achievable development objectives and operating guidelines necessary to support a responsive system as defined by the CLOUT operating concept.

ESTIMATED COMPLETION DATE: June 1987

ANALYSTS: Mr Curtis Neumann,
Capt Melinda Grant,
Capt Lee Lehmkuhl; (513) 257-6920; AV 787-6920

D.2. TITLE: Support For The Development And Implementation Of The Weapon System Management Information System (WSMIS)

D.2.a. WSMIS Enhancements

CUSTOMER: LMSC/SMW, LOC, HQ MAC, AFLC/MMM, AFIT/LS

OBJECTIVE: Take an active role in providing direction to the WSMIS Program Office, the development contractors, and users for various technical issues, such as the inclusion of test/support equipment and the development of strategic airlift modeling.

ANTICIPATED BENEFITS: The inclusion of test/support

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equipment in WSMIS/SAM will allow LOC/CF and the appropriate item managers to better manage test/support equipment by relating those resources to weapon system combat capability. Also, our review of the technical accuracy of weapon system representations (such as strategic airlift) in WSMIS and the WSMIS operating procedures will provide a more useful and accurate system.

ESTIMATED COMPLETION DATE: This program will continue into 1988.

ANALYSTS: Mr Michael Niklas,
Ms Barbara Wieland,
Mr Richard Moore; (513) 257-6920; AV 787-6920

D.2.b. WRSK/BLSS Computation Using Dyna-METRIC In WSMIS

CUSTOMER: LMSC/SMW, AFLC/MMM

OBJECTIVE: The objective of this project is to develop a prototype WRSK/BLSS requirements computation using the Dyna-METRIC model embedded in WSMIS/SAM. We will act as technical consultants to ensure accuracy in the use of the model and completeness in the options provided to vary computational goals.

ANTICIPATED BENEFITS: Dyna-METRIC considers the indenture relationship between LRUs and SRUs, whereas D029 does not. As a result, for a specified aircraft availability, Dyna-METRIC should buy more economically. In addition, Dyna-METRIC offers much more flexibility in defining operational scenarios and repair and support processes.

ESTIMATED COMPLETION DATE: October 1987

ANALYSTS: Ms Barbara Wieland,
Mr Michael Niklas; (513) 257-6920; AV 787-6920

D.2.c. TAC 30 Day WRSK Evaluation

CUSTOMER: AFLC/MM/XR, LOC, HQ TAC/LG

OBJECTIVE: Determine the impact on operational capability of flying a 30 day wartime program using only on-hand WRSK and associated maintenance resources programmed for wartime surge support. Compare results to those forecasted by WSMIS/SAM and examine differences observed in data factors and results obtained from the Dyna-METRIC capability assessment model.

ANTICIPATED BENEFITS: This exercise will provide insight into the appropriateness of the WRSK computation procedures, factors, and assumptions used in the computation. It will also

provide insight into the demand process and how the WSMIS/SAM data base and products might be refined.

ESTIMATED COMPLETION DATE: November 1987

ANALYSTS: Mr Curtis Neumann,
            Ms Barbara Wieland; (513) 257-6920; AV 787-6920

D.2.d.   Computation Of Engine Requirements Using Dyna-METRIC

CUSTOMER: AFLC/MMMRR

OBJECTIVE: Determine the best way to use Dyna-METRIC for computing engine and module spares requirements. Recommend to MMMRR whether the current computational method, the Alternate Engine Policy, should be replaced by Dyna-METRIC.

ANTICIPATED BENEFITS: The Alternate Engine Policy has several limitations. It cannot consider the daily changes in a wartime flying program, the maintenance capability of each base, depot support cut-offs, nor flightline maintenance. Dyna-METRIC 4.4, when properly applied, will be able to explicitly address these factors. We anticipate that Dyna-METRIC will consistently compute a better and lower cost spares requirement than the Alternate Engine Policy.

ESTIMATED COMPLETION DATE: October 1987

ANALYST: Mr Michael Niklas; (513) 257-6920; AV 787-6920

D.2.e.   Dyna-METRIC And Support Software

CUSTOMER: LMSC/SMW, AFIT/LS, Air Force Users

OBJECTIVE: Maintain the Dyna-METRIC model, develop support software, and provide a consultation service for Air Force users. Enhance Dyna-METRIC when necessary to enable it to model particular real-world situations. Advise the Dyna-METRIC User Group on technical issues. Teach Dyna-METRIC logic at AFIT Course LOG 290.

ANTICIPATED BENEFITS: Dyna-METRIC, the heart of WSMIS/SAM, is a state-of-the-art logistics support model which has been used in many diverse applications, such as estimating the impact of WRM budget changes on wartime aircraft availability and developing unit level C-ratings. Maintaining the currency of the model, simplifying its use, and informing users of its capabilities and limitations helps ensure that the model will be applied correctly. This is extremely important since many high level decisions and budget allocations are influenced by output

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from Dyna-METRIC.

ESTIMATED COMPLETION DATE: Continuing

ANALYSTS: Mr Michael Niklas,
           Mr Richard Moore,
           Ms Barbara Wieland; (513) 257-6920; AV 787-6920

D.3. TITLE: WRSK Requirements And Content

CUSTOMER: AFLC/MMMA

OBJECTIVE: Be a working member of the team headed by MMMA which is to determine if existing procedures and policies adequately consider the future impact of improved item reliabilities and potential combat damage on WRSK/BLSS content.

ANTICIPATED BENEFITS: AFLC, in conjunction with AFSC, has been tasked by HQ USAF/LE to prepare an informative briefing that addresses the existing WRSK/BLSS procedures. We are confident at the outset of this project that there is considerable room for improvement, especially in the area of combat damage. If we can suggest ways that the current procedures can be changed so that WRSK/BLSS kits contain a "smarter" mix of parts and our suggestions are adopted, we will have improved the Air Force's warfighting capability.

ESTIMATED COMPLETION DATE: September 1987

ANALYST: Ms Barbara Wieland; (513) 257-6920; AV 787-6920

D.4. TITLE: Distribution

CUSTOMER: AFLC/DST

OBJECTIVE: The initial objective of this continuing project is to gain an understanding of the distribution process in order to determine the factors that affect order and ship times and what actions can be taken that affect the movement of parts. We will continue as analysis consultants on the DS CONUS Cargo Movement Requirements study in support of this objective.

ANTICIPATED BENEFITS: The part of the DS study that entails the formulation and evaluation of alternative LOGAIR routings is continuing into 1987. Even though DS arrived at a new LOGAIR route structure that will probably replace the current structure, they need tools that not only evaluate proposed route structures but also determine optimal route structures based on changing conditions. We will continue with our development of LOGAIR networks and scenarios for the Logistics Composite Model

(LCOM) that will be useful in evaluating proposed route structures and in experimenting with tentative cargo loading and aircraft schedules. We will also continue the search for optimization tools to satisfy the need for a better way to arrive at optimal routes.

ESTIMATED COMPLETION DATE: This work will continue into 1988.

ANALYST: Ms Barbara Wieland; (513) 257-6920; AV 787-6920

D.5. TITLE: Modeling Maintenance Processes

CUSTOMER: AFLC/XR/MA

OBJECTIVE: Develop an understanding of the maintenance process to determine the major factors that affect maintenance throughput time and what actions could be taken to reduce this time.

ANTICIPATED BENEFITS: This project will assist us in determining the best use of maintenance resources for providing maximum logistics support to combat capability as defined under the CLOUT operating concept. Examination of the Rand-developed Dynamic Simulation of Constrained Repair (Dyna-SCORE) and Dyna-METRIC 5 models will enable us to judge their effectiveness in evaluating the impact of alternative maintenance management procedures on improving support to operational capability.

ESTIMATED COMPLETION DATE: December 1987

ANALYSTS: Mr Curtis Neumann,
Ms Barbara Wieland,
Mr Michael Niklas; (513) 257-6920; AV 787-6920

D.6. TITLE: Comparison Of Dyna-METRIC 4.4 And Jet Engine Management Simulator

CUSTOMER: Internal Study

OBJECTIVE: Evaluate the results from Dyna-METRIC 4.4 and the Jet Engine Management Simulator (JEMS) when common input scenarios are used and determine the reasons for any differences.

ANTICIPATED BENEFITS: Both of these models are widely used for several unique and some similar applications. Verification that these models give compatible results will reaffirm user confidence in model output.

ESTIMATED COMPLETION DATE: December 1987

ANALYST: Capt Douglas Stemp; (513) 257-6920; AV 787-6920

D.7. TITLE: Verification Of The Mini-Dyna-METRIC Model For Micro Computers

CUSTOMER: HQ USAF/LEY

OBJECTIVE: Verify that output from the AFLMC-developed Mini-Dyna-METRIC program for micro computers is compatible with the Honeywell mainframe Dyna-METRIC 3.04 version when common scenarios are used.

ANTICIPATED BENEFITS: The Mini-Dyna-METRIC model will allow base and MAJCOM weapon system managers to conduct timely "what if" analyses and specialized assessments. This verification process will provide the assurance that the model is computationally correct and point out areas where problems may arise (if any are found). It will also free valuable mainframe computer time that is currently needed to run the Dyna-METRIC model for bases and MAJCOMs.

ESTIMATED COMPLETION DATE: December 1987

ANALYST: Capt Douglas Stemp; (513) 257-6920; AV 787-6920

CURTIS E. NEUMANN
Chief, Assessment Application Division
DCS/Plans and Programs

IV.   THE CONCEPT DEVELOPMENT DIVISION

A. INTRODUCTION

The Concept Development Division provides a source of expertise within the Headquarters for several computer models/systems used by AFLC. Our focus has been on the recoverable item requirements process and the allocation of those requirements between the wholesale and retail levels. We have been primarily concerned with determining end item readiness (aircraft availability) as a function of spares dollars (BP1500 expenditures). In fact, we are the AFLC OPR for the Aircraft Availability Procurement Model (AAPM), the model being used to incorporate aircraft availability objectives into the Recoverable Item Requirements System (D041). Our staff consists of eight operations research analysts and one computer assistant. All of our analysts are focusing their efforts on improving the AFLC requirements processes. Until recently, two of our analysts were "on loan" to AFLC/MM, where they were working full time in support of the Requirements Data Bank (RDB), a large scale effort to improve, modernize, and integrate the AFLC logistics requirements management systems. In addition, several other Division personnel have served as technical consultants to the RDB in matters related to computational objectives and techniques. Other analysts have directed their activities toward improving the current D041, D062, and D028 systems.

B. ACCOMPLISHMENTS IN 1986

Our 1986 plan consisted of eleven prioritized projects. We picked up two additional projects during the year: the Aircraft Availability Level of Indenture Study, and the D062 Leadtime Variability Study. We completed one of our projects (some of the projects are multi-year efforts); we made good progress on six others; we had minimal progress on three; and three projects did not get worked at all.

B.1.   TITLE: Direct Support To The Requirements Data Bank (RDB)

CUSTOMER: AFLC/MMM

OBJECTIVE: The RDB objectives are to improve and modernize the AFLC logistics requirements management systems. In support of this effort, XRSC provided technical direction and guidance in the design and development of the computational techniques to be utilized by the RDB.

RESULTS: In conjunction with AFLC/MMM personnel, we developed an approach for considering aircraft availability based requirement techniques in the Other War Reserve Material (OWRM)

computation under both full and limited funding environments. Information was provided to the RDB contractor for guidance.

We developed and documented several alternative approaches for improving the aircraft availability requirements algorithms. The new approaches consider repair costs in addition to procurement costs, depot awaiting parts (AWP) times in addition to base AWP times, and a procedure for handling Depot Level Maintenance (DLM) delay. Approaches are being programmed, tested, and evaluated by the RDB independent verification and validation (IV&V) contractor.

We reviewed and corrected Variable Safety Level (VSL) documentation contained in Chapter 30, AFLCR 57-4. Corrected documentation was provided to the RDB contractor.

We conducted technical reviews of the RDB's contractor-proposed specifications for incorporating aircraft availability requirement techniques in the RDB Peacetime Operating Stocks (POS) computation for aircraft recoverable spares.

We served as technical consultants in matters relating to the RDB computational objectives and techniques.

We led efforts to establish functional descriptions for the RDB consumable item requirements computation and the engine overhaul process.

        ANALYSTS: Ms Priscilla Chadwick,
                    Capt Linda Pangborn; (513) 259-4895
                    Maj Ronald Stokes,
                    Mr John Hill; (513) 257-6920; AV 787-6920

B.2. TITLE: Incorporate Aircraft Availability Into D041

        CUSTOMER: AFLC/MMM

        OBJECTIVE: Provide the technical support necessary to get aircraft availability requirement techniques implemented in D041.

        RESULTS: We developed, programmed, and tested a procedure which eliminated most of a projected $1.7 billion increase in WRM procurements which would occur if we were to use the original version of the Aircraft Availability Model (AAM) in D041. The procedure will be implemented by AFLC/MMM.

We completed a study on the use of base and depot stock level floors in the aircraft availability algorithm. The floors are used to assure that the stock levels produced by the algorithm are at least equal to the expected number of assets in resupply.

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The use of floors increases the cost to achieve weapon system availability goals because it constrains the algorithm's search for the least cost solution. Material Management personnel concluded that the study showed the use of floors did not result in a large enough increase in the peacetime procurement to justify elimination of floors.

We completed detailed comparisons of the expected differences in safety levels, and the reasons for the differences, using the new aircraft availability algorithm as opposed to the current VSL algorithm. Results were briefed to Material Management personnel to let them know what to expect when we begin using aircraft availability in D041.

We wrote several technical documents to further expand AFLC's knowledge of the AAM and to facilitate its use.

We significantly enhanced the computer efficiency and flexibility of the CREATE AAM, the model used to complete the studies discussed above.

ANALYSTS: Maj Ronald Stokes,
Capt Melinda Grant,
Mr Fred Rexroad; (513) 257-6920; AV 787-6920

B.3. TITLE: Weapon System Phase In/Out And The Aircraft Availability Procurement Model (AAPM)

CUSTOMER: AFLC/MMM

OBJECTIVE: Develop a technique for handling weapon systems being phased in/out of the inventory or experiencing unusual variations in the flying hour program.

RESULTS: A technique was developed for computing requirements for level one items (LRUs) in situations where their related weapon system is being phased in or out. The technique is being tested and initial results look good. Next, it will be necessary to identify and evaluate techniques for level two through five items (SRUs). Work on this project will continue into 1987.

ANALYSTS: Maj Ronald Stokes,
Capt Melinda Grant; (513) 257-6920; AV 787-6920

B.4. TITLE: The Aircraft Availability Maintenance Model (AAMM)

CUSTOMER: AFLC/MMM

OBJECTIVE: Develop a model to estimate the impact of

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changes in the repair budget on aircraft availability.

RESULTS: An approach has been developed. The AAPM is currently being revised to accommodate this approach. A sample data base has been developed for testing this concept. Work on this project will continue into 1987.

ANALYSTS: Mr Freddie Riggins,
Mr Mark Fryman (matrixed from MMMAA for 1986 only),
Maj Ronald Stokes; (513) 257-6920; AV 787-6920

B.5. TITLE: OWRM Recoverable Item Requirements Computation Using Aircraft Availability Techniques

CUSTOMER: AFLC/MMM

OBJECTIVE: Develop and prototype the capability to compute OWRM recoverable item requirements with aircraft availability techniques.

RESULTS: An approach was developed for considering aircraft availability requirement techniques in the OWRM requirements computation for recoverable items as part of our project supporting the RDB. In 1987 we will continue our efforts on this project.

ANALYST: Mr Fred Rexroad; (513) 257-6920; AV 787-6920

B.6. TITLE: Evaluate Alternative Forecasting Procedures

CUSTOMER: Internal Study

OBJECTIVE: Develop a data base and computer programs for evaluating alternative spare parts requirement forecasting procedures. We would like to compare the impact on weapon systems availability of stock levels based on different estimates of mean demands and variance-to-mean ratios using historical data.

RESULTS: Previous work on forecasting mean demand levels and variance-to-mean ratios was reviewed. The latest advances in multi-indenture, multi-echelon inventory theory were also reviewed. Progress has been very slow due to assignment of resources to higher priority projects.

ANALYST: Maj Ronald Stokes; (513) 257-6920; AV 787-6920

B.7. TITLE: Analysis Of Problem Part Management

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CUSTOMER: AFLC/XR

OBJECTIVE: Determine if there is a relatively unchanging list of "problem parts" which bases cannot requisition under a MICAP status because "sufficient" quantities exist in base repair, but which are in fact continually grounding aircraft due to a lack of serviceables. If such parts exist, recommend management actions to solve this problem.

RESULTS: Examination of mission capable rates for supply and maintenance for the 48th TFW and comparison of D028 and SBSS stock levels at the same location have indicated that problem parts may exist. However, further investigation is required. Little progress was made on this project due to higher priorities.

ANALYSTS: LTC Mike Lacey; (513) 257-3201; AV 787-3201
Capt Melinda Grant: (513) 257-6920; AV 787-6920

B.8. TITLE: D028 Central Leveling System

CUSTOMER: USAF/LEY

OBJECTIVE: Investigate some aspects of the D028 Central Leveling System (D028 allocates stock levels to the depots and bases based on D041 computed requirements) which are possible problems: (1) the D028 requirement that each user receive a minimum of one unit of stock; (2) D028 items not keeping, as a minimum, the depot repair cycle quantity of stock at the depot; and (3) the volatility of the D028 stock levels.

RESULTS: About 13 percent of the time, the D028-computed stock levels are higher than the D041-computed worldwide requirement. About half of this is caused by the one-per-user rule. Two alternatives to resolve this difference are: fund the one-per-user requirement in D041, or eliminate it from D028. Study showed that funding the one- per-user rule would cost approximately $50 million, with no increase in overall system support. Conversely, study showed that eliminating the one-per-user rule would increase worldwide support through a better allocation of the D041 worldwide requirement. We recommended to the Air Force Stockage Advisory Board that the one-per-user rule not be used in D028 if doing so would result in a D028 worldwide requirement higher than that computed by D041. Decision is pending.

About 17 percent of the D028 items do not retain the depot repair cycle quantity of stock at the depot. Seven percent are explained by constraints forced on D028; another 5 percent differ by only one unit of stock. The remaining 5 percent of the items

could be problems because of data discrepancies between the D028 and D041 systems. We recommended that these items be flagged for item manager review and action if appropriate. The recommendation was partially accepted. Items will be flagged and SBSS levels used until item managers can review and take appropriate action.

Study showed that computing stock levels on the current monthly cycle results in many level changes (approximately 40 percent of the user stock levels). One of the main reasons for month-to-month level changes in D028 is the addition or deletion of users to the system. This is a reflection of many marginal users in the system with low demand rates. Our recommendation was to compute D028 levels quarterly to help stabilize the system. This recommendation was accepted for implementation.

> ANALYSTS: Capt Melinda Grant,
> Mr Fred Rexroad; (513) 257-6920; AV 787-6920

B.9. TITLE: Defining The Hierarchical Relationship Of Reparable Parts

CUSTOMER: Internal Study

OBJECTIVE: The reparable part hierarchical relationship is included in the aircraft availability algorithm being incorporated in D041. This relationship is input to the algorithm in indenture files. We have reason to believe that the indenture files currently being produced in D041 are not as accurate as they could be. The first objective of this project is to improve the accuracy of those indenture files. We also want to develop the capability to create customized indenture files to support other projects.

RESULTS: Due to assignment of resources to higher priority projects, this project was not initiated.

ANALYST: Mr Fred Rexroad; (513) 257-6920; AV 787-6920

B.10. TITLE: Develop The WARS Research Model

CUSTOMER: Internal Study

OBJECTIVE: Develop the capability within XRS to run and modify the WARS mathematical algorithms.

RESULTS: Due to assignment of resources to higher priority projects, no resources were committed to the continuation of this project.

ANALYST: Mr Fred Rexroad; (513) 257-6920; AV 787-6920

B.11. TITLE: Aircraft Availability In D028

CUSTOMER: AFLC/MMM

OBJECTIVE: Determine the feasibility/desirability of changing the basis of the D028 allocation of the D041 computed worldwide requirement from minimizing expected backorders to maximizing aircraft availability.

RESULTS: Due to assignment of resources to higher priority projects no progress was made on this project.

ANALYSTS: Capt Melinda Grant,
Mr Fred Rexroad; (513) 257-6920; AV 787-6920

B.12. TITLE: Aircraft Availability Level Of Indenture Study

CUSTOMER: Internal Study

OBJECTIVE: The current version of the AAPM considers five levels of indenture. This study looks at the difference in results when the number of indenture levels considered by the AAPM is allowed to vary.

RESULTS: Requirements computations were made using the CREATE AAPM considering 1, 2, 3, 4, and 5 indenture levels. Analysis of the results indicated a problem with the procedures developed to roll up the existing 5 indenture levels file to 4, 3, 2, and 1 levels. This project is on hold until we have the resources to develop software that generates indenture files in which the number of indenture levels can be varied.

ANALYST: Mrs Deborah Blalock; (513) 257-6920; AV 787-6920

B.13. TITLE: D062 Leadtime Variability Study

CUSTOMER: AFLC/MMM

OBJECTIVE: Determine the feasibility/desirability of using methods other than the current method (of using the last leadtime experienced) to estimate leadtimes for the Consumable Item Computation System (D062).

RESULTS: Methodology has been developed for testing alternative leadtime estimates. Data sets for some of these tests have been created and some of the alternatives have been partially tested. We are currently devising methods for

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gathering data for additional tests. Work on this project will be continued in 1987.

ANALYST: Mr Fred Rexroad; (513) 257-6920; AV 787-6920

C. OTHER DIVISION ACTIVITIES

As the Air Force technical experts on Mod-METRIC (an initial provisioning model), our services are often sought as technical advisors and consultants. For example, at their request, we provided information on Mod-METRIC to representatives of the governments of Brazil and Taiwan; worked with representatives of the Canadian government to resolve problems with their version of the model; and provided the basic Mod-METRIC mathematical equations to NASA. MAC, AFAA, and HQ AFLC/MMME sought our advice on the use of Mod-METRIC to determine required quantities of engine spares. We are in the process of doing a total rewrite of the Mod-METRIC technical pamphlet, AFLCP 57-13. The new version will be clearer and easier to use and will address questions and problem areas most commonly asked or referred to by users. We developed new "user friendly" interactive software for Mod-METRIC users, replacing the previous awkward and archaic procedures. The new software reduces, from several hours to less than one half hour, the time for users to build a data set and run the model.

We are the Air Force technical experts on the Central Leveling System (D028). We provide assistance in identifying and implementing changes to the D028 algorithm, such as in the case of using base condemnation rates in the establishment of user stock levels.

We are the primary point of contact in XRS for matters dealing with small computers. In this capacity, we implemented several changes to our existing microcomputers to increase storage capacity and reduce processing times, established software to enable faster data transfers between the microcomputers and CREATE, and developed statistical packages for use by XRS and MMM personnel. We also maintain a library of software and manuals for the microcomputers and assist XRS personnel with application development using several different types of microcomputer languages.

We do technical evaluations of contractor proposals and studies. We provide technical assistance to contractors when appropriate. We review technical documents for potential AFLC applications.

We are the Air Force technical experts on the modeling techniques utilized by the Recoverable Item Requirements System (D041). This includes both the variable safety level and aircraft availability algorithms. We maintain research versions of both algorithms on CREATE. We also assist in the maintaining and

updating of the mathematical documentation of both algorithms.

D. THE PROGRAM FOR 1987

Consistent with the Directorate's new emphasis, we have
restructured and reprioritized our goals for 1987. Our number
one priority is providing the necessary technical support to
ensure that the aircraft availability algorithm is ready for
implementation in D041 by the end of the year. This project is
consistent with two other high priority projects being worked
elsewhere within XRS: the enhancement of WSMIS and the
determination of consumable items' impact on aircraft
availability. That is, we want to be able to relate our
investment in recoverable and consumable spares to peacetime and
wartime aircraft availability. The many delays already
encountered indicate that implementing aircraft availability in
D041 will not be an easy task. However, the importance of this
project justifies an intense effort.

As for our other projects, we are consolidating some projects,
and dropping others to give us a more manageable load in 1987.
We will continue to support the RDB effort by serving as
technical consultants and, if necessary, on an individual project
basis. We will also continue to support the development of the
Aircraft Availability Maintenance Model. A new project for this
year will be to build on a Logistics Management Institute study
dealing with the incorporation of engine pipeline and stock level
data into the D041 requirements computation for recoverable
components.

Our projects are listed in priority order below.

D.1. TITLE: Incorporate Aircraft Availability Into D041

CUSTOMER: AFLC/MMM

OBJECTIVE: Get the aircraft availability algorithm ready
for implementation in D041. In order to accomplish this we will
continue to identify, test, and evaluate additional improvements
to the AAPM; continue developing a suitable technique for
handling weapon systems being phased in/out of the inventory;
assist in the implementation of the necessary modifications to
the D041 AAPM to allow the release of long supply POS assets to
satisfy WRM deficits; and investigate and resolve concerns
expressed by item managers about increased repair quantities and
costs.

ANTICIPATED BENEFITS: Resolution of these problems should
pave the way for implementation of aircraft availability and,
therefore, an improved requirements computation system.

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ESTIMATED COMPLETION DATE: December 1987

ANALYSTS: Maj Ronald Stokes,
            Mr Fred Rexroad,
            Capt Lee Lehmkuhl,
            Mr Jack Hill; (513) 257-6920; AV 787-6920

D.2.   TITLE: The Aircraft Availability Maintenance Model (AAMM)

CUSTOMER: AFLC/MMM

OBJECTIVE: Develop, program, and test the approach developed in phase one of this effort to compute the impact of changes in the repair budget on aircraft availability.

ANTICIPATED BENEFITS: Development of the proposed model will give AFLC/MMM the capability to estimate the impact of repair budget dollar constraints on aircraft availability. It will also provide a starting point for the development of additional models which can address trade-offs between maintenance capacity and recoverable item spares levels.

ESTIMATED COMPLETION DATE: September 1987

ANALYSTS: Mr Freddie Riggins,
            Maj Ronald Stokes,
            Mr Jack Hill; (513) 257-6920; AV 787-6920

D.3.   TITLE: Direct Support To The Requirements Data Bank (RDB)

CUSTOMER: AFLC/MMM

OBJECTIVE: The RDB objectives are to improve and modernize the AFLC logistics requirements management systems. In support of this effort, XRS will provide technical direction and guidance in the design and development of the computational techniques to be utilized in the RDB.

ANTICIPATED BENEFITS: Improved allocation of resources; improved budget and POM forecasts; all requirements determined in accordance with approved end item readiness goals.

ESTIMATED COMPLETION DATE: This is a long term project extending into the 1990s. No XRSC personnel will be matrixed to the RDB as in past years. This project basically covers XRSC personnel acting in a consultant capacity (in the past this has been a heavy XRSC workload item). Specific tasks will be managed and completed on an individual project basis.

ANALYSTS: XRSC Staff; (513) 257-6920; AV 787-6920

D.4. **TITLE:** D062 Leadtime Variability Study

CUSTOMER: AFLC/MMM

OBJECTIVE: Determine the feasibility/desirability of using methods other than the current method (of using the last leadtime experienced) to estimate leadtimes for the Consumable Item Computation System.

ANTICIPATED BENEFITS: Justification of the current method (which will alleviate the Air Force Audit Agency's concern) or an improved requirements computation.

ESTIMATED COMPLETION DATE: May 1987

ANALYST: Mr Fred Rexroad; (513) 257-6920; AV 787-6920

D.5. **TITLE:** OWRM Recoverable Item Requirements Computation Using Aircraft Availability Techniques

CUSTOMER: AFLC/MMM

OBJECTIVE: Develop and prototype on CREATE the capability to compute OWRM recoverable item requirements with aircraft availability techniques.

ANTICIPATED BENEFITS: A research model would be available to measure the impact of using aircraft availability techniques in the OWRM computation, perform special studies, and to assist in the implementation of aircraft availability techniques in the production OWRM computation (D041).

ESTIMATED COMPLETION DATE: December 1988

ANALYSTS: Mr Fred Rexroad,
Mr Jack Hill; (513) 257-6920; AV 787-6920

D.6. **TITLE:** Incorporate Engine Data Into The Requirements Computation For D041 Recoverable Components

CUSTOMER: Internal Study

OBJECTIVE: Validate the implementation strategy proposed in a study by the Logistics Management Institute (LMI) to incorporate engine pipeline and stock level data into the D041 requirements computation; develop XRSC prototype of the model LMI used for their study; and expand the LMI study to include all

engine types.

   ANTICIPATED BENEFITS: Improved requirements computation for DØ41 recoverable components.

   ESTIMATED COMPLETION DATE: December 1988

   ANALYST: Capt Lee Lehmkuhl; (513) 257-692Ø; AV 787-692Ø

D.7. **TITLE:** **DØ28 Central Leveling System**

   CUSTOMER: Internal Study

   OBJECTIVE: Validate or improve the CREATE version of the DØ28 algorithm; establish a DØ28 data base for research and special studies.

   ANTICIPATED BENEFITS: This would establish the capability for performing studies to improve DØ28.

   ESTIMATED COMPLETION DATE: December 1987

   ANALYST: Capt Mindy Grant,
             Mr Freddie Riggins: (513) 257-692Ø; AV 787-692Ø

JOHN M. HILL
Chief, Concept Development Division
DCS/Plans and Programs

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V.   THE CONSULTANT SERVICES DIVISION

A. INTRODUCTION

The Consultant Services Division includes six analysts and two
Air Force Reserve officers. Our areas of emphasis have been the
development and application of simulation models for evaluating
aircraft engine repair management policies and the investigations
of logistics data bases. We developed the JEMS (Jet Engine
Management Simulator) and OMENS (Opportunistic Maintenance Engine
Simulator) models, both of which are Monte Carlo simulations. We
also use analytic models such as Vari-METRIC and Dyna-METRIC in
our attempts to improve the quantification of operational
effectiveness in terms of engine and secondary item investments.

We have conducted studies of logistic data bases, including an
examination of the utility of using Vietnam war data for
projecting future wartime failure rates, and a study of actuarial
forecasting techniques for aircraft engine failure rates.

We spend a considerable amount of time in a consultant role,
providing advice and assistance to others regarding the
application and interpretation of JEMS, OMENS, and other
simulation models.

B. ACCOMPLISHMENTS IN 1986

Our 1986 plan consisted of eight projects in a priority order.
During the year we assumed responsibility for a ninth project,
Wartime Data Bases. One project (EOQ Indenture Files) was
successfully completed; another (Wholesale Fill Rate Study)
provided no constructive results and has been dropped. Most of
the other projects are continuing as part of our 1987 plan.
Specific achievements are documented by project below.

B.1. TITLE: JEMS Applications

        CUSTOMER: AFSC/ASD/C-17L, AFLC/MMMR, LOC/PN, HQ MAC/LGMPE,
AFAA/QLW

        OBJECTIVE: To use the JEMS models to answer specific
questions relating engine support to aircraft readiness.

        RESULTS: We completed the simulations required by AFAA/QLW
to evaluate the number of JEIM (Jet Engine Intermediate
Maintenance) facilities required for the C-5 A/B. We have also
developed and tested the TJEMS (transport JEMS) and MJEMS
(modular JEMS) models for the F117 engine. These models will be
available for future studies regarding JEIM facilities and
provisioning requirements for alternative engine maintenance
concepts for the C-17.

ANALYSTS: Mr Harold Hixson,
Mr Phil Persensky; (513) 257-7408; AV 787-7408

B.2. TITLE: POM Forecasting

CUSTOMER: AFLC/MM

OBJECTIVE: To review/develop alternative aggregate methods for forecasting the Program Objective Memoranda (POM) budget requirements by weapon system, and in total, and to develop techniques for relating changes in budgets presented in the POM to expected changes in sorties (or other appropriate measures) that can be achieved for a given weapon system.

RESULTS: The major emphasis on this project during 1986 was the study of item migration and the relative stability of unit price, demand rate and repair cost. Item migration means the movement of National Stock Numbers (NSNs) into and out of the active set of NSNs which are used in requirements computations. Migration was examined in relation to the number of NSNs in each year's set of active items. We also looked at the number and magnitude of changes in unit price, demand rates, and repair costs. These are major input factors to requirements computations and to budget forecasts. Large instabilities in these factors would impact forecast accuracy. Very large fluctuations were found to exist in all three areas when we looked at the D041 and D062 data bases. Working papers documenting these findings were sent to AFLC/MMM and AFIT/ENS.

ANALYST: Mr Don Casey; (513) 257-7408; AV 787-7408

B.3. TITLE: Requirements Data Bank (RDB) - Engines

CUSTOMER: LOC/PNA

OBJECTIVE: To provide technical support for engine requirements forecasting to the RDB task group member from LOC/PNA. Support consists of reviewing the current actuarial techniques that were developed in the late '50s with a view toward improving the forecast factor development and application techniques for the RDB engine forecast models.

RESULTS: Using 8 quarters of data for selected Oklahoma City ALC engines and 10 quarters of data for San Antonio ALC engines and modules, we have studied the possibility of developing and using actuarial failure rates based on "time since last engine removal for maintenance" instead of the "time since last major overhaul or new" as we now do. We have analyzed the data and have developed the new type of failure rates for

all of the Oklahoma City ALC engines and for about one quarter of the San Antonio ALC engines. This project was put on hold in October because of higher priority work. Remaining work includes completing the analysis of the San Antonio engines, designing an experiment to use these rates in forecasting engine changes, and determining the relative accuracy of the old and new methods.

ANALYSTS: Mr John Madden,
Mr Harold Hixson,
Mr Phil Persensky; (513) 257-7408; AV 787-7408

B.4. TITLE: EOQ Indenture Files

CUSTOMER: AFLC/MMA

OBJECTIVE: To develop indentured data sets (i.e., sets that recognize whether an item is removed and replaced directly from an aircraft or from another item) that include both recoverable and EOQ items for use in requirements and assessment models.

RESULTS: A data base containing scrubbed D049 data as well as data from many other data bases was located at Oklahoma City ALC. We worked with HQ DLA to obtain data for DLA-sourced EOQ items. We combined this with information from D041 and other files to develop final indentured data bases for several weapon systems. These data bases were passed along to a contractor for use in final testing of the EOQ-METRIC model.

ANALYST: Mr Tom Stafford; (513) 257-7408; AV 787-7408

B.5. TITLE: Wholesale Fill Rate Study

CUSTOMER: AFLC/MML

OBJECTIVE: To investigate current Air Force wholesale fill rates and their value as Air Force support indicators. If they have little value, determine other performance indicators which might be used to measure depot effectiveness in supporting Air Force mission requirements.

RESULTS: Demands decreased during the FY83-FY85 time frame. However, during that same time period the wholesale fill rate decreased while the retail fill rate increased. During this same period MAJCOM fully mission capable rates were very high and the MICAP hours and incidents dropped to their lowest points in six years. No explanation was found for the low wholesale fill rates.

ANALYST: Mr Don Casey; (513) 257-7408; AV 787-7408

B.6.   TITLE: Channel Cargo Traffic Forecasting

CUSTOMER: AFLC/DSXR, HQ MAC

OBJECTIVE: To evaluate forecasting methods which have the potential to improve forecasting accuracy.

RESULTS: A study was conducted to determine the extent of seasonality present in data for about 90 channels for which cargo movement data was available.   A new forecasting technique developed for use with seasonality indicators was tested.   The forecasts of cargo movements for 43 percent of the channels were improved by the new seasonal forecasting technique.

ANALYSTS: Mr Harold Hixson,
           Maj John Evans III; (513) 257-7408; AV 787-7408

B.7.   TITLE: Jet Engine Management Simulator (JEMS)

CUSTOMER: AFLC/MMMRR, LOC/PNA, ASD/C-17L, HQ MAC/LGMPE, AFAA/QLW

OBJECTIVE: To develop additional Monte Carlo simulation models for major aircraft weapon systems that will relate both modular and non-modular engine logistics support to aircraft capability. TJEMS models are developed for non-modular engines and MJEMS models are developed for modular engines. We need these models to gain insights into specific engine logistics issues.

RESULTS: Both TJEMS and MJEMS have been upgraded with special emphasis on improving accuracy, completeness of output, and addition of user friendly control features. The JEMS models were used on the projects in support of AFAA and ASD/C-17L (reported under para V.B.1 above).

ANALYSTS: Mr John Madden,
           Mr Phil Persensky,
           Mr Bill Morgan; (513) 257-7408; AV 787-7408

B.8.   TITLE: Integrated Capability Assessment Model (INTEGRATE)

CUSTOMER: Internal Study

OBJECTIVE: To develop an integrated set of computer models or procedures to compute weapon system capability assessments as functions of the major resources, such as spares, manpower, facilities, equipment, munitions, etc.

RESULTS: Not much progress was made on this project in

1986, due to higher priority workloads, and it is not being included in our 1987 program. It will be picked up again sometime in the future.

ANALYSTS: Mr Tom Stafford,
Mr Phil Persensky; (513) 257-7408; AV 787-7408

B.9. TITLE: Wartime Data Bases

CUSTOMER: AFLC/MMM

OBJECTIVE: To determine whether there is a difference in failure rates between war zone and non-war zone activity. This project will review, assess, and exercise two war data bases to determine their respective usefulness in developing wartime factors for requirements and planning purposes. This supports a "Logistics Need" stating a requirement to produce wartime consumption factors.

RESULTS: We reviewed two data collection efforts that had been contracted by AFHRL and AFWAL. These included a foreign data base which will become available for use in FY87, and a Southeast Asia (SEA) data base which has been implemented on ASD's CYBER computer. A preliminary report summarizing our analysis of one of the four aircraft types (F-4C) in the SEA data base was sent to AFLC/MMM and to AFHRL. The primary conclusion was that the data base probably cannot be used to meet the objective because of poor data quality and the degree of aggregration. In addition, the software provided by the contractor for the statistical analyses was inadequate. It is very slow and lacks many of the normal statistical capabilities required for most analyses.

ANALYSTS: Mr John Madden,
Maj John Evans III,
Mr Bill Morgan; (513) 257-7408

C. OTHER DIVISION ACTIVITIES

We supported a HQ AFLC task group reviewing AFLC organizations to help develop recommendations on how to reduce headquarters manning.

We worked with the AFOSR Summer Faculty researcher both during his 10 week assignment and on follow-up research programs.

We supported two reservists: Maj John Evans III and Maj James Brannock who are assigned to XRSM for training as Individual Mobilization Augmentees.

We wrote/critiqued Statements of Work for contract studies.

We assisted a number of AFIT students in using our data and models.

We are the XRS focal point for the R&M 2000 program.

We are the Air Force experts on both the Jet Engine Management Simulator (JEMS) and Opportunistic Maintenance Engine Simulator (OMENS) and assist the ALCs, the MAJCOMs, and others in applying them in various aircraft engine studies.

One of our senior analysts is an Adjunct Professor at the Air Force Institue of Technology's School of Systems and Logistics. We provide guest speakers every quarter and are sponsors of the LOG 221 course, Logistics Managers and Computer Simulation.

D. THE PROGRAM FOR 1987

The Directorate's new emphasis for 1987 will mean a major shift in our Division's efforts. We will be concentrating on quantifying the relationship between EOQ items and aircraft availability. This project will eventually impact other projects being worked in the other two Divisions. Currently, our aircraft availability based requirements and assessment computations, for both POS and WRSK/BLSS, do not include the impact of shortages of EOQ repair parts. By quantifying and including this impact we hope to provide a more realistic statement of ready aircraft.

We have also revised the priority of some of our other projects, reflecting both the new emphasis for this year as well as lessons learned from some of last year's studies. Our projects are listed in priority order below.

D.1. TITLE: Relating Stock Fund Assets, Maintenance Queues, And Aircraft Availability

CUSTOMER: Internal Study

OBJECTIVE: To quantify the relationships among stock fund (or repair part) assets, recoverable item maintenance queues (at both base and depot), and aircraft availability.

ANTICIPATED BENEFITS: If recoverable items are queued up awaiting repair parts, we must either have enough recoverable assets to account for those items in the queues or suffer aircraft down due to lack of repair part support. With our current modeling capability, if we could quantify the relationship between stock fund assets and maintenance queues, we could predict aircraft availability. That is, we could determine

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the value received for various stock fund asset alternatives.

ESTIMATED COMPLETION DATE: December 1987

ANALYSTS: Mr John Madden,
Mr Don Casey,
Mr Phil Persensky; (513) 257-7408; AV 787-7408

D.2. Jet Engine Management Simulator (JEMS)

D.2.a. TITLE: JEMS Applications

CUSTOMER: AFSC/ASD/C-17L, AFLC/MMM, LOC/PN, HQ MAC/LGMPE,
ALCs

OBJECTIVE: To use the TJEMS or MJEMS models to answer
specific questions concerning aircraft readiness and engine
support.

ANTICIPATED BENEFITS: The JEMS models allow the user to
answer a variety of readiness assessment type questions related
to adequacy of engine support and repair capabilities in both
peace and war scenarios. Typical questions include: How will a
reduction in spare engines affect the wartime capability? When
in the war will there be the greatest impact from this reduction?
Which resources should be increased to improve availability
rates? Are JEIM facilities adequate for the projected workloads?
How does management of whole engines compare to management of
modular engines?

ESTIMATED COMPLETION DATE: Continuing

ANALYSTS: Mr Harold Hixson,
Mr Phil Persensky,
Mr Bill Morgan; (513) 257-7408; AV 787-7408

D.2.b. TITLE: JEMS Development

CUSTOMER: AFSC/ASD/C-17L, AFLC/MMMR, LOC/PN, HQ MAC/LGMPE,
ALCs

OBJECTIVE: To develop Monte Carlo simulation models for
major aircraft weapon systems that will relate both modular and
non-modular engine logistic support to aircraft availability.
TJEMS models are developed for non-modular engines and MJEMS
models are developed for modular engines. We use these models to
gain insight into specific engine logistics issues.

ANTICIPATED BENEFITS: These models help analysts and engine
managers determine if engine support is sufficient to sustain

wartime requirements. They help identify and respond to potential bottlenecks caused by resource limitations (such as number of repair crews, repair parts, workstands, etc.). They also help to develop better understanding of the dynamics of engine management and provide a common understanding among HQ AFLC, the ALCs, and the MAJCOMs.

ESTIMATED COMPLETION DATE: Continuing

ANALYSTS: Mr Phil Persensky,
Mr Bill Morgan; (513) 257-7408; AV 787-7408

D.3. TITLE: Wartime Data Bases

CUSTOMER: AFLC/MMM

OBJECTIVE: To determine whether there is a difference in failure rates between war zone and non-war zone flying activity. This project will review, assess, and exercise two war data bases to determine their usefulness in developing wartime factors for requirements and planning purposes. The data bases are the USAF Southeast Asia (SEA) data covering the Vietnam era, and a foreign data base covering selected weapon systems.

ANTICIPATED BENEFITS: Improved estimation of wartime factors, and corresponding improvements in the accuracy of budgeting/procurement actions.

ESTIMATED COMPLETION DATE: Will continue into 1988

ANALYSTS: Mr Bill Morgan,
Maj John Evans III; (513) 257-7408; AV 787-7408

D.4. TITLE: Cargo Sorting And Handling Simulation

CUSTOMER: AFLC/DSXE

OBJECTIVE: Model LOGAIR cargo sorting and handling processes in air freight terminals.

ANTICIPATED BENEFITS: This project will help DSXE determine how well present terminals at selected ALCs could serve as single hubs in the LOGAIR system.

ESTIMATED COMPLETION DATE: Develop the GPSS model - September 1987; exercise the model - continuing into 1988.

ANALYSTS: Mr Harold Hixson,
Mr Tom Stafford,
Mr Phil Persensky,

D.5.   TITLE: Depot Engine Repair Model

CUSTOMER: SA ALC/MM/MA

OBJECTIVE: To develop simulation models of depot level engine repair processes.

ANTICIPATED BENEFITS: This project will provide the capability to determine depot repair flow times for engines as functions of the resources employed in the repair processes. It will enable assessments of alternative shop layouts and procedures and help determine whether whole engine or modular engine management policies would be more effective.

ESTIMATED COMPLETION DATE: Continuing into 1988

ANALYSTS: Mr John Madden,
           Mr Harold Hixson,
           Mr Phil Persensky,
           Mr Tom Stafford,
           Mr Bill Morgan; (513) 257-7408; AV 787-7408

D.6.   TITLE: Requirements Data Bank (RDB) - Engines

CUSTOMER: LOC/PNA

OBJECTIVE: To provide technical support for engine requirements forecasting to the RDB task group member from LOC/PNA. Support will consist of reviewing the current actuarial techniques that were developed in the late '50s, with a view toward improving the forecast factor development and application techniques for the RDB engine forecast models.

ANTICIPATED BENEFITS: Improved factors and forecast methods will assure more accurate forecasts of engine repairs at both bases and depots, which in turn will produce a more accurate determination of the resources needed to keep engine and module shortages from adversely affecting our peace and war programs.

ESTIMATED COMPLETION DATE: Complete development of actuarial failure rates based on time since last engine removal - June 1987; assessment of the relative accuracy of the new versus current rates - December 1987.

ANALYSTS: Mr Harold Hixson,
           Mr Phil Persensky; (513) 257-7408; AV 787-7408

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D.7. **TITLE:** Opportunistic Maintenance Engine Simulator (OMENS)

CUSTOMER: AFLC/MMMR, AFSC/ASD/YZL, OC-ALC/MM, SA-ALC/MM

OBJECTIVE: To assist the acquisition community in formulating decision rules for determining which engine life limited parts should be replaced at the time of engine maintenance. The OMENS model is applied to different engines through specific computer program modifications to estimate engine factors for requirements computations. We assist users by modifying and applying the OMENS model.

ANTICIPATED BENEFITS: Substantial reductions in spare engine requirements can be achieved through the opportunistic replacement of life limited parts. The relatively small cost in increased replacement parts is overwhelmingly offset by the decreased requirement for spare engines and in decreased engine removals for maintenance.

ESTIMATED COMPLETION DATE: Continuing

ANALYSTS: Mr Tom Stafford,
Mr Bill Morgan; (513) 257-7408; AV 787-7408

D.8. **TITLE:** Channel Cargo Traffic Forecasting

CUSTOMER: AFLC/DSXR, HQ MAC

OBJECTIVE: To evaluate forecasting methods which have the potential to improve forecasting accuracy.

ANTICIPATED BENEFITS: DSXR will have a better forecast to forward to HQ MAC. HQ MAC will receive improved monthly channel forecasts of cargo tonnage requirements. The result will be improved flight scheduling.

ESTIMATED COMPLETION DATE: November 1987

ANALYSTS: Mr Harold Hixson,
Maj John Evans III; (513) 257-7408; AV 787-7408

John L. Madden

JOHN L. MADDEN
Chief, Consultant Services Division
DCS/Plans and Programs

A. INTRODUCTION

The AFLC Logistics Management Sciences Contract Studies Program provides outside analytical studies of military logistics problems.

The program gives the Commander and his Staff an objective and scientific basis for decisions regarding actions to be taken to improve logistics support to the operating commands. We have two methods for contracting: open competition on a study-by-study basis and the Professional Audit and Evaluation Studies contract which is similar to a Basic Ordering Agreement and is competed every three years.

B. STUDIES COMPLETED IN 1986

B.1. TITLE: Assessment Modeling With Limited Repair And Transportation Capabilities

CUSTOMER: AFLC/XRS

OBJECTIVE: Develop an efficient, accurate approximation technique for calculating wartime surge queue lengths and times caused by capacity constraints for a given service facility, such as a repair center or a transportation segment for specific LRUs or SRUs.

RESULTS: The mathematical algorithm developed by the contractor will be further evaluated by XRS personnel.

ANALYST: Contract Study, Mary Oaks; (513) 257-4535; AV 787-4535

B.2. TITLE: Evaluation Of CONUS Cargo Movement Requirements

CUSTOMER: AFLC/DST

OBJECTIVE: Review and evaluate the task, study plan, and execution of the first phase of the CONUS Cargo Movement Requirements Study (CCMRS). Review and evaluate the approach and work in progress of the second phase of CCMRS.

RESULTS: The independent evaluation was used to validate the approach used in CCMRS.

ANALYST: Contract Study, Mary Oaks; (513) 257-4535; AV 787-4535

B.3.   TITLE: Material Management Manpower Standards

CUSTOMER: AFLC/XRM/MMM

OBJECTIVE: Conduct an organizational/system/functional analysis to be used in developing standards within Material Management. Develop computerized profile models of MM functions and effectiveness indicators.

RESULTS: The study has been completed and is under review by AFLC/XRM and MMM personnel.

ANALYST: Contract Study, Mary Oaks; (513) 257-4535; AV 787-4535

B.4.   TITLE: Assessing The Effect Of Spare Engine And Module Assets On Budget Program 1500 (BP 1500) Peacetime Operating Stock Requirements

CUSTOMER: AFLC/XRS

OBJECTIVE: Develop a prototype version of the Aircraft Availability Model that incorporates the effects of spare aircraft engines and modules (TF34 and F100) on BP 1500 funding requirements.

RESULTS: The study highlighted the need to include engine and module asset levels and pipelines in the requirements computation for BP 1500 recoverable items that are engine or module components. XRS plans to evaluate the appropriateness of the proposed implementation strategy and expand this effort to include other engines.

ANALYST: Contract Study, Mary Oaks; (513) 257-4535; AV 787-4535

B.5. TITLE: Feasibility Study Of Intra-Depot Material Transport System - SM-ALC

CUSTOMER: AFLC/DSX

OBJECTIVE: To assess the feasibility of making improvements to the Intra-Depot Material Transport System (IDMTS) at McClellan AFB. If improvements are feasible, identify alternative designs.

RESULTS: McClellan AFB personnel will continue with an in-house study to further define and understand the data presented by the contractor and collect more data in those areas where the

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contractor was weak.

ANALYST: Contract Study, Mary Oaks; (513) 257-4535; AV 787-4535

B.6.   TITLE: Development Of A Material Requirements Forecasting System

CUSTOMER: AFLC/MM

OBJECTIVE: To develop a requirements forecasting system for short, intermediate, and long range time horizons.

RESULTS: Sponsor withdrew request.

ANALYST: Contract Study, Mary Oaks; (513) 257-4535; AV 787-4535

C.   STUDIES IN PROGRESS/PLANNED FOR 1987

C.1.   TITLE: Automated Technical Order System (ATOS)

CUSTOMER: AFLC/XRI

OBJECTIVE: Determine the best automated Technical Order (TO) system and the estimated cost. Develop the criteria that might be used in selecting or prioritizing the TOs for entry into the automated system. Evaluate the hardware and protocol requirements in the ATOS Phase 2 Request for Proposal to determine compatibility with data transfer requirements that the Air Force might impose on contractors in the future.

ANTICIPATED BENEFITS: This project will provide an independent analysis that will assist AFLC in developing an acquisition strategy/program for a TO system capable of supporting existing, as well as future, weapon systems.

ESTIMATED COMPLETION DATE: Completed; currently being reviewed by AFLC/XRI personnel.

ANALYST: Contract Study, Mary Oaks; (513) 257-4535; AV 787-4535

C.2.   TITLE: Consumable Item Stockage Policy To Meet A Weapon System Support Objective, Phase II

CUSTOMER: AFLC/XRS, AFLC/MMM

OBJECTIVE: Phase I of this study investigated the logical

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consistency of a model (Vari-METRIC) that considers item indenture levels and computes consumable item reorder points and quantities. Phase II will test the model using an indentured data base linking consumable and recoverable item indentures.

ANTICIPATED BENEFITS: This analysis of the interaction between EOQ items and higher indenture items should produce an important understanding of some of the practical Vari-METRIC implementation problems that AFLC will face.

ESTIMATED COMPLETION DATE: Completed; currently being reviewed by AFLC/XRS and MMM personnel.

ANALYST: Contract Study, Mary Oaks; (513) 247-4535; AV 787-4535

C.3. TITLE: Inventory And Assessment Of Air Force Maintenance Training Devices

CUSTOMER: LOC/TG

OBJECTIVE: To develop and provide a method for maintenance of a complete inventory listing of AFLC configuration-managed maintenance trainers, a feedback system to identify potential and/or actual equipment/modification deficiencies, and a technique/model for assessing the adequacy of logistics support of configuration-managed technical training devices.

ANTICIPATED BENEFITS: We expect to develop a better method for assessing the adequacy of logistics support of configuration-managed technical training devices, e.g. more accurate inventory, earlier detection of deficiencies, etc.

ESTIMATED COMPLETION DATE: July 1987

ANALYST: Contract Study, Mary Oaks; (513) 257-4535; AV 787-4535

C.4. TITLE: Combat Data Base Development

CUSTOMER: AFLC/XRS

OBJECTIVE: To obtain data and information about the differences in demands on both supply and maintenance in peace and war.

ANTICIPATED BENEFITS: This project should enable us to take advantage of lessons learned by a foreign air force engaged in actual combat with aircraft similar to our own.

ESTIMATED COMPLETION DATE: September 1987

ANALYST: Contract Study, Mary Oaks; (513) 257-4535; AV 787-4535

C.5.   TITLE: Demand Forecasting For Mission Critical Items

CUSTOMER: AFLC/XRS

OBJECTIVE: To improve the prediction of demands for a select few Line Replaceable Units (LRUs) on the basis of data pertinent to those LRUs that are, or could be, observed, quantified, and recorded.

ANTICIPATED BENEFITS: This project could produce the parameters for a better data system that could improve our ability to forecast demands for both peace and war.

ESTIMATED COMPLETION DATE: September 1987

ANALYST: Contract Study, Mary Oaks; (513) 257-4535; AV 787-4535

C.6.   TITLE: Professional Audit And Evaluation Studies (PA&E)

CUSTOMER: HQ AFLC

OBJECTIVE: To provide the Commander of AFLC the services of a multi-disciplined management audit and evaluation contractor. The two tasks listed below (C.6.a. and C.6.b.) will be awarded under this contract.

ANTICIPATED BENEFITS: This contract provides an independent analysis of areas of major concern to the Command.

ESTIMATED COMPLETION DATE: Basic contract (FY87) with three option years (FY88-90)

ANALYST: Contract Study, Mary Oaks; (513) 257-4535; AV 787-4535

C.6.a. TITLE: Feasibility Of Metals Recovery From Plating Processes

CUSTOMER: AFLC/MAQ

OBJECTIVE: To evaluate the feasibility and economic practicality of metals recovery for sale/reuse from spent plating baths.   This effort will address available and developing

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technologies to provide recommendations for appropriate means to segregate, collect and recover metals from spent plating solutions and precipitated plating sludges.

ANTICIPATED BENEFITS: This study will provide documentation for specific ALC plating processes, enabling ALC personnel to plan, formulate, and implement the most practical metals recovery technologies available. It will also provide information to assist in hazardous waste management.

ESTIMATED COMPLETION DATE: July 1988

ANALYST: Contract Study, Mary Oaks; (513) 257-4535; AV 787-4535

C.6.b. TITLE: Feasibility Study Of An Intra-Depot Material Transport System (IDMTS)

CUSTOMER: AFLC/DS

OBJECTIVE: Identify required functional capabilities and operating constraints of an IDMTS for Oklahoma City ALC; identify alternative arrangements, and select the most cost effective alternative which will meet the projected needs of the ALC for the next 15 years.

ANTICIPATED BENEFITS: This study should produce improved transportation response times and workload leveling by allowing continuous movement of material between distribution activities and between distribution and maintenance activities. Further benefits will be realized through a reduced manual labor requirement and the reduction of the need for petroleum based fuels.

ESTIMATED COMPLETION DATE: April 1988

ANALYST: Contract Study, Mary Oaks; (513) 257-4535; AV 787-4535

Mary E. Oaks

MARY E. OAKS
Studies Program Manager
Directorate, Management Sciences
DCS/Plans and Programs

VII.   FINAL REMARKS

In this Report we have tried to describe our capabilities,
motivations, and what we have done and intend to do.

This is our third Annual Report. We are interested in your sug-
gestions for improving the Report or the study program. Write to
AFLC/XRS, WPAFB, Ohio, 45433, or call (513) 257-3201, AV 787-
3201.

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DPX	1	XRX	3
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DSS	1	LMSC	
DST	1	CC	1
DSX	1	SHE	1
HO	1	SHO	1
IG	1	SM	1
IN	1	SME	1
JA	1	SMI	1
MA	1	SMM	1
MAJ	1	SMO	5
MAP	1	SMP	1
MAQ	1	SMR	1
MAW	1	SMW	5
MAX	1		
MI	1	LOC	
MIM	1	CC	1
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AGMC/XR	3		Rand Corporation	
			Santa Monica, CA	3
HQ USAF				
LEX	2		Logistics Mgmt	
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XOO	1			
AFAFC/CC	1			
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AFBRMC/RDB	1			
AFCOLR/CC	1			
AFHRL/LR	1			
AFLMC/CC	5			
AF ACADEMY/DF	1			
AFIT/LS	1			
Air University/EC	1			
DLA/LO	3			
PACAF/OA	1			
DTIC	1			
DLSIE	1			

END

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DTIC