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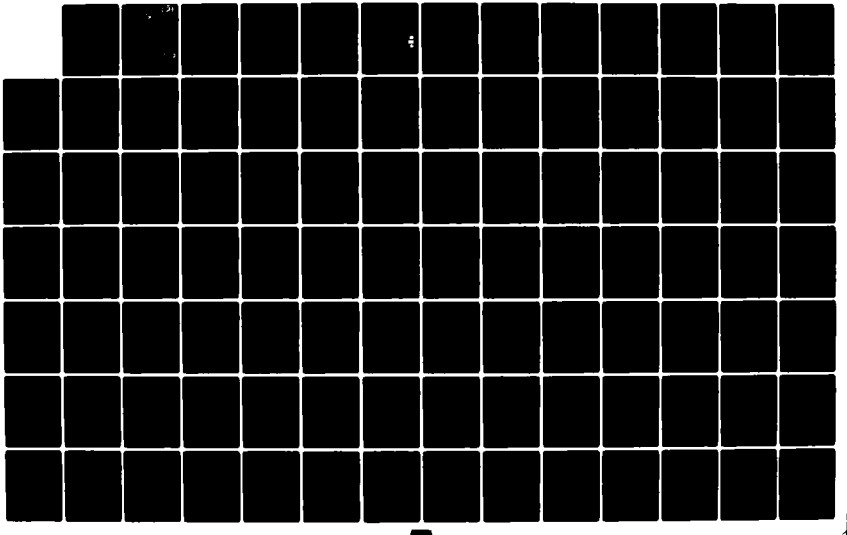

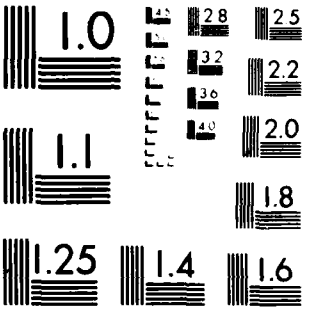

DEPARTMENT OF THE AIR FORCE
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AIR FORCE INSTITUTE OF TECHNOLOGY

Wright-Patterson Air Force Base, Ohio

THE UTILITY OF HANDHELD PROGRAMMABLE CALCULATORS IN AIRCRAFT LIFE CYCLE COST ESTIMATION

Captain Dennis P. Brooks, USAF

LSSR 41-82

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Life cycle cost estimation is a high priority issue in systems acquisition and maintenance. Interest begins with the Office of the President. Over the last twenty-three years this interest has generated a plethora of reports and models to estimate life cycle costs. The complexity and magnitude of this information has caused many to avoid life cycle cost analysis. This report explores the utility of handheld programmable calculators in estimating aircraft life cycle costs. Selected current computer models were analyzed by function and cost generation technique. Two were identified and simplified for use with a Hewlett-Packard HP-41CV calculator. Five other programs, currently in a format for the Texas Instruments TI-59 calculator, were converted and expanded as necessary for general usage with the HP-41CV. The report contains the research; programs generated; example program runs; a comparison between the HP-41CV output, the original format output, and where applicable actual costs; and suggestions for further research. The results indicate that programmable calculators can be a valuable tool in life cycle cost estimation.

LSSR 41-82

THE UTILITY OF HANDHELD PROGRAMMABLE CALCULATORS IN AIRCRAFT LIFE CYCLE COST ESTIMATION

A Thesis

Presented to the Faculty of the School of Systems and Logistics

of the Air Force Institute of Technology

Air University

In Partial Fulfillment of the Requirements for the

Degree of Master of Science in Logistics Management

By

Dennis P. Brooks, BS
Captain, USAF

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CHAPTER I

OVERVIEW

Managing costs in acquisition programs has assumed prime importance in today's budget environment. A realization that total program costs at times overshadow differences in acquisition costs has led to viewing programs in terms of life cycle cost (LCC). The complexity and sheer quantity of data required to manage a program through its life cycle has led to the use of computers. Yet, even the use of computers is hampered by complex computer programs requiring large amounts of input data, computer terminal accessibility, and computer time availability. Program managers are required to make their decisions based on readily available information, the quality of which makes a significant contribution to overall life cycle management efficiency and effectiveness.

The introduction of the handheld programmable calculator has had a significant impact on reducing the cost and time of the feedback loop in making life cycle cost assessments of design and in developing life cycle cost impacts. Their use has been made possible by the development of cost estimating relationships (CERs). These CERs are sets of variable inputs in fixed mathematical relationships. An example would be: Design Cost = 2.07 (Maximum Gross Weight)$^{1.09}$.

The "Maximum Gross Weight" is a variable input with the fixed values of 2.07 and 1.09 determined by regression of historical data that influenced design cost in the past.

Proponents of using life cycle cost analysis begin with the Executive Office of the President.

> Major system management objectives. Each agency acquiring major systems should: . . . Maintain a capability to: . . . Estimate life cycle costs during system design concept evaluation and selection, full-scale development, facility conversion, and production, to ensure appropriate trade-offs among investment costs, ownership costs, schedules, and performance [9:3-5].

Unfortunately, to date, there exists no comprehensive method of determining total life cycle costs. A multitude of models exist, each determining some portion of LCC, yet none are able to encompass all variables and costs. This is due partially to the changing environment and partially to a lack of accurate historical data. There are several evaluations of current models. Three that evaluate model utility are: "Analysis of Available Life Cycle Cost Models and Their Applications," AFSC/AFLC Commander's Working Group 1976; "Selected Models Used in Life Cycle Cost Analyses," AFIT/LSCT 1977; and "An Appraisal of Models Used in Life Cycle Cost Estimation for USAF Aircraft Systems," RAND 1978.

Despite the existence of current models, Air Force policies and procedures have not been fully standardized and have failed to provide a reliable method for accurately forecasting life cycle costs.

As a result, LCC models and forecasts are often misused, inaccurate, and/or inconsistent. The purpose of this study is to examine several current LCC models used to estimate aircraft costs and to develop a limited, easily used model for use with a programmable calculator. The models examined are in use by Department of Defense (DOD) agencies and the civilian aircraft industry. Due to the speed and memory limitations of handheld programmable calculators, only models using CERs to estimate life cycle costs will be used or evaluated.

The next chapter will review, first, the life cycle cost concept, providing a background, vocabulary, and general knowledge of the theory of LCC. Second, the problem will be further defined. Third, justification will be presented to verify the existence of the problem. Finally, there will be a statement of the research objective and the research hypothesis with the research questions pertinent to the problem.

CHAPTER II

BACKGROUND

Life cycle cost is defined by the Office of Management and Budget (OMB) as:

> . . . the sum total of the direct, indirect, recurring, non-recurring, and other related costs incurred, or estimated to be incurred, in the design, development, production, operation, maintenance, and support of a major system over its anticipated useful life span [9:3].

The Office of the Secretary of Defense, Cost Analysis Improvement Group (OSD CAIG), separates life cycle cost into four areas: research and development; procurement; operating and support; and disposal (10:2).

The phrase, life cycle cost, first appeared in the early nineteen sixties when the problem was identified that operations and support costs of weapon systems at times far exceeded the initial acquisition costs (5:1). It was considered essential to incorporate "the total cost to the Government of acquisition and ownership of that system over its full life [10:2]," in decisions that led to acquisition, replacement, or major modification. Concern for cost control to meet requirements with shrinking budgets led to the current DOD life cycle cost program.

"Life Cycle Costing in the 80's," (5:1-7) gives an excellent

recount of the history of LCC in the DOD. The following is a synopsis of that article. Table 1 portrays the development of LCC. The Logistics Management Institute, a nonprofit research organization working for the DOD, coined the phrase "life cycle cost" in studying contract awards. Their study found that consideration of costs from initiation of requirement to retirement of the system could have significant effects on contract award. Based on this, several trial LCC procurements were initiated. The better known of these is the purchase of aircraft tires. Several companies presented tires to meet an Air Force requirement. Based solely on price, company A would have received the contract. However, the various tires were tested to determine wear and failure rates. The "useful life" was to a point of maximum acceptable wear or failure. The results of the study led to the selection of company B's product. A higher priced tire with a significantly longer useful life yielded the best cost/landing ratio. This study graphically portrayed the value of evaluating life cycle cost versus initial price in acquisition decisions. In 1964 DOD Directive 4100.35, calling for design of integrated logistics support to minimize system LCC, was part of a new emphasis to reduce support costs. At this same time, several systems considered life cycle costs during the advanced development and contract definition phase. In the late sixties defense spending was not popular with the public. This was due in part to the unpopular Vietnam War and

TABLE 1

The History of Life Cycle Cost Development

1960-65	LMI Studies
1963-65	Trial LCC Procurements
1964	DOD Directive 4100.35 on ILS
1964-68	Trial System Level Life Cycle Costing
1967-72	Special Studies on Cost Growth
	Defense Science Board
	Blue Ribbon Committee
	Little Four Studies
	Congressional Commission
1969	DOD Instruction on Economic Analysis
1970	DOD Guide LCC-1 on Life Cycle Cost for Equipment; DOD Guide LCC-2 Casebook on Equipment Level LCC; Design to Cost Proposed
1971	DOD Directive 500.1 on Acquisition of Systems; AFLCM/AFSCM 800-4 on ORLA
1972	DTC Test Cases on 17 systems/10 subsystems; Commission on Government Procurement; MIT Study on consumer life cycle cost
1973	DOD Guide LCC-3 on Life Cycle Costing for Systems;

TABLE 1--Continued

	DOD Directive 5000.4 on OSD CAIG, Dept. Sec. Defense Clements Implementation Memorandum; Joint Logistics Commander's Guide on Design to Costs; GSA Federal Supply Services LCC Program Implemented
1974	Budget Act on 1974; Public Law 93-400; MIL STD 1390A on Level of Repair
1975	DOD Directive 5000.2 on the Major System Acq. Process; DOD Directive 5000.28 on Design to Cost; DOD VAMOS Cost Study; GSA Federal Supply Services LCC Studies
1976	DOD Directive 4105.62 on Source Selection; OMB Circular A-109 on Systems Acquisition; Design to Life Cycle Cost Test Case (F-18)
1977	Bill S. 1264 (Chiles Bill) Initiated
1977-79	DOD Directive Updating; 5000.1, 5000.2, 5000.3, 5000.4, JCC DTC Guide, 4100.35
1978	Senate asks for Life Cycle on SAR Systems; Chiles Bill resubmitted; South Carolina State Purchasing Agents Seminar on LCC
1979	Chiles Bill resubmitted

partly because of an increasing movement toward the support of social programs in lieu of military spending. The shrinking funds and increasingly expensive weapon system costs led to several studies seeking alternatives to lower system replacement costs. A common recommendation of all the studies was initiation of LCC analysis in evaluations of system costs.

In 1970, the DOD issued the first guidance on how to apply LCC analysis: LCC-1, on equipment level (versus system level) acquisitions; and LCC-2, devoted to case studies in equipment level life cycle costs. 1971 brought three major steps in LCC development. DOD Directive 5000.1 firmly established the requirement for life cycle cost and design to cost. Air Force Logistics Command Manual (AFLCM)/Air Force Systems Command Manual (AFSCM) 800.4, Optimum Repair Level Analysis (ORLA), determined LCC in repairs at depot, intermediate, or base level. The third step was the evaluation of line replaceable units (LRUs) and shop replaceable units (SRUs) by LCC in the Logistics Support Cost (LSC) model. In 1973, the DOD issued LCC-3 giving LCC guidance for systems acquisition. This was followed with the establishment of the CAIG (DOD Directive 5000.4), and the Joint Logistics Commander's issuance of "Life Cycle Cost as a Design Parameter," integrating design to cost and life cycle costing. DOD Directive 5000.28, issued in 1975, required a modified form of LCC in design-to-unit-production-cost goals. The Visibility and

Management of Support Cost (VAMOSC) study was implemented to improve estimation of downrange cost capability. In 1976, DOD Directive 4105.62 required consideration of LCC in source selection. The F-18 contract was a trial LCC procurement with a life cycle cost incentive clause in the contract. OMB Circular A-109 came out requiring the use of LCC in the acquisition process by all executive branch agencies. Senator Chiles, Subcommittee on Federal Spending Practices and Open Government, introduced and has continued to re-submit a bill requiring LCC considerations in all federal procurements. The Senate Committee on Armed Services, in 1978, asked for LCC estimates on selected acquisition review (SAR) programs. The DOD guidance on life cycle costing is continually updated. Keeping pace with the development of the life cycle costing field are models to portray LCC. The use of LCC models continues to expand as the models are more fully developed and proven useful.

The rationale for using LCC is that decisions made early in the acquisition phase have a potential for far-reaching effects in total system costs. Decisions involving system design, performance, and operational characteristics significantly affect operation and support costs. These and other factors can be controlled by managers in the acquisition phase if the managers have appropriate information for making decisions.

The Problem

The current LCC problem is twofold. First, models must be identified and derived that adequately portray the cost elements driving total cost in each phase of a system life cycle. Second, managers require a usable form of the models that is readily accessible.

> The effective application of life cycle costing (LCC) generally requires the use of a life cycle cost model. Historically, this has caused problems because many who should be involved in life cycle costing have felt they could not adequately comprehend the LCC models involved [8:1].

> . . . life cycle analysis is not yet a finished and fully effective management tool. The conceptual framework for life cycle analysis has developed in patchwork fashion and is still incomplete. Policy guidance for its use and purpose needs to be more fully explicated. Important questions remain about the preferred organizational and procedural arrangements for preparing, corroborating, documenting, reviewing, and acting upon life cycle analysis studies. The methodology of life cycle analysis is also incomplete. And while a wide array of life cycle cost (LCC) models are in common use, data to support them and conventions to guide their application are lacking [3:1].

The CAIG has identified simplicity as an important and desirable trait in the use of LCC models: "Often the cost, labor hours, and schedule required to set up and provide data for a complex model prohibits its effective and timely use in the decision process [10:5]." There is a continuing requirement to provide better information in LCC analyses on a timely basis to managers. " . . . maximum leverage for the control of life cycle (costs) lies in the use of

simpler models. This fact seems to be well recognized in both industry and government. The trend is in this direction [14:24]." Several LCC models have been reduced for use on the Texas Instruments TI-59 handheld programmable calculator. Table 2 provides a list of the calculator programs reviewed and their usage. Unfortunately, these programs develop results for isolated portions of total life cycle cost. Managers in the acquisition process need an analytical tool at their fingertips to evaluate LCC implications of daily decisions on a system as well as component level. At the present time, a consistent, reliable, accurate, and readily available method of estimating system life cycle cost has not been identified.

Research Objective

The objective of this research is to identify those cost elements in current LCC models that have historically driven aircraft LCC in each area of the life cycle. These elements will be used to identify a model for use in a handheld programmable calculator to provide acquisition managers with a reliable and useful LCC analysis at a level that will enhance time and effort expended on decisions. The model will be tested for utility by comparison with current full scale computer model results, actual system costs, and expert opinion.

TABLE 2

Calculator Life Cycle Cost Programs Reviewed

1. Aircraft Top-Level Life Cycle Cost Models, Nov 1977. (Northrop)
2. Cost Oriented Resource Estimating (CORE) Model, Jun 1981.
3. Economic Analysis Model, Sep 1979.
4. External Tank Spares (Replacement Spares) Model, Mar 1978.
5. Learning Curve Programs, Aug 1978.
6. Life Cycle Cost Model, Apr 1981 Revision.
7. Logistics Support Cost Model for Ground Support Equipment, Mar 1978.
8. Next Generation Trainer (NGT) Operating and Support Cost Model, Sep 1980 Revision.
9. Optimal Repair Level Analysis for Ground Support Project, Mar 1978.
10. Raw Inflation Programs, Jun 1979 Revision.
11. Weighted Inflation Programs, Jan 1980 Revision.

Research Hypothesis

A model can be developed, within the limitations of a handheld programmable calculator, that will provide useful information in aircraft acquisition decisions. The alternate hypothesis is considered to be that the limitations of the handheld calculator or the methodology used in converting the programs for calculator use precluded the development of useful information within defined limits.

Research Questions

1. What are the cost drivers in the models available for each phase of the acquisition process and system life cycle?
2. What combination of cost elements will yield an effective model for aircraft LCC analysis on a handheld programmable calculator?
3. What models are currently used at the Aerospace Systems Division for aircraft LCC analysis?
4. What additional models are in use in civilian industry that could contribute to aircraft LCC analyses?
5. What are the results in evaluation of current models?
6. How well does a calculator model predict future costs when compared to original computer programs and actual costs?

CHAPTER III

SCOPE AND DELIMITATION

To maintain the usefulness of the model the equations and requirements for data will be limited to the capabilities of a Hewlett-Packard HP-41CV calculator with extended function and memory modules. The HP-41CV was chosen because of its alpha-numeric capability (the calculator has a full twenty-six letter keyboard with limited punctuation) and because of the state-of-the-art versatility in programming. Several peripherals are available for extended memory, hardcopy printout, video interface, and special application software. Any calculator of comparable memory could be used.

Calculation of a completely accurate life cycle cost requires a large amount of sometimes inaccessible data and a perfect knowledge of the future. The scope of life cycle cost estimations is vividly portrayed in the complexity of current programs dealing with limited areas of total life cycle costs. The major use of life cycle cost models is to compare the relative costs of alternatives. Representative costs can be derived from limited data with the use of CERs. Several trends have been identified by Dr. H. I. Starr (PhD) of Logistics Technology International, Ltd., in determining key cost drivers in aircraft LCC (15:1-5):

	% of LCC
Research and Development	3-10%
Production	20-30%
Operating and Support	60-77%

1. R&D Cost Drivers

a) item/assembly/system weight tends to be proportional to cost.

b) power in electronics systems and engines tend to be proportional to cost.

c) risk, quantified by advanced materials, power to weight, etc., has a significant influence on cost.

d) even though a small percentage contribution, decisions made during R&D in design tradeoffs have a significant effect on later phases.

2. Production Cost Drivers

a) chosen tolerance range and item reliability

b) number of electronics subsystems

c) production quantity

d) advanced materials

e) number of suppliers

3. Operating and Support Cost Drivers

a) use rate

b) deployed quantity

c) mission scenario

d) failure/maintenance rates

4. Indirect Cost Drivers

   a) funding

   b) schedules

   c) current acquisition process

Current models were reviewed with these cost drivers in mind. The models tended to support Doctor Starr's identification of cost drivers.

This study is designed to bring enough causal factors into a limited model to produce a useful tool. There are several programs available for use with a TI-59 calculator that have proven the usefulness of such limited programs. This study draws upon existing models to produce an increasingly complex derivation of life cycle cost. The complexity is governed by the amount of data available to the user. Peripheral sub-programs provide information on learning curves, reliability, line replaceable unit (LRU) and shop replaceable unit (SRU) design trade-offs, and LRU/SRU optimal repair level analysis.

Due to time constraints and calculator limitations, the analysis is limited to those models in Table 2 and Table 3. The limitations of the HP-41CV will identify the depth and scope of the model. The calculator as used had a 2333 byte memory enhanced to a 6554 byte memory with three extended memory modules.

TABLE 3

Selected Computer Life Cycle Cost Models

1. Air Force Logistics Command Operations and Support Cost Model
2. Cost Oriented Resource Estimating (CORE) Model
3. Cost Reduction Is Everyone's Responsibility (CRIER) Life Cycle Cost Model
4. Designing to System Performance/Cost (DSPC)
5. Development and Production Costs of Aircraft III (DAPCA III)
6. Engine/Airframe Generalized Life Cycle Cost Evaluator (EAGLE)
7. Expected Values Model
8. Life Cycle Cost Model for Aircraft Engines
9. Life Cycle Cost Model for Inertial Navigation Systems (INS LCC)
10. Logistics Composite Model
11. Logistics Support Cost Model (LSC)
12. Modular Life Cycle Cost Model (MLCCM)
13. Multi-Echelon Technique for Recoverable Item Control (METRIC/MOD-METRIC)
14. Optimum Repair Level Analysis (ORLA)
15. Planning Programming and:

    Budgeting Annual Cost Estimating (BACE)

    Cost Analysis Cost Estimating (CACE)

    Missile Annual Cost Estimating (MACE)

TABLE 3--Continued

16. Programmed Review of Information for Costing and Evaluation (PRICE)
17. Research into the Economics of Design and User Cost Effects (REDUCE)
18. Simplified Maintenance Cost Model
19. Weapon System Support Costs

Research Design

Data Source

The LCC models analyzed were collected from the Air Force Institute of Technology (AFIT), Wright-Patterson Air Force Base, Ohio, Aeronautical Systems Division/Life Cycle Cost Management Division (ASD/ACCL), Air Force Wright Aeronautical Labs/Vehicle Synthesis Branch (AFWAL/FIMB), and the civilian firms listed in Appendix B. These models have been developed and modified over the last twenty-two years. The models and equations chosen are identified and supported in Chapter 4. Data to evaluate the calculator model performance was obtained from AFWAL/FIMB and system program offices at Wright-Patterson Air Force Base. The data reflects acquisitions over the last twenty years.

Variables

The variables of concern are those cost elements identified as cost drivers in each area of the life cycle. The models are separated into phases of the life cycle. Where limitations of the HP-41CV or the models prevent accurate computation, variable inputs will be defined by input requirements and suggested LCC models to derive aggregate data.

CHAPTER IV

BASIC DESIGN

The model presented in this chapter is a three-step progressively expanding input model for determining portions of aircraft life cycle costs. The model begins with four required variable inputs, progresses to twenty three, and ends with a version requiring one hundred forty five different variable inputs. A description of the input and output labels is found in Appendix A. The required units of measure are also explained in Appendix A. There are four subprograms added for user convenience to determine the effects of learning rates on production; component and/or system reliability; LRU/SRU optimum levels of repair; and LRU/SRU logistics support costs. Appendix B contains a listing of the programs in HP-41CV format. They can be converted for use with any suitable calculator. An example run of each subprogram is displayed in Appendix C.

Justification

The first step of the model is an airframe life cycle cost estimate based on 1981 RAND CERs (6:1-3). The RAND CERs were chosen for simplicity in use, yet are applicable to a broad range of aircraft. This step generates research and development and

production estimates of airframe cost. It can generate data on any fighter, attack, or cargo aircraft (not derived from a previous version ex: An F-5 is derived from a T-38). The lack of inputs and generality of use lead to inaccuracy, but this step does give guidance early in the acquisition cycle in estimating airframe costs. Statistical support has been generated by RAND and is listed in their documentation. Using four input variables the equations develop eight outputs. The outputs are based on one hundred aircraft and 1977 dollars. To convert to current dollars multiply the outputs in hours by the appropriate current hourly rate. Dollar outputs can be converted by application of an inflation factor. One source of inflation factors is Air Force Regulation 173-13. This step has the advantages of simplicity and early use, but the disadvantage of considering only airframe cost and there is no subsystem breakdown.

The second step of the model is a translation of a Northrop Aircraft-Top-Level Life Cycle Cost Model into the HP-41CV format. The Northrop program was chosen because it is still relatively simple, with twenty-three inputs, but it encompasses avionics and engine data as well as airframe and considers research, development, production, and operations and support costs. The model existed in a programmable calculator format. Minor mathmatical errors were corrected in the translation. The model is limited to fighter/attack aircraft. As can be seen by the required inputs in Appendix A, the

model is useable early in the acquisition process. The model was designed to look for large cost differences among various alternatives during the early conceptual design phase of the acquisition cycle. The model is considered consistent with Air Force Regulation 173-10. Statistical support for the model can be obtained from the Northrop Aircraft Group. Using twenty-three inputs the model generates eighteen cost outputs. An example run is contained in Appendix B. The model is based on seven hundred and fifty aircraft and 1977 dollars. One of the inputs yields cost data on any quantity chosen. The dollar outputs can be converted to the desired year by application of the appropriate inflation factor. This step is usable early, is fairly simple, and encompasses total aircraft life cycle costs, but subsystem breakdowns are still not available.

The third and final step of the model is a limited handheld version of the Grumman Modular Life Cycle Cost Model (MLCCM), January 1980 revision. This step illustrates the expanded capabilities of handheld calculators. Although the output in the example run in Appendix C is limited it can be expanded to include any portion of the output generated by the original computer model. The example output illustrates the various formats: airframe, avionics, and engine; subsystem breakdown, avionics, and engine; and maintenance level breakdown. The program listed in Appendix B takes approximately fifteen minutes to run R&D and production costs and an additional

forty minutes to run initial spares and operations and support costs. The second portion length is due to the repetitive summation of individual costs in each subsystem. The number of inputs, memory required, and available outputs graphically illustrate the capabilities of handheld programmable calculators. This step entails one hundred and forty five different inputs and was the most comprehensive CER format computer program found. The example run displays thirty-eight outputs in R&D, production, initial spares, and operations and support costs encompassing total system life cycle costs. Quantities and inflation factors are inputted yielding output in desired year dollars and quantities. The original CERs were expressed in terms of 100 airframes, 150 avionics units, and 1000 engines. The dollar outputs are converted from 1975 dollars. According to Mr. Nathan L. Sternberger, MLCCM Air Force Point of Contact, the model is more sensitive to airframe data, but it does provide engine and avionics information for total life cycle cost estimates. Justification, support, and development of the CERs can be found in the four volume library covering the computer model. The calculator version is limited in user interaction but can be tailored to individual and program needs. Any handheld calculator with suitable memory and card reader ability can be used with an appropriate translation of the calculator model.

The engine data can be significantly enhanced by developing

engine estimations with the "Engine/Airframe Generalized Life Cycle Cost Evaluator (EAGLE)" developed by Pratt and Whitney. The program is currently being introduced as a replacement to the engine modules of the MLCCM program.

The Avionics Lab at Wright-Patterson Air Force Base, is currently developing a similar model for avionics to be introduced into the MLCCM.

Both computer models and future updates can be incorporated into the calculator model as direct inputs into the appropriate storage registers or as additions to/additional calculator programs.

The MLCCM has the advantage of subsystem breakdown to explore alternatives at a lower level. It cannot be used as early as the other models due to input requirements, but it can still be used relatively early in the acquisition cycle.

To complement the base model, Hewlett-Packard versions of ORLA, LSC, LCC Reliability, and the unit curve and cumulative average learning curve programs are provided.

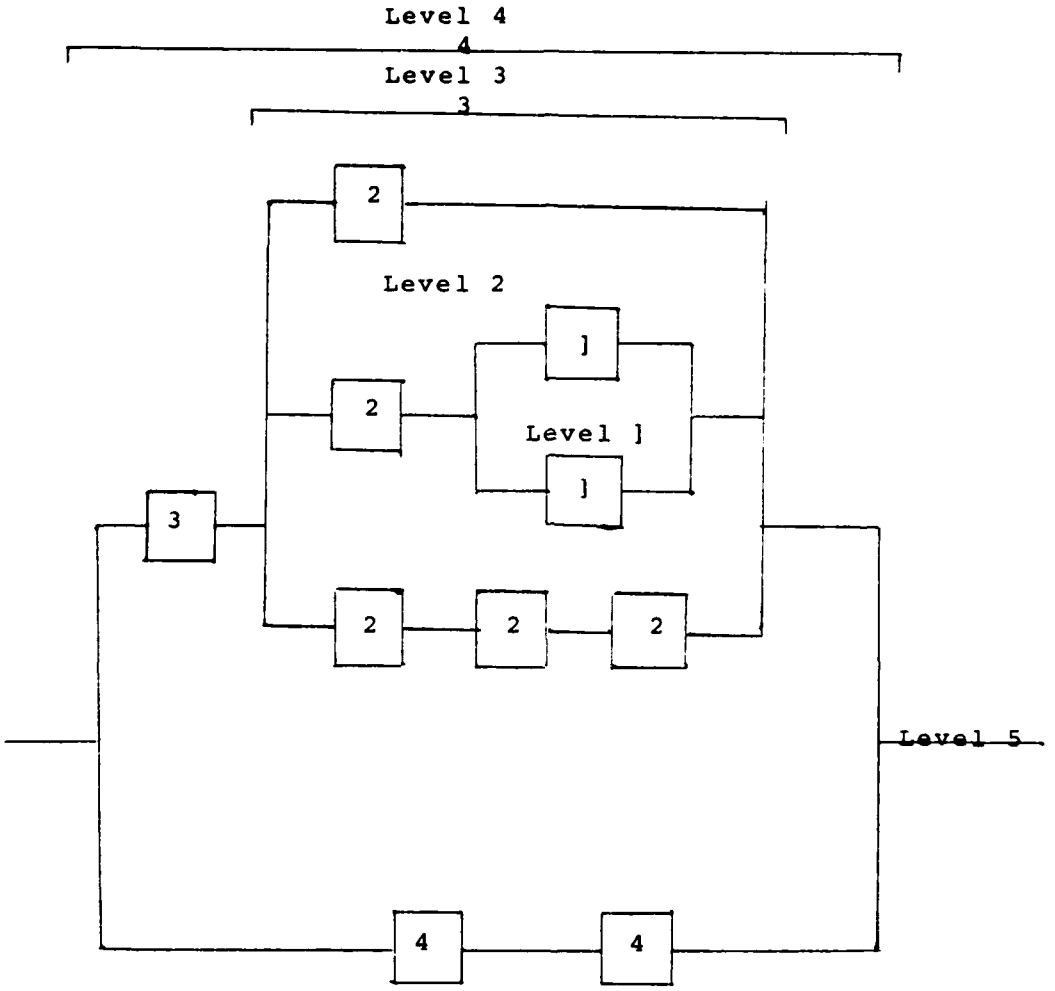
The complete package is programmed and recorded on magnetic cards. Copies can be obtained through the author.

The Learning Curve (LN CURV) program is designed to determine specified unit or total production costs given first unit cost and learning rate. The program will calculate the output based on unit curve or cumulative average curve equations.

The Optimum Repair Level Analysis (ORLA) program is an expanded version of the W. E. Rogers AFLCM/AFSCM 800-4 ORLA for GSS Project for general usage. The program is designed for use at an LRU/SRU level to evaluate hardware design tradeoffs. The program determines the cost of discarding, repairing at base level, or repairing at depot level. The model does not consider common or unique AGE or facilities costs.

The Life Cycle Component Reliability program computes system reliability by evaluating reliability at each sequential level starting at any level in the system. A level is defined as a set of components with equal functional importance. An example is to start at the resistor level. Inputs consist of resistor reliability and placement in parallel or series. As each set of resistors is placed in another series or parallel arrangement a new level is reached. Sets become circuits, then circuit boards, components, black boxes, subsystems, and ultimately an aircraft, computer, or system.

The Logistics Support Cost model is useful in examining design tradeoffs, support costs, and support alternatives at a line replaceable/shop replaceable unit level. The model does not consider: training equipment, documentation, facilities, war readiness material, initial hardware installation, support equipment maintenance, modification costs, or energy requirements. The model assumes:



All components have an MTBF of 500 for T = 1.

Fig. 1. LCC Reliability Example Circuit

1. A uniform level of program activity.

2. The spares stock level and pipeline quantities are computed to support peak activity levels.

3. There is one depot and a specified number of base repair locations.

4. Each base has the same number of systems (7:1-2).

CHAPTER V

CONCLUSION

There is utility in transferring computer programs, or portions thereof, into programs for programmable calculators. Appendix D contains the percentage accuracy of the models used and the variations to actual costs incurred. The utility of the subprograms has and is being shown through their use in the DOD and industry.

This report has identified a number of Life Cycle Cost models in use in the DOD and civilian industry. It has also identified several recognized evaluations of model use and utility. The important cost drivers in each phase were identified and models chosen that utilized predominately those drivers. The programs/models were further evaluated for utility in conversion to use with programmable calculators. Several models were identified that existed in a programmable calculator form and were converted for use with the HP-41CV. The results of the models were compared to current computer model results and actual costs. The programmable calculator is a feasible tool and shows an expanded capacity and utility beyond its current use.

The recommendations from this study are twofold. First, continue to develop calculator LCC models using regression based

CER computer models with updates as current aircraft are acquired. Second, continue to encourage the use and development of calculator programs throughout DOD in all fields. The user orientation, availability, and cost savings are daily proving the utility of programmable calculators.

Research should be continued to increase the usability of the models herein. The programs should be updated with current information and evaluated and modified for user utility. The increasing capacity of handheld calculators with increasing technology greatly enhances their utility now and in the future.

APPENDICES

APPENDIX A

ACRONYM DEFINITIONS

RAND INPUTS

EM/UN WGT?	Empty or Unit Weight?
EMP WGT?	Empty Weight?
CARGO?	Cargo Type Aircraft?
MAX SPD KNOTS?	Maximum Speed in Knots
NUM FLT TEST?	Number of Flight Test Aircraft
UNIT WGT?	Unit Weight?

RAND OUTPUTS 100 Aircraft 1977 Dollars

HRS EN =	Hours Engineering
HRS TO =	Hours Tooling
HRS LA =	Hours Labor
$ MATL =	Materials Cost
$ DEV =	Development Cost
$ PROG =	Program Cost
$ FL T =	Flight Test Cost
QC =	Quality Control Costs

NORTHROP INPUTS

DTJ	Dry Turbojet
ABTJ	After Burner Turbojet
ABTF	After Burner Turbofan
AW-A/A-A/G	All Weather, Air to Air, Air to Ground
AW-SF	All Weather, Single Function

VFR-SF	Visual Flying Rules, Single Function
NF	New Fighter
SS	Single Seat
AF LR	Air Frame Learning Rate in Decimal Form
EW	Empty Weight
%G	Percent Graphite (Decimal)
%T	Percent Titanium (Decimal)
%O	Percent Other Advanced Materials (Decimal)
EN LR	Engine Learning Rate (Decimal)
FMIL	Military (30 Minute) Thrust
BPR	By Pass Ratio
F MAX	Maximum (5 Minute) Thrust
N	Number of engines per aircraft
AV LR	Avionics Learning Rate (Decimal)
AV WT	Avionics Weight Uninstalled
UF	Utilization Factor (Decimal)
NYRS	Useful Life of System (Years)
UR	Utilization Rate (Hours/Year)
$/GAL	Fuel Cost (Dollars/Gallon)
F*S	Specific Fuel Consumption per Engine at Military (30 Minute) Thrust
L/D	Maximum Lift/Drag Ratio
Q	Number of Aircraft

NORTHROP OUTPUTS	1977 Dollars
AF 750	Airframe Cost at Unit 750
PU 1000	Engine Cost at Unit 1000
P 750	Engine Cost per Aircraft at Unit 750
E 750	Avionics Cost at Unit 750
F 750	Total Cost at Unit 750
RΣD	Research and Development Cost
POL$/FH	POL Cost per Flying Hour
AQ	Airframe Cost (Q Units)
PQ	Engine Cost (Q Units)
EQ	Avionics Cost (Q Units)
FQ	Total Cost (Q Units)
I OΣS	Initial Support Cost
FH OΣS	Operation and Support Cost per Flying Hour
CL IV M	Class IV Modification Cost
UE OΣS	Support Equipment Cost
POL OΣS	POL Operation and Support Cost
OTH OΣS	Other Operation and Support Cost
TLCC	Total Life Cycle Cost

GRUMMAN INPUTS

1. Advanced Material AM

W - Wing
F - Fuselage
N - Nacelle
T - Tail

Ti%, S%, G%, GR%, B%
Percentage by weight of subscripted materials (1) titanium, (2) steel, (3) fiberglass, (4) graphite epoxy, (5) boron epoxy.

2. Data DA

AL	Aircraft Length	Feet
AT	Aircraft Type	fighter/attack = 1; cargo/transport/tanker = 2.
AVIW	Avionics Installation Weight	Lbs

Weight of brackets, shelves, wiring & plugs used to install avionics equipment. Does not include black box equipment.

AVW	Avionics Weight	Lbs

Weight of avionics black box equipment uninstalled. Does not include wiring, shelves, cooling ducts, and fasteners.

ATBO	Average Time Between Overhaul	Hours

Number of flight hours accumulated by the average engine from one overhaul to next overhaul. Average number for a new development engine = 250 hours. Average number for an off-the-shelf engine = 1000 hours.

B/H	BTU per Hour	BTU/Hr/1000

Total cooling capacity of air conditioning equipment used for personnel and equipment cooling.

CW	Cargo Weight	Lbs

Maximum internal cargo weight that a cargo/transport/ tanker aircraft is capable of transporting.

CFA	Cargo Floor Area	Square Feet

Total area of compartment floors on which passengers/ troops, wheeled vehicles and cargo are transported. Excludes baggage type compartments.

CV	Cargo Volume	Cubic Feet

Total volume of all compartments in which cargo is normally carried.

EPR	Engine Pressure Ratio	Ratio

Ratio of compressor outlet total pressure to engine inlet total pressure, at sea level static standard highest power rating uninstalled.

FFY First Flight Year (FFYR in years since 1900)

FD	Fuselage Density	Lbs/Cubic Feet

To compute, add weight of the fuselage basic and secondary structure, auxiliary power plant, instruments and navigational equipment, electrical, electronics, armament including guns and ammunition, crew furnishings and equipment, air conditioning, photographic, auxiliary gear groups, fuel system and useful load including crew but excluding fuel and stores. Also include weight of fuselage mounted landing gear and ballast. Weight of the engine section and propulsion group including air inlet shall be included for those aircraft with engines internal to the fuselage. One half of the surface controls and hydraulic/pneumatic group weight shall also be included. The remaining half is considered to be external to the fuselage. Total weight of the above is divided by fuselage volume. For those aircraft with engines installed in the fuselage, delete volume of the engine inlet duct from fuselage volume.

FV	Fuselage Volume	Cubic Feet

Fuselage total volume less calculated engine inlet duct volume i.e., for engine installed in fuselage.

FL VA	Fuel Valves	Number

Number of main line shut-off valves in main and auxiliary fuel systems for feed, distribution, refueling/defueling and jettison. Excludes APU fuel feed, vent valves and fuel shut-off valves.

H/M	Hours per Mission	Hours

Average mission duration for either fighter/attack or cargo/transport/tanker aircraft.

IFLW	Internal Fuel Weight	Lbs

Weight of total internal usable fuel for the aircraft. Includes fuel in wing, tail and fuselage.

LW	Landing Weight	Lbs

Maximum basic mission weight with which an aircraft must be capable of landing.

L+S	Length + Span	Feet

Aircraft length plus wing span.

MM	Maximum Mach Number at Optimum Altitude	Ratio

Aircraft speed in terms of maximum mach number at optimum altitude in clean configuration.

MQT	Military/Model Qualification Test	Years

Date of approval of engine qualification test expressed as years since 1900.

≠ACT	Number of Flight Control Actuators	Number

Total number of hydraulic or electro mechanical actuators required to operate all aircraft movable flight surfaces. Example: ailerons, flaps, rudders, speed brakes, elevators, and spoilers.

≠APU	Number of Auxiliary Power Units	Number
≠C/A	Number of Crew per Aircraft	Number
≠CLS	Number of Control Surfaces	Number

Total number of primary and secondary flight control surfaces, i.e., ailerons, rudders, elevators, tabs, flaps, flight and ground spoilers and slats.

≠EN	Number of Engines	Number
≠EX	Number of Emergency Exits	Number

≠G+S Total number of fixed internal guns and external hard point attachment stations. Attachment stations that carry multiple weapon racks are counted as one (1).

≠HS Total number of aircraft sub-systems which require the use of hydraulic or pneumatic power in their normal and/or auxiliary operating mode.

≠IT Number of separate fuel cells, bladders and integral tanks which contain the internal fuel.

≠S	Number of Seats per Aircraft	Number

This includes all crew seats plus seats or bunks for alternate crew members. Does not include passenger seats or litters.

≠W	Number of primary landing gear wheels normally used during taxi, take-off and landing.	
ULF	Structural ultimate load factor that an aircraft at Flight Design Gross Weight can withstand.	
≠P	Planned or actual number of prototype and flight test aircraft.	
RMFG	Labor rate for manufacturing, including overhead. This category includes machinists, assemblers/riveters, installation mechanics, laboratory technicians, sheet metal fabrications, mechanical/fluid system technicians and finishing and processing personnel.	$/Hr
SS	Sink Speed	Feet/Sec
	The maximum vertical landing velocity the aircraft can withstand.	
TFF	Date of first flight of aircraft design expressed as months since 1 January 1950.	
TGWC	Take-Off Gross Weight-Clean	Lbs
	Basic mission take-off gross weight with full internal fuel, internal guns and ammunition, racks and pylons, but no external stores.	
TGWM	Take-Off Gross Weight-Maximum	Lbs
	Maximum basic mission take-off gross weight including stores.	
≠PSN	Total of flight crew, relief crew, attendants and passengers/troops.	
TAVSS	Total number of avionic AN nomenclatured subsystems per aircraft. If two identical subsystems are used, count as two.	

TT	Total Thrust per Aircraft, including Afterburner	Lbs

Sum of the maximum thrust rating of uninstalled engines at sea level static standard conditions.

TKA	Total KVA Maximum Design	KVA

Total normal electrical power output capability of engine, air turbine motors and auxiliary power unit driven generators/alternators.

TWA	Total Wetted Area per Aircraft	Square Feet

Total external surface area of the aircraft including the canopy. This can be calculated by viewing the total area of the external skin as being minus curves and laid flat.

UR	Utilization Rate	Hours/Year

Average flight hours per active aircraft per year obtained by multiplying the average flight hours per active aircraft per month by 12 months.

WN	Horizontal distance from wing tip to wing tip. Exclude wing tip missile installations.
≠A	Total Number of Aircraft
FH/A	Flight Hours per Aircraft — Hours/Month
LC	Life Cycle — Months
INF	A factor to account for inflation rate from 1975 to the output year desired.
WA	Wing Area — Square Feet

The gross planform area of the wings from aircraft centerline to wing tips.

WT/C	Wing Thickness to Chord Ratio, Average	Ratio

Average of theoretical root chord and tip chord thickness divided by average of the theoretical root chord and tip chord length.

KFD	KFOLD	WING TYPE
	1.000	Fixed
	1.728	Fold
	1.377	Variable Sweep

FWA	Fuselage Wetted Area	Square Feet

External area of fuselage including the canopy.

TA — Sum of the gross theoretical vertical tail area and gross theoretical horizontal tail area. For aircraft with engines breaking through carry-thru structure of horizontal tail, use exposed horizontal tail area.

≠T	Number of Tail Surfaces	Number

Each vertical tail is counted as (1), the left hand stabilizer counts as (1), as does the right hand stabilizer.

NWA	Nacelle Wetted Area	Square Feet

Total wetted area of all wing nacelles on the aircraft.

TPS	Type of Seat	Factor

Fixed crew seats are designated (1), while ejection or high "G" seats are designated (2).

SF	SWPFAC	WING TYPE
	0	Fixed
	0	Fold
	1	Variable Sweep

MT — Total Thrust / Number of Engines

TPEN	Type of Engine Factor Jet propelled aircraft are designated (1), propeller driven aircraft (2).
CSD	Constant speed drive integral to engine = 1, remotely located = 2.
ANFT	Percentage of aluminum and steel lines using flared or flareless type AN/MS fittings.
FTR	Yes/No Fighter Aircraft
ATK	Yes/No Attack Aircraft
C/T	Yes/No Cargo/Tanker/Transport
SUBIF	Subsystem Inflation Factor
RMIF	Raw Material Inflation Factor
PDR	Planned highest rate of aircraft production per month to be attained during the production phase of the program.
REGR	Labor rate for design engineering, including overhead. This category includes product engineering, vehicle technology, systems technology, engineering development test operations, engineering operations, production engineering, engineering management, and materials and processes.
RFLT	Labor rate for flight test, including overhead. This category includes flight test planning, instrumentation, conducting of tests, flight test reporting and data acquisition.
REN	Labor rate for engineering support, including overhead. This category includes support equipment engineering, trainer engineering, field service, publications and customer training.
RMGT	Labor rate for program management, including overhead. This category includes program management, subcontract management, configuration/information and program control and budgets.

RMFS Labor rate for manufacturing support, including overhead. This category includes production control, industrial engineering, scheduling and shop loading, estimating, trade studies, budgeting and manpower analysis, and manufacturing program management.

RFBS Labor rate for fabrication support services, including overhead. This category includes mechinists, technicians and mechanics necessary in the fabrication and test of support equipment and factory test equipment.

RTDE Labor rate for tool design, including overhead. This category includes tool and fixture design, numerical control programs and methods engineering.

RTFB Labor rate for tool fabrication including overhead. This category includes the skills required for fabrication of tools and fixtures.

RQCL Labor rate for quality control, including overhead. This category includes quality assurance management, quality engineering, procurement control, inspection operations, quality control laboratory and measurement standards.

ALL RATES IN DOLLARS/HOUR

APU Auxiliary power unit production cost for the 100th unit. 1975 $

LR AF Learning Curve Slope - Structure — Decimal

A log linear plot of unit cost vs quantity representing learning experience, i.e., the expected increase in productivity, as measured by time to do a particular job, resulting from repetitive effort. The slope represents the ratio of unit cost of the 2Nth unit to unit cost of the Nth unit.

ENTWR Engine Thrust to Weight Ratio — Ratio

Maximum SLS uninstalled engine thrust divided by engine dry weight.

TIT	Turbine Inlet Temperature	Degrees R

Maximum total gas temperature leaving the first stage turbine stators in degrees Rankine.

SLM	The maximum design mach number of the engine at sea level on a standard day.	
AVIF	Avionics Inflation Factor (Decimal)	
AVLR	Learning Curve Slope - Avionics	Decimal
ENLR	Learning Curve Slope - Engine	Decimal
DT	Number of years from start of full scale development through completion of military/model qualification test for engine only.	
EAF	Engine Airflow	Lb/Sec

Total airflow through the engine at sea level static standard condition highest rating, including total fan flow of a turbofan engine.

AFIF	Airframe Inflation Factor (Decimal)	
RΣD LRAF	Production Learning Rate for the Airframe during Research and Development (R&D)	
INS	Inertial Navigation System	Yes/No
ECM	Electronic Counter-measures capability	Yes/No
SPFAC	Spares Factor for Flight Test	

Total number of engines required during development flight testing divided by (PROTO x NOENG). A number greater than 1. Suggested value = 1.5.

LR EN RΣD	Engine Production Learning Rate During R&D (Decimal)	
ENIF	Engine Inflation Factor (Decimal)	
%GΣA	General and Administrative expense percentage (Decimal)	
%PR	Percentage for manufacturer's profit (Decimal)	
LR SUB	Learning Curve Slope - Sub-Systems	Decimal
≠B	Number of Bases	
A/S/B =	All bases have an equal number of squadrons and aircraft per squadron.	Yes/No
≠Ba	Number of Bases with 1, 2, or 3 Squadrons ($\neq B_1$, $\neq B_2$, $\neq B_3$)	
S/B	Number of Squadrons per Base (1, 2, or 3)	
A/S	Number of Aircraft per Squadron (12, 16, 18, 20, 22, 24, or 28)	
≠DAVS	Total number of different AN nomenclatured avionic subsystems per aircraft. If there are two or more identical units, count that unit as one (1).	
MLD	Minimum Landing Distance	Feet
	Basic mission first landing minimum ground roll distance at sea level.	
CSW	Crew System Weight	Lbs
	Weight of furnishings and accommodations for personnel. Includes seats, bunks, oxygen, windshield wiper, instrument boards, consoles, fire detection and prevention, control stick and rudder pedals.	
≠PCP	Number of compartments on cargo/transport/tanker aircraft normally used for crew, relief crew, passengers/troops and cargo.	

MVSQ	Mass Times Velocity Squared	Lbs x Knots^2

A relative measure of the energy required to stop an aircraft computed by multiplying first landing weight by the square of the landing speed. Landing weight is the maximum basic mission weight with which the aircraft is capable of landing.

≠LGB	Total number of main wheel brakes per aircraft.	
MAL	Maximum Altitude	Feet

Highest service ceiling which the aircraft can attain while climbing at 100 FPM for any mission.

%SUP	Fraction of aircraft operational or in the maintenance pipeline repaired.	(Decimal)
≠LIM	Number of Landings per Month	
APUW	Auxiliary Power Unit Weight	Lbs

Includes weight of airborne APU as well as plumbing, circuitry, ducts, supports, and fasteners for installation.

ECSW	Total weight of the environmental control system including temperature control, pressurizing, ventilating, heating and cooling systems and anti-icing equipment.
CT	Number of air cooling turbines in the aircraft air conditioning system.
≠G	Total number of engine, air turbine motor (ATM) and auxiliary power unit (APU) driven generator/alternators.
≠HP	Total number of power driven hydraulic pumps used in main and auxiliary hydraulic systems, power transfer units excluded.
≠HSPS	Total number of power driven main and auxiliary hydraulic supply systems.

≠ATM Number of air turbine motors on the aircraft to drive generators/alternators.

≠PTU Number of hydraulic power transfer units on an aircraft.

FUSW Fuel System Weight Lbs

Weight of fuel tank bladders, if any, and all fuel transfer lines, vents, drains, components and equipment installed.

≠FUBP Number of pumps used in the fuel systems to distribute, jettison, feed and defuel. Excludes engine mounted pumps.

≠ANT Total number of antennas required by aircraft communication and navigation subsystems.

NOAC Number of aircraft in the inventory that are operationally ready and which are not grounded for maintenance or spare parts. This quantity is obtained by multiplying the number of aircraft produced by an attrition factor and pipeline rate.

G/H Gallons of Fuel pe. Gal/Hour
Flight Hour

Total fuel used for an average mission, divided by number of hours for an average mission.

C/G Cost of fuel per gallon in selected year dollars.

GRUMMAN OUTPUTS

1. Research Development Test & Evaluation

AFM	Airframe
AV	Avionics
EN	Engine
RΣD	Total RDT&E

2. Production

SUB PRD	Subsystem Production
AF PRD	Airframe Production
AV PRD	Avionics Production
EN PRD	Engine Production
GΣA	General and Administrative Expenses
PROF	Profit
TOT PRD	Total Production

3. Initial Support

IS	Initial Support
STR	Structure
CR	Crew System
LG	Landing Gear
FC	Flight Controls
EI	Engine Installation
ECS	Environmental Control System
EL	Electrical

HYD	Hydraulic
FUEL	Fuel System
CH	Cargo Handling
ARM	Armament
APU	Auxiliary Power Unit
SSE	Special Support Equipment
IT	Initial Contractor Training
EN	Engines
AV	Avionics
TOT IS	Total Initial Support

4. Operations and Support

POL	Petroleum, Oil, and Lubricants
BLM	Base Level Maintenance
RS	Replenishment Spares
DCR	Depot Component Repair
BLO	Base Level Operations
BLT	Base Level Training
PDM	Depot Airframe
OM	Other Maintenance
TOT OS	Total Operations and Support

LEARNING CURVE INPUTS

UNIT/CUM?	Unit Curve or Cumulative Curve Equations?
# Units?	Total Number of Units?
Unit of Int?	Unit of Interest?
Unit 1 Cost?	First Unit Production Cost?
% Learn?	Learning Rate? (Decimal)

LEARNING CURVE OUTPUTS

Un Cost =	Unit of Interest Production Cost
Tot Cost =	Total Production Cost of All Units

LRU/SRU LOGISTICS SUPPORT COST INPUTS

DEVC	All nonrecurring and recurring engineering, tooling, manufacturing (e.g., breadboards, prototypes, flight vehicles, DT&E items, IOT&E items and spares to support RDT&E efforts), purchased equipment, quality control, allowance for changes, General and Administrative, and Profit associated with RDT&E funded efforts over the life cycle for the appropriate Work Breakdown Structure (WBS) elements.
SYS I	The cost of acquiring the production funded items including engineering, tooling, manufacturing, sub-contract, purchased parts and equipment, quality control, General and Administrative (G&A) and Profit.
SEC	The cost of equipment, vehicles and tools required to maintain and care for the item or portions of the item while not directly engaged in the performance of the items' mission including all effort associated with design development and production of the support equipment.

M	Number of intermediate repair locations (operating bases).
AOH	Average manhours to perform a shop bench check, screening, and fault verification of an item prior to initiating repair action or condemning the item.
POH	Expected operating hours for one month during the peak usage period for all items.
PIUP	Program Inventory Usage Period. Operational service life in years.
UC	Expected unit cost (including G&A and Profit) of the item at the time of initial spares provisioning.
W	Item unit weight in pounds.
MTBD	Mean Time Between Demand in operating hours. The average time between demand for supply support expressed in operating hours.
MTBR	Mean Time Between Removals Expressed in operating hours.
NRTS	Fraction of removed items expected to be returned to the depot for repair or condemnation.
RTS	Fraction of removed items expected to be repaired at base level.
COND	Fraction of failed items expected to result in condemnation at base and depot.
PAMH	Average manhours expended on the installed equipment for preparation and assessment to the item; for example, jacking, unbuttoning, removal of other units and hook up of support equipment.
RMH	Average manhours to fault isolate, remove, and replace the item on the installed equipment and verify restoration of the equipment to operational status.
SMI	Operating hour intervals between scheduled, periodic, or phased inspections on the installed item.

SMH — Average manhours to perform a scheduled, periodic, or phased inspection of the installed item.

BCMH — Average manhours to perform a shop bench check, screening, and fault verification of an item prior to initiating repair action or condemning the item.

BMH — Average manhours to perform intermediate level (base shop) maintenance on a removed item including fault isolation, repair, and verification.

BMC — Average direct material cost to repair an item at base level including direct material cost of repairing lower level assemblies.

BRCT — Average Base Repair Cycle Time in months. The elapsed time for an item repaired at the base from removal of the failed item until it is returned to base serviceable stock (less time awaiting parts). For items of a "black box" variety (e.g., avionics LRUs), the repair of which normally consists of removal and replacement of "plug-in" components (SRUs), BRCT = 0.13 months (4 days). For other, nonmodular components, BRCT = 0.20 months (6 days).

DMH — Average manhours to perform depot-level maintenance on a removed item including fault isolation, repair, and verification.

DMC — Average direct material cost to repair an item at depot level including direct material cost of repairing lower level assemblies.

PA — Number of new "P" coded (i.e. National Stock Number has not been established) reparable assemblies within the item.

PP — Number of new "P" coded consumable items within this item.

PCB — Number of consumable items within this item that will be stocked at base level for the first time.

OST — Average Order and Shipping Time in months. The elapsed time between the initiation of a request for a serviceable item and its receipt by the requesting activity. The value of OST is a function of the base location (CONUS and/or OVERSEAS) and therefore a weighted average value must be calculated as shown below:

$$OST_{WT} = (\%\ \text{CONUS BASES})(.4\ \text{months}) + (\%\ \text{OVERSEAS BASES})(.53\ \text{months})$$

The .4 months for CONUS and .53 months for overseas bases are standard factors. (Ref AFLCR 173-10)

DRCT — Average depot repair cycle time in months. The elapsed time for a NRTS item from removal of the failed item until it is made available to depot serviceable stock. This includes the time required for base-to-depot transportation and handling and the shop flow time within the specialized repair activity required to repair the item. (Ref AFLCP 173-10)

BLR — Base Labor Rate including direct labor and indirect labor and material costs. (Ref AFLC Pamphlet 173-10, dated 28 Aug 1980)

DLR — Depot Labor Rate including direct labor and indirect labor and material costs. (Ref AFLCP 173-10)

PSC — Average Packing and Shipping Cost. The value of PSC is a function of the shipping location (CONUS &/or OVERSEAS) and therefore a weighted average value must be calculated as shown below:

$$PSC_{WT} = (\%\ \text{CONUS BASES})(\$.72/\text{lb}) + (\%\ \text{OVERSEAS BASES})(\$1.49/\text{lb})$$

SA — Annual base supply line item inventory management cost. (Ref AFLCP 173-10)

IMC — Initial management cost to introduce a new line item of supply (assembly or piece part) into the Government inventory. (Ref AFLCP 173-10)

RMC	Recurring Management Cost to maintain a line item of supply (assembly or piece part) in the wholesale inventory system. (Ref AFLCP 173-10)

LRU/SRU LOGISTICS SUPPORT COST OUTPUTS

BSC	The cost to provide base repair pipeline spares for all bases.
BSTK	The number of spares required for each base to fill the base repair pipeline including a safety stock to protect against random fluctuations in demand.
DSC	The cost to provide depot repair pipeline spares.
DSTK	The number of spares required to fill the depot repair pipeline.
SIC	The cost of support equipment, base spares and depot spares.
TPC	The total cost of system investment and support investment.
BMHC	The cost of base maintenance manhours (direct and indirect) over the life cycle.
BMMH	Direct labor manhours per year to accomplish base-level repairs.
PMSH	Direct intermediate level (base shop) manhours for the peak month.
BMMC	Cost of material to repair failed units at the base.
DMHC	The cost to accomplish depot-level maintenance of failed items over the program inventory usage period.
DMMH	The direct labor manhours per year to accomplish depot-level repairs.
DMMC	The cost of material to repair failed items at the depot level.

SDTC The cost of roundtrip transportation of items sent to the depot for repair.

CSC The cost of spares required over the life cycle to replace condemned items.

QSC Quantity of spares required over the life cycle to replace condemned items.

IMCC The cost to enter new line items of supply into the Government inventory and to manage these over the life of the equipment, and the cost of base level supply management of these new items.

TOC The total cost of ownership including, base maintenance manhour and material costs, depot maintenance manhour and material cost, second destination transportation costs, condemnation spares costs and inventory management costs.

LCC The total cost to the Government for an item over its full life, including the cost of development, procurement and ownership as computed by the model.

ORLA INPUTS Optimum Repair Level Analysis

BRCYT Base Repair Cycle Time (Modular LRU 0.20 month - Non Modular LRU 0.33 month).

LWRD Depot Labor Wage Rate

LURI Intermediate Labor Wage Rate

DSST Depot Safety Stock Level (months)

NTDPRD Number of technical data pages required at depot level

NTDPRI Number of technical data pages required at intermediate level.

MCFA Management cost to introduce new FSN assembly into Air Force inventory.

MCFP	Management Cost to introduce new FSM part into Air Force inventory
NRA	Number of repairable assemblies introduced into inventory
NNRA	Number of non-repairable parts introduced into inventory
MTBCT	Mean Time Between Corrective Tasks (hours)
MTBF	Mean Time Between Failures (hours)
NB	Number of bases
NBC	Number of Bases Conus
NBOS	Number of Bases Overseas
OSTC	Order and Shipping Time (Continental U.S.)
OSTOS	Order and Shipping Time Overseas
IL	Planned Inventory Usage Period
FRCPP	Fraction of average repair cost comprised of known piece parts
PSLRC	Packing and Shipping Labor Rate (Continental U.S.)
PSLROS	Packing and Shipping Labor Rate Overseas
PSMRC	Packing and Shipping Material Rate (Continental U.S.)
PSMROS	Packing and Shipping Material Rate Overseas
PWRC	Packing Weight Ratio (Continental U.S.)
PWROS	Packing Weight Ratio Overseas
QPA	Quantity per Assembly (used with UE)
MCA	Annual Supply Management Cost for Assembly
MHCT	Required Man Hours per Corrective Task (AVG)
MCP	Annual Supply Management Cost for Part

DRPT	Depot Repair Pipeline Time (months)
FSAC	Annual Field Supply Administration Cost
CRM	Cost of Repair Material (dollars per task) including Piece Parts
SSRC	Shipping Rate - Continental U.S. - Surface
SSROS	Shipping Rate Overseas
RMW	Weight of Repair Materials per repair task (lbs)
TDOCP	Technical Data Origination Cost per page
UC	Unit Cost (dollars)
U/B	Units per Operating Element (station sets per base)
OH/M	Usage Rate (operating hours per month)
UW	Unit Weight (lbs)
PTRD	Annual personnel turnover rate at Depot level
PTRI	Annual personnel turnover rate at Intermediate level
PTTD	Number of intermediate personnel to be trained
PTTI	Number of depot personnel to be trained
DTD	Duration of depot level training (weeks)
DTI	Depot level training instruction and material cost
TCPD	Duration of intermediate level training (weeks)
TCPI	Intermediate level training instruction and material cost per man

LIFE CYCLE COMPONENT RELIABILITY INPUTS

≠LEV	Number of Levels
≠CIR/LEV	Number of circuits at the level
COM MTBF=?	Are the component MTBFs equal?
S/P?	Are the components configured in series or parallel?
≠COM/CIR?	Number of components in the circuit?
≠PAR CIR?	Number of parallel circuits?
REL?	Component reliability if known.
MTBF?	Component mean time between failure if reliability unknown.
T?	Time interval
≠Com/Ser?	Number of components in the series.

LIFE CYCLE COMPONENT RELIABILITY OUTPUTS

Reliability =	Component/Circuit Reliability
System Reliability =	Total System being considered

APPENDIX B

PROGRAM LISTINGS

RAND

```
01◆LBL "RAN          RAND AIRFRAME DEVELOPMENT AND
         D"          PROCUREMENT
02 5
03 STO 01
04 "HRS ENG          OUTPUT LABELS
         R"
05 ASTO 08
06 "HRS TOO
         L"
07 ASTO 12
08 "HRS LAB
         R"
09 ASTO 16
10 "$ MATL"
11 ASTO 20
12 "$ DEV S
       UP"
13 ASTO 24
14 "$ PROG"
15 ASTO 28
16 1.27
17 STO 31
18 "$ FL TS
         T"
19 ASTO 32
20 8.00001
21 STO 34
22 "EM/UN W          EMPTY OR UNIT WEIGHT FORMULAS?
      GT?"
23 PROMPT
24 ASTO Y
25 "EM"
26 ASTO X
27 X=Y?
28 XEQ 09
29 XEQ 10

30◆LBL 11
31 "CARGO?"          CARGO TYPE AIRCRAFT?
32 PROMPT
33 ASTO Y
34 "Y"
35 ASTO X
36 X=Y?
37 SF 02
38 "MAX SPD          MAXIMUM SPEED IN KNOTS?
    KNOTS?"
39 PROMPT
40 STO 03
41 "NUM FLT          NUMBER OF FLIGHT TEST AIRCRAFT?
     TEST?"
42 PROMPT
43 STO 04
```

```
44◆LBL 01        FORMULA LOOP
45 CLA
46 RCL IND
     01
47 XEQ 08
48 RCL 02
49 RCL IND
     01
50 XEQ 08
51 Y↑X
52 *
53 RCL 03
54 RCL IND
     01
55 XEQ 08
56 Y↑X
57 *
58 RCL 01
59 32            LENGTHEN EQUATION FOR FLIGHT TEST
60 X=Y?
61 XEQ 03
62 RDN
63 RDN
64 RCL 01
65 16
66 X=Y?
67 XEQ 06        STORE LABOR OUTPUT
68 RDN
69 RDN
70 GTO 02

71◆LBL 02
72 ARCL IND
     01
73 XEQ 08
74 XEQ 88        LABEL OUTPUTS  (OUTPUTS MUST BE MULTIPLIED
75 DSE 34        BY LABOR RATES AND INFLATION FACTORS AS
76 GTO 01        APPLICABLE)
77 STOP

78◆LBL 88        WORKING LABELS
79 1000
80 *
81 FS? 02
82 XEQ 12
83 "⊢="
84 ARCL X
85 AVIEW
86 FS? 55
87 STOP
88 RCL 01
89 33
90 X=Y?
91 XEQ 05
92 RDN
```

```
 93 RDN
 94 RTN

 95◆LBL 03
 96 RDN
 97 RDN
 98 RCL 04
 99 RCL 33
100 Y↑X
101 *
102 GTO 02

103◆LBL 04
104 .0638
105 GTO 07

106◆LBL 05
107 RDN
108 RDN
109 FS? 02
110 XEQ 04
111 .125

112◆LBL 07
113 CF 02
114 RCL 36
115 *
116 "QC"
117 XEQ 88

118◆LBL 06
119 RDN
120 RDN
121 STO 36
122 GTO 02

123◆LBL 08
124 1
125 ST+ 01
126 RDN
127 RTN

128◆LBL 09
129 .00355      FIXED VARIABLES FOR EMPTY WEIGHT
130 STO 05
131 .787
132 STO 06
133 .98
134 STO 07
135 .0221
136 STO 09
137 .778
138 STO 10
139 .68
140 STO 11
```

```
141 .165
142 STO 13
143 .82
144 STO 14
145 .456
146 STO 15
147 .299
148 STO 17
149 .954
150 STO 18
151 .526
152 STO 19
153 .00417
154 STO 21
155 .818
156 STO 22
157 1.23
158 STO 23
159 2.19
160 STO 25
161 .828
162 STO 26
163 .696
164 STO 27
165 .000293
166 STO 29
167 .644
168 STO 30
169 .767
170 STO 33
171 "EMP WGT
      ?"
172 PROMPT
173 STO 02
174 GTO 11

175◆LBL 10
176 .00445        FIXED VARIABLES FOR UNIT WEIGHT
177 STO 05
178 .758
179 STO 06
180 1.03
181 STO 07
182 .0296
183 STO 09
184 .734
185 STO 10
186 .743
187 STO 11
188 .235
189 STO 13
190 .77
191 STO 14
192 .522
193 STO 15
```

```
194 .404
195 STO 17
196 .905
197 STO 18
198 .604
199 STO 19
200 .00761
201 STO 21
202 .761
203 STO 22
204 1.28
205 STO 23
206 3.56
207 STO 25
208 .779
209 STO 26
210 .745
211 STO 27
212 .000617
213 STO 29
214 .584
215 STO 30
216 .805
217 STO 33
218 "UNIT WG
        T?"
219 PROMPT
220 STO 02
221 GTO 11

222◆LBL 12
223 .75
224 *
225 RTN
226 .END.
```

NORTHROP

```
01◆LBL "NOR      NORTHROP FIGHTER/ATTACK MODEL
          "
02 0
03 STO 50
04 3
05 STO 51
06 "DTJ"         SELECT ENGINE TYPE
07 XEQ 04
08 XEQ 09
09 "ABTF"
10 XEQ 04
11 XEQ 09
12 "ABTJ"
13 XEQ 04

14◆LBL 08
15 SF 10
16 3
17 STO 51
18 "AW-A/A-      SELECT AIRCRAFT FUNCTION
      A/G"
19 XEQ 04
20 XEQ 09
21 "AW-SF"
22 XEQ 04
23 XEQ 09
24 "VFR-SF"
25 XEQ 04

26◆LBL 07
27 "N F"         NEW FIGHTER?
28 XEQ 04
29 SF 08
30 "S S"         SINGLE SEAT?
31 XEQ 04

32◆LBL 19
33 "AF LR"       AIRFRAME LEARNING RATE? (DECIMAL)
34 XEQ 01
35 STO 00
36 "EW"          EMPTY WEIGHT?
37 XEQ 02
38 STO 01
39 "%G"          PERCENT GRAPHITE? (DECIMAL)
40 XEQ 02
41 XEQ 03
42 1700
43 *
44 STO 02
45 "%T"          PERCENT TITANIUM? (DECIMAL)
46 XEQ 02
47 XEQ 03
48 10700
49 *
50 ST+ 02
```

```
 51 "%O"          PERCENT OTHER ADVANCED MATERIAL?
 52 XEQ 02        (DECIMAL)
 53 XEQ 03
 54 2150
 55 *
 56 ST+ 02
 57 RCL 02
 58 STO 08
 59 "AF 750"      AIRFRAME COST AT 750 AIRCRAFT
 60 XEQ 00
 61 "EN LR"       ENGINE LEARNING RATE? (DECIMAL)
 62 XEQ 01
 63 STO 03
 64 FS? 02
 65 GTO 11
 66 "FMIL"        DRY TURBOJET
 67 XEQ 02
 68 STO 37
 69 .96
 70 Y↑X
 71 58
 72 *
 73 FS? 00
 74 GTO 10
 75 "BPR"         DRY TURBOFAN
 76 XEQ 02
 77 1
 78 +
 79 FS? 01
 80 GTO 12
 81 -.15
 82 Y↑X
 83 *
 84 GTO 10

 85◆LBL 12        AFTERBURNER TURBOFAN
 86 .52
 87 Y↑X
 88 *
 89 "FMAX"
 90 XEQ 02
 91 RCL 37
 92 -
 93 .08
 94 Y↑X
 95 *
 96 GTO 10

 97◆LBL 11        AFTERBURNER TURBOJET
 98 "FMIL"
 99 XEQ 02
100 STO 37
101 .96
102 Y↑X
103 64
```

```
104 *
105 "FMAX"
106 XEQ 02
107 RCL 37
108 -
109 .06
110 Y↑X
111 *

112◆LBL 10
113 "PU 1000"      UNIT COST AT 1000 ENGINES
114 XEQ 00
115 "N"
116 XEQ 02
117 STO 38
118 RCL 03
119 1
120 +
121 STO 04
122 Y↑X
123 *
124 .75
125 RCL 03
126 Y↑X
127 *
128 RCL 04
129 /
130 STO 05
131 ST+ 08
132 "P 750"       ENGINE PER AIRCRAFT COST AT 750 AIRCRAFT
133 XEQ 00
134 "AV LR"       AVIONICS LEARNING RATE? (DECIMAL)
135 XEQ 01
136 STO 06
137 FS? 03
138 1500          AW/AG/AA
139 FS? 04
140 900           AW/SF
141 FS? 05
142 600           VFR/SF
143 "AV WT"       UNINSTALLED AVIONICS WEIGHT?
144 XEQ 02
145 *
146 STO 07
147 ST+ 08
148 "E 750"       AVIONICS PER AIRCRAFT COST AT 750 AIRCRAFT
149 XEQ 00
150 RCL 08
151 "F 750"       AVERAGE FLYAWAY COST AT 750 AIRCRAFT
152 XEQ 00
153 RCL 08
154 1.411
155 Y↑X           RDT&E = .376[F750^1.411]
156 .376                    69
```

```
157 *
158 STO 09
159 STO 27
160 "RΣD"          RDT&E OUTPUT 77 $
161 XEQ 00
162 "UF"
163 XEQ 02
164 "NYRS"
165 XEQ 02
166 *
167 STO 11
168 "UR"
169 XEQ 02
170 STO 12
171 *
172 STO 13
173 .0260          FLYING HOUR MAINT.
174 STO 14
175 .6859
176 STO 15
177 FS? 06
178 XEQ 13
179 .182 E06       OTHER RECURRING MAINT.
180 STO 17
181 8.9
182 STO 18
183 .5647
184 STO 19
185 9.96 E06
186 STO 20
187 FS? 07
188 XEQ 14
189 .00142         UNIT EQUIPMENT RELATED MAINT.
190 STO 21
191 1.158
192 STO 22
193 FS? 06
194 XEQ 15
195 "$/GAL"        POL
196 XEQ 02
197 STO 39
198 .0032
199 *
200 RCL 38
201 "F*S"          MILITARY RATED THRUST/ENGINE *
202 XEQ 02         SPECIFIC FUEL CONSUMPTION, UNINSTALLED
203 *
204 STO 40
205 .577
206 Y↑X
207 *
208 RCL 01
209 "L/D"
210 XEQ 02
211 /
```

```
212 STO 41
213 1.01
214 Y↑X
215 *
216 FS? 01
217 XEQ 16
218 FS? 02
219 XEQ 16
220 STO 23
221 "POL$/FH"      POL COST/FLYING HOUR 77 $
222 XEQ 00
223 "Q"           NUMBER OF AIRCRAFT OF INTEREST?
224 XEQ 02
225 STO 24
226 750
227 /
228 STO 25
229 RCL 00
230 Y↑X
231 RCL 24
232 RCL 02
233 XEQ 17
234 STO 28
235 STO 26
236 "AQ"          AIRFRAME COST 77 $
237 XEQ 00
238 RCL 25
239 RCL 03
240 Y↑X
241 RCL 24
242 RCL 05
243 XEQ 17
244 STO 29
245 ST+ 26
246 "PQ"          ENGINE COST 77 $
247 XEQ 00
248 RCL 25
249 RCL 06
250 Y↑X
251 RCL 24
252 RCL 07
253 XEQ 17
254 STO 30
255 ST+ 26
256 "EQ"          AVIONICS COST 77 $
257 XEQ 00
258 RCL 26
259 ST+ 27
260 "FQ"          AIRCRAFT COST 77 $
261 XEQ 00
262 RCL 26
263 .37
264 *
265 STO 31
```

```
266 ST+ 27
267 "I OΣS"      INITIAL OPERATIONS AND SUPPORT COST
268 XEQ 00       77 $
269 RCL 08
270 RCL 15
271 Y↑X
272 RCL 14
273 RCL 24
274 RCL 13
275 XEQ 18
276 STO 32
277 ST+ 27
278 "FH OΣS"     O&S COST /FLYING HOUR 77 $
279 XEQ 00
280 RCL 11
281 .0045
282 RCL 26
283 XEQ 17
284 STO 33
285 ST+ 27
286 "CL IV M     CLASS IV MODIFICATIONS COST 77 $
    "
287 XEQ 00
288 RCL 08
289 RCL 22
290 Y↑X
291 RCL 11
292 RCL 24
293 RCL 21
294 XEQ 18
295 STO 34
296 ST+ 27
297 "UE OΣS"     UNIT EQUIPMENT O&S COST 77 $
298 XEQ 00
299 RCL 13
300 RCL 24
301 RCL 23
302 XEQ 17
303 STO 35
304 ST+ 27
305 "POL OΣS     POL O&S COST 77 $
    "
306 XEQ 00
307 RCL 08
308 RCL 19
309 Y↑X
310 RCL 18
311 *
312 RCL 20
313 RCL 12
314 /
315 -
316 RCL 17
317 +
318 RCL 11
```

```
319 RCL 24
320 XEQ 17
321 STO 36
322 ST+ 27
323 "OTH OΣS"      OTHER O&S COST 77 $
324 XEQ 00
325 RCL 27
326 "TLCC"
327 XEQ 00         TOTAL LIFE CYCLE COST 77 $
328 CF 01          CLEAR FLAGS
329 CF 02
330 CF 03
331 CF 04
332 CF 05
333 CF 06
334 CF 07
335 CF 08
336 CF 09
337 CF 10
338 "END"
339 AVIEW
340 STOP

341◆LBL 00         WORKING LABELS
342 "⊢="
343 ARCL X
344 AVIEW
345 STOP
346 RTN

347◆LBL 01
348 PROMPT
349 LN
350 2
351 LN
352 /
353 RTN

354◆LBL 02
355 "⊢?"
356 PROMPT
357 RTN

358◆LBL 03
359 RCL 01
360 *
361 .76
362 Y↑X
363 RTN

364◆LBL 04
365 "⊢?"
366 PROMPT
367 ASTO Y
```

```
368 "Y"
369 ASTO X
370 X=Y?
371 XEQ 05
372 XEQ 06
373 RTN

374◆LBL 05
375 SF IND 5
              0
376 RCL 51
377 ST+ 50
378 FS? 08
379 GTO 19
380 FS? 10
381 GTO 07
382 GTO 08

383◆LBL 06
384 1
385 ST+ 50
386 RTN

387◆LBL 09
388 1
389 ST- 51
390 RTN

391◆LBL 13
392 .000832
393 STO 14
394 .8912
395 STO 15
396 RTN

397◆LBL 14
398 .14 E06
399 STO 17
400 RTN

401◆LBL 15
402 4.56
403 STO 21
404 .6222
405 STO 22
406 RTN

407◆LBL 16
408 RCL 39
409 1.5
410 *
411 RCL 40
412 .187
413 Y↑X
414 *
```

```
415 RCL 41
416 .627
417 Y↑X
418 *
419 RTN

420◆LBL 17
421 *
422 *
423 RTN

424◆LBL 18
425 *
426 *
427 *
428 RTN
429 .END.
```

GRUMMAN

```
 01◆LBL "L1"     GRUMMAN WORKING LABELS:
 02◆LBL "15"     INPUT
 03 STO IND
00
 04 1
 05 ST+ 00
 06 RDN
 07 RTN
 08◆LBL "16"
 09 "⊢?"
 10 PROMPT
 11 STO IND
01
 12 1
 13 ST+ 01
 14 RDN
 15 RTN
 16◆LBL "18"
 17 STO IND
01
 18 1
 19 ST+ 01
 20 RDN
 21 RTN
 22 .END.

 01◆LBL "L2"     REPETITIVE FORMULAS
 02◆LBL "4"
 03 1
 04 ST+ 00
 05 RDN
 06 RTN
 07◆LBL "7"
 08 XEQ "12"
 09 XEQ "13"
 10 XEQ "13"
 11 XEQ "14"
 12 RTN
 13◆LBL "8"
 14 1
 15 ST+ 00
 16 ST+ 01
 17 RDN
 18 RTN
 19◆LBL "9"
 20 XEQ "12"
 21 XEQ "13"
 22 XEQ "14"
 23 RTN
 24◆LBL "12"
 25 RCL IND
01
 26 RCL IND
00
```

```
 27 Y↑X
 28 XEQ "8"
 29 RTN
 30◆LBL "13"
 31 RCL IND
01
 32 RCL IND
00
 33 Y↑X
 34 *
 35 XEQ "8"
 36 RTN
 37◆LBL "14"
 38 RCL IND
00
 39 *
 40 XEQ "4"
 41 RTN
 42◆LBL "27"
 43 RCL 44
 44 RCL 43
 45 *
 46 *
 47 RCL 30
 48 *
 49 RCL 02
 50 *
 51 RTN
 52◆LBL "1"
 53 RCL 02
 54 *
 55 RTN
 56◆LBL "29"
 57 RCL 48
 58 GTO "31"
 59◆LBL "30"
 60 RCL 51
 61 GTO "31"
 62 .END.

 01◆LBL "L3"     REPETITIVE FORMULAS
 02◆LBL "10"
 03 XEQ "12"
 04 XEQ "14"
 05 RTN
 06◆LBL "11"
 07 XEQ "12"
 08 XEQ "13"
 09 XEQ "13"
 10 XEQ "13"
 11 XEQ "14"
 12 RTN
 13◆LBL "17"
 14 1
```

```
 15 ST+ 01
 16 RDN
 17 RTN
 18 .END.

 01◆LBL "L4"      MULTIPLE SUMMATION
 02◆LBL "34"
 03 +
 04 +
 05 +
 06 RTN
 07◆LBL "35"
 08 +
 09 +
 10 RTN
 11 .END.

 01◆LBL "L5"      REPETITIVE FORMULAS
 02◆LBL "39"
 03 RCL IND
01
 04 RCL IND
00
 05 *
 06 XEQ "8"
 07 RTN
 08◆LBL "4"
 09 1
 10 ST+ 00
 11 RDN
 12 RTN
 13◆LBL "8"
 14 1
 15 ST+ 00
 16 ST+ 01
 17 RDN
 18 RTN
 19◆LBL "40"
 20 RCL IND
00
 21 +
 22 XEQ "4"
 23 RTN
 24◆LBL "41"
 25 RCL IND
00
 26 -
 27 XEQ "4"
 28 RTN
 29◆LBL "42"
 30 XEQ "39"
 31 XEQ "39"
 32 +
 33 RTN
```

```
34◆LBL "43"
35 XEQ "39"
36 XEQ "39"
37 -
38 RTN
39◆LBL "44"
40 XEQ "42"
41 XEQ "39"
42 -
43 XEQ "40"
44 RTN
45◆LBL "45"
46 XEQ "42"
47 XEQ "40"
48 RTN
49◆LBL "46"
50 XEQ "42"
51 XEQ "41"
52 RTN
53◆LBL "47"
54 XEQ "43"
55 XEQ "39"
56 +
57 XEQ "40"
58 RTN
59◆LBL "48"
60 XEQ "43"
61 XEQ "40"
62 RTN
63◆LBL "49"
64 XEQ "43"
65 XEQ "41"
66 RTN
67 .END.

01◆LBL "L6"     FLAG SET / REPETITIVE FORMULAS
02◆LBL "36"
03 SF 01
04 SF 03
05 RTN
06◆LBL "37"
07 RCL IND
01
08 XEQ "17"
09 +
10 RTN
11 .END.

01◆LBL "L7"     REPETITIVE FORMULAS
02◆LBL "33"
03 *
04 +
05 XEQ "17"
06 RTN
```

```
07 .END.

01◆LBL "L8"      AVIONICS MULTIPLE
02◆LBL "32"
03 "ECM?"
04 PROMPT
05 ASTO Y
06 "N"
07 ASTO X
08 X=Y?
09 GTO "HI"
10 RCL 11
11 1.5
12 *
13 STO 12
14 GTO "IH"
15 .END.

01◆LBL "L9"      REPETITIVE FORMULAS
02◆LBL "21"
03 RCL IND
00
04 RCL IND
01
05 *
06 XEQ "8"
07 +
08 RTN
09◆LBL "23"
10 RCL IND
00
11 XEQ "4"
12 XEQ "21"
13 XEQ "21"
14 XEQ "21"
15 XEQ "21"
16 XEQ "21"
17 RTN
18◆LBL "22"
19 XEQ "23"
20 XEQ "21"
21 RTN
22◆LBL "24"
23 XEQ "25"
24 XEQ "21"
25 RTN
26◆LBL "25"
27 XEQ "22"
28 XEQ "21"
29 RTN
30 .END.

01◆LBL "T"       PROGRESS CURVE APPLICATION
02 RCL 15
```

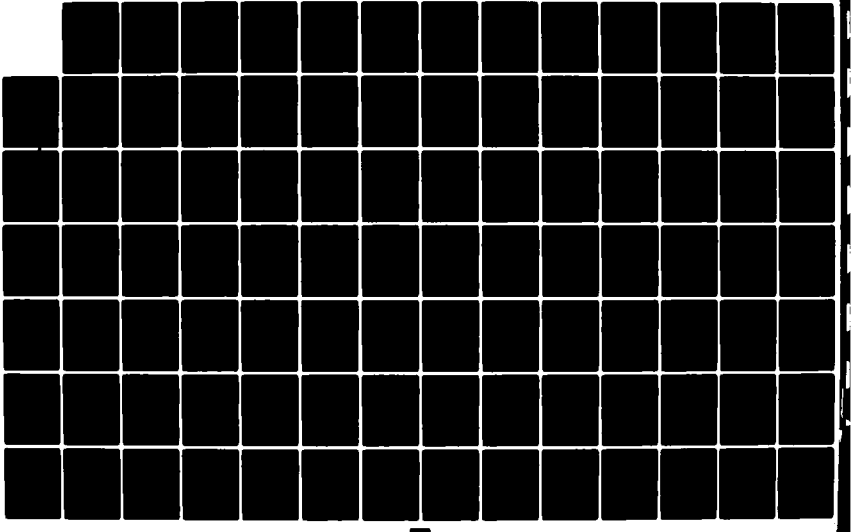
```
03 RCL 31
04 1
05 +
06 Y↑X
07 1
08 -
09 RCL 31
10 1
11 +
12 /
13 RCL 15
14 RCL 31
15 Y↑X
16 1
17 +
18 2
19 /
20 +
21 RCL 15
22 RCL 31
23 1
24 -
25 Y↑X
26 1
27 -
28 RCL 31
29 *
30 12
31 /
32 +
33 RCL 31
34 2
35 -
36 RCL 31
37 1
38 -
39 *
40 RCL 31
41 *
42 RCL 31
43 3
44 -
45 RCL 15
46 X<>Y
47 Y↑X
48 1
49 -
50 *
51 720
52 /
53 -
54 RCL 18
55 *
56 RTN
```

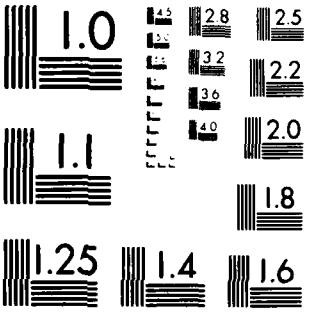
```
57 .END.

01◆LBL "R"          RESET EXTENDED MEMORY
02 100
03 STO 00
04 150
05 STO 01
06 RTN
07◆LBL "O"          LABEL OUTPUT
08 "⊢="
09 ARCL X
10 AVIEW
11 STOP
12 RTN
13 END

01◆LBL "AM          ADVANCED MATERIAL ADJUSTMENT FACTORS
02 174              SET 174-176 TO 0
03 STO 99
04 0
05 STO IND
99
06 1
07 ST+ 99
08 RDN
09 STO IND
99
10 1
11 ST+ 99
12 RDN
13 STO IND
99
14 XEQ 14
15 XEQ 19
16 XEQ 19
17 XEQ 19
18 XEQ 15
19 .99              ENTER AM TABLE VALUES
20 XEQ 13
21 1.75
22 XEQ 13
23 .85
24 XEQ 13
25 .75
26 XEQ 13
27 1.24
28 XEQ 13
29 1.98
30 XEQ 13
31 1.53
32 XEQ 13
33 1.38
34 XEQ 13
35 1.73
```

AD-A123 045 THE UTILITY OF HANDHELD PROGRAMMABLE CALCULATORS IN AIRCRAFT LIFE CYCLE C..(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF SYST.. D P BROOKS

2/3

UNCLASSIFIED SEP 82 AFIT-LSSR-41-82 F/G 1/0 NL





```
36 XEQ 13
37 1.73
38 XEQ 13
39 2.65
40 XEQ 13
41 .79
42 XEQ 13
43 2.13
44 XEQ 13
45 3.02
46 XEQ 13
47 11.45
48 XEQ 13
49 .82
50 XEQ 13
51 1.72
52 XEQ 13
53 .95
54 XEQ 13
55 .86
56 XEQ 13
57 1.25
58 XEQ 13
59 2.1
60 XEQ 13
61 1.6
62 XEQ 13
63 1.38
64 XEQ 13
65 1.73
66 XEQ 13
67 1.73
68 XEQ 13
69 2.48
70 XEQ 13
71 .87
72 XEQ 13
73 2.44
74 XEQ 13
75 3.45
76 XEQ 13
77 13.1
78 XEQ 13
79 1.37
80 XEQ 13
81 1.64
82 XEQ 13
83 .95
84 XEQ 13
85 .89
86 XEQ 13
87 1.27
88 XEQ 13
89 1.74
```

```
 90 XEQ 13
 91 1.41
 92 XEQ 13
 93 1.38
 94 XEQ 13
 95 1.73
 96 XEQ 13
 97 1.73
 98 XEQ 13
 99 2.64
100 XEQ 13
101 .8
102 XEQ 13
103 2.18
104 XEQ 13
105 3.09
106 XEQ 13
107 11.73
108 XEQ 13
109 XEQ 06
110 XEQ 07
111 XEQ 08
112 XEQ 18
113 "W"                 STORE ALPHA PROMPTS
114 XEQ 09
115 "F"
116 XEQ 09
117 "N"
118 XEQ 09
119 "T"
120 XEQ 09
121 "TI"
122 XEQ 10
123 "S"
124 XEQ 10
125 "G"
126 XEQ 10
127 "GR"
128 XEQ 10
129 "B"
130 XEQ 10
131 XEQ 06
132◆LBL 01              VIEW STRUCTURE PROMPTS
133 XEQ 05
134 XEQ 07
135 CLA
136 ARCL IND
 00
137 AVIEW
138 PSE
139 PSE
140 XEQ 11
141◆LBL 02              INPUT MATERIAL %
142 CLA
```

```
143 ARCL IND
 01
144 "⊢%=?"
145 PROMPT
146 STO IND
02
147 XEQ 12
148 XEQ 03
149 DSE 03        MATERIALS / STRUCTURE LOOP
150 GTO 02
151 DSE 04        STRUCTURE LOOP
152 GTO 01
153 XEQ 05
154 XEQ 18
155 XEQ 15
156 XEQ 08
157 15.00001
158 STO 07
159 3.00001
160 STO 08
161 XEQ 14
162◆LBL 04        % * TABLE VALUES
163 RCL IND
05
164 RCL IND
02
165 *
166 ST+ IND
06
167 XEQ 03
168 DSE 03        MATERIALS / STRUCTURE LOOP
169 GTO 04
170 5
171 ST- 02
172 XEQ 05
173 1
174 ST+ 06
175 DSE 08        NACELLE REPEAT
176 GTO 04
177 3
178 ST- 06
179 5
180 ST+ 02
181 DSE 04        STRUCTURE LOOP
182 GTO 04
183 GTO 16
184◆LBL 03        WORKING LABELS
185 1
186 ST+ 02
187 ST+ 05
188 RTN
189◆LBL 05
190 5.00001
191 STO 03
```

```
192 RTN
193◆LBL 06
194 100
195 STO 00
196 RTN
197◆LBL 07
198 104
199 STO 01
200 RTN
201◆LBL 08
202 109
203 STO 02
204 RTN
205◆LBL 09
206 ASTO IND
 00
207 1
208 ST+ 00
209 RTN
210◆LBL 10
211 ASTO IND
 01
212 1
213 ST+ 01
214 RTN
215◆LBL 11
216 1
217 ST+ 00
218 RTN
219◆LBL 12
220 1
221 ST+ 01
222 RTN
223◆LBL 13
224 STO IND
05
225 1
226 ST+ 05
227 RTN
228◆LBL 14
229 174
230 STO 06
231 RTN
232◆LBL 15
233 129
234 STO 05
235 RTN
236◆LBL 17
237 1
238 ST+ 06
239 RTN
240◆LBL 18
241 4.00001
242 STO 04
```

```
243 RTN
244◆LBL 19
245 0
246 STO IND
06
247 XEQ 17
248 RTN
249◆LBL 16          VIEW OUTPUT
250 XEQ 14
251 RCL IND        STORE 174-176 IN 40-42
06
 252 STO 40
 253 STOP
 254 XEQ 17
 255 RCL IND
06
 256 STO 41
 257 STOP
 258 XEQ 17
 259 RCL IND
06
 260 STO 42
 261 "AM"
 262 PCLPS
 263 END

  01◆LBL "DA"      PERMANENT DATA INPUT
  02 99
  03 STO 35        STORE IN REGISTERS 99-35
  04 CLA
  05 "AL"
  06 XEQ 01
  07 "AT"
  08 XEQ 01
  09 "AVIW"
  10 XEQ 01
  11 "AVW"
  12 XEQ 01
  13 "ATBO"
  14 XEQ 01
  15 "B/H"
  16 XEQ 01
  17 "CW"
  18 XEQ 01
  19 "CFA"
  20 XEQ 01
  21 "CV"
  22 XEQ 01
  23 "EPR"
  24 XEQ 01
  25 "FFY"
  26 XEQ 01
  27 "FD"
  28 XEQ 01
  29 "FV"
```

```
30 XEQ 01
31 "FLVA"
32 XEQ 01
33 "H/M"
34 XEQ 01
35 "IFLW"
36 XEQ 01
37 "LW"
38 XEQ 01
39 "L+S"
40 XEQ 01
41 "MM"
42 XEQ 01
43 "MQT"
44 XEQ 01
45 "≠ACT"
46 XEQ 01
47 "≠APU"
48 XEQ 01
49 "≠C/A"
50 XEQ 01
51 "≠CLS"
52 XEQ 01
53 "NOENG"
54 "≠EN"
55 XEQ 01
56 "≠EX"
57 XEQ 01
58 "≠G+S"
59 XEQ 01
60 "≠HS"
61 XEQ 01
62 "≠IT"
63 XEQ 01
64 "≠S"
65 XEQ 01
66 "≠W"
67 XEQ 01
68 "ULF"
69 XEQ 01
70 "≠P"
71 XEQ 01
72 "RMFG"
73 XEQ 01
74 "SS"
75 XEQ 01
76 "TFF"
77 XEQ 01
78 "TGWC"
79 XEQ 01
80 "TGWM"
81 XEQ 01
82 "≠PSN"
83 XEQ 01
84 "TAVSS"
```

```
 85 XEQ 01
 86 "TT"
 87 XEQ 01
 88 "TKA"
 89 XEQ 01
 90 "TWA"
 91 XEQ 01
 92 "UR"
 93 XEQ 01
 94 "WN"
 95 XEQ 01
 96 2
 97 ST- 35
 98 "≠A"
 99 XEQ 01
100 7
101 ST- 35
102 "FH/A"
103 XEQ 01
104 "LC"
105 XEQ 01
106 7
107 ST- 35
108 "INF"
109 PROMPT
110 STO 35
111 "DA"
112 PCLPS
113◆LBL 01          LABEL INPUT REQUESTS
114 "⊢?"
115 PROMPT
116 STO IND
35
117 1
118 ST- 35
119 RTN
120 .END.

 01◆LBL "UAF        INPUT DATA FOR FIRST PRODUCTION
        D"          SUBPROGRAM
 02 189
 03 PSIZE           SET AVAILABLE STORAGE REGISTERS
 04 "L1"            RECALL REQUIRED WORKING LABELS
 05 GETSUB
 06 XEQ "R"
 07 1.162           STORE DATA
 08 XEQ "15"
 09 -.596
 10 XEQ "15"
 11 .803
 12 XEQ "15"
 13 .65339
 14 XEQ "15"
 15 "WA"
 16 XEQ "16"
```

```
 17 "WT/C"
 18 XEQ "16"
 19 RCL 68
 20 XEQ "18"
 21 "KFD"
 22 XEQ "16"
 23 1.111
 24 XEQ "15"
 25 .777
 26 XEQ "15"
 27 1.9499
 28 XEQ "15"
 29 "FWA"
 30 XEQ "16"
 31 RCL 88
 32 XEQ "18"
 33 .479
 34 XEQ "15"
 35 .563
 36 XEQ "15"
 37 310.51
 38 XEQ "15"
 39 "TA"
 40 XEQ "16"
 41 "≠T"
 42 XEQ "16"
 43 1.083
 44 XEQ "15"
 45 10.616
 46 XEQ "15"
 47 "NWA"
 48 XEQ "16"
 49 1.058
 50 XEQ "15"
 51 5.8247 E
-05
 52 XEQ "15"
 53 RCL 57
 54 XEQ "18"
 55 .489
 56 XEQ "15"
 57 .736
 58 XEQ "15"
 59 4.046
 60 XEQ "15"
 61 1.486 E-
05
 62 XEQ "15"
 63 RCL 70
 64 XEQ "18"
 65 RCL 87
 66 XEQ "18"
 67 "TPS"
 68 XEQ "16"
```

```
 69 .319
 70 XEQ "15"
 71 .649
 72 XEQ "15"
 73 .94
 74 XEQ "15"
 75 4.0108 E
-02
 76 XEQ "15"
 77 1.21 E-0
6
 78 XEQ "15"
 79 RCL 79
 80 XEQ "18"
 81 RCL 81
 82 XEQ "18"
 83 RCL 98
 84 XEQ "18"
 85 "SF"
 86 XEQ "16"
 87 RCL 63
 88 XEQ "18"
 89 .292
 90 XEQ "15"
 91 1.336
 92 XEQ "15"
 93 1.1635 E
-04
 94 XEQ "15"
 95 RCL 63
 96 XEQ "18"
 97 RCL 65
 98 XEQ "18"
 99 .827
100 XEQ "15"
101 1.569
102 XEQ "15"
103 -1.286
104 XEQ "15"
105 1.2567 E
-05
106 XEQ "15"
107 "MT"
108 XEQ "16"
109 STO 37
110 "TPEN"
111 XEQ "16"
112 RCL 98
113 XEQ "18"
114 1.27
115 XEQ "15"
116 .227
117 XEQ "15"
118 2.2555 E
```

```
-04
119 XEQ "15"
120 RCL 94
121 XEQ "18"
122 RCL 81
123 XEQ "18"
124 .55
125 XEQ "15"
126 1.312
127 XEQ "15"
128 .496
129 XEQ "15"
130 -2.45
131 XEQ "15"
132 3.312 E-
05
133 XEQ "15"
134 RCL 58
135 XEQ "18"
136 RCL 82
137 XEQ "18"
138 "CSD"
139 XEQ "16"
140 RCL 98
141 XEQ-"18"
142 1.128
143 XEQ "15"
144 2.4574 E
-03
145 XEQ "15"
146 RCL 72
147 XEQ "18"
148 "ANFT"
149 XEQ "16"
150 .782
151 XEQ "15"
152 .233
153 XEQ "15"
154 -2.304
155 XEQ "15"
156 2.4738 E
-05
157 XEQ "15"
158 RCL 84
159 XEQ "18"
160 RCL 71
161 XEQ "18"
162 RCL 98
163 XEQ "18"
164 1.027
165 XEQ "15"
166 1.3729 E
-02
167 XEQ "15"
```

```
168 RCL 73
169 XEQ "18"
170 .615
171 XEQ "15"
172 1.951 E-
04
173 XEQ "15"
174 RCL 93
175 XEQ "18"
176 .513
177 XEQ "15"
178 3.1535 E
-02
179 XEQ "15"
180 RCL 88
181 XEQ "18"
182 "UAFD"
183 PCLPS          CLEAR PROGRAM
184 .END.
 01◆LBL "UAF       EXECUTE FIRST SUBPROGRAM
        P"
 02 XEQ "R"
 03 "L2"          GET WORKING LABELS
 04 GETSUB
 05 "L3"
 06 GETSUB
 07 "L4"
 08 GETSUB
 09 "L6"
 10 GETSUB
 11 "FTR?"        IDENTIFY AIRCRAFT TYPE
 12 PROMPT
 13 ASTO Y
 14 "Y"
 15 ASTO X
 16 X=Y?
 17 SF 01
 18 "ATK?"
 19 PROMPT
 20 ASTO Y
 21 "Y"
 22 ASTO X
 23 X=Y?
 24 XEQ "36"
 25 "C/T?"
 26 PROMPT
 27 ASTO Y
 28 "Y"
 29 ASTO X        UPC
 30 X=Y?          STRUCTURE
 31 SF 02
 32 XEQ "7"         WING MH
 33 RCL IND
       01
```

```
34 *
35 STO 30
36 XEQ "17"
37 XEQ "9"          FUSELAGE MH
38 STO 02
39 XEQ "9"          TAIL MH
40 STO 03
41 XEQ "10"         NACELLE MH
42 STO 04
43 RCL 30
44 RCL 02
45 RCL 03
46 XEQ "34"
47 STO 54          STRUCTURE MH
48 RCL 30          CONVERT TO CURRENT $ (RATEMFG *)
49 RCL 66
50 *
51 STO 30
52 RCL 02
53 RCL 66
54 *
55 STO 02
56 RCL 03
57 RCL 66
58 *
59 STO 03
60 RCL 04
61 RCL 66
62 *
63 STO 04
64 RCL 30
65 RCL 02
66 RCL 03
67 XEQ "34"
68 1 E-06
69 *
70 STO 20          CUR $ M. STRUCTURE
71 XEQ "10"        RAW MATERIAL
72 STO 21
73 XEQ "7"         CREW SYSTEM
74 STO 05
75 XEQ "7"         FLIGHT CONTROLS
76 RCL IND
     01
77 RCL IND
     00
78 *
79 XEQ "8"
80 RCL IND
     01
81 *
82 XEQ "17"
83 +
84 STO 06
```

```
 85 XEQ "9"        LANDING GEAR
 86 STO 07
 87 XEQ "7"        ENGINE INSTALLATION
 88 STO 08
 89 XEQ "9"        ENVIRONMENTAL CONTROL SYSTEM
 90 STO 09
 91 XEQ "11"       ELECTRICAL
 92 STO 10
 93 XEQ "10"       HYDRAULIC
 94 1
 95 RCL-IND
          01
 96 -
 97 XEQ "17"
 98 .75
 99 *
100 1
101 +
102 *
103 STO 11
104 XEQ "7"        FUEL
105 STO 12
106 XEQ "10"       ARMAMENT
107 STO 13
108 XEQ "10"       CARGO HANDLING
109 STO 14
110 STO 32
111 RCL 05
112 RCL 07
113 XEQ "35"
114 RCL 06
115 RCL 08
116 RCL 09
117 XEQ "34"
118 RCL 10
119 RCL 11
120 RCL 12
121 XEQ "34"
122 RCL 13
123 +              SUMMATION SUBSYSTEMS
124 "SUBIF?"
125 PROMPT         INFLATION FACTOR
126 *
127 STO 29         CUR $ M. SUBSYSTEMS
128 RCL 21
129 "RMIF?"
130 PROMPT         RAW MATERIAL INFLATION FACTOR
131 *
132 STO 21         CUR $ M. RAW MATERIAL
133 +
134 RCL 20         CUR $ M. STRUCTURE
135 +              CUR $ M. AIRFRAME
136 XEQ "10"
137 *
```

```
138 STO 23          FINAL ASSEMBLY
139 "UAFP"
140 PCLPS           CLEAR PROGRAM
141 .END.
 01◆LBL "AF"        SECOND SUBPROGRAM  DATA INPUT
 02 "L1"            GET WORKING LABEL
 03 GETSUB
 04 XEQ "R"
 05 -.492           DATA INPUT
 06 XEQ "15"
 07 .8647
 08 XEQ "15"
 09 "PDR"
 10 XEQ "16"
 11 STO 16
 12 "REGR"          LABOR RATE INPUTS
 13 XEQ "16"
 14 "RFLT"
 15 XEQ "16"
 16 "REN"
 17 XEQ "16"
 18 "RMGT"
 19 XEQ "16"
 20 "RMFS"
 21 XEQ "16"
 22 "RFBS"
 23 XEQ "16"
 24 "RTDE"
 25 XEQ "16"
 26 "RTFB"
 27 XEQ "16"
 28 -.171
 29 XEQ "15"
 30 .1505
 31 XEQ "15"
 32 RCL 16
 33 XEQ "18"
 34 "RQCL"
 35 XEQ "16"
 36 "AF"
 37 PCLPS           CLEAR PROGRAM
 38 .END.
 01◆LBL "AFP"       EXECUTE SECOND SUBPROGRAM
                    "
 02 XEQ "R"
 03 "L2"            GET WORKING LABELS
 04 GETSUB
 05 "L3"
 06 GETSUB
 07 "L4"
 08 GETSUB
 09 "L7"
 10 GETSUB
 11 RCL 54
```

```
12 RCL 23
13 1 E06
14 *
15 STO 23          STRMH + FINASSY$/RATEMFG
16 RCL 66
17 /
18 +
19 STO 28
20 XEQ "10"        SUSTAINING MH
21 *
22 STO 22
23 RCL IND
     01
24 .331
25 *
26 XEQ "17"
27 RCL IND
     01
28 .021
29 XEQ "33"
30 RCL IND
     01
31 .085
32 XEQ "33"
33 RCL 22
34 *
35 STO 24          ENGINEERING CUR $
36 RCL IND
     01
37 .133
38 *
39 XEQ "17"
40 RCL 22
41 *
42 STO 25          PROGRAM MANAGEMENT CUR $
43 RCL IND
     01
44 .209
45 *
46 XEQ "17"
47 RCL 22
48 *
49 STO 26          MANUFACTURING SUPPORT CUR $
50 RCL IND
     01
51 .034
52 *
53 XEQ "17"
54 RCL IND
     01
55 .113
56 XEQ "33"
57 RCL IND
     01
```

```
 58 .074
 59 XEQ "33"
 60 RCL 22
 61 *
 62 STO 27          TOOLING CUR $
 63 RCL 26
 64 RCL 25
 65 RCL 24
 66 XEQ "34"
 67 STO 22          CUR $ SUSTAINING
 68 XEQ 55
 69 RCL 20          ADVANCED MATERIAL FACTOR
 70 1 E06
 71 *
 72 *
 73 STO 20          CUR $ STRUCTURE
 74 XEQ 56
 75 RCL 22          ADVANCED MATERIAL FACTOR
 76 *
 77 STO 22          CUR $ SUSTAINING
 78 XEQ 57
 79 RCL 21          ADVANCED MATERIAL FACTOR
 80 1 E06
 81 *
 82 *
 83 STO 21          CUR $ RAW MATERIALS
 84 "$APU?"
 85 PROMPT
 86 STO 15          INPUT APU COSTS
 87 STO 33
 88 XEQ "10"        QUALITY CONTROL MH
 89 RCL 28
 90 *
 91 STO 25
 92 RCL IND
          01
 93 *
 94 XEQ "17"
 95 STO 25          CUR $ QUALITY CONTROL
 96 RCL 20
 97 RCL 21
 98 RCL 22
 99 XEQ "35"
100 STO 53          UPC AIRFRAME
101 +
102 RCL 23
103 RCL 29
104 1 E06
105 *
106 XEQ "35"
107 STO 02
108 RCL 53
109 100
110 "LR AF?"
```

```
111 PROMPT
112 LN
113 2
114 LN
115 /
116 Y↑X
117 /
118 STO 53        1ST AIRFRAME UPC
119 RCL 02
120 RCL 23
121 RCL 29
122 1 E06
123 *
124 XEQ "35"
125 STO 24
126 "AFP"         CLEAR PROGRAM
127 PCLPS

128◆LBL 55        WORKING LABELS FOR SUBPROGRAM
129 1
130 RCL 40
131 XEQ 58
132 RTN

133◆LBL 56
134 1
135 RCL 41
136 XEQ 58
137 RTN

138◆LBL 57
139 1
140 RCL 42
141 XEQ 58
142 RTN

143◆LBL 58
144 X=0?
145 RDN
146 RTN
147 .END.
 01◆LBL "UAV      EXECUTE THIRD SUBPROGRAM
          "
 02 "L1"          GET WORKING LABELS
 03 GETSUB
 04 "L3"
 05 GETSUB
 06 100
 07 STO 01
 08 "ENTWR"       INPUT DATA
 09 XEQ "16"
 10 "TIT"
 11 XEQ "16"
 12 "MQT"
```

```
13 XEQ "16"
14 "EPR"
15 XEQ "16"
16 "SLM"
17 XEQ "16"
18 100
19 STO 01
20 RCL 89        FIGHTER AVIONICS UPC
21 .9
22 Y↑X
23 RCL 96
24 1.09
25 Y↑X
26 *
27 9.3797
28 *
29 "AVIF?"
30 PROMPT
31 STO 35
32 *
33 150
34 "AVLR?"
35 PROMPT
36 STO 49
37 XEQ 58
38 STO 48        1ST UNIT FIGHTER AVIONICS UPC
39 RCL 89
40 .97
41 Y↑X
42 RCL 96
43 *
44 11.34
45 *
46 RCL 35
47 *
48 150
49 RCL 49
50 XEQ 58
51 STO 51        1ST UNIT ATTACK AVIONICS UPC
52 RCL 89
53 2.34
54 Y↑X
55 RCL 96
56 1.35
57 Y↑X
58 *
59 1.3449 E
        -03
60 *
61 RCL 35
62 *
63 150
64 RCL 49
65 XEQ 58
```

```
 66 STO 50        1ST UNIT CARGO AVIONICS UPC
 67 RCL IND
          01
 68 LN
 69 8.86
 70 *
 71 XEQ "17"
 72 RCL IND
          01
 73 LN
 74 34.56
 75 *
 76 XEQ "17"
 77 +
 78 RCL IND
          01
 79 XEQ "17"
 80 -
 81 218.7
 82 -
 83 STO 38        DELTA TECHNOLOGY TIME
 84 RCL IND
          01
 85 STO 02
 86 .7
 87 *
 88 XEQ "17"
 89 RCL IND
          01
 90 X↑2
 91 *
 92 1
 93 -
 94 RCL 02
 95 +
 96 2116
 97 *             PRESS
 98 .647
 99 Y↑X
100 XEQ "17"
101 STO 02
102 RCL 37
103 .473
104 Y↑X
105 1.06
106 RCL 38
107 Y↑X
108 *
109 RCL 02
110 *
111 5.7363
112 *             ENGINE $ M.
113 1000
114 "ENLR"
```

```
115 PROMPT
116 XEQ 58
117 STO 49          1ST ENGINE $ M.
118 "UAV"
119 PCLPS           CLEAR PROGRAM

120◆LBL 58          SUBPROGRAM WORKING LABELS
121 LN
122 2
123 LN
124 /
125 Y↑X
126 /
127 RTN
128 .END.
 01◆LBL "RDD       RDT&E DATA INPUT
         "
 02 XEQ "R"
 03 "L1"           GET WORKING LABEL
 04 GETSUB
 05 RCL 57         INPUT DATA
 06 XEQ "18"
 07 RCL 67
 08 XEQ "18"
 09 RCL 68
 10 XEQ "18"
 11 RCL 81
 12 XEQ "18"
 13 RCL 62
 14 XEQ "18"
 15 1.259
 16 XEQ "15"
 17 .127
 18 XEQ "15"
 19 1.722
 20 XEQ "15"
 21 .399
 22 XEQ "15"
 23 4.756
 24 XEQ "15"
 25 1.214
 26 XEQ "15"
 27 .322
 28 XEQ "15"
 29 1.22
 30 XEQ "15"
 31 .345
 32 XEQ "15"
 33 7.604
 34 XEQ "15"
 35 1.288
 36 XEQ "15"
 37 .483
```

```
38 XEQ "15"
39 1.709
40 XEQ "15"
41 .516
42 XEQ "15"
43 24.265
44 XEQ "15"
45 .134
46 XEQ "15"
47 1.062
48 XEQ "15"
49 .416
50 XEQ "15"
51 .836
52 XEQ "15"
53 91.669
54 XEQ "15"
55 .085
56 XEQ "15"
57 .89
58 XEQ "15"
59 .448
60 XEQ "15"
61 .8
62 XEQ "15"
63 672.54
64 XEQ "15"
65 "DT"
66 XEQ "16"
67 "EPR"
68 XEQ "16"
69 "EAF"
70 XEQ "16"
71 "SLM"
72 XEQ "16"
73 1.124
74 XEQ "15"
75 .341
76 XEQ "15"
77 .274
78 XEQ "15"
79 1.554
80 XEQ "15"
81 4.492
82 XEQ "15"
83 "RDD"
84 PCLPS          CLEAR PROGRAM
85 .END.
01◆LBL "RDP      RDT&E EXECUTE FIRST SUBPROGRAM
          "
02 170           SET STORAGE REGISTER SIZE
03 PSIZE
04 XEQ "R"       GET WORKING LABELS
05 "L2"
```

```
06 GETSUB
07 "L3"
08 GETSUB
09 "L8"
10 GETSUB
11 XEQ "11"
12 STO 02        TOTAL ENGINEERING LABOR MH
13 4
14 ST- 01
15 XEQ "11"
16 STO 03        TOTAL TOOLING LABOR MH
17 4
18 ST- 01
19 XEQ "11"
20 "AFIF?"
21 PROMPT
22 STO 35        AIRFRAME INFLATION FACTOR
23 *
24 STO 04        CUR $ TOTAL OTHER DIRECT CHARGES
25 3
26 ST- 01
27 XEQ "11"
28 RCL 35
29 *
30 STO 05        CUR $ 1ST AIRFRAME MANUFACTURING MATERIAL
31 4
32 ST- 01
33 XEQ "11"
34 RCL 35
35 *
36 STO 06        CUR $ FIRST AIRFRAME LABOR
37 1
38 RCL 42        ADVANCED MATERIAL FACTOR
39 X=0?
40 RDN
41 RCL 05
42 *
43 STO 05
44 1
45 RCL 40
46 X=0?
47 RDN
48 RCL 06
49 *
50 STO 06
51 "RENGR?"
52 PROMPT
53 RCL 02
54 *
55 STO 02        CUR $ ENGINEERING LABOR
56 "RTDE?"
57 PROMPT
58 "RTFB?"
59 PROMPT
```

```
60 +
61 2
62 /
63 RCL 03
64 *
65 STO 03        CUR $ TOOLING LABOR
66 0
67 STO 21
68 STO 11
69 RCL 05
70 RCL 06
71 +
72 STO 19        FIRST AIRFRAME
73 "RED LR
      AF?"
74 PROMPT
75 STO 05
76 2
77 /
78 STO 06
79 FS? 01
80 GTO 00
81 5
82 STO 10

83◆LBL 06        RDT&E AIRFRAME LOOP
84 RCL 67
85 X>Y?
86 XEQ 01

87◆LBL 02
88 RCL 19
89 RCL 10
90 RCL 06
91 LN
92 2
93 LN
94 /
95 Y↑X
96 *
97 ST+ 21
98 1
99 ST- 10
100 DSE 10
101 GTO 02
102 RCL 11
103 X=0?
104 GTO 04
105 SF 07

106◆LBL 03
107 FS? 07
108 XEQ 05
109 RCL 12
```

```
110 RCL 11
111 RCL 05
112 LN
113 2
114 LN
115 /
116 Y↑X
117 *
118 ST+ 21
119 FS? 07
120 STO 12
121 1
122 ST- 11
123 CF 07
124 DSE 11
125 GTO 03

126◆LBL 04
127 RCL 21
128 STO 19
129 RCL 04
130 +
131 RCL 02
132 RCL 03
133 +
134 +
135 STO 36        CUR $ TOTAL RDT&E AIRFRAME
136 FS? 01
137 RCL 48
138 FS? 03
139 RCL 51
140 FS? 02
141 RCL 50
142 STO 50        RECALL AVIONICS UPC
143 1 E-06
144 *
145 STO 10        ADJUST FOR INS AND ECM
146 "INS?"
147 PROMPT
148 ASTO Y
149 "N"
150 ASTO X
151 X=Y?
152 GTO 20
153 RCL 10
154 .255
155 Y↑X
156 RCL 59
157 .232
158 Y↑X
159 *
160 2.718
161 *
162 GTO 21
```

```
163◆LBL 20
164 RCL 10
165 1.67
166 *

167◆LBL 21
168 .387
169 Y↑X
170 RCL 67
171 .731
172 Y↑X-
173 *
174 6.53
175 *
176 STO 11
177 RCL 77
178 1
179 X=Y?
180 XEQ "32"

181◆LBL "HI"
182 RCL 11
183 STO 12

184◆LBL "IH"
185 RCL 11
186 RCL 12
187 +
188 1 E06
189 *
190 STO 39       RDT&E AVIONICS
191 XEQ "11"
192 1.111
193 RCL 38
194 Y↑X
195 *
196 STO 13       FIRST HALF OF ENGINE COSTS
197 .9
198 LN
199 2
200 LN
201 /
202 STO 31
203 RCL 67
204 RCL 75
205 *
206 STO 17
207 "SPFAC?"
208 PROMPT
209 *
210 STO 16
211 0
212 STO 21
213 "RΣD LR
```

```
        EN?"
214 PROMPT
215 LN
216 2
217 LN
218 /
219 STO 02

220◆LBL 10
221 RCL 49
222 1 E-06
223 *
224 RCL 17
225 RCL 02
226 Y↑X
227 *
228 ST+ 21
229 DSE 17
230 GTO 10
231 RCL 21
232 RCL 67
233 RCL 75
234 *
235 /
236 RCL 16
237 *
238 1.5
239 *
240 STO 17       SECOND HALF OF ENGINE FORMULA
241 RCL 13
242 +
243 "ENIF?"
244 PROMPT
245 *
246 1 E06
247 *
248 STO 37       CUR $ RDT&E ENGINES
249 "RDP"
250 PCLPS        CLEAR PROGRAM

251◆LBL 01       WORKING LABELS SUBPROGRAM
252 RCL 67
253 RCL 10
254 -
255 STO 11
256 GTO 02

257◆LBL 00
258 12
259 STO 10
260 GTO 06

261◆LBL 05
262 RCL 19
```

```
263 STO 12
264 RTN
265 .END.
 01◆LBL "OUT      RDT&E AND PRODUCTION OUTPUT PROGRAM
                  "
 02 RCL 52
 03 RCL 67
 04 -             # OF PRODUCTION AIRCRAFT
 05 STO 15
 06 "L3"          GET WORKING LABELS
 07 GETSUB
 08 "L4"
 09 GETSUB
 10 "T"
 11 GETSUB
 12 RCL 36
 13 .1
 14 *
 15 ST+ 36        INTEGRATED LOGISTICS SUPPORT
 16 RCL 36
 17 "AFM"
 18 XEQ "0"       AIRFRAME RDT&E
 19 RCL 39
 20 "AV"
 21 XEQ "0"       AVIONICS RDT&E
 22 RCL 37
 23 "EN"
 24 XEQ "0"       ENGINE RDT&E
 25 XEQ "35"
 26 RCL 36
 27 "%GΣA?"
 28 PROMPT
 29 STO 05
 30 *
 31 PRX           GENERAL AND ADMINISTRATIVE RDT&E
 32 STO 06
 33 +
 34 RCL 05
 35 1
 36 +
 37 RCL 06
 38 *
 39 "%PR?"
 40 PROMPT
 41 STO 07
 42 *
 43 RCL 05
 44 /
 45 PRX           PROFIT RDT&E
 46 +
 47 "RΣD"
 48 XEQ "0"       TOTAL RDT&E
 49 RCL 33
```

```
50 RCL 29
51 1 E06
52 *
53 +
54 100
55 "LR SUB"
56 XEQ 56
57 STO 31
58 Y↑X
59 /
60 STO -18
61 XEQ "T"
62 STO 02
63 "SUB PRD
                "
64 XEQ "O"          SUBSYSTEM PRODUCTION
65 RCL 53
66 STO 18
67 "LR AF"
68 XEQ 56
69 STO 31
70 XEQ "T"
71 STO 03
72 "AF PRD"
73 XEQ "O"          AIRFRAME PRODUCTION
74 RCL 50
75 STO 18
76 "LR AV"
77 XEQ 56
78 STO 31
79 XEQ "T"
80 STO 04
81 "AV PRD"
82 XEQ "O"          AVIONICS PRODUCTION
83 RCL 49
84 STO 18
85 RCL 15
86 4
87 *
88 STO 15
89 "LR EN"
90 XEQ 56
91 STO 31
92 XEQ "T"
93 STO 08
94 "EN PRD"
95 XEQ "O"          ENGINE PRODUCTION
96 RCL 02
97 RCL 03
98 RCL 04
99 RCL 08
100 XEQ "34"
101 RCL 02
102 RCL 03
```

```
103 +
104 RCL 04
105 2
106 /
107 +
108 RCL 05
109 *
110 STO 06
111 "GΣA"
112 XEQ "0"       GENERAL AND ADMINISTRATIVE PRODUCTION
113 +
114 RCL 05
115 1
116 +
117 RCL 06
118 *
119 RCL 07
120 *
121 RCL 05
122 /
123 "PROF"
124 XEQ "0"       PROFIT PRODUCTION
125 +
126 "TOT PRD
    "
127 XEQ "0"       TOTAL PRODUCTION
128 "OUT"
129 PCLPS         CLEAR PROGRAM

130◆LBL 56        WORKING LABELS SUBPROGRAM
131 "⊢?"
132 PROMPT
133 LN
134 2
135 LN
136 /
137 RTN
138 .END.
                  INITIAL SUPPORT
 01◆LBL "ISD      INPUT DATA FIRST SUBPROGRAM IS
    "
 02 190           SET STORAGE REGISTER SIZE
 03 PSIZE
 04 XEQ "R"
 05 "L1"          GET WORKING LABELS
 06 GETSUB
 07 2.083         INPUT DATA
 08 XEQ "15"
 09 .704
 10 XEQ "15"
 11 -2.489
 12 XEQ "15"
 13 2.906 E-
       03
```

```
14 XEQ "15"
15 RCL 57
16 XEQ "18"
17 "≠B"
18 XEQ "16"
19 STO 40
20 RCL 98
21 XEQ "18"
22 .691
23 XEQ "15"
24 .923
25 XEQ "15"
26 1.068 E0
             3
27 XEQ "15"
28 RCL 57
29 XEQ "18"
30 RCL 81
31 XEQ "18"
32 1.896
33 XEQ "15"
34 1.92
35 XEQ "15"
36 1.095 E-
         04
37 XEQ "15"
38 RCL 57
39 XEQ "18"
40 RCL 81
41 XEQ "18"
42 1.156
43 XEQ "15"
44 .286
45 XEQ "15"
46 .195
47 XEQ "15"
48 RCL 87
49 XEQ "18"
50 RCL 70
51 XEQ "18"
52 .639
53 XEQ "15"
54 1.829
55 XEQ "15"
56 1.364
57 XEQ "15"
58 -1.29
59 XEQ "15"
60 1.205 E-
           06
61 XEQ "15"
62 RCL 87
63 XEQ "18"
64 RCL 88
```

```
 65 XEQ "18"
 66 RCL 59
 67 XEQ "18"
 68 RCL 98
 69 XEQ "18"
 70 1.196
 71 XEQ "15"
 72 2.684
 73 XEQ "15"
 74 289.89
 75 XEQ "15"
 76 RCL 70
 77 XEQ "18"
 78 RCL 81
 79 XEQ "18"
 80 1.294
 81 XEQ "15"
 82 .723
 83 XEQ "15"
 84 .53
 85 XEQ "15"
 86 RCL 69
 87 XEQ "18"
 88 RCL 63
 89 XEQ "18"
 90 .39
 91 XEQ "15"
 92 2.28
 93 XEQ "15"
 94 2.296
 95 XEQ "15"
 96 76.73
 97 XEQ "15"
 98 RCL 69
 99 XEQ "18"
100 RCL 65
101 XEQ "18"
102 RCL 98
103 XEQ "18"
104 .667
105 XEQ "15"
106 1.112
107 XEQ "15"
108 -2.602
109 XEQ "15"
110 5.399
111 XEQ "15"
112 RCL 69
113 XEQ "18"
114 RCL 64
115 XEQ "18"
116 RCL 98
117 XEQ "18"
118 1.868
```

```
119 XEQ "15"
120 .299
121 XEQ "15"
122 .506
123 XEQ "15"
124 RCL 82
125 XEQ "18"
126 RCL 79
127 XEQ "18"
128 .692
129 XEQ "15"
130 .619
131 XEQ "15"
132 -2.159
133 XEQ "15"
134 1.227 E0
              4
135 XEQ "15"
136 RCL 79
137 XEQ "18"
138 RCL 81
139 XEQ "18"
140 RCL 98
141 XEQ "18"
142 .92
143 XEQ "15"
144 1.6
145 XEQ "15"
146 73.374
147 XEQ "15"
148 RCL 79
149 XEQ "18"
150 RCL 81
151 XEQ "18"
152 -.654
153 XEQ "15"
154 .982
155 XEQ "15"
156 6.966
157 XEQ "15"
158 2.402 E-
              02
159 XEQ "15"
160 RCL 80
161 XEQ "18"
162 RCL 49
163 .4966
164 *
165 XEQ "18"
166 RCL 98
167 XEQ "18"
168 RCL 75
169 XEQ "18"
170 1.834
```

```
171 XEQ "15"
172 4.779
173 XEQ "15"
174 -8.759
175 XEQ "15"
176 621.79
177 XEQ "15"
178 RCL 75
179 XEQ "18"
180 RCL 78
181 1
182 +
183 XEQ "18"
184 RCL 98
185 XEQ "18"
186 "ISD"          CLEAR PROGRAM
187 PCLPS
188 .END.
 01◆LBL "ISP      EXECUTE FIRST SUBPROGRAM
          "
 02 XEQ "R"
 03 "L2"          GET WORKING LABELS
 04 GETSUB
 05 "L3"
 06 GETSUB
 07 "26"
 08 GETSUB
 09 FS? 02        SELECT SQUADRON MULTIPLES BY
 10 XEQ 51
 11 XEQ 52        TYPE AIRCRAFT

                  STRUCTURE
 12◆LBL 53
 13 XEQ "7"       INITIAL AND PIPELINE SPARES
 14 RCL 52
 15 STO 30
 16 *
 17 STO 15        I&PS STORE
 18 XEQ "9"       BASE LEVEL SUPPORT EQUIPMENT
 19 STO 08
 20 XEQ "26"
 21 ST+ 15        BLS STORE
 22 XEQ "9"       DATA
 23 XEQ "54"
 24 ST+ 15        D STORE
 25 XEQ "9"       CREW
 26 XEQ "55"
 27 STO 17        I&PS
 28 XEQ "11"
 29 STO 08
 30 XEQ "26"
 31 ST+ 17        BLS
 32 XEQ "9"
 33 XEQ "54"
 34 ST+ 17        D
```

```
35 XEQ "9"          LANDING GEAR
36 XEQ "55"
37 STO 19           I&PS
38 XEQ "7"
39 STO 08
40 XEQ "26"
41 ST+ 19           BLS
42 XEQ "7"
43 XEQ "54"
44 ST+ 19           D
45 XEQ "9"          FLIGHT CONTROLS
46 XEQ "55"
47 STO 21           I&PS
48 XEQ "7"
49 STO 08
50 XEQ "26"
51 ST+ 21           BLS
52 XEQ "9"
53 XEQ "54"
54 ST+ 21           D
55 XEQ "7"          ENGINE INSTALLATION
56 RCL IND
     01
57 *
58 XEQ "55"
59 STO 23           I&PS
60 XEQ "17"
61 XEQ "7"
62 XEQ "54"
63 ST+ 23           D
64 "ISP"
65 PCLPS            CLEAR PROGRAM

66◆LBL 51           WORKING LABELS SUBPROGRAM
67 1.587
68 STO 02
69 2.158
70 STO 03
71 GTO 53

72◆LBL 52
73 1.263
74 STO 02
75 1.527
76 STO 03
77 RTN
78 .END.
01◆LBL "Y"          SECOND SUBPROGRAM DATA
02 XEQ "R"
03 "L1"             GET WORKING LABELS
04 GETSUB
05 .106             INPUT DATA
06 XEQ "15"
07 3.932
```

```
08 XEQ "15"
09 6.249 E-
          06
10 XEQ "15"
11 RCL 94
12 XEQ "18"
13 RCL 82
14 XEQ "18"
15 .311
16 XEQ "15"
17 1.136
18 XEQ "15"
19 2.96 E04
20 XEQ "15"
21 RCL 94
22 XEQ "18"
23 RCL 81
24 XEQ "18"
25 2.482
26 XEQ "15"
27 1.086
28 XEQ "15"
29 -5.365
30 XEQ "15"
31 2.687 E-
          04
32 XEQ "15"
33 RCL 82
34 XEQ "18"
35 RCL 60
36 XEQ "18"
37 RCL 98
38 XEQ "18"
39 .2
40 XEQ "15"
41 2.251
42 XEQ "15"
43 7.863 E-
          02
44 XEQ "15"
45 RCL 58
46 XEQ "18"
47 RCL 82
48 XEQ "18"
49 .102
50 XEQ "15"
51 .639
52 XEQ "15"
53 4.081 E0
           5
54 XEQ "15"
55 RCL 58
56 XEQ "18"
57 RCL 81
```

```
 58 XEQ "18"
 59 .805
 60 XEQ "15"
 61 1.24
 62 XEQ "15"
 63 -3.758
 64 XEQ "15"
 65 2.528
 66 XEQ "15"
 67 RCL 58
 68 XEQ "18"
 69 RCL 60
 70 XEQ "18"
 71 RCL 98
 72 XEQ "18"
 73 .892
 74 XEQ "15"
 75 1.432
 76 XEQ "15"
 77 3.566
 78 XEQ "15"
 79 .173
 80 XEQ "15"
 81 RCL 82
 82 XEQ "18"
 83 RCL 72
 84 XEQ "18"
 85 RCL 98
 86 XEQ "18"
 87 1.088
 88 XEQ "15"
 89 .7
 90 XEQ "15"
 91 .107
 92 XEQ "15"
 93 21.654
 94 XEQ "15"
 95 RCL 64
 96 XEQ "18"
 97 RCL 72
 98 XEQ "18"
 99 RCL 82
100 XEQ "18"
101 .723
102 XEQ "15"
103 1.106
104 XEQ "15"
105 1.327
106 XEQ "15"
107 .378
108 XEQ "15"
109 RCL 82
110 XEQ "18"
111 RCL 72
```

```
112 XEQ "18"
113 RCL 81
114 XEQ "18"
115 .172
116 XEQ "15"
117 1.463
118 XEQ "15"
119 7.615 E-
          05
120 XEQ "15"
121 RCL 71
122 XEQ "18"
123 RCL 84
124 XEQ "18"
125 .962
126 XEQ "15"
127 -5.54
128 XEQ "15"
129 2.057
130 XEQ "15"
131 RCL 87
132 XEQ "18"
133 RCL 98
134 XEQ "18"
135 .743
136 XEQ "15"
137 .853
138 XEQ "15"
139 2.872 E0
          4
140 XEQ "15"
141 RCL 75
142 XEQ "18"
143 RCL 98
144 XEQ "18"
145 1.502
146 XEQ "15"
147 1.279
148 XEQ "15"
149 .796
150 XEQ "15"
151 RCL 73
152 XEQ "18"
153 RCL 82
154 XEQ "18"
155 2.411
156 XEQ "15"
157 1.182
158 XEQ "15"
159 9.511 E-
          08
160 XEQ "15"
161 RCL 62
162 XEQ "18"
```

```
163 RCL 73
164 XEQ "18"
165 1.432
166 XEQ "15"
167 .305
168 XEQ "15"
169 9.464 E-
          05
170 XEQ "15"
171 RCL 62
172 XEQ "18"
173 RCL 73
174 XEQ "18"
175 "Y"              CLEAR PROGRAM
176 PCLPS
177 .END.
 01◆LBL "YP"         EXECUTE SECOND SUBPROGRAM
 02 XEQ "R"
 03 "L2"             GET WORKING LABELS
 04 GETSUB
 05 "26"
 06 GETSUB
 07 XEQ "9"          ENVIRONMENTAL CONTROL SYSTEM
 08 XEQ 55
 09 STO 25           I&PS
 10 XEQ "9"
 11 STO 08
 12 XEQ "26"
 13 ST+ 25           BLS
 14 XEQ "7"
 15 XEQ 54
 16 ST+ 25           D
 17 XEQ "9"          ELECTRICAL
 18 XEQ 55
 19 STO 26           I&PS
 20 XEQ "9"
 21 STO 08
 22 XEQ "26"
 23 ST+ 26           BLS
 24 XEQ "7"
 25 XEQ 54
 26 ST+ 26           D
 27 XEQ "7"          HYDRAULIC
 28 XEQ 55
 29 STO 27           I&PS
 30 XEQ "7"
 31 STO 08
 32 XEQ "26"
 33 ST+ 27           BL
 34 XEQ "7"
 35 XEQ 54
 36 ST+ 27           D
 37 XEQ "9"          FUEL
 38 XEQ 55
```

```
39 STO 29        I&PS
40 XEQ "9"
41 XEQ 54
42 ST+ 29        D
43 XEQ "9"
44 STO 08
45 XEQ "26"
46 ST+ 29        BLS
47 XEQ "9"       ARMAMENT
48 XEQ 55
49 STO 31        I&PS
50 XEQ "9"
51 STO 08
52 XEQ "26"
53 ST+ 31        BLS
54 XEQ "9"
55 XEQ 54
56 ST+ 31        D
57 RCL 32        CARGO HANDLING
58 1 E06
59 *
60 STO 45        RECALL UPC
61 .025
62 *
63 XEQ "55"
64 STO 32        I&PS
65 RCL 45
66 .02
67 *
68 STO 08
69 XEQ "26"
70 ST+ 32        BLS
71 RCL 45
72 .01
73 *
74 XEQ "54"
75 ST+ 32        D
76 RCL 33        APU
77 STO 45
78 .06
79 *
80 XEQ "55"
81 STO 33        I&PS
82 RCL 45
83 .01
84 *
85 STO 08
86 XEQ "26"
87 ST+ 33        BLS
88 RCL 45
89 .01
90 *
91 XEQ "54"
92 ST+ 33        D
```

```
 93 "YP"
 94 PCLPS          CLEAR PROGRAM

 95◆LBL 54         WORKING LABELS SUBPROGRAM
 96 1000
 97 *
 98 RTN

 99◆LBL 55
100 RCL 30
101 *
102 RTN
103 .END.
 01◆LBL "AV"       THIRD SUBPROGRAM DATA
 02 XEQ "R"
 03 "L1"           GET WORKING LABEL
 04 GETSUB
 05 2              INPUT DATA
 06 XEQ "15"
 07 2
 08 XEQ "15"
 09 -.86
 10 XEQ "15"
 11 56.414
 12 XEQ "15"
 13 RCL 96
 14 XEQ "18"
 15 RCL 97
 16 XEQ "18"
 17 RCL 98
 18 XEQ "18"
 19 1.491
 20 XEQ "15"
 21 .87
 22 XEQ "15"
 23 1.509
 24 XEQ "15"
 25 1.044 E-
       03
 26 XEQ "15"
 27 RCL 96
 28 XEQ "18"
 29 "≠DAYS"
 30 XEQ "16"
 31 RCL 64
 32 XEQ "18"
 33 2.06
 34 XEQ "15"
 35 -2.353
 36 XEQ "15"
 37 1.538 E-
       03
 38 XEQ "15"
 39 RCL 96
```

```
40 XEQ "18"
41 RCL 98
42 XEQ "18"
43 .755
44 XEQ "15"
45 -.429
46 XEQ "15"
47 .384
48 XEQ "15"
49 5.278 E0
        5
50 XEQ "15"
51 "ENTWR"
52 XEQ "16"
53 RCL 95
54 XEQ "18"
55 RCL 90
56 XEQ "18"
57 1.477
58 XEQ "15"
59 5.619
60 XEQ "15"
61 -.8217
62 XEQ "15"
63 2.268 E-
          17
64 XEQ "15"
65 RCL 81
66 XEQ "18"
67 "TIT"
68 XEQ "16"
69 RCL 98
70 XEQ "18"
71 2.002
72 XEQ "15"
73 3.425
74 XEQ "15"
75 2.034 E-
          09
76 XEQ "15"
77 RCL 63
78 XEQ "18"
79 RCL 88
80 XEQ "18"
81 "AV"
82 PCLPS          CLEAR PROGRAM
83 .END.
01◆LBL "AVP       EXECUTE THIRD SUBPROGRAM
          "
02 180            SET STORAGE REGISTER SIZE
03 PSIZE
04 XEQ "R"
05 "L2"           GET WORKING LABELS
06 GETSUB
```

```
07 "26"
08 GETSUB
09 "L4"
10 GETSUB
11 XEQ "12"      AVIONICS
12 XEQ "12"
13 +
14 .586
15 Y↑X
16 XEQ "13"
17 XEQ "14"
18 XEQ 55
19 STO 46        I&PS
20 XEQ "7"
21 STO 08
22 XEQ "26"
23 ST+ 46        BLS
24 XEQ "9"
25 XEQ 54
26 ST+ 46        D
27 RCL 30        ENGINE
28 RCL 75
29 *             # OF PRODUCTION AIRCRAFT ENGINES
30 RCL 49
31 .4966
32 *             FIRST ENGINE COST
33 .25
34 *
35 *
36 STO 45        I&PS
37 XEQ "7"
38 RCL 75
39 *
40 STO 08
41 XEQ "26"
42 ST+ 45        BLS
43 XEQ "7"
44 XEQ 54
45 ST+ 45        D
46 XEQ "9"       INITIAL TRAINING
47 RCL 97
48 1000
49 /
50 1.712
51 Y↑X
52 *
53 XEQ 54
54 FS? 01
55 GTO d
56 2.5           CARGO MULTIPLE
57 *

58◆LBL d
59 STO 35        IT
```

```
 60 FS? 02          IF CARGO SKIP
 61 GTO e

 62◆LBL "SSE        SPECIAL SUPPORT EQUIPMENT
                    "
 63 RCL 82
 64 1.349
 65 Y↑X
 66 998.18
 67 *
 68 RCL 52
 69 RCL 67
 70 -
 71 "≠A/S"
 72 PROMPT
 73 /
 74 *
 75 STO 36          SSE

 76◆LBL e
 77 FS? 01          ZERO UNUSED REGISTERS BY AIRCRAFT TYPE
 78 XEQ 56
 79 FS? 02
 80 XEQ 57
 81 "IS"            INITIAL SUPPORT OUTPUT
 82 PRA
 83 "STR"
 84 RCL 15
 85 XEQ "0"         STRUCTURE
 86 "CR"
 87 RCL 17
 88 ST+ 15
 89 XEQ "0"         CREW
 90 "LG"
 91 RCL 19
 92 ST+ 15
 93 XEQ "0"         LANDING GEAR
 94 "FC"
 95 RCL 21
 96 ST+ 15
 97 XEQ "0"         FLIGHT CONTROLS
 98 "EI"
 99 RCL 23
100 ST+ 15
101 XEQ "0"         ENGINE INSTALLATION
102 "ECS"
103 RCL 25
104 ST+ 15
105 XEQ "0"         ENVIRONMENTAL CONTROL SYSTEM
106 "EL"
107 RCL 26
108 ST+ 15
109 XEQ "0"         ELECTRICAL
110 "HYD"
```

```
111 RCL 27
112 ST+ 15
113 XEQ "0"       HYDRAULIC
114 "FUEL"
115 RCL 29
116 ST+ 15
117 XEQ "0"       FUEL
118 "CH"
119 RCL 32
120 ST+ 15
121 XEQ "0"       CARGO HANDLING
122 "ARM"
123 RCL 31
124 ST+ 15
125 XEQ "0"       ARMAMENT
126 "APU"
127 RCL 33
128 ST+ 15
129 XEQ "0"       APU
130 "%GΣA?"
131 PROMPT
132 STO 02
133 RCL 15
134 RCL 46
135 +
136 *
137 STO 03
138 ST+ 15
139 "GΣA"
140 XEQ "0"       GENERAL AND ADMINISTRATIVE
141 RCL 02
142 1
143 +
144 RCL 03
145 *
146 "%PROF?"
147 PROMPT
148 *
149 RCL 02
150 /
151 ST+ 15
152 "PROF"
153 XEQ "0"       PROFIT
154 "SSE"
155 RCL 36
156 ST+ 15
157 XEQ "0"       SPECIAL SUPPORT EQUIPMENT
158 "IT"
159 RCL 35
160 ST+ 15
161 XEQ "0"       INITIAL TRAINING
162 "EN"
163 RCL 45
164 ST+ 15
```

```
165 XEQ "O"          ENGINE
166 "AV"
167 RCL 46
168 ST+ 15
169 XEQ "O"          AVIONICS
170 "TOT IS"
171 RCL 15
172 XEQ "O"          TOTAL INITIAL SPARES
173 "AVP"
174 PCLPS            CLEAR PROGRAM

175◆LBL 54           WORKING LABELS SUBPROGRAM
176 1000
177 *
178 RTN

179◆LBL 55
180 RCL 30
181 *
182 RTN

183◆LBL 56
184 0
185 STO-32
186 STO 33
187 RTN

188◆LBL 57
189 0
190 STO 31
191 STO 36
192 RTN
193 .END.
```

```
01◆LBL "OSD      CARGO OPERATIONS AND SUPPORT
        "        FIRST SUBPROGRAM DATA
02 XEQ "P"
03 "L1"          GET WORKING LABELS
04 GETSUB
05 RCL 74        INPUT DATA
06 XEQ "18"
07 1.691
08 XEQ "15"
09 RCL 92
10 XEQ "18"
11 8.966 E-
          02
12 XEQ "15"
13 RCL 56
14 XEQ "18"
15 2.339 E-
          02
16 XEQ "15"
17 14.421
18 XEQ "15"
19 RCL 76
20 XEQ "18"
21 6.425 E-
          02
22 XEQ "15"
23 "MLD"
24 XEQ "16"
25 STO 03
26 .613 E-0
          3
27 XEQ "15"
28 1.956
29 XEQ "15"
30 RCL 74
31 XEQ "18"
32 .401
33 XEQ "15"
34 RCL 85
35 XEQ "18"
36 4.648
37 XEQ "15"
38 RCL 55
39 XEQ "18"
40 .148
41 XEQ "15"
42 -.856
43 XEQ "15"
44 RCL 91
45 XEQ "18"
46 1.505 E-
          03
47 XEQ "15"
48 "CSW"
49 XEQ "16"
```

```
50 XEQ "18"
51 2.915 E-
      03
52 XEQ "15"
53 24.28
54 XEQ "15"
55 RCL 56
56 XEQ "18"
57 .367 E-0
      3
58 XEQ "15"
59 4.286 E-
      04
60 XEQ "15"
61 .419
62 XEQ "15"
63 "≠PCP"
64 XEQ "16"
65 RCL 61
66 XEQ "18"
67 RCL 85
68 XEQ "18"
69 3.523
70 XEQ "15"
71 1.927
72 XEQ "15"
73 -8.698
74 XEQ "15"
75 4.329 E-
      02
76 XEQ "15"
77 RCL 69
78 XEQ "18"
79 2.096
80 XEQ "15"
81 "MVSQ"
82 XEQ "16"
83 2.357 E-
      09
84 XEQ "15"
85 RCL 56
86 XEQ "18"
87 2.356 E-
      02
88 XEQ "15"
89 10.917
90 XEQ "15"
91 RCL 83
92 1 E-03
93 *
94 RCL 69
95 /
96 XEQ "18"
97 RCL 56
98 XEQ "18"
```

```
 99 2.31
100 XEQ "15"
101 -1.32
102 XEQ "15"
103 22.931
104 XEQ "15"
105 RCL 83
106 1 E-03
107 *
108 RCL 69
109 /
110 XEQ "18"
111 RCL 03
112 1 E-03
113 *
114 XEQ "18"
115 "≠LGB"
116 XEQ "16"
117 1.989
118 XEQ "15"
119 -2.274
120 XEQ "15"
121 .348
122 XEQ "15"
123 .131
124 XEQ "15"
125 RCL 99
126 XEQ "18"
127 .133
128 XEQ "15"
129 RCL 56
130 XEQ "18"
131 6.41 E-0
              3
132 XEQ "15"
133 3.469
134 XEQ "15"
135 RCL 76
136 XEQ "18"
137 .974 E-0
              2
138 XEQ "15"
139 RCL 85
140 XEQ "18"
141 .094
142 XEQ "15"
143 .28
144 XEQ "15"
145 RCL 62
146 1 E-03
147 *
148 XEQ "18"
149 "MAL"
150 PROMPT
151 1 E-03
```

```
152 *
153 XEQ "18"
154 RCL 56
155 XEQ "18"
156 .239
157 XEQ "15"
158 1.756
159 XEQ "15"
160 -.515
161 XEQ "15"
162 2.898 E-
          03
163 XEQ "15"
164 "OSD"
165 PCLPS          CLEAR PROGRAM
166 .END.
 01◆LBL "OSP      EXECUTE FIRST SUBPROGRAM
          "
 02 XEQ "R"
 03 "L2"          GET WORKING LABELS
 04 GETSUB
 05 "L3"
 06 GETSUB
 07 "L5"
 08 GETSUB
 09 RCL 30        NUMBER OF AIRCRAFT SUPPORTED
 10 "%SUP?"
 11 PROMPT
 12 STO 30
 13 *
 14 STO 30
 15 XEQ "44"      STRUCTURE
 16 STO 17        BASE LEVEL MAINTENANCE
 17 XEQ "48"
 18 STO 51        REPLENISHMENT SPARES
 19 XEQ "47"
 20 STO 48        DEPOT COMPONENT REPAIR
 21 XEQ "48"      CREW
 22 ST+ 17        BLM
 23 XEQ "46"
 24 ST+ 51        RS
 25 XEQ "7"
 26 ST+ 48        DCR
 27 XEQ "44"      LANDING GEAR
 28 "≠L/M?"
 29 PROMPT
 30 RCL 43
 31 *
 32 *
 33 RCL 30
 34 *
 35 STO 04        BLM
 36 XEQ "9"
 37 ST+ 51        RS
 38 XEQ "7"
```

```
39 ST+ 48          DCR
40 XEQ "39"        FLIGHT CONTROLS
41 XEQ "39"
42 -
43 XEQ "41"
44 ST+ 17          BLN
45 XEQ "48"
46 ST+ 51          RS
47 XEQ "7"
48 ST+ 48          DCR
49 "OSP"
50 PCLPS           CLEAR PROGRAM
51 .END.
01◆LBL "APU        SECOND SUBPROGRAM DATA
       "
02 XEQ "R"
03 "L1"            GET WORKING LABELS
04 GETSUB
05 "L4"
06 GETSUB
07 RCL 87          INPUT DATA
08 XEQ "18"
09 2.767 E-
          04
10 XEQ "15"
11 RCL 56
12 XEQ "18"
13 3.63 E-0
         3
14 XEQ "15"
15 3.868
16 XEQ "15"
17 RCL 78
18 XEQ "18"
19 41.73
20 XEQ "15"
21 RCL 91
22 XEQ "18"
23 1.257 E-
          04
24 XEQ "15"
25 41.998
26 XEQ "15"
27 RCL 78
28 XEQ "18"
29 RCL 56
30 XEQ "18"
31 "APUW"
32 PROMPT
33 1 E-03
34 *
35 XEQ "18"
36 3.785
37 XEQ "15"
38 -.534
```

```
39 XEQ "15"
40 .704
41 XEQ "15"
42 27.025
43 XEQ "15"
44 RCL 61
45 XEQ "18"
46 .124
47 XEQ "15"
48 RCL 74
49 XEQ "18"
50 .465
51 XEQ "15"
52 RCL 56
53 XEQ "18"
54 9.96 E-0
          3
55 XEQ "15"
56 2.629
57 XEQ "15"
58 "ECSW"
59 PROMPT
60 RCL 87
61 /
62 XEQ "18"
63 21.037
64 XEQ "15"
65 RCL 56
66 XEQ "18"
67 1.866 E-
         03
68 XEQ "15"
69 .468
70 XEQ "15"
71 "CT"
72 PROMPT
73 RCL 75
74 "PCP"
75 PROMPT
76 XEQ "35"
77 XEQ "18"
78 4.507
79 XEQ "15"
80 RCL 85
81 XEQ "18"
82 8.434
83 XEQ "15"
84 .78
85 XEQ "15"
86 RCL 92
87 XEQ "18"
88 3.392 E-
         02
89 XEQ "15"
90 RCL 85
```

```
 91 XEQ "18"
 92 5.027
 93 XEQ "15"
 94 RCL 56
 95 XEQ "18"
 96 2.764 E-
           02
 97 XEQ "15"
 98 12.77
 99 XEQ "15"
100 "≠G"
101 XEQ "16"
102 STO 09
103 6.468
104 XEQ "15"
105 RCL 58
106 XEQ "18"
107 3.375 E-
           02
108 XEQ "15"
109 34.368
110 XEQ "15"
111 RCL 58
112 XEQ "18"
113 3.516 E-
           02
114 XEQ "15"
115 RCL 09
116 XEQ "18"
117 1.555
118 XEQ "15"
119 RCL 56
120 XEQ "18"
121 1.17 E-0
             2
122 XEQ "15"
123 6.018
124 XEQ "15"
125 RCL 75
126 XEQ "18"
127 8.442
128 XEQ "15"
129 RCL 85
130 XEQ "18"
131 4.853
132 XEQ "15"
133 RCL 56
134 XEQ "18"
135 3.123 E-
           02
136 XEQ "15"
137 3.26
138 XEQ "15"
139 RCL 62
140 XEQ "18"
```

```
141 1.639 E-
          05
142 XEQ "15"
143 RCL 85
144 XEQ "18"
145 1.977
146 XEQ "15"
147 4.707
148 XEQ "15"
149 RCL 62
150 XEQ "18"
151 3.912 E-
          05
152 XEQ "15"
153 RCL 75
154 XEQ "18"
155 1.658
156 XEQ "15"
157 RCL 85
158 XEQ "18"
159 4.568
160 XEQ "15"
161 8.978
162 XEQ "15"
163 "APU"
164 PCLPS          CLEAR PROGRAM
165 .END.
 01◆LBL "APU       EXECUTE SECOND SUBPROGRAM
        P"
 02 XEQ "R"
 03 "L2"           GET WORKING LABELS
 04 GETSUB
 05 "L5"
 06 GETSUB
 07 XEQ "48"       AUXILLIARY POWER UNIT
 08 ST+ 17         BLM
 09 XEQ "46"
 10 ST+ 51         RS
 11 XEQ "7"
 12 ST+ 48         DCR
 13 XEQ "44"       ENVIRONMENTAL CONTROL
 14 ST+ 17         BLM
 15 XEQ "48"
 16 ST+ 51         RS
 17 XEQ "48"
 18 ST+ 48         DCR
 19 XEQ "44"       ELECTRICAL
 20 ST+ 17         BLM
 21 XEQ "46"
 22 ST+ 51         RS
 23 XEQ "44"
 24 ST+ 48         DCR
 25 XEQ "44"       ENGINE INSTALLATION
 26 ST+ 17         BLM
```

```
27 XEQ "48"
28 ST+ 51          RS
29 XEQ "44"
30 ST+ 48          DCR
31 "APUP"
32 PCLPS           CLEAR SUBPROGRAM
33 .END.

01◆LBL "HYD        THIRD SUBPROGRAM DATA
       "
02 XEQ "R"
03 186
04 PSIZE           SET STORAGE REGISTER SIZE
05 "L1"            GET WORKING LABEL
06 GETSUB
07 "≠HP"           INPUT DATA
08 XEQ "16"
09 STO 11
10 8.486
11 XEQ "15"
12 RCL 76
13 XEQ "18"
14 .882
15 XEQ "15"
16 RCL 56
17 XEQ "18"
18 5.111 E-
          02
19 XEQ "15"
20 9.425
21 XEQ "15"
22 "≠HSPS"
23 PROMPT
24 RCL 72
25 +
26 XEQ "18"
27 .881
28 XEQ "15"
29 RCL 56
30 XEQ "18"
31 1.233 E-
          02
32 XEQ "15"
33 .528
34 XEQ "15"
35 "≠ATM"
36 XEQ "16"
37 10.59
38 XEQ "15"
39 "≠PTU"
40 XEQ "16"
41 1.48
42 XEQ "15"
43 RCL 78
44 XEQ "18"
```

```
45 17.504
46 XEQ "15"
47 RCL 56
48 XEQ "18"
49 1.946 E-
      02
50 XEQ "15"
51 RCL 86
52 XEQ "18"
53 .513
54 XEQ "15"
55 7.058
56 XEQ "15"
57 "FUSW"
58 XEQ "16"
59 4.001 E-
      05
60 XEQ "15"
61 "≠FUBP?"
62 PROMPT
63 STO 12
64 RCL 86
65 +
66 XEQ "18"
67 5.043 E-
      02
68 XEQ "15"
69 .872
70 XEQ "15"
71 RCL 86
72 RCL 12
73 +
74 XEQ "18"
75 .214
76 XEQ "15"
77 RCL 56
78 XEQ "18"
79 3.73 E-0
      3
80 XEQ "15"
81 RCL 85
82 XEQ "18"
83 2.574
84 XEQ "15"
85 8.097
86 XEQ "15"
87 RCL 61
88 XEQ "18"
89 3.453 E-
      02
90 XEQ "15"
91 RCL 93
92 RCL 91
93 /
94 XEQ "18"
```

```
 95 .929
 96 XEQ "15"
 97 5.539
 98 XEQ "15"
 99 RCL 91
100 XEQ "18"
101 3.594 E-
          04
102 XEQ "15"
103 RCL 85
104 XEQ "18"
105 .484
106 XEQ "15"
107 1.491 E-
          02
108 XEQ "15"
109 RCL 83
110 XEQ "18"
111 9.65 E-0
           6
112 XEQ "15"
113 RCL 85
114 XEQ "18"
115 1.489
116 XEQ "15"
117 4.5
118 XEQ "15"
119 RCL 50
120 .4966
121 *
122 RCL 96
123 RCL 97
124 +
125 /
126 XEQ "18"
127 .107
128 XEQ "15"
129 RCL 56
130 XEQ "18"
131 .121
132 XEQ "15"
133 RCL 58
134 XEQ "18"
135 .449
136 XEQ "15"
137 73.974
138 XEQ "15"
139 RCL 50
140 .4966
141 *
142 XEQ "18"
143 3.486 E-
          05
144 XEQ "15"
145 "≠ANT"
```

```
146 XEQ "16"
147 1.198
148 XEQ "15"
149 RCL 64
150 XEQ "18"
151 .183
152 XEQ "15"
153 4.021
154 XEQ "15"
155 RCL 96
156 RCL 97
157 +
158 XEQ "18"
159 1.271 E-
          02
160 XEQ "15"
161 RCL 50
162 .4966
163 *
164 XEQ "18"
165 1.684 E-
          04
166 XEQ "15"
167 RCL 56
168 XEQ "18"
169 .109
170 XEQ "15"
171 58.813
172 XEQ "15"
173 RCL 56
174 XEQ "18"
175 130
176 XEQ "15"
177 RCL 77
178 XEQ "18"
179 50482
180 XEQ "15"
181 RCL 82
182 XEQ "18"
183 1609
184 XEQ "15"
185 486459
186 XEQ "15"
187 RCL 57
188 1 E-03
189 *
190 XEQ "18"
191 RCL 85
192 XEQ "18"
193 RCL 93
194 1 E-03
195 *
196 RCL 92
197 /
198 XEQ "18"
```

```
199 2.531
200 XEQ "15"
201 -1.861
202 XEQ "15"
203 .569
204 XEQ "15"
205 4497.4
206 XEQ "15"
207 "HYD"          CLEAR PROGRAM
208 PCLPS
209 .END.
 01◆LBL "HYD      EXECUTE THIRD SUBPROGRAM
        P"
 02 XEQ "R"
 03 "L2"          GET WORKING LABELS
 04 GETSUB
 05 "L4"
 06 GETSUB
 07 "L5"
 08 GETSUB
 09 XEQ "42"      HYDRAULICS/PNEUMATICS
 10 XEQ "39"
 11 -
 12 XEQ "41"
 13 ST+ 17        BLM
 14 XEQ "48"
 15 ST+ 51        RS
 16 XEQ "42"
 17 RCL 11
 18 +
 19 1.026
 20 *
 21 5.426
 22 +
 23 ST+ 48        DCR
 24 XEQ "47"      FUEL SYSTEM
 25 ST+ 17        BLM
 26 XEQ "46"
 27 ST+ 51        RS
 28 XEQ "43"
 29 XEQ "39"
 30 -
 31 XEQ "40"
 32 ST+ 48        DCR
 33 XEQ "46"      CARGO HANDLING
 34 ST+ 17        BLM
 35 XEQ "48"
 36 ST+ 51        RS
 37 XEQ "48"
 38 ST+ 48        DCR
 39 XEQ "47"      AVIONICS
 40 ST+ 17        BLM
 41 XEQ "42"
 42 XEQ "39"
```

```
43 -
44 XEQ "41"
45 ST+ 51          RS
46 XEQ "44"
47 ST+ 48          DCR
48 XEQ "42"        BASE LEVEL OPERATIONS
49 XEQ "39"
50 +
51 XEQ "41"
52 RCL 43
53 12
54 /
55 *
56 "NOAC?"
57 PROMPT
58 STO 31
59 *
60 STO 14
61 RCL 56          BASE LEVEL TRAINING
62 54.9
63 *
64 RCL 77
65 21079
66 *
67 +
68 RCL 82
69 1185
70 *
71 +
72 241567
73 -
74 RCL 43
75 12
76 /
77 *
78 RCL 31
79 *
80 STO 15
81 XEQ "7"         DEPOT AIRFRAME
82 RCL 43
83 12
84 /
85 *
86 RCL 31
87 *
88 STO 16
89 "HYDP"          CLEAR PROGRAM
90 PCLPS
91 .END.

01◆LBL "EN"        ENGINE DATA
02 XEQ "R"
03 "L1"            GET WORKING LABELS
```

```
04 GETSUB
05 RCL 98          INPUT DATA
06 XEQ "18"
07 RCL 95
08 XEQ "18"
09 RCL 75
10 XEQ "18"
11 -1.521
12 XEQ "15"
13 -.136
14 XEQ "15"
15 1
16 XEQ "15"
17 1.018 E0
            2
18 XEQ "15"
19 RCL 95
20 XEQ "18"
21 "ENTWR"
22 XEQ "16"
23 RCL 98
24 XEQ "18"
25 RCL 75
26 XEQ "18"
27 -1.322
28 XEQ "15"
29 .884
30 XEQ "15"
31 .667
32 XEQ "15"
33 1
34 XEQ "15"
35 1.348 E0
            5
36 XEQ "15"
37 RCL 95
38 XEQ "18"
39 RCL 49
40 .3499
41 *
42 XEQ "18"
43 RCL 75
44 XEQ "18"
45 -.76
46 XEQ "15"
47 .257
48 XEQ "15"
49 1
50 XEQ "15"
51 3.328 E0
            2
52 XEQ "15"
53 "EN"            CLEAR PROGRAM
54 PCLPS
55 .END.
```

```
01◆LBL "ENG      EXECUTE ENGINE AND OPERATIONS AND
          "      SUPPORT OUTPUT
02 XEQ "R"
03 "L2"          GET WORKING LABELS
04 GETSUB
05 "L3"
06 GETSUB
07 "L4"
08 GETSUB
09 "INF?"        INFLATION FACTOR
10 PROMPT
11 STO 02
12 RCL 17
13 XEQ "27"
14 RCL 04
15 XEQ "1"
16 +
17 STO 17        BLM IN CUR $
18 RCL 51
19 XEQ "27"
20 STO 51        RS IN CUR $
21 RCL 48
22 XEQ "27"
23 STO 48        DCR IN CUR $
24 XEQ "7"       ENGINE
25 XEQ "27"
26 ST+ 17        BLM
27 XEQ "11"
28 XEQ "27"
29 ST+ 51        RS
30 XEQ "7"
31 XEQ "27"
32 ST+ 48        DCR
33 RCL 31        PETROLEUM, OIL, AND LUBRICANTS
34 STO 30
35 "G/H?"
36 PROMPT
37 "C/G?"
38 PROMPT
39 1.05
40 *
41 *
42 XEQ "27"
43 "POL"
44 XEQ "O"       POL OUTPUT
45 RCL 17
46 STO 01
47 "BLM"
48 XEQ "O"       BLM OUTPUT
49 RCL 51
50 ST+ 01
51 "RS"
52 XEQ "O"       RS OUTPUT
53 RCL 48
54 ST+ 01
```

```
55 "DCR"
56 XEQ "0"        DCR OUTPUT
57 RCL 14
58 XEQ "1"
59 ST+ 01
60 "BLO"
61 XEQ "0"        BLO OUTPUT
62 RCL 15
63 XEQ "1"
64 ST+ 01
65 "BLT"          BLT OUTPUT
66 XEQ "0"
67 RCL 16
68 XEQ "1"
69 ST+ 01
70 "PDM"
71 XEQ "0"        DEPOT AIRFRAME OUTPUT
72 RCL 17
73 RCL 48
74 +
75 .01
76 *
77 ST+ 01
78 "OM:
79 XEQ "0"        OTHER MAINTENANCE OUTPUT
80 RCL 01
81 "TOT OΣS
            "
82 XEQ "0"        TOTAL OPERATIONS AND SUPPORT OUTPUT
83 "ENG"
84 PCLPS          CLEAR PROGRAM
85 .END.
```

```
01◆LBL "FTR      FIGHTER OPERATIONS AND SUPPORT
         "       FIRST SUBPROGRAM DATA
02 XEQ "R"
03 "L1"          GET WORKING LABELS
04 GETSUB
05 RCL 57        INPUT DATA
06 XEQ "18"
07 RCL 56
08 XEQ "18"
09 RCL 88
10 XEQ "18"
11 1.138
12 XEQ "15"
13 -.693
14 XEQ "15"
15 2.912
16 XEQ "15"
17 1.207 E-
      04
18 XEQ "15"
19 RCL 57
20 XEQ "18"
21 RCL 62
22 XEQ "18"
23 .518
24 XEQ "15"
25 .781
26 XEQ "15"
27 4.578 E-
      05
28 XEQ "15"
29 RCL 77
30 XEQ "18"
31 RCL 88
32 XEQ "18"
33 RCL 56
34 XEQ "18"
35 1.347
36 XEQ "15"
37 5.107
38 XEQ "15"
39 -.285
40 XEQ "15"
41 1.304 E-
      05
42 XEQ "15"
43 RCL 87
44 XEQ "18"
45 RCL 56
46 XEQ "18"
47 .306
48 XEQ "15"
49 -1.464
50 XEQ "15"
```

```
 51 2.557 E0
          3
 52 XEQ "15"
 53 RCL 77
 54 XEQ "18"
 55 RCL 64
 56 XEQ "18"
 57 .642
 58 XEQ "15"
 59 .111
 60 XEQ "15"
 61 2.552
 62 XEQ "15"
 63 "SS"
 64 PROMPT
 65 STO 05
 66 XEQ "18"
 67 RCL 62
 68 XEQ "18"
 69 .241
 70 XEQ "15"
 71 .989
 72 XEQ "15"
 73 2.043 E-
          04
 74 XEQ "15"
 75 RCL 05
 76 XEQ "18"
 77 RCL 63
 78 XEQ "18"
 79 .779
 80 XEQ "15"
 81 .918
 82 XEQ "15"
 83 2.655 E-
          04
 84 XEQ "15"
 85 .348
 86 XEQ "15"
 87 .257
 88 XEQ "15"
 89 1.118
 90 XEQ "15"
 91 RCL 82
 92 XEQ "18"
 93 RCL 79
 94 XEQ "18"
 95 RCL 56
 96 XEQ "18"
 97 .622
 98 XEQ "15"
 99 .691
100 XEQ "15"
101 -.654
102 XEQ "15"
```

```
103 2.871
104 XEQ "15"
105 RCL 82
106 XEQ "18"
107 RCL 81
108 XEQ "18"
109 RCL 79
110 XEQ "18"
111 1.067
112 XEQ "15"
113 .361
114 XEQ "15"
115 .05
116 XEQ "15"
117 .182
118 XEQ "15"
119 RCL 63
120 XEQ "18"
121 RCL 56
122 XEQ "18"
123 .454
124 XEQ "15"
125 -.05
126 XEQ "15"
127 .533
128 XEQ "15"
129 RCL 81
130 XEQ "18"
131 4.085
132 XEQ "15"
133 RCL 75
134 XEQ "18"
135 1.633
136 XEQ "15"
137 RCL 80
138 XEQ "18"
139 .366
140 XEQ "15"
141 27.369
142 XEQ "15"
143 RCL 59
144 XEQ "18"
145 RCL 75
146 XEQ "18"
147 .182
148 XEQ "15"
149 1.005
150 XEQ "15"
151 1.061
152 XEQ "15"
153 RCL 80
154 XEQ "18"
155 RCL 75
156 XEQ "18"
157 -2.101
```

```
158 XEQ "15"
159 .598
160 XEQ "15"
161 8.138 E0
          4
162 XEQ "15"
163 "FTR"          CLEAR PROGRAM
164 PCLPS
165 .END.
 01◆LBL "FTR       EXECUTE FIRST SUBPROGRAM
         P"
 02 XEQ "R"
 03 "L2"           GET WORKING LABELS
 04 GETSUB
 05 XEQ "7"        STRUCTURE
 06 STO 17         BASE LEVEL MAINTENANCE (BLM)
 07 XEQ "9"
 08 STO 51         REPLENISHMENT SPARES (RS)
 09 XEQ "7"        CREW
 10 ST+ 17         BLM
 11 XEQ "9"
 12 ST+ 51         RS
 13 XEQ "9"
 14 STO 48         DEPOT COMPONENT REPAIR (DCR)
 15 XEQ "9"        LANDING GEAR
 16 ST+ 17         BLM
 17 XEQ "9"
 18 ST+ 51         RS
 19 2
 20 ST- 01
 21 XEQ "9"
 22 ST+ 48         DCR
 23 XEQ "7"        FLIGHT CONTROLS
 24 ST+ 17         BLM
 25 XEQ "7"
 26 ST+ 51         RS
 27 XEQ "9"
 28 ST+ 48         DCR
 29 RCL 81         ENGINE INSTALLATION
 30 4.085
 31 *
 32 RCL 75
 33 1.633
 34 *
 35 +
 36 RCL 80
 37 .366
 38 *
 39 +
 40 27.369
 41 -
 42 ST+ 17         BLM
 43 XEQ "9"
 44 ST+ 51         RS
```

```
45 XEQ "9"
46 ST+ 48          DCR
47 "FTRP"
48 PCLPS           CLEAR PROGRAM
49 .END.
01◆LBL "OSD        SECOND SUBPROGRAM DATA
        2"
02 XEQ "R"
03 "L1"            GET WORKING LABEL
04 GETSUB
05 RCL 82          INPUT DATA
06 XEQ "18"
07 RCL 81
08 XEQ "18"
09 RCL 56
10 XEQ "18"
11 .649
12 XEQ "15"
13 .295
14 XEQ "15"
15 -.814
16 XEQ "15"
17 48.065
18 XEQ."15"
19 RCL 81
20 XEQ "18"
21 RCL 60
22 XEQ "18"
23 RCL 82
24 XEQ "18"
25 .632
26 XEQ "15"
27 .315
28 XEQ "15"
29 1.207
30 XEQ "15"
31 1.789 E-
          03
32 XEQ "15"
33 RCL 94
34 XEQ "18"
35 RCL 82
36 XEQ "18"
37 1.267
38 XEQ "15"
39 .749
40 XEQ "15"
41 3.56 E-0
          4
42 XEQ "15"
43 RCL 58
44 XEQ "18"
45 RCL 77
46 XEQ "18"
```

```
47 .096
48 XEQ "15"
49 .773
50 XEQ "15"
51 16.077
52 XEQ "15"
53 RCL 58
54 XEQ "18"
55 RCL 82
56 XEQ "18"
57 .115
58 XEQ "15"
59 1.535
60 XEQ "15"
61 1.031 E-
          02
62 XEQ "15"
63 RCL 58
64 XEQ "18"
65 .129
66 XEQ "15"
67 18.863
68 XEQ "15"
69 RCL 72
70 XEQ "18"
71 RCL 56
72 XEQ "18"
73 .06
74 XEQ "15"
75 -.996
76 XEQ "15"
77 5.042 E0
          3
78 XEQ "15"
79 RCL 82
80 XEQ "18"
81 RCL 56
82 XEQ "18"
83 2.115
84 XEQ "15"
85 -.741
86 XEQ "15"
87 2.343 E-
          02
88 XEQ "15"
89 RCL 72
90 XEQ "18"
91 RCL 56
92 XEQ "18"
93 .095
94 XEQ "15"
95 -.594
96 XEQ "15"
97 189.53
98 XEQ "15"
```

```
 99 RCL 84
100 XEQ "18"
101 RCL 81
102 XEQ "18"
103 1.247
104 XEQ "15"
105 .82
106 XEQ "15"
107 5.746 E-
          05
108 XEQ "15"
109 RCL 84
110 XEQ "18"
111 RCL 71
112 XEQ "18"
113 1.43
114 XEQ "15"
115 .979
116 XEQ "15"
117 1.941 E-
          06
118 XEQ "15"
119 RCL 84
120 XEQ "18"
121 RCL 71
122 XEQ "18"
123 .298
124 XEQ "15"
125 .012
126 XEQ "15"
127 .877
128 XEQ "15"
129 RCL 73
130 XEQ "18"
131 RCL 82
132 XEQ "18"
133 .632
134 XEQ "15"
135 .89
136 XEQ "15"
137 .299
138 XEQ "15"
139 RCL 97
140 XEQ "18"
141 RCL 56
142 XEQ "18"
143 .187
144 XEQ "15"
145 -1.657
146 XEQ "15"
147 5.692 E0
          5
148 XEQ "15"
149 RCL 96
150 XEQ "18"
```

```
151 RCL 60
152 XEQ "18"
153 1.482
154 XEQ "15"
155 1.338
156 XEQ "15"
157 1.268 E-
          05
158 XEQ "15"
159 RCL 96
160 XEQ "18"
161 RCL 64
162 XEQ "18"
163 2.431
164 XEQ "15"
165 1.084
166 XEQ "15"
167 5.286 E-
          09
168 XEQ "15"
169 "OSD2"        CLEAR PROGRAM
170 PCLPS
171 .END.
 01◆LBL "OSP      EXECUTE SECOND SUBPROGRAM
          2"
 02 XEQ "R"
 03 "L2"          GET WORKING LABEL
 04 GETSUB
 05 XEQ "7"       ENVIRONMENTAL CONTROL SYSTEM
 06 ST+ 17        BLM
 07 XEQ "7"
 08 ST+ 51        RS
 09 XEQ "9"
 10 ST+ 48        DCR
 11 XEQ "9"       ELECTRICAL
 12 ST+ 17        BLM
 13 XEQ "9"
 14 ST+ 51        RS
 15 RCL IND
       00
 16 RCL IND
       01
 17 Y↑X
 18 XEQ "8"
 19 RCL IND
       00
 20 *
 21 XEQ "4"
 22 ST+ 48        DCR
 23 XEQ "9"       HYDRAULIC/PNEUMATIC
 24 ST+ 17        BLM
 25 XEQ "9"
 26 ST+ 51        RS
 27 XEQ "9"
```

```
28 ST+ 48          DCR
29 XEQ "9"         FUEL SYSTEM
30 ST+ 17          BLM
31 XEQ "9"
32 ST+ 51          RS
33 XEQ "9"
34 ST+ 48          DCR
35 XEQ "9"         ARMAMENT
36 ST+ 17          BLM
37 XEQ "9"         AVIONICS
38 ST+ 17          BLM
39 XEQ "9"
40 ST+ 51          RS
41 XEQ "9"
42 ST+ 48          DCR
43 "OSP2"
44 PCLPS           CLEAR PROGRAM
45 .END.
01◆LBL "FT"        THIRD SUBPROGRAM DATA
02 XEQ "R"
03 "L1"            GET WORKING LABEL
04 GETSUB
05 RCL 59          INPUT DATA
06 XEQ "18"
07 RCL 56
08 XEQ "18"
09 .371
10 XEQ "15"
11 .14
12 XEQ "15"
13 8.052 E0
      2
14 XEQ "15"
15 RCL 60
16 XEQ "18"
17 RCL 82
18 XEQ "18"
19 .079
20 XEQ "15"
21 .912
22 XEQ "15"
23 1.303 E0
      3
24 XEQ "15"
25 RCL 82
26 XEQ "18"
27 RCL 88
28 XEQ "18"
29 RCL 56
30 XEQ "18"
31 3.284
32 XEQ "15"
33 2.043
34 XEQ "15"
```

```
35 .642
36 XEQ "15"
37 9.996 E-
          07
38 XEQ "15"
39 "FT"          CLEAR PROGRAM
40 PCLPS
41 .END.
01◆LBL "FTP      EXECUTE THIRD SUBPROGRAM
            "
02 XEQ "R"
03 "L2"          GET WORKING LABEL
04 GETSUB
05 XEQ "9"       BASE LEVEL OPERATIONS (BLO)
06 RCL 43
07 12
08 /
09 *
10 "NOAC?"
11 PROMPT
12 STO 31
13 *
14 STO 14
15 XEQ "9"       BASE LEVEL TRAINING (BLT)
16 RCL 43
17 12
18 /
19 *
20 RCL 31
21 *
22 STO 15
23 XEQ "7"       DEPOT AIRFRAME (PDM)
24 RCL 43
25 12
26 /
27 *
28 RCL 31
29 *
30 STO 16
31 "FTP"         CLEAR PROGRAM
32 PCLPS
33 .END.
```

```
01◆LBL "LN          LEARNING CURVE MODEL
      CURV"
02 "U"
03 ASTO Y
04 "UNIT/CU         SELECT UNIT CURVE OR CUMULATIVE AVERAGE
       M?"          CURVE EQUATIONS
05 PROMPT
06 ASTO X
07 X≠Y?
08 SF 01
09 "≠ UNITS         TOTAL NUMBER OF UNITS?
         ?"
10 PROMPT
11 STO 01
12 STO 02
13 "UNIT OF         UNIT OF INTEREST?
    INT?"
14 PROMPT
15 STO 03
16 1
17 -
18 STO 04
19 "UNIT 1          FIRST UNIT COST?
   COST?"
20 PROMPT
21 STO 05
22 "% LEARN         LEARNING RATE? (DECIMAL)
         ?"
23 PROMPT
24 LN
25 2
26 LN
27 /                      LN%
28 STO 06           UC=K(X)^---
29 RCL 05                 LN 2
30 RCL 03
31 XEQ 05
32 STO 08
33 FS? 01
34 GTO 01
35 XEQ 04           UNIT COST OUTPUT
36 0
37 STO 07

38◆LBL 02           UNIT CURVE SUMMATION LOOP
39 RCL 05
40 RCL 01                  N        LN%
41 XEQ 05           TC=   Σ  K(X_i)^---
42 ST+ 07                 i=1       LN 2
43 DSE 01
44 GTO 02
45 RCL 07
46 XEQ 03           TOTAL COST OUTPUT
```

```
47◆LBL 01
48 RCL 08
49 RCL 03
50 *
51 RCL 05
52 RCL 04
53 XEQ 05
54 RCL 04
55 *
56 -
57 XEQ 04
58 RCL 05
59 RCL 02
60 XEQ 05
61 RCL 02
62 *
63 XEQ 03

64◆LBL 03
65 "TOT COS
     T"
66 XEQ 06
67 RTN

68◆LBL 04
69 "UN COST
     "
70 XEQ 06
71 RTN

72◆LBL 05
73 RCL 06
74 Y↑X
75 *
76 RTN

77◆LBL 06
78 "⊢="
79 ARCL X
80 AVIEW
81 FS? 55
82 STOP
83 RTN
84 END
```

CUMULATIVE CURVE

$UC = TC_X - TC_{(X-1)}$

UNIT COST OUTPUT

$TC_X = X(\bar{Y}_X)$

$Y_X = K(X^{\frac{LN\%}{LN\ 2}})$

TOTAL COST OUTPUT

WORKING LABELS

```
01◆LBL "LSC"     LRU/SRU LOGISTICS SUPPORT COSTS
02 63
03 STO 61
04 "BSC"         OUTPUT LABELS
05 XEQ 03
06 "BSTK"
07 XEQ 03
08 "DSC"
09 XEQ 03
10 "DSTK"
11 XEQ 03
12 "SIC"
13 XEQ 03
14 "TPC"
15 XEQ 03
16 "BMHC"
17 XEQ 03
18 "BMMH"
19 XEQ 03
20 "PMSH"
21 XEQ 03
22 "SMMC"
23 XEQ 03
24 "DMHC"
25 XEQ 03
26 "DMMH"
27 XEQ 03
28 "DMMC"
29 XEQ 03
30 "SDTC"
31 XEQ 03
32 "CSC"
33 XEQ 03
34 "QSC"
35 XEQ 03
36 "IMCC"
37 XEQ 03
38 "TOC"
39 XEQ 03
40 "LCC"
41 XEQ 03

42◆LBL A
43 0
44 STO 59
45 "DEVC"        INPUT DATA
46 XEQ 01
47 "SYSI"
48 XEQ 01
49 "SEC"
50 XEQ 01
51 "M"
52 XEQ 01
```

```
 53 "AOH"
 54 XEQ 01
 55 "POH"
 56 XEQ 01
 57 "PIUP"
 58 XEQ 01
 59 "UC"
 60 XEQ 01
 61 "W"
 62 XEQ 01
 63 "MTBD"
 64 XEQ 01
 65 "MTBR"
 66 XEQ 01
 67 "NRTS"
 68 XEQ 01
 69 "RTS"
 70 XEQ 01
 71 "COND"
 72 XEQ 01
 73 "PAMH"
 74 XEQ 01
 75 "RMH"
 76 XEQ 01
 77 "SMI"
 78 XEQ 01
 79 "SMH"
 80 XEQ 01
 81 "BCMH"
 82 XEQ 01
 83 "BMH"
 84 XEQ 01
 85 "BMC"
 86 XEQ 01
 87 "BRCT"
 88 XEQ 01
 89 "DMH"
 90 XEQ 01
 91 "DMC"
 92 XEQ 01
 93 "PA"
 94 XEQ 01
 95 "PP"
 96 XEQ 01
 97 "PCB"
 98 XEQ 01
 99 "OST"
100 XEQ 01
101 "DRCT"
102 XEQ 01
103 "BLR"
104 XEQ 01
105 "DLR"
106 XEQ 01
107 "PSC"
```

```
108 XEQ 01
109 "SA"
110 XEQ 01
111 "IMC"
112 XEQ 01
113 "RMC"
114 XEQ 01

115◆LBL B
116 CLA
117 RCL 12
118 RCL 21
119 *
120 RCL 11
121 RCL 27
122 *
123 +
124 STO 55       PIPELINE TIME IN MONTHS
125 RCL 05
126 RCL 09
127 RCL 03
128 *
129 /
130 STO 54
131 RCL 55
132 *
133 STO 36
134 SQRT
135 1.5
136 *
137 ST+ 36
138 RCL 36
139 XEQ "IN"
140 STO 36       BASE SPARES
141 RCL 12
142 RCL 19
143 *
144 RCL 18
145 +
146 RCL 05
147 RCL 03
148 RCL 10
149 *
150 /
151 *
152 STO 43       PEAK DIRECT BASE MAINTENANCE
153 RCL 36       SHOP MANHOURS
154 RCL 03
155 *
156 RCL 07
157 *
158 STO 35       BASE SPARES COST
159 RCL 54
160 RCL 03
161 RCL 11
```

```
162 RCL 28
163 *
164 *
165 *
166 XEQ "IN"
167 STO 38        DEPOT SPARES
168 RCL 07
169 *
170 STO 37        DEPOT SPARES COST
171 RCL 04
172 RCL 03
173 /
174 STO 54
175 RCL 04
176 RCL 10
177 /
178 STO 55
179 RCL 14
180 RCL 15
181 RCL 18
182 +
183 +
184 RCL 12
185 RCL 19
186 *
187 +
188 RCL 10
189 /
190 STO 42
191 0
192 RCL 16
193 X=Y?
194 GTO 04
195 RCL 17
196 RCL 16
197 /
198 ST+ 42

199◆LBL 04
200 RCL 54
201 ST* 42        DIRECT MANHOURS PER BASE PER YEAR
202 RCL 42
203 RCL 03
204 RCL 06
205 RCL 29
206 *
207 *
208 *
209 STO 41        BASE MAINTENANCE MANHOURS
210 RCL 55
211 RCL 06
212 RCL 12
213 RCL 20
214 *
215 *
```

```
216 *
217 STO 44        BASE MAINTENANCE MANHOUR COST
218 RCL 55
219 RCL 11
220 RCL 22
221 *
222 *
223 STO 46        DEPOT MAINTENANCE MANHOURS
224 RCL 06
225 RCL 30
226 *
227 *
228 STO 45        DEPOT MAINTENANCE MANHOUR COST
229 RCL 06
230 ST* 55
231 RCL 55
232 RCL 13
233 *
234 XEQ "IN"
235 STO 50        CONDEMNATION SPARES
236 RCL 11
237 ST* 55
238 RCL 55
239 RCL 23
240 *
241 STO 47        DEPOT MAINTENANCE MATERIAL COST
242 RCL 55
243 2.7
244 RCL 31
245 RCL 08
246 *
247 *
248 *
249 STO 48        SECOND DESTINATION TRANSPORTATION COST
250 RCL 50
251 RCL 07
252 *
253 STO 49        CONDEMNATION SPARES COST
254 RCL 06
255 RCL 34
256 *
257 RCL 33
258 +
259 RCL 24
260 RCL 25
261 1
262 +
263 +
264 *
265 RCL 03
266 RCL 32
267 RCL 06
268 *
269 *
270 RCL 24
```

```
271 RCL 26
272 +
273 1
274 +
275 *
276 +
277 STO 51        INVENTORY MANAGEMENT COST
278 RCL 02
279 RCL 35
280 RCL 37
281 +   -
282 +
283 STO 39        SUPPORT INVESTMENT COST
284 STO 40        TOTAL PROCUREMENT COST
285 STO 53
286 RCL 01
287 ST+ 40
288 ST+ 53
289 RCL 41
290 RCL 44
291 RCL 45
292 RCL 47
293 +
294 +
295 +   -
296 RCL 48
297 RCL 49
298 RCL 51
299 +
300 +
301 +
302 ST+ 53
303 STO 52        TOTAL OWNERSHIP COST
304 RCL 00
305 ST+ 53        LIFE CYCLE COST
306 35
307 STO 60
308 35.05301
309 STO 62
310 63
311 STO 61

312◆LBL 02        WORKING LABELS
313 RCL IND
          60
314 ARCL IND
          61
315 "⊢ = $"
316 ARCL X
317 AVIEW
318 STOP
319 CLA
320 1
321 ST+ 60
322 ST+ 61
```

```
323 ISG 62
324 GTO 02
325 STOP

326◆LBL 01
327 "⊢?"
328 PROMPT
329 STO IND
          59
330 1
331 ST+ 59
332 CLA
333 RTN

334◆LBL 03
335 ASTO IND
          61
336 1
337 ST+ 61
338 RTN

339◆LBL "IN"
340 STO 56
341 FRC
342 0
343 X=Y?
344 GTO 05
345 RCL 56
346 INT
347 1
348 +
349 RTN

350◆LBL 05
351 RCL 56
352 RTN
353 .END.
```

```
01◆LBL "ORL      OPTIMAL REPAIR LEVEL ANALYSIS
        A"
02 1
03 STO 00
04 "BRCYT"       INPUT DATA
05 XEQ 01
06 "LWR"
07 XEQ 02
08 1
09 ST+ 00
10 "DSST"
11 XEQ 01
12 "NTDPR"
13 XEQ 02
14 "MCFA"
15 XEQ 01
16 "MCFP"
17 XEQ 01
18 "NRA"
19 XEQ 01
20 "NNRA"
21 XEQ 01
22 "MTBCT"
23 XEQ 01
24 "MTBF"
25 XEQ 01
26 "NB"
27 XEQ 01
28 "NB"
29 XEQ 04
30 "OST"
31 XEQ 04
32 "IL"
33 XEQ 01
34 "FRCPP"
35 XEQ 01
36 "PSLR"
37 XEQ 04
38 "PSMR"
39 XEQ 04
40 "PWR"
41 XEQ 04
42 "QPA"
43 XEQ 01
44 "MCA"
45 XEQ 01
46 "MHCT"
47 XEQ 01
48 "MCP"
49 XEQ 01
50 "DRPT"
51 XEQ 01
52 "FSAC"
53 XEQ 01
```

```
 54 "CRM"
 55 XEQ 01
 56 "SSR"
 57 XEQ 04
 58 "RMW"
 59 XEQ 01
 60 "TDOCP"
 61 XEQ 01
 62 "UC"
 63 XEQ 01
 64 "U/B"
 65 XEQ 01
 66 "OH/M"
 67 XEQ 01
 68 "UW"
 69 XEQ 01
 70 "PTR"
 71 XEQ 02
 72 "PTT"
 73 XEQ 02
 74 "DT"
 75 XEQ 02
 76 "TCP"
 77 XEQ 02
 78 RCL 39        CALCULATE DISCARD OPTION
 79 RCL 40
 80 RCL 27
 81 *
 82 *
 83 RCL 12
 84 /
 85 STO 50
 86 STO 51
 87 RCL 19
 88 12
 89 RCL 38
 90 XEQ 06
 91 ST+ 51
 92 RCL 25
 93 RCL 34
 94 *
 95 RCL 23
 96 RCL 21
 97 +
 98 +
 99 STO 52
100 RCL 26
101 RCL 35
102 *
103 RCL 24
104 RCL 22
105 +
106 +
107 STO 53
108 RCL 15
```

```
109 RCL 14
110 /
111 RCL 52
112 *
113 RCL 16
114 RCL 14
115 /
116 RCL 53
117 *
118 +
119 STO 54
120 RCL 41
121 120
122 RCL 50
123 XEQ 06
124 ST+ 51
125 RCL 15
126 RCL 14
127 /
128 RCL 17
129 *
130 RCL 16
131 RCL 14
132 /
133 RCL 18
134 *
135 +
136 STO 55
137 RCL 50
138 *
139 STO 56
140 3
141 *
142 SQRT
143 RCL 56
144 +
145 RCL 38
146 *
147 ST+ 51
148 RCL 51
149 "DISCARD     DISCARD OPTION OUTPUT
                "
150 XEQ 03
151 RCL 07       CALCULATE INTERMEDIATE REPAIR OPTION
152 RCL 37
153 *
154 RCL 14
155 /
156 STO 51
157 RCL 19
158 1
159 -
160 RCL 43
161 *
```

```
162 1
163 +
164 STO 57
165 RCL 03
166 40
167 *
168 RCL 49
169 +
170 RCL 47
171 RCL 45
172 RCL 57
173 XEQ 06
174 ST+ 51
175 RCL 01
176 RCL 50
177 *
178 STO 57
179 RCL 55
180 RCL 50
181 *
182 STO 58
183 3
184 *
185 SQRT
186 RCL 58
187 +
188 1
189 RCL 20
190 -
191 *
192 RCL 33
193 *
194 RCL 57
195 3
196 *
197 SQRT
198 RCL 57
199 +
200 RCL 38
201 *
202 +
203 RCL 20
204 RCL 33
205 *
206 RCL 50
207 *
208 12
209 *
210 SQRT
211 4.4
212 *
213 +
214 ST+ 51
```

```
215 RCL 50
216 12
217 RCL 19
218 RCL 29
219 XEQ 06
220 RCL 03
221 *
222 ST+ 51
223 RCL 50
224 12
225 RCL 19
226 RCL 36
227 XEQ 06
228 RCL 54
229 *
230 ST+ 51
231 RCL 10
232 RCL 11
233 +
234 RCL 32
235 RCL 19
236 *
237 *
238 ST+ 51
239 RCL 50
240 RCL 19
241 12
242 RCL 33
243 XEQ 06
244 ST+ 51
245 STO 57
246 RCL 30
247 RCL 19
248 1
249 -
250 *
251 RCL 09
252 +
253 RCL 11
254 1
255 -
256 RCL 14
257 /
258 *
259 STO 58
260 RCL 28
261 RCL 19
262 1
263 -
264 *
265 RCL 08
266 +
267 RCL 10
```

```
268 RCL 14
269 /
270 *
271 RCL 58
272 +
273 ST+ 51
274 ST+ 57
275 RCL 51
276 "INTERME      OUTPUT INTERMEDIATE REPAIR OPTION
      DIATE"
277 XEQ 03
278 RCL 50        CALCULATE DEPOT REPAIR OPTION
279 RCL 31
280 RCL 38
281 *
282 *
283 ST+ 57
284 RCL 06
285 RCL 37
286 *
287 RCL 14
288 /
289 ST+ 57
290 RCL 19
291 1
292 -
293 RCL 42
294 *
295 1
296 +
297 STO 51
298 RCL 02
299 40
300 *
301 RCL 48
302 +
303 RCL 46
304 RCL 44
305 RCL 51
306 XEQ 06
307 ST+ 57
308 RCL 50
309 12
310 RCL 19
311 2
312 XEQ 06
313 RCL 41
314 RCL 54
315 *
316 *
317 ST+ 57
318 RCL 50
319 RCL 05
```

```
320 RCL 38
321 *
322 *
323 ST+ 57
324 RCL 56
325 3
326 *
327 SQRT
328 RCL 56
329 +
330 RCL 38
331 *
332 ST+ 57
333 RCL 50
334 12
335 RCL 19
336 RCL 29
337 XEQ 06
338 RCL 02
339 *
340 ST+ 57
341 RCL 57
342 "DEPOT"        OUTPUT DEPOT REPAIR OPTION
343 XEQ 03

344◆LBL 01         WORKING LABELS
345 "⊢?"
346 XEQ 05
347 RTN

348◆LBL 02
349 ASTO 04
350 "⊢D?"
351 XEQ 05
352 CLA
353 ARCL 04
354 "⊢I?"
355 XEQ 05
356 RTN

357◆LBL 03
358 "⊢="
359 ARCL X
360 AVIEW
361 STOP
362 RTN

363◆LBL 04
364 ASTO 04
365 "⊢C?"
366 XEQ 05
367 CLA
368 ARCL 04
```

```
369 "+OS?"
370 XEQ 05
371 RTN

372◆LBL 05
373 PROMPT
374 STO IND
          00
375 1
376 ST+ 00
377 RTN

378◆LBL 06
379 *
380 *
381 *
382 RTN
383 .END.
```

```
01◆LBL "LCC      COMPONENT/SYSTEM RELIABILITY
       REL"
02 "≠LEV"        NUMBER OF LEVELS?
03 XEQ 88
04 STO 08

05◆LBL 06
06 "≠CIR/LE      NUMBER OF CIRCUITS/LEVEL?
       V"
07 XEQ 88
08 STO 09

09◆LBL 07
10 XEQ 08

11◆LBL 10
12 DSE 09        CIRCUIT LOOP
13 GTO 07
14 DSE 08        LEVEL LOOP
15 GTO 06
16 "SYSTEM       SYSTEM OUTPUT
    REL="
17 ARCL X
18 AVIEW
19 FS? 55
20 STOP
21 "END"
22 AVIEW
23 STOP

24◆LBL 08        COMPONENT LOOP
25 "Y"
26 ASTO Y
27 "COM MTB      COMPONENT MEAN TIME BETWEEN FAILURES
       F="       EQUAL?
28 XEQ 88
29 ASTO X
30 X=Y?
31 SF 01
32 1
33 STO 04
34 STO 05
35 STO 07
36 "S"
37 ASTO Y
38 "S/P"         COMPONENTS IN SERIES OR PARALLEL?
39 XEQ 88
40 ASTO X
41 X=Y?
42 GTO 01

43◆LBL A
44 SF 02
45 "≠COM/CI      NUMBER OF COMPONENTS IN THE CIRCUIT?
       R"
```

```
46 XEQ 88
47 STO 01
48 STO 06
49 "≠PAR CI      NUMBER OF PARALLEL CIRCUITS?
          R"
50 XEQ 88
51 STO 02

52◆LBL 03        PARALLEL CIRCUIT LOOP
53 XEQ 02
54 1
55 X<>Y
56 -
57 ST* 05
58 FS? 01
59 XEQ 87
60 DSE 01
61 GTO 03
62 RCL 05

63◆LBL 04
64 1
65 X<>Y
66 -
67 ST* 07
68 RCL 06
69 STO 01
70 DSE 02
71 GTO 03
72 RCL 07
73 XEQ 89

74◆LBL B
75◆LBL 01
76 "≠COM/SE      NUMBER OF COMPONENTS IN SERIES?
          R"
77 XEQ 88
78 STO 03

79◆LBL 02        SERIES CIRCUIT LOOP
80 "REL"         COMPONENT RELIABILITY IF KNOWN?
81 XEQ 88
82 X>0?
83 GTO 11
84 "MTBF"        MTBF IF RELIABILITY UNKNOWN?
85 XEQ 88
86 1/X
87 "T"           TIME PERIOD?
88 XEQ 88
89 *
90 CHS
91 E↑X

92◆LBL 11
93 FS? 02
```

```
 94 RTN
 95 ST* 04
 96 FS? 01
 97 XEQ 86
 98 DSE 03
 99 GTO 02
100 RCL 04

101◆LBL 05        OUTPUT RELIABILITY
102 XEQ 89

103◆LBL C
104 RCL 07
105 RCL 04
106 *
107 XEQ 89

108◆LBL 86        WORKING LABELS
109 RCL 03
110 Y↑X
111 GTO 05

112◆LBL 87
113 RCL 01
114 Y↑X
115 GTO 04

116◆LBL 88
117 "⊢?"
118 PROMPT
119 RTN

120◆LBL 89
121 CF 01
122 CF 02
123 "RELIABI
      LITY="
124 ARCL X
125 AVIEW
126 FS? 55
127 STOP
128 GTO 10
129 END
```

APPENDIX C

EXAMPLE PROGRAM RUNS

```
  XEQ "RAND"
EM/UN WGT?
UN
          RUN
UNIT WGT?
 104,322.000
    0     RUN
CARGO?
Y
          RUN
MAX SPD KNOT
S?
 491.0000
          RUN
NUM FLT TEST
?
 100.0000
          RUN
HRS EN=12,56
5,047.86
          RUN
HRS TO=10,69
8,291.7
          RUN
HRS LA=32,73
5,811.48
          RUN
$ MATL=445,1
29,157.7
          RUN
$ DEV =104,7
16,301.2
          RUN
$ PROG=2,191
,198,907.
          RUN
$ FL T=42,04
8,591.29
          RUN
QC=2,784,726
.363
          RUN
```

RAND EXAMPLE

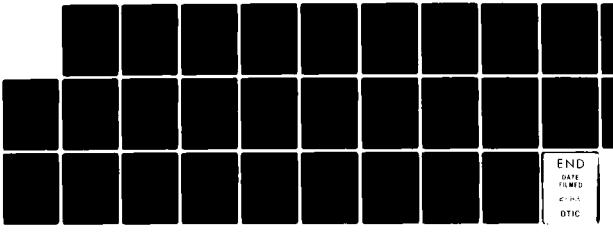
```
    XEQ "NOR"    NORTHROP EXAMPLE
DTJ?
N
            RUN
ABTF?
Y
            RUN
AW-A/A-A/G?
Y
            RUN
N F?
N
            RUN
S S?
Y
            RUN
AF LR
 .8000      RU
             N
EW?
 20,000.0000
           RUN
%G?
 .3500      RU
             N
%T?
 .0100      RU
             N
%O?
 .3500      RU
             N
AF 750=3.819
,126.892
           RUN
EN LR
 .9000      RU
             N
FMIL?
 11,000.0000
           RUN
BPR?
 1.0000      R
            UN
FMAX?
 19,000.0000
           RUN
PU 1000=1,29
4,040.200
           RUN
N?
 2.0000      R
            UN
P 750=2,869,
571.696
           RUN
```

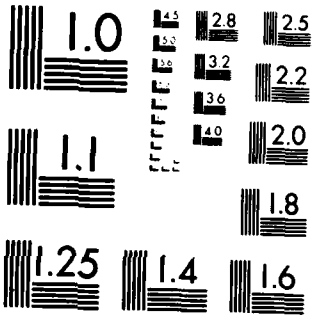
```
AV LR
 .9200     RU
             N
AV WT?
 1,500.0000
           RUN
E 750=2,250,
000.000

           RUN
F 750=8,938,
698.588
           RUN
R&D=2,417,88
6,289.
           RUN
UF?
 .8000     RU
             N
           RUN
NYRS?
 15.0000
           RUN
UR?     .
 300.0000
           RUN
$/GAL?
 .4400     RU
             N
F*S?
 7,500.0000
           RUN
L/D?
 11.7650
           RUN
POL$/FH=422.
6274
           RUN
Q?
 729.0000
           RUN
AQ=2,809,714
,498.
           RUN
PQ=2,100,967
,693.
           RUN
EQ=1,645,863
,157.
           RUN
FQ=6,556,545
,348.
           RUN
```

AD-A123 045 THE UTILITY OF HANDHELD PROGRAMMABLE CALCULATORS IN AIRCRAFT LIFE CYCLE C..(U) AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOOL OF SYST.. D P BROOKS

3/3

UNCLASSIFIED SEP 82 AFIT-LSSR-41-82 F/G 1/0 NL





```
I OΣS=2,425,
921,779.
          RUN
FH OΣS=3,998
,364,793.
          RUN
CL IV M=354,
053,448.8
          RUN
UE OΣS=1,392
,428,007
          RUN
POL OΣS=1,10
9,143,393.
          RUN
OTH OΣS=1,58
9,953,473.
          RUN
TLCC=1.9844E
10
          RUN
END
```

```
      XEQ "AM"
W
TI%=?
 0.0000      R
             UN
S%=?
 0.0000      R
             UN
G%=?
 0.0000      R
             UN
GR%=?
 0.0000      R
             UN
B%=?
 0.0000      R
             UN
F
TI%=?
 0.0000      R
             UN
S%=?
 0.0000      R
             UN
G%=?
 0.0000      R
             UN
GR%=?
 0.0000      R
             UN
B%=?
 0.0000      R
             UN
N
TI%=?
 0.0000      R
             UN
S%=?
 0.0000      R
             UN
G%=?
 0.0000      R
             UN
GR%=?
 0.0000      R
             UN
B%=?
 0.0000      R
             UN
T
TI%=?
 0.0000      R
             UN
```

GRUMMAN EXAMPLE
ADVANCED MATERIAL

C-141A ALL ARE Ø

```
S%=?
 0.0000     R
           UN
G%=?
 0.0000     R
           UN
GR%=?
 0.0000     R
           UN
B%=?
 0.0000     R
           UN

    XEQ "DA"
AL?
 145.0000
          RUN
AT?
 2.0000     R
           UN
AVIW?
 1,567.0000
          RUN
AVW?
 2,102.0000
          RUN
ATBO?
 3,000.0000
          RUN
B/H?
 160.0000
          RUN
CW?
 66,090.0000
          RUN
CFA?
 721.0000
          RUN
CV?
 6,500.0000
          RUN
EPR?
 16.0000
          RUN
FFY?
 63.0000
          RUN
FD?
 3.4800     R
           UN
≠W?
 10.0000
          RUN
```

```
S%=?
 0.0000     R
           UN
G%=?
 0.0000     R
           UN
GR%=?
 0.0000     R
           UN
B%=?
 0.0000     R
           UN
    XEQ "DA"      PERMANENT DATA INPUT
AL?
 145.0000
          RUN
AT?
 2.0000     R
           UN
AVIW?
 1,567.0000
          RUN
AVW?
 2,102.0000
          RUN
ATBO?
 3,000.0000
          RUN
B/H?
 160.0000
          RUN
CW?
 66,090.0000
          RUN
CFA?
 721.0000
          RUN
CV?
 6,500.0000
          RUN
EPR?
 16.0000
          RUN
FFY?
 63.0000
          RUN
FD?
 3.4800     R
           UN
≠W?
 10.0000
          RUN
```

```
FV?
 16,000.0000
          RUN
FLVA?
 14.0000
          RUN
H/M?
 3.7100     R
           UN
IFLW?
 150,020.000
    0     RUN
LW?
 235,810.000
    0     RUN
L+S?
 305.7000
          RUN
MM?
 .8600     RU
            N
MQT?
 63.2500
          RUN
≠ACT?
 29.0000
          RUN
≠APU?
 1.0000     R
           UN
≠C/A?
 5.0000     R
           UN
≠CLS?
 48.0000
          RUN
≠EN?
 4.0000     R
           UN
≠EX?
 13.0000
          RUN
≠G+S?
 0.0000     R
           UN
≠HS?
 33.0000
          RUN
≠IT?
 12.0000
          RUN
≠S?
 8.0000     R
           UN
```

```
ULF?
 3.7500      R
            UN
≠P?
 5.0000      R
            UN
RMFG?
 15.0000
            RUN
SS?
 10.0000
            RUN
TFF?
 168.0000
            RUN
TGWC?
 316,600.000
    0       RUN
TGWM?
 323,100.000
    0       RUN
≠PSN?
 162.0000
            RUN
TAVSS?
 25.0000
            RUN
TT?
 84,000.0000
            RUN
TKA?
 252.0000
            RUN
TWA?
 13,051.0000
            RUN
UR?
 1,120.0000
            RUN
WN?
 160.7000
            RUN
≠A?
 289.0000
            RUN
FH/A?
 93.3000
            RUN
LC?
 180.0000
            RUN
INF
 1.0000      R
            UN
```

```
  XEQ "UAFD"      SUBPROGRAM DATA INPUT
WA?
 3,228.0000
          RUN
WT/C?
 .1200     RU
            N
KFD?
 1.0000     R
           UN
FWA?
 5,645.0000
          RUN
TA?
 899.0000
          RUN
#T?
 3.0000     R
           UN
NWA?
 1,150.0000
          RUN
TPS?
 1.0000     R
           UN
SF?
 0.0000     R
           UN
MT?
 21,000.0000
          RUN
TPEN?
 1.0000     R
           UN
CSD?
 1.0000     R
           UN
ANFT?
 1.0000     R
           UN

  XEQ "UAFP"      EXECUTE FIRST SUBPROGRAM UPC
FTR?              TYPE AIRCRAFT
N
          RUN
ATK?
N
          RUN
C/T?
Y
          RUN
```

```
SUBIF?                    INFLATION FACTORS
 1.0000      R
            UN
RMIF?
 1.0000      R
            UN

     XEQ "AF"    SUBPROGRAM DATA INPUT
PDR?
 4.0000      R
            UN
REGR?
 20.6400
           RUN
RFLT?
 19.6600
           RUN
REN?
 17.3400
           RUN
RMGT?
 18.3200
           RUN
RMFS?
 16.7600
           RUN
RFBS?
 13.5100
           RUN
RTDE?
 19.5300
           RUN
RTFB?
 15.7500
           RUN
RQCL?
 16.3800
           RUN
    XEQ "AFP"    EXECUTE SECOND SUBPROGRAM UPC
$APU?
 15,000.0000
           RUN
LR AF?
 .7500      RU
             N
    XEQ "UAV"    EXECUTE THIRD SUBPROGRAM UPC
ENTWR?
 4.5200      R
            UN
TIT?
 2,210.0000
           RUN
```

```
MQT?
 63.2500
          RUN
EPR?
 16.0000
          RUN
SLM?
 .7700     RU
            N
AVIF?
 1.0000 ¯   R
           UN
AVLR?
 .9000     RU
            N
ENLR
 .9000     RU
            N


   XEQ "RDD"    DATA INPUT RDT&E
DT?
 3.0000     R
          . UN
EPR?
 16.0000
          RUN
EAF?
 498.0000
          RUN
SLM?
 .7700     RU
            N


   XEQ "RDP"    EXECUTE RDT&E SUBPROGRAM
AFIF?
 1.0000     R
           UN
RENGR?
 20.6400
          RUN
RTDE?
 19.5300
          RUN
RTFB?
 15.7500
          RUN
RED LR AF?
 .7500     RU
            N
INS?
N
          RUN
```

```
SPFAC?
 1.5000     R
           UN
RΣD LR EN?
 .9000     RU
            N
ENIF?
 1.0000     R
           UN
   XEQ "OUT"
AFM=516,005,
256.9
           RUN
AV=59,326,64
9.82
           RUN
EN=165,866,6
95.6
           RUN
%GΣA?
 .1040     RU
            N
 53,664,546.
   72      ***
%PR?
 .0600     RU
            N
 34,180,188.
   22      ***
RΣD=829,043,
337.2
           RUN
LR SUB?
 .8900     RU
            N
SUB PRD=332,
851,611.0
           RUN
LR AF?
 .7500     RU
            N
AF PRD=1,821
,939,554.
           RUN
LR AV?
 .9000     RU
            N
AV PRD=202,3
43,956.8
           RUN
LR EN?
 .9000     RU
            N
```

EXECUTE RDT&E AND PRODUCTION OUTPUT SUBPROGRAM

```
EN PRD=749.4
61,160.3
          RUN
GΣA=234,620,
166.9
          RUN
PROF=149,434
,998.7
          RUN
TOT PRD=3,49
0,651,448.
          RUN
   XEQ "ISD"     DATA INPUT FIRST SUBPROGRAM IS
≠B?
 12.0000
          RUN
   XEQ "ISP"     EXECUTE FIRST SUBPROGRAM IS
A/S/B=?
Y
          RUN
≠Ba?
 12.0000
          RUN
S/B?
 1.0000     R
           UN
A/S?
 16.0000
          RUN


     XEQ "Y"     DATA INPUT SECOND SUBPROGRAM IS


    XEQ "YP"     EXECUTE SECOND SUBPROGRAM IS

    XEQ "AV"     DATA INPUT THIRD SUBPROGRAM IS
≠DAVS?
 18.0000
          RUN
ENTWR?
 4.5200     R
           UN
TIT?
 2,210.0000
          RUN
  XEQ "AVP"     EXECUTE THIRD SUBPROGRAM IS
IS
STR=333,911,     INITIAL SPARES OUTPUT
154.8
          RUN
```

```
CR=9,854,782
.509
          RUN
LG=31,690,88
5.57
          RUN
FC=19,123,95
0.77
          RUN
EI=146,692,7
34.5
          RUN
ECS=19,909,6
51.94
          RUN
EL=34,804,07
8.83
          RUN
HYD=16,807,5
97.91
          RUN
FUEL=3,301,3
33.904
          RUN
CH=3,134,342
.099
          RUN
ARM=0.0000
          RUN
APU=411,700.
2000
          RUN
%GΣA?
 .1040     RU
            N
GΣA=77,083,2
70.34
          RUN
%PROF?
 .0600     RU
            N
PROF=49,096,
495.88
          RUN
SSE=0.0000
          RUN
IT=80,757,12
1.90
          RUN
EN=240,827,4
08.4
          RUN
AV=121,548,8
48.0
          RUN
```

```
TOT IS=1,188
,955,958.
          RUN
    XEQ "OSD"     DATA INPUT FIRST SUBPROGRAM CARGO
MLD?              OPERATIONS AND SUPPORT
 1,620.0000
          RUN
CSW?
 4,651.0000
          RUN
*PCP?
 2.0000     R
           UN
MVSQ?
 259.98+07
          RUN
*LGB?
 8.0000     R
           UN
MAL
 48,850.0000
          RUN
    XEQ "OSP"     EXECUTE FIRST SUBPROGRAM C O&S
%SUP?
 .8740      RU
             N
*L/M?
 38.0000
          RUN
    XEQ "APU"     DATA INPUT SECOND SUBPROGRAM C O&S
APUW
 547.0000
          RUN
ECSW
 2,648.0000
          RUN
CT
 2.0000     R
           UN
PCP
 2.0000     R
           UN
*G?
 5.0000     R
           UN
  XEQ "APUP"      EXECUTE SECOND SUBPROGRAM C O&S

   XEQ "HYD"      DATA INPUT THIRD SUBPROGRAM C O&S
*HP?
 6.0000     R
           UN
```

```
≠HSPS
 3.0000      R
            UN
≠ATM?
 0.0000      R
            UN
≠PTU?
 0.0000      R
            UN
FUSW?
 1,402.0000
           RUN
≠FUBP?
 20.0000
           RUN
≠ANT?
 22.0000
           RUN
   XEQ "HYDP"        EXECUTE THIRD SUBPROGRAM C O&S
NOAC?
 227.0000
           RUN

    XEQ "EN"         DATA INPUT ENGINE
ENTWR?
 4.5200      R
            UN
   XEQ "ENG"         EXECUTE ENGINE AND CARGO OPERATIONS
INF?                 AND SUPPORT OUTPUT
 1.0000      R
            UN
G/H?
 1,940.0000
           RUN
C/G?
 .4200      RU
             N
POL=3,261,52
2,099.
           RUN
BLM=1,449,24
2,263.
           RUN
RS=591,439,3
76.5
           RUN
DCR=1,253,18
3,061.
           RUN
BLO=1,373,65
2,932.
           RUN
BLT=979,177,
552.5
           RUN
PDM=228,381,
170.6
           RUN
```

```
OM=27,024,25
3.24
          RUN
TOT OES=5,90
2,100,610.
          RUN
```

```
XEQ "LN CURV"          LEARNING CURVE EXAMPLE

UNIT/CUM?              UNIT CURVE
U
          RUN
# UNITS?
 15.0000
          RUN
UNIT OF INT?
 10.0000
          RUN
UNIT 1 COST?
 75,000.0000
          RUN
% LEARN?
 .9500     RU
            N
UN COST=63,2
50.0222
          RUN
TOT COST=981
,903.7907

XEQ "LN CURV"          CUMULATIVE AVERAGE CURVE

UNIT/CUM?
C
          RUN
# UNITS?
 15.0000
          RUN
UNIT OF INT?
 10.0000
          RUN
UNIT 1 COST?
 75,000.0000
          RUN
% LEARN?
 .9500     RU
            N
UN COST=58,7
94.3795
          RUN
TOT COST=920
,706.2378
```

```
   XEQ "LSC"      LRU/SRU LOGISTICS SUPPORT COST EXAMPLE
DEVC?             INPUT DATA
 50,000.0000
          RUN
SYSI?
 900,000.000
    0     RUN
SEC?
 150,000.000
    0     RUN
M?
 20.0000
          RUN
AOH?
 600,000.000
    0     RUN
POH?
 115,000.000
    0     RUN
PIUP?
 15.0000
          RUN
UC?
 1,100.0000
          RUN
W?
 40.0000
          RUN
MTBD?
 170.0000
          RUN
MTBR?
 102.0000
          RUN
NRTS?
 .0500     RU
            N
RTS?
 .9500     RU
            N
COND?
 .0100     RU
            N
PAMH?
 .5000     RU
            N
RMH?
 .5000     RU
            N
SMI?
 0.0000     R
           UN
SMH?
 0.0000     R
           UN
```

```
BCMH?
 .2000      RU
             N
BMH?
 .3600      RU
             N
BMC?
 105.0000
           RUN
BRCT?
 .1300      RU
             N
DMH?
 5.0000      R
            UN
DMC?
 150.0000
           RUN
PA?
 3.0000      R
            UN
PP?
 15.0000
           RUN
PCB?
 15.0000
           RUN
OST?
 .5300      RU
             N
DRCT?
 1.9400      R
            UN
BLR?
 21.3800
           RUN
DLR?
 30.1700
           RUN
PSC?
 1.4300      R
            UN
SA?
 8.7500      R
            UN
IMC?
 1,200.0000
           RUN
RMC?
 150.0000
           RUN
BSC = $198.0    OUTPUT
00.0000
           RUN
```

```
BSTK = $9.00
00
          RUN
DSC = $72,60
0.0000
          RUN
DSTK = $66.0
000
          RUN
SIC = $420,6
00.0000
          RUN
TPC = $1,320
,600.000
          RUN
BMHC = $2,90
8,937.647
          RUN
BMMH = $453.
5294
          RUN
PMSH = $30.5
539
          RUN
BMMC = $8,80
1,470.588
          RUN
DMHC = $665,
514.7057
          RUN
DMMH = $1,47
0.5882
          RUN
DMMC = $661,
764.7059
          RUN
SDTC = $681,
352.9412
          RUN
CSC = $971,3
00.0000
          RUN
QSC = $883.0
000
          RUN
IMCC = $115,
425.0000
          RUN
TOC = $14,80
5,765.59
          RUN
          RUN
LCC = $16,17
6,365.59
          RUN
```

```
  XEQ "ORLA"     OPTIMUM REPAIR LEVEL EXAMPLE
BRCYT?
 .3300      RU
             N
LWRD?
 18.0500
           RUN
LWRI?
 13.0300
           RUN
DSST?
 .5000      RU
             N
NTDPRD?
 10.0000
           RUN
NTDPRI?
 10.0000
           RUN
MCFA?
 46.6000
           RUN
MCFP?
 46.6000
           RUN
NRA?
 0.0000      R
            UN
NNRA?
 30.0000
           RUN
MTBCT?
 63,155.0000
           RUN
MTBF?
 164,203.000
    0      RUN
NB?
 1.0000      R
            UN
NBC?
 1.0000      R
            UN
NBOS?
 0.0000      R
            UN
OSTC?
 1.0000      R
            UN
OSTOS?
 1.0000      R
            UN
IL?
 10.0000
           RUN
```

```
FRCPP?
 .0100      RU
             N
PSLRC?
 .2861      RU
             N
PSLROS?
 1.0000      R
            UN
PSMRC?
 .0630      RU
             N
PSMROS?
 1.0000      R
            UN
PWRC?
 1.2850      R
            UN
PWROS?
 1.0000      R
            UN
QPA?
 10.0000
           RUN
MCA?
 104.2000
           RUN
MHCT?
 1.5000      R
            UN
MCP?
 104.2000
           RUN
DRPT?
 1.4800      R
            UN
FSAC?
 36.5900
           RUN
CRM?
 4.0000      R
            UN
SSRC?
 .0513      RU
             N
SSROS?
 1.0000      R
            UN
RMW?
 .0100      RU
             N
TDOCP?
 160.0000
           RUN
```

```
UC?
 363.0000
          RUN
U/B?
 12.0000
          RUN
OH/M?
 348.0000
          RUN
UW?
 .5000   -  RU
             N
PTRD?
 .1500      RU
             N
PTRI?
 .3300      RU
             N
PTTD?
 1.0000      R
            UN
PTTI?
 1.0000      R
            UN
DTD?
 .0500      RU
             N
DTI?
 .0500      RU
             N
TCPD?
 200.0000
          RUN
TCPI?
 200.0000
          RUN
DISCARD=29,5
71.6076
          RUN
INTERMEDIATE
=43,519.9089
          RUN
DEPOT=33,981
.1351
          RUN
DEPOT=33,981
.1351?
```

```
XEQ "LCC REL     RELIABILITY EXAMPLE
          "
*LEV?
 5.000000
          RUN
*CIR/LEV?
 1.000000
          RUN
COM MTBF=?
Y
          RUN
S/P?
P
          RUN
*COM/CIR?
 2.000000
          RUN
*PAR CIR?
 1.000000
          RUN
REL?
 0.000000
          RUN
MTBF?
 500.000000
          RUN
T?
 1.000000
          RUN
RELIABILITY=
0.999996
          RUN
*CIR/LEV?
 3.000000
          RUN
COM MTBF=?
N
          RUN
S/P?
S
          RUN
*COM/SER?
 2.000000
          RUN
REL?
 .999996
          RUN
REL?
 0.000000
          RUN
MTBF?
 500.000000
          RUN
```

```
T?
 1.000000
          RUN
RELIABILITY=
0.997998
          RUN
          RUN
COM MTBF=?
Y
          RUN
S/P?
S
          RUN
#COM/SER?
 3.000000
          RUN
REL?
 0.000000
          RUN
MTBF?
 500.000000
          RUN
T?
 1.000000
          RUN
RELIABILITY=
0.994018
          RUN
          RUN
COM MTBF=?
Y
          RUN
S/P?

S
          RUN
#COM/SER?
 1.000000
          RUN
REL?
 0.000000
          RUN
MTBF?
 500.000000
          RUN
T?
 1.000000
          RUN
RELIABILITY=
0.998002
          RUN
#CIR/LEV?
 1.000000
          RUN
```

```
COM MTBF=?
N
          RUN
S/P?
P
          RUN
≠COM/CIR?
 3.000000
          RUN
≠PAR CIR?
 1.000000
          RUN
REL?
 .998002
          RUN
REL?
 .997998
          RUN
REL?
 .994018
          RUN
RELIABILITY=
1.000000
          RUN
          RUN
≠CIR/LEV?
 2.000000
          RUN
COM MTBF=?
N
          RUN
S/P?
S
          RUN
≠COM/SER?
 2.000000
          RUN
REL?
 1.000000
          RUN
REL?
 0.000000
          RUN
MTBF?
 500.000000
          RUN
T?
 1.000000
          RUN
RELIABILITY=
0.998002
          RUN
COM MTBF=?
Y
          RUN
```

```
S/P?
S
            RUN
#COM/SER?
 2.000000
            RUN
REL?
 0.000000
            RUN
MTBF?
 500.000000
            RUN
T?
 1.000000
            RUN
RELIABILITY=
0.996008
            RUN
#CIR/LEV?
 1.000000
            RUN
COM MTBF=?
N
            RUN
S/P?
P
            RUN
#COM/CIR?
 2.000000
            RUN
#PAR CIR?
 1.000000
            RUN
REL?
 .998002
            RUN
REL?
 .996008
            RUN
RELIABILITY=
0.999992
            RUN
SYSTEM REL=0
.999992
```

APPENDIX D

OUTPUT COMPARISON

RAND C-141A Airframe R&D and Production

	Model	Original	Actual
Hrs En	12,565,047.86	17,166,982	13,000,000
Hrs Tool	10,698,291.74	14,266,000	10,700,000
Hrs Lab	32,735,811.48	43,508,000	30,000,000
$ Matl	445,129,157.70	595,939,000	387,345,000
$ Dev	104,716,301.20	136,771,000	47,485,000
$ Prog	2,191,198,907.00	2,921,599,000	1,849,211,000
$ Fl Tst	42,048,591.29	49,506,000	40,391,000
QC	2,784,726.36	3,698,000	1,610,000

NORTHROP A-10 Aircraft R&D, Production, and Operations and Support

	Model	Original	
AF_{750}	3,819,126.89	3,819,000.00	
Pu_{1000}	1,294,040.20	1,294,000.00	
P_{750}	2,869,571.70	2,870,000.00	
E_{750}	2,250,000.00	2,250,000.00	
F_{750}	8,938,698.59	8,939,000.00	
R&D	2,417,886,289.00	2,379,000,000.00	Math Error
POL_{FH}	422.63	423.00	
A_{729}	2,809,714,498.00	2,810,000,000.00	
P_{729}	2,100,967,693.00	2,101,000,000.00	
E_{729}	1,645,863,157.00	1,646,000,000.00	
F_{729}	6,556,545,348.00	6,557,000,000.00	
I O&S	2,425,921,779.00	2,426,000,000.00	
FH O&S	3,998,364,793.00	3,998,000,000.00	
CL IV M	354,053,448.80	354,000,000.00	
UE O&S	1,392,428,007.00	1,118,000,000.00	Math Error
POL O&S	1,109,143,393.00	1,109,000,000.00	
OTH O&S	1,589,953,473.00	1,590,000,000.00	
TOT LCC	19,844,000,000.00	19 5,310,000,000.00	Notation Error

GRUMMAN C-141A Aircraft R&D, Production, Initial Spares, and Operations and Support

	Model	Original
AFM	516,005,256.90	561,755,000.00
AV	59,326,649.82	61,939,000.00
EN	165,866,695.60	163,511,000.00
G&A	53,664,546.72	58,423,000.00
PR	34,180,188.22	37,211,000.00
TOT	829,043,337.20	882,838,100.00
AFM	1,821,939,554.00	1,860,443,000.00
AV	202,343,956.80	226,629,000.00
EN	749,461,160.30	716,906,000.00
G&A	234,620,166.90	205,271,000.00
PR	149,434,998.70	130,742,000.00
TOT	3,490,651,448.00	3,139,990,200.00
STR	333,911,154.80	351,224,100.00
CR	9,854,782.51	13,141,200.00
LG	31,690,885.57	35,718,300.00
FC	19,123,950.77	21,043,600.00
EI	146,692,734.50	109,067,700.00
ECS	19,909,651.94	22,760,600.00
EL	34,804,078.83	41,549,500.00
HYD	16,807,597.91	21,783,500.00
FUEL	3,301,333.90	6,454,700.00
CH	3,134,342.10	2,772,500.00
APU	411,700.20	2,416,500.00
G&A	77,083,870.34	79,956,000.00
PR	49,096,495.88	50,926,000.00
IT	80,757,121.90	80,374,000.00
EN	240,827,408.40	199,887,100.00
AV	121,548,848.00	140,874,400.00
TOT	1,188,955,958.00	1,099,575,600.00
POL	3,261,522,099.00	3,261,522,000.00
BLM	1,449,242,263.00	1,485,428,000.00
RS	591,439,376.50	605,432,000.00
DCR	1,253,183,061.00	1,277,842,000.00
BLO	1,373,652,932.00	1,373,653,000.00
BLT	979,177,552.50	979,178,000.00
PDM	228,381,170.60	228,381,000.00
OM	27,024,253.24	26,306,000.00
TOT	5,902,100,610.00	5,976,218,500.00

LSC

	Model	Original
BSC	198,000.00	198,000.00
BSTK	9.00	9.00
DSC	72,600.00	72,600.00
DSTK	66.00	66.00
SIC	420,600.00	420,600.00
TPC	1,320,600.00	1,320,600.00
BMHC	2,908,937.65	2,908,937.65
BMMH	453.53	453.53
PMSH	30.55	30.55
BMMC	8,801,470.59	8,801,470.59
DMHC	665,514.71	665,514.71
DMMH	1,470.59	1,470.59
DMMC	661,764.71	661,764.71
SDTC	681,352.94	681,352.94
CSC	971,300.00	971,300.00
QSC	833.00	383.00
IMCC	115,425.00	115,425.00
TOC	14,805,765.59	14,805,765.59
LCC	16,178,365.59	16,176,365.59

ORLA

	Model	Original
DISCARD	29,571.61	29,571.01
INTERMEDIATE	43,519.91	43,415.44
DEPOT	33,981.14	33,969.68

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