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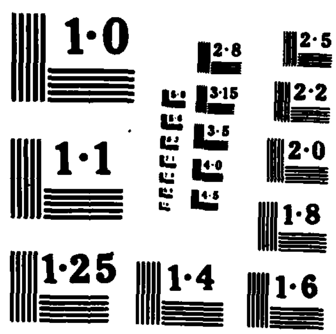
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The basic Parts Requirements and Cost Model (basic PARCOM), developed at the US Army Concepts Analysis Agency, was redesigned to include partial substitution parts replacement policies and other features lacking in the basic PARCOM. The redesigned model is documented and denoted as Extended PARCOM. Extended PARCOM provides the Army with an analytical tool for quick reaction, gross estimation of wartime spare parts requirements and costs as they relate to flying hour and availability objectives and to part replacement

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20. ABSTRACT Continued

policies. The model also assists in the identification of problem parts and possible causes of the problems. The Extended PARCOM User's Guide is structured to provide a user with sufficient information on model input/output and operation to effectively apply Extended PARCOM. Additional information on model application may be found in the Extended PARCOM Functional Description, published separately.

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EXTENDED PARTS REQUIREMENTS AND COST MODEL (PARCOM) USER'S GUIDE

(Short title: Extended PARCOM User's Guide)

MARCH 1985

PREPARED BY
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CONTENTS

FIGURES

TABLES

EXTENDED PARTS REQUIREMENTS AND COST MODEL (PARCOM) USER'S GUIDE

(Short title: Extended PARCOM User's Guide)

CHAPTER 1

GENERAL DESCRIPTION

1-1. PURPOSE OF THE USER'S GUIDE. The purpose of this user's guide is to provide personnel with the information necessary to effectively utilize the Extended Parts Requirements and Cost Model (Extended PARCOM). Extended PARCOM is a planning support system for the logistics analyst/planner which permits the examination of three critical logistics issues:

- The shortfall of current fleet combat capability relative to required capability based on a specified current spares inventory.
- The "best" spares mix and associated fleet combat capability achievable with a limited amount of funds for add-on spares.
- The spares cost required to sustain a fleet flying program for a specified number of days and, conversely, the number of days of such sustainability achievable with a specified spares "budget."

1-2. PROJECT REFERENCES

a. Aircraft Spares Stockage Methodology (Aircraft Spares) Study, CAA-SR-84-12, US Army Concepts Analysis Agency, April 1984.

b. Overview/PARCOM Turnkey Project (OPTP), CAA-SR-84-33, US Army Concepts Analysis Agency, November 1984.

c. Parts Requirements and Cost Model (PARCOM) User's Guide, CAA-D-84-10, US Army Concepts Analysis Agency, October 1984.

d. Parts Requirements and Cost Model (PARCOM) Functional Description, CAA-D-84-15, US Army Concepts Analysis Agency, October 1984.

e. Partial Substitution and other Modifications to the PARCOM Model, CAA-TP-84-11, US Army Concepts Analysis Agency, November 1984.

f. Extended Parts Requirements and Cost Model (Extended PARCOM) Functional Description, CAA-D-85-3, US Army Concepts Analysis Agency, March 1985.

g. Pickard, W. C., Zellner, P. A., and Bailey, D. R., DOD Assimilation of US Air Force Methodologies for Relating Logistics Resources to Materiel Readiness, Synergy, Inc., August 1983.

h. Maximizing Daily Helicopter Flying Hours Study (MAX FLY Study), CAA-SR-83-11, US Army Concepts Analysis Agency, August 1983 (SECRET).

1-3. DEVELOPMENT BACKGROUND

a. **Model Origin.** The US Army Concepts Analysis Agency (CAA) developed the Parts Requirements and Cost Model (PARCOM) to generate cost effective mixes of aircraft spare parts and to assess aircraft fleet performance under specified wartime scenario conditions. Development occurred during the course of the Aircraft Spare Stockage Methodology (Aircraft Spares) Study (reference 1-2a, above) conducted by CAA. That study, and PARCOM development, were in response to interest shown by the Deputy Chief of Staff for Logistics (DCSLOG) in developing a methodology (or methodologies) relating aircraft spare parts stockage levels to combat readiness and flying hour capability. The calculation of spare parts requirements and of the effects of budgeting changes had been a slow and cumbersome peacetime oriented exercise. The principal criterion for spares stockage had been the achievement of acceptable stockout, or fill rate, levels. To more realistically predict wartime spare parts requirements, and to better justify budget requests for spare parts procurement, the Army needed a more responsive methodology based on wartime flying hour expectations and system readiness/availability requirements. PARCOM was developed to meet that need.

b. **Follow-on Effort.** Results reported in Aircraft Spares were sufficiently encouraging to warrant a follow-on study, designated the Overview/PARCOM Turnkey Project (OPTP) (reference 1-2b, above). Included in the objectives of OPTP were the following actions pertaining to PARCOM:

(1) Document PARCOM, as developed in the Aircraft Spares Study, and deliver it to the US Army Aviation Systems Command (USAVSCOM). This documentation consisted of a User's Guide (reference 1-2c, above) and a Functional Description (reference 1-2d, above).

(2) Evaluate and report on the potential for extending the capability of PARCOM to include partial-substitution parts replacement policies and any other features deemed desirable but lacking in the model (PARCOM) developed for Aircraft Spares. A technical paper (reference 1-2e, above) reported on the model extension. The extended model is denoted as Extended PARCOM; the original model, as developed in the Aircraft Spares Study, is denoted simply as PARCOM or basic PARCOM.

1-4. PURPOSE. The OPTP Study proposed delivery of documentation for Extended PARCOM in the form of revisions to the User's Guide and Functional Description for basic PARCOM. This report includes the revisions to the PARCOM User's Guide. Another report (reference 1-2f, above) includes the revisions to the PARCOM Functional Description.

1-5. TERMS AND ABBREVIATIONS. The following listing provides an explanation of any terms or acronyms subject to interpretation by the reader:

acft	aircraft
ASL	authorized stockage list
avail	availability
BRT	retail repair time
CAA	US Army Concepts Analysis Agency
cum	cumulative
DCY	depot recycle time
FR	failure rate
frac	fraction
full sub	full substitution (part replacement policy)
hr	hour
ID	identification
init	initial
inv	inventory
MAX FLY	Maximization of Daily Flying Hours (study)
min	minimum
NMC	not mission capable
NMCS	not mission capable supply
no sub	no substitution (part replacement policy)
NRTS	not repairable this station
nr	number
NSN	national stock number
OST	order and ship time
PARCOM	Parts Requirements and Cost Model
PLL	prescribed load list
repl	replacement

req	required
rqmt	requirement(s)
spare(s)	replacements for modular components, assemblies and subassemblies whose removal, in their entirety, from an aircraft prevents it from functioning. Includes, items commonly known as spares, spare parts, and repair parts that fit the definition.
stk	stock
sub	substitution

1-6. SECURITY AND PRIVACY. All program code and listings are UNCLASSIFIED and require no special security considerations.

a. The classification of output reports depends on the specific data base used and the type and labeling of generated output. All example output in this report is UNCLASSIFIED.

b. The classification of input files is also a function of the data base used and the user's method labeling. All example input in this report is UNCLASSIFIED.

CHAPTER 2

SYSTEM SUMMARY

2-1. SYSTEM APPLICATION

a. **Requirements Mode.** Extended PARCOM provides information to logistics staff officers on the parts amounts and costs of cost-effective mixes of aircraft spare parts required to achieve a specified flying program under various:

- Part replacement policies
- Cost constraints
- Initial inventory conditions
- Aircraft availability constraints

The options for requirements cases are summarized in Table 2-1. A row of "X" entries denotes the simultaneous assignment of conditions defining each general case for a specified partial-substitution policy.

Table 2-1. Key Attributes of Requirements Cases

Flying hour objective		Aircraft availability objective		Cost objective	
Consecutive daily achieved	Maximum cumulative achieved	No specified aircraft avail-ability	Minimum daily aircraft avail-ability	Unconstrained funds	Constrained funds
X	X	X		X	
X	X		X	X	
X		X			X
X			X		X
	X	X			X
	X		X		X

(1) **Parts Replacement Policy.** Whether or not a failed critical part degrades aircraft flying hour productivity depends on the parts replacement policy used. Basic PARCOM represented the effects of only two specific policies, full substitution and no substitution. These policies are special cases of the partial-substitution policy capability of Extended PARCOM.

(a) Full and No Substitution. Under a "no substitution" policy, only a spare may replace a failed part. Under a "full substitution" policy a failed part may be replaced by either a spare or, if a spare is not readily available, by a serviceable part removed from an aircraft which is already NMC (not mission capable). A third parts replacement policy is "NMCS = 0," which has, as a goal, the replacement of all failed parts with spares. Basically the "NMCS = 0" policy is just a "no substitution" policy with an additional requirement that daily aircraft availability be 1.00. This variation is of interest since it represents the most expensive plausible policy. In a sense, all else being equal, a "full substitution" policy is associated with the "cheapest" buy which fulfills the flying program, while the "NMCS = 0" policy is associated with the "most expensive" buy ("covering" all failures with spares).

(b) Partial-Substitution. In Extended PARCOM, a partial-substitution parts replacement policy is defined by partitioning all part types into a full-sub set and a no-sub set. A part type is in only one set and remains in that set throughout the scenario. The full-substitution and no-substitution policies of the basic PARCOM are special cases of partial substitution in which all parts are either in the full-sub set or in the no-sub set. The analytic usefulness of the definition given below arises from the consequence that any NMCS aircraft will either be awaiting exactly one no-sub part or at least one full-sub part but will never be awaiting a mixture of full-sub and no-sub parts.

- All parts in the full-sub set operate with a full-substitution replacement policy relative to aircraft which are NMCS due to lack of a part from that set. That is, a failed full-sub part on an aircraft may be replaced either by a spare (if available) or, if a spare is not available, by a serviceable part installed on an NMCS aircraft which is awaiting a full-sub part. However, no failed full-sub part can be replaced by any part installed on an NMCS aircraft awaiting a no sub-part.

- Parts in the no-sub set operate with a no-substitution replacement policy. That is, a failed no-sub part on an aircraft may only be replaced by a spare part. An NMCS aircraft lacking a no-sub part may neither receive a serviceable part from another NMCS aircraft, nor may it provide a serviceable part to (fill a "hole" in) any other NMCS aircraft.

(2) Unconstrained Costs. With unconstrained costs, a user has unlimited funds but wishes to spend the least amount for an add-on spare buy which will enable the fleet to achieve a specified goal/objective. Within each unconstrained cost case the following options apply:

(a) Goal/Objective. The basic goal is "sparing to flying hours," i.e., generating a parts mix which will achieve a specified flying hour program at least cost. An additional goal of a minimum required (daily) aircraft availability can also be used. In this context, aircraft availability = 1 - NMCS, where NMCS = the fraction of surviving aircraft in "not mission capable supply" status.

(b) Initial Inventory. For each item, initial inventory may be set to a current inventory which is distributed in theater according to a specified schedule. Extended PARCOM will then compute the least cost add-on requirement, which is denoted as a residual requirements solution. The computed requirement is treated as an add-on to the theater war reserve. The model, however, can also generate a solution with the initial inventory set to zero, which is denoted as a total requirements solution.

(3) Constrained Costs. While the unconstrained cost solution is the one that "best" meets the flying program, a requirements buy may not be affordable if funds are limited. With constrained costs, a user wishes to apply limited funds to buy a cost-effective slice of the unconstrained cost requirement. The associated options are:

(a) Goal/Objective. The basic goal is to generate a parts mix, within the constrained budget, which maximizes the fraction of the flying program achievable. Thus, the flying program (possibly in conjunction with aircraft availability constraints) is a part of the goal/objective.

(b) Initial Inventory. The residual constrained cost solution assumes initial inventory = current inventory and computes an add-on solution based on an input cost limit. As an option, the model can also compute a total requirements solution with the initial inventory = 0, using another input cost constraint.

(4) Treatment of Case Objectives. As shown in Table 2-1, for each cost objective the user specifies a flying hour objective and an availability objective. For each of these, one of two subobjectives may apply. The cost subobjectives have already been discussed. Details on the nature of the other subobjectives are discussed below.

(a) Maximizing Cumulative Flying Hours Achieved. This is the standard subobjective met when running a constrained cost case. It entails the direct determination of the parts mix which will yield the greatest number of achieved flying hours for a specified cost limit. The flying hours achieved will be less than the desired flying hour program if the cost limit is less than the cost of the unconstrained cost solution mix.

(b) Maximizing Consecutive Days of Flying Hour Program Achievement. This sustainability subobjective, like the previous one, is only relevant in constrained cost cases (for unconstrained cost cases, achieved flying hours will equal programed flying hours, and consecutive days of flying hour program achievement will equal the total days programed for the assumed war). The solution mix meeting a constrained cost/sustainability subobjective is obtained through a two-stage process. First the user applies Extended PARCOM to generate an unconstrained cost solution. The output list from that run shows, for each day, the cumulative cost of the add-on parts that would have been required if the war were truncated at that day. D, the last day on that list for which the associated cumulative cost is less than or equal to the "cost limit" of the constrained cost case, is then the maximum number of consecutive days sustainable at 100 percent program flying hours with "cost limit" spares dollars. Next, the desired solution mix is obtained by running Extended PARCOM again, in an unconstrained cost mode, with a truncated war of D days in length.

(c) **Minimum Specified Daily Aircraft Availability.** This subobjective is in addition to any flying hour objective and is operative in all cases. The availability objective may increase the demand for available aircraft beyond those required to achieve the flying program. The input availability constraints are used to calculate daily "allowed NMCS aircraft," which, in turn, is used in all case calculations.

(d) **No Specified Daily Aircraft Availability.** Extended PARCOM must always read in values for minimum daily aircraft availability objectives; however, entering blank or zero equates to not specifying an availability.

(5) **Capability Value of Requirements Mixes.** After a requirement solution mix is computed, Extended PARCOM will also generate a record of daily achievable fleet flying capability implied by use of that solution mix. The capability assessment measures are:

- Daily achievable aircraft availability
- Daily achievable fraction of flying program completed
- Daily achievable flying hours per available aircraft per day

Overall average (over the scenario length) values of these measures are also computed. In the requirements mode, Extended PARCOM capability assessment results superficially show the logistics planner cases in which the costs of correcting capability shortfalls are based only on filling inventory shortfalls (i.e., by buying spares). However, the results may also suggest the need to examine the cost effectiveness of other ways to meet the flying program objective. For example, intensive management or improved efficiency in repair and processing cycles might reduce requirements by shortening the length of the logistics pipeline. In addition, product improvement programs might reduce requirements by lowering failure rates. Applied with the constrained cost option, Extended PARCOM could be used to compare improvements in flying hour program capability from applying a fixed number of dollars, C, to "pipeline/failure rate improvement" with improvements from "buying spares." The capability with a qualitatively improved current inventory can be compared to the capability resulting from the constrained cost solution obtained by using the C dollars to efficiently "buy spares."

b. Capability Assessment Mode. While designed primarily as a requirements assessment model, Extended PARCOM can also assess the capability of an aircraft fleet with a specified (e.g., current) spare inventory to meet a flying hour objective under a variety of user-specified partial-substitution policies. These assessments are, depending on user inputs, in addition to or in place of results generated in the requirements mode described above. The user defines the policies treated in terms of the designation of full-sub or no-sub parts, as noted earlier. Except for part replacement policy, all scenario conditions are the same in all capability assessments. When the requirements mode is also exercised, the scenario conditions (except for replacement policy) specified for that case also apply to all capability assessment cases. The assessment measures are the same as those described above for capability value of requirements mixes.

2-2. SYSTEM OPERATION

a. Extended PARCOM is designed to operate from card image input constructed by the user, along with a parts data base in a format very similar to that used by the Overview Model (reference 1-2g, above) in the US Army Concepts Analysis Agency (CAA) Maximization of Flying Hours (MAX FLY) Study (reference 1-2h, above). A peripheral storage device (tape or disc) is used to store the parts data base, since it is not in a card-image format.

b. Extended PARCOM output consists entirely of printed files. The type and quantity of output can be controlled to a degree by user-specified input options.

2-3. SYSTEM CONFIGURATION. The current Extended PARCOM version was developed for the Sperry 1100/82 Multi-Processing System at CAA. The model is coded in FORTRAN.

2-4. SYSTEM ORGANIZATION. Extended PARCOM is implemented as a single processor which:

- Reads part type data/characteristics from a peripheral storage device.
- Reads card image scenario data supplementary to the parts data. The scenario data also specify the goal/objective for the solution requirement mix(es).
- Generates cost-effective requirements solution mixes (costs and composition) of spares based on the specified goals and on a specified partial-substitution replacement policy.
- Generates achievable combat capability (readiness, flying hours) reflected in the solution spares mixes.
- Generates achieveable combat capability reflected in a (input) specified spares inventory under a specified partial-substitution replacement policy.

As noted earlier, a single Extended PARCOM execution can generate a requirements solution for a combination of initial inventory conditions, parts replacement policies, and cost constraints.

2-5. PERFORMANCE

a. Input. The parts data base for Extended PARCOM is a modified version of the format used by the Overview Model, as applied at CAA. The data base consists of 12 records for each part type, with each record being up to 102 characters in length. For the current maximum capacity of 300 part types, the Overview/PARCOM parts data base would have 3,603 records (3 "label" records begin the data base). However, since only 7 records are read by PARCOM from each "part type" set of 12, only 2,100 of the 3,603 records are used. The card image scenario data, for the current maximum capacity of 300 part types in a (maximum) 120-day scenario, consists of approximately 40-120 records depending on the day-to-day variation in specified aircraft deployments, flying program, and availability goals.

b. Output. The parts data input is "echoed," i.e., printed in an output list. A variety of reports on spare requirements (costs and amounts, total and by part type), and resulting capability (aircraft availability, fraction of flying goal achieved, and flying hours per aircraft per day) are printed. For each demonstration case at maximum capacity, the volume of printed output is approximately 120 pages.

c. Limitations. The model is currently designed for, at most, 300 part types processed over, at most, a 120-day scenario. However, these limits may be increased by altering the DIMENSION and COMMON statements of the FORTRAN code, insofar as available computer memory allows. Further extension of capacity can be achieved by "splitting" Extended PARCOM into several submodels, each of which processes only a specific problem from the set of problems currently treated in a single "run" of a single model. With its current limits, Extended PARCOM uses 47K of memory on the Sperry 1100/82 computer at CAA.

d. Processing Time. The central processing time required for an Extended PARCOM execution depends on the scenario length and the number of part types processed, as well as the types of problems processed. A complete Extended PARCOM execution with the above limits may consume up to 13 central processing minutes on the CAA computer.

2-6. DATA BASE

a. The major portion, in terms of quantity of records, of the Extended PARCOM input data base is from the parts data base. Extended PARCOM uses the data elements shown in Table 2-2. Many of these are also used in the parts data base for the Overview Model. Only a portion of the information in the Overview parts data base is read and used by Extended PARCOM. Since the parts data base has records of 102 characters in length, it is not read as card image (80 characters per record), and therefore, must be read from a peripheral storage device (tape or disc).

Table 2-2. Data Elements for Each Part Type in the Parts Data Base

(1)	National stock number (NSN)
(2)	Unit cost
(3)	Retail repair time
(4)	Depot repair time
(5)	Order and ship time
(6)	Failure rate
(7)	Retail NRTS rate
(8)	Retail condemnation percentage
(9)	Depot condemnation percentage
(10)	Item essentiality code
(11)	Quantity per application
(12)	Part description
(13)	Number of initial depot serviceables
(14)	Number of initial depot unserviceables
(15)	Number of initial war reserve (retail) serviceables
(16)	Number of initial war reserve (retail) unserviceables
(17)	Total parts in retail ASL/PLLs on Day 1
(18)	Distribution schedule of parts deployed after Day 1 (by 5-day intervals)

b. The rest of the Extended PARCOM input data base is denoted by "the scenario data base" and consists of scenario specification data, scenario constraint data, additional (to parts data base) parts data, and print/calculate options. These are summarized in Table 2-3. These records are all card image. During Extended PARCOM execution the parts data base is read between the first and last scenario data base records. Therefore, the two aforementioned data bases should always be read on separate logical units if, as is now the case, the two data bases are separately formatted and constructed.

Table 2-3. Data Elements for the Scenario Data Base

Scenario Specification Data

- Case identifier
- Length of war
- Flying program
- Aircraft deployment schedule
- Aircraft losses

Scenario Constraint Data

- Cost limit (for constrained cost)
- Aircraft availability constraints (minimum daily availability)
- Maximum flying hours per aircraft per day

Additional Parts Data

- Order ship time offset
- Maximum essentiality code for part to be processed
- Lag time before initial depot serviceables are sent to retail
- Duration of time required to distribute initial depot serviceables to retail

Part Replacement Policy Specification Data for Requirement Calculations

- (1st Option) Number of parts in full-sub parts set and the part numbers of the parts designated as full-sub
- (2nd Option) Screening limits on depot cycle time, NRTS rate, retail repair time, and failure rate. A part type with parameters exceeding any screening limit is selected for the full-subset.

Part Replacement Policy Specification for Current Inventory Capability Assessment

- Number of parts in each full-sub parts set and the part numbers of parts designated full sub

Print/Calculate Options

- Options to print various input/output lists
- Options to omit requirements calculations and only do capability assessment of current inventory
- Option to select the order in which part requirements are listed in output--either by decreasing part unit cost or by decreasing amount of requirement

Tuning Parameters

- Desired closeness of "flying hours flown" convergence during capability assessment
- Maximum number of iterations used to calculate "flying hours flown" during capability assessment
- Increment step size used during partial-substitution requirements calculations

Miscellaneous

- Designation of (up to 100) part types for which cumulative requirements through each scenario day will be listed

2-7. PARTS DATA BASE FORMAT. The parts data base read by Extended PARCOM consists of 3 file header records, which are skipped, followed by a series of sets of 12 records, each set being associated with data for a single part type. Extended PARCOM reads from only 7 of the 12 records in each set, the first, third, fifth, and sixth through ninth records. The rest are skipped. The program could be altered to read a compressed parts data package which could be constructed by preprocessing an Overview parts data base to "select out" the elements used by Extended PARCOM. Table 2-4 gives the names, as used by the Extended PARCOM READ statement, and formats of the parts data elements input for each part type. "Record number" in the table refers to the ordinal position of a data record within the 12-record block for a part type. "Columns in field" refers to the character positions, within a record, occupied by the tabulated data element. "Format" refers to the FORTRAN language format specification currently used. "Description" is a summary definition of the data element. Note that some of these input data are scaled (multiplied by a constant factor).

a. Figure 2-1 shows a sample parts data base with four part types.

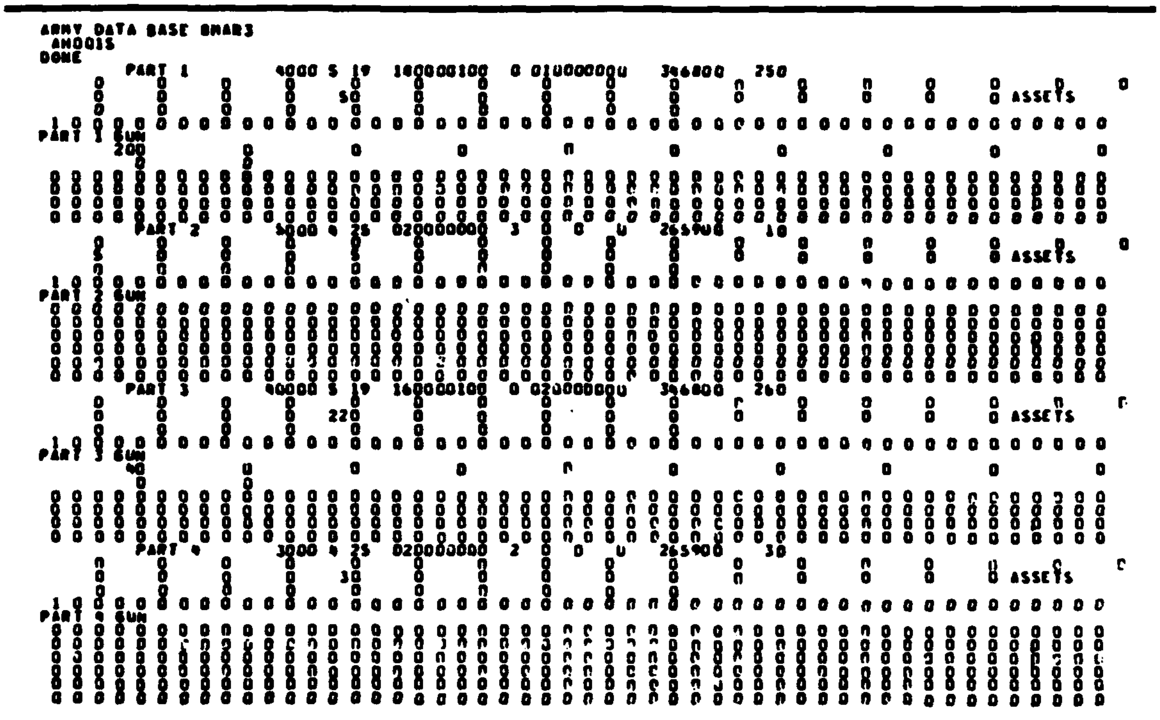

Figure 2-1. Parts Data Base

b. All data read in are screened for processing. Only parts with nonzero failure rates and with specified essentiality are processed and assigned part numbers for internal model reference. Nonprocessed parts data is "echoed" (printed) but is thereafter ignored. All data elements described in Table 2-4 are associated, via a subscripted array, with the "part number" of their associated part type. Currently, the Extended PARCOM program limits allow up to 300 part types to be processed.

Table 2-4. Parts Data Record Format

Record number	PARCOM name	Columns in field	Format	Description
1	Z1	3-17	A15	National stock number of part
	Z2	18-26	F9.0	100 * unit cost (dollars) of part
	Z3	32-34	F3.0	Order ship time (days) for part (= 0 for all parts in example data)
	Z4	35-39	F5.0	1,000,000 * failure rate (failures per flying hour) for part
	Z5	40-42	F3.0	NRTS (not repairable this station) percentage, i.e., percent of failures sent to depot for repair
	Z6	43-45	F3.0	Retail repair time (days) for part
	Z7	46-48	F3.0	Depot repair time (days) for part
	Z8	49-51	F3.0	Retail condemnation rate (percent scrapped at retail repair)
	Z9	52-54	F3.0	Depot condemnation rate (percent scrapped at depot repair)
	IES	55	I1	Essentiality Code of part (1 = most essential)
3	DSRV	1-6	F6.0	Number of initial serviceables located at depot on Day 1
	DUNS	7-12	F6.0	Number of initial unserviceables located at depot on Day 1
	WRS	13-18	F6.0	Number of initial war reserve (retail) serviceables located in theater on Day 1
	WRU	19-24	F6.0	Number of initial war reserve (retail) unserviceables located in theater on Day 1
	DAY1	25-30	F6.0	Number of items in retail (theater) ASL/PLLs on Day 1
5	IQPA	1-2	I2	Quantity per application, i.e., number of parts installed per aircraft
6	ADSC	1-16	A16	Description of part
7-9	PT(k), k=1,24	1-100	10F10.0	Number of items received (from ASL/PLL) in theater after Day 1 in each successive 5-day interval k, i.e., Days 5*(k-1)+1 through 5*k.

c. All items issued or available during the scenario should be included in the categories of Records 3 and 7-9 described above. If scenarios of longer than 120 days are desired, the DIMENSION for variables PT(k) and PTDEP(j,k) must be increased to allow for more than the k=24 (= 120/5) 5-day intervals currently used.

2-8. SCENARIO DATA BASE FORMAT

a. Figure 2-2 shows a sample scenario data base.

```
00.   .01    7     0     5
  2
  1    2
PART SUB  DOC EX
          2300.         93000.   2
     10.    5           2     1  1     1     1     1     1     1     1     1
  2
  1    2
150  200
  4
  1    2    4    5
500 1000 1500 1500
  1
  1
0.0
  2
  1    2
.10  .09
  2
  1    2
  2
  3    4
```

Figure 2-2. Scenario Data Base

b. The scenario data base read by Extended PARCOM consists of 11 sets of card image records, as shown in Table 2-5, which summarize names, formats, and descriptions. Record Set 1 always has exactly one card. Record Set 2 has exactly two cards if NFS is less than 0, exactly one card if NFS = 0, and at least two cards if NFS exceeds 0. (The exact number then depends on user specification.) Record Sets 3 and 4 always have exactly one card. The length of Record Sets 5-11 depend on user specification as noted below. All record sets must be present. Aircraft availability constraints are "omitted" by setting AM (I) = 0 in Record Set 9 for all days. Remarks on Table 2-5 are given after the table in order of input.

Table 2-5. Scenario Data Base Format
(page 1 of 6 pages)

Columns	PARCOM name	Dimension	Format	Description
Record Set 1				
1-5	ADDOST	1	F5.2	Offset (days) added to order ship time read from parts data base.
6-10	CONVF	1	F5.2	Convergence goal for "flying hours flown" calculation during capability assessment (see Remarks).
11-15	IESS	1	I5	Maximum Essentiality Code for a part type to be processed.
16-20	DLAG	1	F5.0	Depot lag time (days) before depot serviceables are received in theater (see Remarks).
21-25	DDIS	1	F5.0	Depot distribution time (days) - duration of time over which depot serviceables are (uniformly) distributed in theater (see Remarks).
Record Set 2				
1-5	NFS	1	I5	Indicator of the nature and number of the full-sub parts defining the partial-sub policy. If NFS > 0, then the full-sub part set is specified on following card(s). NFS = 0 means there are no full-sub parts. NFS < 0 means that the full-sub part set is defined by screening thresholds on following card(s).
(Include following card only if NFS > 0)				
1-80	IFS(j) j=1,NFS	300	16I5	If NFS > 0, specify the part numbers of parts in the full-sub set.
(Include following card only if NFS < 0)				

Table 2-5. Scenario Data Base Format
(page 2 of 6 pages)

Columns	PARCOM name	Dimension	Format	Description
Record Set 2 (continued)				
1-5	ZDCY	1	F5.0	Screening limit (days) on depot recycle time (DCY). All parts with DCY > ZDCY are designated as full-sub.
6-10	ZNRTL	1	F5.3	Screening limit (fraction) on NRTS rate. All parts with NRTS > ZNRTL are designated as full-sub.
11-15	BREPL	1	F5.0	Screening limit (days) on retail repair time (BRT). All parts with BRT > BREPL are designated as full-sub.
16-25	FRLIM	1	F10.6	Screening limit (failures/flying hour) on failure rate (FR). All parts with FR > FRLIM are designated full-sub.
Record Set 3				
2-17	CASE	1	A16	Case (run) identification.
Record Set 4				
2-15	CLNCR	1	F14.0	Add-on cost limit (dollars) for residual requirement (init stk = current inv) constrained cost case.
16-30	CLNCT	1	F15.0	Cost limit (dollars) for total requirement (init stk = 0) constrained cost case.
31-35	LIMIT	1	I5	Maximum number of iterations per day of "flying hours flown" calculations during capability assessment (see Remarks).

Table 2-5. Scenario Data Base Format
(page 3 of 6 pages)

Columns	PARCOM name	Dimension	Format	Description
Record Set 5				
2-10	FHM	1	F9.1	Maximum flying hours/aircraft/day.
11-15	NW	1	I5	Number of days in war (length of scenario).
21-25	ISEL	1	I5	If ISEL = 0, only total (init stk = 0) requirements will be done. If ISEL = 1, only residual (init stk = current inv) requirements will be done. If ISEL = 2, both total and residual requirements will be computed.
26-30	IORD	1	I5	If IORD $\leq$ 0, the solution requirements lists are ordered by decreasing part unit cost. If IORD > 0, these lists are ordered by decreasing amount of solution requirement.
31-35	IOPT1	1	I5	If IOPT1 $\leq$ 0, only capability assessments of current inventory will be done. If IOPT1 > 0, both current inventory capability assessments and requirements cases will be done.
36-40	IOPT2	1	I5	If IOPT2 $\leq$ 0, the full-sub part numbers used in the current inventory capability assessment cases are not printed. If IOPT2 > 0, they will be.
41-45	IOPT3	1	I5	If IOPT3 $\leq$ 0, the no-sub part numbers used in the current inventory capability assessment cases are not printed. If IOPT3 > 0, they will be.
46-50	IOPT4	1	I5	Option ($\leq$ 0 = omit, > 0 = do) to print requirements lists for the unconstrained cost solution.

Table 2-5. Scenario Data Base Format
(page 4 of 6 pages)

Columns	PARCOM name	Dimension	Format	Description
Record Set 5 (continued)				
51-55	IOPT5	1	I5	Option (≤ 0 = omit, > 0 = do) to print 'cumulative (unconstr cost) requirements costs through day N' list.
56-60	IPRT	1	I5	Option (≤ 0 = omit, > 0 = do) to print the scenario input data summary.
61-65	IPRT1	1	I5	If IPRT1 $\leq$ 0, the full-sub and no-sub part sets used in requirements cases will not be printed, nor will part input data list summaries after the first one. If IPRT1 > 0, these will be printed.
Record Set 6				
1-5	NACDEP	1	I5	Number of day intervals (see IDAY(I) below) for which aircraft deployments are specified.
1-80	IDAY(I)	61	16I5	Initial day of interval (in increasing order) for specified (by NAC(I) below) aircraft deployment.
1-80	NAC(I)	61	16I5	Cumulative number of aircraft deployed by IDAY(I). These are input in the same order as IDAY(I). NAC(I) applies from day IDAY(I) through day IDAY(I+1)-1, or (for the last interval) through day NW.
Record Set 7				
1-5	NFHDAY	1	I5	Number of day intervals for which daily program flying hours are specified.

Table 2-5. Scenario Data Base Format (page 5 of 6 pages)

Columns	PARCOM name	Dimension	Format	Description
Record Set 7 (continued)				
1-80	IDAY(I)	61	16I5	Initial day of interval (in increasing order) for specified (by NFH(I) below) program flying hours.
1-80	NFH(I)	61	16I5	Daily program flying hours for each day from IDAY(I) through the day before IDAY(I+1), or through day NW.
Record Set 8				
1-5	NLDAY	1	I5	Number of day intervals for which daily aircraft attrition losses are specified.
1-80	IDAY(I)	61	16I5	Initial day of interval (in increasing order) for specified daily aircraft losses.
1-80	ZLOSS(I)	61	16F5.1	Daily aircraft losses for each day from IDAY(I) through the day before IDAY(I+1), or through day NW.
Record Set 9				
1-5	NMDAY	1	I5	Number of day intervals for which a "minimum required aircraft availability" is specified.
1-80	IDAY(I)	61	16I5	Initial day of interval (in increasing order) requiring specified "minimum required aircraft availability."
1-80	AM(I)	61	16I5	Daily "minimum required aircraft availability" for each day from IDAY(I) through the day before IDAY(I+1), or through day NW.

Table 2-5. Scenario Data Base Format
(page 6 of 6 pages)

Columns	PARCOM name	Dimension	Format	Description
Record Set 10				
1-5	IMSEL	1	I5	The number of part types for which "cumulative requirement for each day" will be printed in the Cumulative Stock Requirement List for Selected Items. IMSEL must be ≤ 100.
1-80	IPT(K)	100	16I5	The "part numbers" (from echoed Part Input Data List) of the specified (IMSEL) part types to be represented in the Cumulative Stock Requirement List for Selected Items.
Record Set 11 (see Remarks)				
1-5	NPTFS	1	I5	Number of full-sub parts designated for this partial-sub policy used only in capability assessment of current inventory. If NPTFS > 0, then you must set NPTNS ≤ 0.
6-10	NPTNS	1	I5	Number of no-sub parts designated for this partial-sub policy used only in capability assessment of current inventory. If NPTNS 0, then you must set NPTFS 0.
1-80	IFS(J) for J=1,NPTFS or INS(J) for J=1,NPTNS	300	16I5	If NPTFS ≥ 0, these are the part numbers of the full-sub parts in this partial-sub policy used only for capability assessment of current inventory. If NPTNS > 0, these are the part numbers of the no-sub parts in the policy.

2-9. REMARKS ON SCENARIO DATA BASE. The following remarks amplify and clarify the meaning and use of selected elements of the Scenario Data Base defined in Table 2-5:

- **Record Set 1**

  - ADDOST was needed in Extended PARCOM demonstration runs only because the Overview parts data base used by CAA had a zero entry for order ship time. A properly constructed Overview parts data base would use ADDOST = 0.

  - CONVF should be set to a small positive number less than .05. Both CONVF and LIMIT determine duration of capability assessment processing for constrained cost.

  - IESS could be set = 1 for a parts data base in which all "essential items" are coded 1.

  - DLAG and DDIS apply to all parts. The depot serviceables entered in the parts data base (DSRV in Table 2-4) are received in theater between Day DLAG+1 and Day (DLAG+DDIS).

- **Record Set 2**

  - If NFS > 0, the parts in the full-sub set must be specified in terms of the "part numbers" generated internally in Extended PARCOM. These are printed in the model output. If NFS = 0, only one card (specifying NFS) is in this record set. If NFS < 0, all four screening thresholds must be specified. If a limit is "not used," its value must be set high enough so that all parts have the associated attribute below the limit; e.g., if only parts with NRTS > .50 and retail repair time > 29 days are to be substitutable, set ZNRTL = .50 and BREPL = 29 and set ZDCY high enough so that all part depot recycle times are less than ZDCY and set FRLIM ≥ 1.0 (because all failure rates will be less than 1). Recall that depot recycle time = 2 * OST + depot repair time.

- **Record Set 4**

  - CLNCR and CLNCT can be used to suppress the processing of the constrained cost case by setting them to negative values; e.g., if CLNCR < 0, then the residual (add-on) requirements for the constrained cost case will not be done.

  - LIMIT should normally be set to 4 or less. A high value of LIMIT increases processing time for capability assessment. The higher the value of LIMIT, the closer is the convergence of "flying hours flown" in the capability assessment calculation. The closeness is printed in the model output, so the user has a guide for "trial and error" tests.

- **Record Set 6**

  - The NAC(I) must be input in the same order as the IDAY(I). Similar remarks apply to Record Sets 7-9.

- **Record Set 7**

  - For I = NFHDAY, NFH(I) is the daily flying hours from IDAY(I) through NW (end of war). Similar remarks apply to Record Sets 8-9.

- **Record Set 9**

  - "No availability constraint" can be modeled by having one interval (NMDAY = 1) with IDAY(1) = 1, and AM(1) = 0.

- **Record Set 10**

  - IMSEL must be less than or equal to 100.

  - The "part numbers" for IPT(K) must be the internal Extended PARCOM subscripts for the specified part types. These are printed in the Parts Input Data List at the beginning of output where the entire part data base is "echoed" with the "part number" appended for those parts processed. Data on parts not processed are also printed in that list, but no part number is appended.

- **Record Set 11**

  - A sequence of partial-sub policies for capability assessment may be input. Input for each policy is as described above, viz: one card giving either NPTFS or NPTNS (but not both), followed by cards specifying the part numbers designated full-sub (if NPTFS < 0) or no-sub (if NPTNS > 0). If full-sub parts are designated, all parts not designated are no-sub by default and vice versa. Input order of part numbers is irrelevant. Part numbers, as before, refer to Extended PARCOM part numbers. If record set 11 is omitted, only the single (input) policy will be used in assessment.

CHAPTER 3

MODEL OUTPUT

3-1. INPUT CONSTRAINTS. The user can limit the amount of output produced by the values assigned to the inputs IOPT1, IOPT2, IOPT3, IOPT4, IOPT5, IPRT, and IPRT1 as described in Table 2-5. In addition, any case can be truncated by setting input NW (number of days in war) to a suitably low value.

3-2. SCOPE OF CASES PROCESSED

a. Cases Processed. Figure 3-1 shows types of cases processed in a single Extended PARCOM run. The subdivisions represent parametric variations in:

- Type result - requirements or capability assessment.
- Cost constraints - with/without.
- Initial inventory of parts - zero or as specified (usually current).
- Parts replacement policy (capability assessment cases only).

Entries shown as "XXX" indicate user-defined input values. Figure 3-1 graphically represents a "nested umbrella" of conditions defining each of the cases generated for a specified scenario, i.e., all blocks above Case ID in the chart state the defining conditions of that case. These are also implicit in the Case ID, interpreted as follows:

First character:
T = full (total) requirements, R = add-on (residual) requirements, C = capability assessment only.

Second character - cost constraints:
U = unconstrained, C = constrained, F = fixed inventory (capability assessment only).

Third character:
Partial-substitution replacement policy designator.

Capability assessment of current inventory can be done in a single "run" for a number of different partial-substitution policies, as specified by user input. However, requirements results can be generated for only a single user-specified partial-substitution policy per model run. Note that the "full requirements" case is equivalent to initial inventory = 0, while the "add-on requirements" case is equivalent to initial inventory = current inventory (or as otherwise entered). Using this notation, RU1 for the selected scenario represents the case: residual (add-on) requirements, unconstrained costs, and the specified partial-substitution parts replacement policy, e.g., 1.

	Case stratification for any chosen scenario						
	Requirements determination				Capability assessment		
	Unconstrained cost		Constrained cost Added-buy limit = $XXX		No additional cost		
	Initial inventory = 0	Initial inventory Part 1 = XXX Part 2 = XXX . . .	Initial inventory = 0	Initial inventory Part 1 = XXX Part 2 = XXX . . .	Initial inventory Part 1 = XXX Part 2 = XXX . . .		
	Full rqmts	Add-on rqmts	Full rqmts	Add-on rqmts	Fixed inventory		
	Part sub policy 1	Part sub policy 1	Part sub policy 1	Part sub policy 1	Part sub policy 1	Part sub policy 2	Part sub policy n
Case ID	TU1	RU1	TC1	RC1	CF1	CF2	CFn
Rqmt mix, costs	X	X	X	X			
Cum cost by day (all parts)	X	X	X	X			
Cum req by day (selected parts)	X	X	X	X			
Daily AC avail	X	X	X	X	X	X	X
Daily fly hr frac[a]	X	X	X	X	X	X	X
Fly hr/acft/day	X	X	X	X	X	X	X

[a]The daily flying hour fraction = 1.00 for all days if the unconstrained cost solution requirement is stocked.

Figure 3-1. Type Outputs Produced for Each Case Within an Extended PARCOM Scenario

b. **Summary of Output.** Figure 3-1 also shows the available output produced for each case generated within an Extended PARCOM scenario. An "X" in the matrix indicates availability of the type output, described in the left margin, for the case with the "Case ID" shown above the "X". Shaded boxes are for inapplicable outputs. A brief description of each type output is given below. A complete descriptive listing of PARCOM output tables, with samples, is given in paragraph 3-3.

(1) **Requirement Mix, Costs.** For the total (initial inventory = 0) case, this shows the least-cost parts mix and cost required to achieve the flying program (unconstrained dollars), or total "best" parts mix purchasable with the budget limit (constrained dollars). For the residual (initial inventory = current inventory) case, this shows the least-cost add-on parts mix and cost which will achieve the flying program (unconstrained dollars), or the "best" add-on buy to initial inventory within the cost limit (constrained dollars).

(2) **Cumulative Cost by Day.** For each Day N, the total cost of the parts requirement to sustain the scenario flying program through Day N only, i.e., it is the total requirement cost for a truncated scenario of N days in length.

(3) **Cumulative Requirement by Day.** For selected items for each Day N, the cumulative requirement for each item needed for the flying program to be sustained through N days.

(4) **Daily Aircraft Availability.** For each day of the full scenario, the fraction of surviving aircraft which are not NMCS assuming, for requirements cases, that the initial spare inventory is augmented by the computed parts requirement.

(5) **Daily Flying Hour Fraction.** For each day of the full scenario, the fraction of the fleet flying program which can be achieved assuming, for requirements cases, that the initial spare inventory is augmented by the computed parts requirement.

(6) **Daily Flying Hours per Available Aircraft per Day.** For each day of the full scenario, the achieved program flying hours per aircraft assuming, for requirements cases, that the initial spare inventory is augmented by the computed parts requirement.

3-3. SAMPLE OUTPUTS. A complete list of standard outputs is presented below in the sequence of output. User-controlled input options can suppress the printing of many of these lists. Figures of sample outputs and descriptive explanations are given. For convenience, the sample outputs are restricted to a case involving four part types over a 5-day war. The order of outputs is:

a. Input Data. The following series of outputs gives comprehensive summaries of the input data entered by the user in the Parts Data Base and the Scenario Data Base.

(1) **Parts Input Data List (Figure 3-2).** The raw parts data is "echoed" in labeled form. The order of parts is as input. The entries under the PART heading are the "part numbers" which are cross-referenced in other lists. MSN denotes the stock number ID (usually the national stock number) input in the Parts Data Base. COST denotes unit cost of the part. OST denotes the order/ship time in days. FAIL RT denotes failure rate in failures per flying hour. NRTS gives the "not repairable this station" fraction. BCY denotes the base repair time (in days). DCY denotes the depot cycle

time in days, i.e., the time from removal until return from depot repair. It is the sum of the depot repair time and 2 x OST. DRT denotes depot repair time. BCON denotes the fraction of failed parts which are condemned (scrapped) at retail repair. DCON denotes the fraction of failed parts sent to depot repair and subsequently condemned at that level of repair. QPA denotes the quantity per application for the part, i.e., the number of units of that part type installed per operational aircraft. ESS denotes the essentiality code of the part. CLASS shows whether the part is designated as a full-sub part or a no-sub part, as specified via the Scenario Data Base (Record Set 2 in Chapter 2, Table 2-5). While all part data is "echoed" in this list, only those parts with nonzero failure rates and with essentiality code less than or equal to a user-specified level (IESS) are assigned part numbers. Listed part data not assigned a part number are not subsequently processed. After the last item of the parts list, the total number of input part types (TOTAL NR PARTS) is given along with the number of these part types to be processed by PARCOM (NR USED). The INIT STK column shows the initial stock in place at theater on Day 1. It reflects the sum of spare assets in serviceable war reserves (WRS in Table 2-4) and in theater ASL/PLLs on Day 1 (DAY1 in Table 2-4).

CASE: PART SUB DOC EX

ITEMS RANK ORDERED IN NORMAL INPUT ORDER

PART	NSN	DESCRIPTION	COST	OST	FAIL RT	NRTS	BCT	DCT	DRT	BCON	DCON	QPA	ESS	CLASS	INIT STK
1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FULL SUB	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	FULL SUB	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NO SUB	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	NO SUB	[illegible]

TOTAL NR PARTS= 4 NR USED= 4

Figure 3-2. Parts Input Data List

(2) Full-sub Parts List for Requirements Cases (Figure 3-3). This list displays, in order of input, data for those parts designated as in the full-sub parts set used in requirements cases. The data shown is extracted (sorted) from the Parts Input Data List. This list is printed only if a positive value for IPRT1 is input in the Scenario Data Base.

CASE: PART SUB DOC EX

FULL SUB ITEMS FOR POLICY 1

PART	NSN	DESCRIPTION	COST	OST	FAIL RT	NRTS	BCT	DCT	DRT	BCON	DCON	QPA	ESS	CLASS	INIT STK
1	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]			FULL SUB	[illegible]
2	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]			FULL SUB	[illegible]

Figure 3-3. Full-sub Parts List for Requirements Cases

(3) **No-sub Parts List for Requirements Cases (Figure 3-4).** This list displays, in order of input, data for those parts in the no-sub parts set used in requirements cases. The user designates the full-sub part set. Extended PARCOM then puts all nondesignated parts in the no-sub set. The full-sub/no-sub partition of the parts data defines the partial-substitution policy. All data shown is extracted (sorted) from the Parts Input Data List. This list is printed only if a positive value for IPRT1 is input in the Scenario Data Base.

CASE= PART SUB DOC EX

NO SUB ITEMS FOR POLICY 1

PART	NSN	DESCRIPTION	COST	OST	FAIL RT	NRTS	RCY	OCY	ORT	BCON	BCON	GPA	ESS	CLASS	INIT STK
3	PART 3	PART 3 GUN	400.		.040000	1.00	0.	8.		.00	.00			NO SUB	220.
4	PART 4	PART 4 GUN	30.		.020000	.00	2.	0.		.00	.00			NO SUB	30.

Figure 3-4. No-sub Parts List for Requirements Cases

(4) **Input-ordered Cost/Stockage List (Figure 3-5).** This list shows the unit cost and inventory for each part processed. Parts are in order of input. Part numbers shown are defined as in paragraph 3-3a(1) above. The rank heading is redundant here, but is subsequently used in presenting this data ordered by part unit cost. The part numbers are cross-referenced with those in the Part Input Data List. The distribution of the entire initial inventory for each part, as input in the Parts Data Base, is summarized in terms of initial serviceables at depot (DSERV), initial unserviceables at depot (DUNSR), theater war reserve serviceables (WRSRV), theater war reserve unserviceables (WRUNS), ASL/PLL stocks in-place on Day 1 (DAY1), and ASL/PLL deployed after Day 1 (DAY2-). The total noncondemned stock (TOT NC) is also shown. This total may be less than the sum of the other entries since some unserviceable stocks may be condemned. This list is printed only if IPRT1 is set to a positive value in the Scenario Data Base.

CASE= PART SUB DOC EX

ITEMS RANK ORDERED IN NORMAL INPUT ORDER

RANK	PART	NSN	DESCRIPTION	COST	CLASS	DSERV	DUNSR	WRSRV	WRUNS	DEPLOYED DAY1	DEPLOYED DAY2-	TOT NC
1	1	PART 1	PART 1 GUN	40.	FULL SUB	0.	0.	0.	0.	50.	200.	250.
2	2	PART 2	PART 2 GUN	50.	FULL SUB	5.	0.	0.	0.	5.	0.	10.
3	3	PART 3	PART 3 GUN	400.	NO SUB	0.	0.	0.	0.	220.	40.	260.
4	4	PART 4	PART 4 GUN	30.	NO SUB	0.	0.	0.	0.	30.	0.	30.

Figure 3-5. Input-ordered Cost/Stockage List

(5) Unadjusted Parts Deployment List (Figure 3-6). This list shows the scheduled arrivals of ASL/PLL stocks which were not in place on Day 1. Arrivals are by 5-day interval, according to the key at the top of the figure (e.g., -25 refers to the period between Day 21 and Day 25). Each part is identified by a leading line showing the part number, the national stock number (NSN), and the part description, as input in the Parts Data Base. The sum of the entries for each part should equal the DAY2- entry in Figure 3-5. In-place ASL/PLL and depot stocks are not included in this list. Scheduled arrivals after Day 120 are ignored and are not recorded in this list. This list is printed only if IPRT1 is set to a positive value in the Scenario Data Base.

```
                         CASE= PART SUB DOC EX

UNADJUSTED PARTS DEPLOYMENT BY DAY INTERVAL
  -5   -10   -15   -20   -25  -30  -35  -40  -45  -50  -55  -60  -65  -70  -75  -80  -85  -90  -95  -100
-105  -110  -115  -120

 1        PART 1         PART 1 GUN
200.    0.    0.    0.    0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  0.    0.    0.    0.
 2        PART 2         PART 2 GUN
  0.    0.    0.    0.    0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  0.    0.    0.    0.
 3        PART 3         PART 3 GUN
 40.    0.    0.    0.    0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  0.    0.    0.    0.
 4        PART 4         PART 4 GUN
  0.    0.    0.    0.    0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  0.    0.    0.    0.
```

Figure 3-6. Unadjusted Parts Deployment List

(6) Adjusted Parts Deployment List (Figure 3-7). This list shows scheduled arrivals in theater of all stocks not in theater on Day 1. Arrivals are by 5-day interval, keyed as in Figure 3-6. In this, as in the previous figure, only arrivals through Day 120 are recorded. If the scenario used is shorter than 120 days, only arrivals during the scenario period will affect results. The total of entries in this figure, for each part, should equal the total noncondemned inventory (TOT NC entry in Figure 3-5) less the in-place theater stocks on Day 1 (the sum of the WRSRV and the DAY1 entries in Figure 3-5). The list is denoted as "adjusted" because it adjusts the previous list (Figure 3-6) by adding in the distributions from depot stocks and from initially unserviceable war reserves.

```
                         CASE= PART SUB DOC EX

ADJUSTED (FOR DEPOT STKS) PARTS DEPLOYED BY INTERVAL
  -5   -10   -15   -20   -25  -30  -35  -40  -45  -50  -55  -60  -65  -70  -75  -80  -85  -90  -95  -100
-105  -110  -115  -120

 1        PART 1         PART 1 GUN
200.    0.    0.    0.    0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  0.    0.    0.    0.
 2        PART 2         PART 2 GUN
  5.    0.    0.    0.    0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  0.    0.    0.    0.
 3        PART 3         PART 3 GUN
 40.    0.    0.    0.    0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  0.    0.    0.    0.
 4        PART 4         PART 4 GUN
  0.    0.    0.    0.    0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.   0.
  0.    0.    0.    0.
```

Figure 3-7. Adjusted Parts Deployment List

(7) Scenario Input Data Summary (Figure 3-8). This output "echoes" much of the scenario input data. It includes a table showing, on a daily basis, the cumulative aircraft deployed, the program flying hours, the minimum aircraft availability objective, the aircraft lost (attrition), and the cumulative aircraft lost. This table has sufficient information to enable the model user to convert a PARCOM-generated aircraft availability into "number of aircraft available" and a "fraction flying hour program achieved" into "number of program hours achieved". Also shown is the dollar value of the total initial inventory of parts processed. Note that this amount excludes parts in the data base which are not processed (because of zero failure rate or inappropriate essentiality code). For parts processed, valuation is determined by accumulating the product of initial inventory and part unit cost.

```
                              CASE= PART SUB DOC EX

              SCENARIO INPUT DATA SUMMARY

          OST OFFSET=     .0 DAYS     DESIRED CONVERGECE= .010
        MAX ITERATIONS=  2   MAX ESSENTIALITY=  7
            MAX FLY HRS/ACFT/DAY= 10.0     ADD-ON COST LIMIT=        2300.
      TOTAL(INIT INV=0) RQMT COST LIMIT=        93000.
           COST OF CURRENT INVENTORY:        115400.
```

DAY	CUM ACFT DEPLOYED	PROGRAM FLY HRS	MIN REQ AVAIL	ACFT LOST	CUM ACFT LOST
1	150.	500.	.10	.0	.0
2	200.	1000.	.09	.0	.0
3	200.	1000.	.09	.0	.0
4	200.	1500.	.09	.0	.0
5	200.	1500.	.09	.0	.0

Figure 3-8. Scenario Input Data Summary

(8) Options Report (Figure 3-9). This output shows and explains the options set by the user in Record Set 5 of the Scenario Data Base. In addition, the value of NFS from Record Set 2 is also shown. When NFS is less than zero, this report also shows the screening thresholds used to select the full-sub part set. The value of INT is set equal to 1 internally and is not specified by the input data.

```
                         CASE= PART SUB DOC EX

      ****** OPTIONS CHOSEN FOR THIS RUN ******


ISEL= 2 ** BOTH THE TOTAL(INIT STK=0) AND RESIDUAL(INIT STK=CURR INV) RQMTS ARE IN THIS RUN **

NFS= 2 ** FULL SUB SET IS SPECIFIED BY INPUT

IORD= 1 ** COMPUTED RQMTS LISTS WILL BE IN ORDER OF DECREASING RQMT AMOUNT FOR PART

IOPT1= 1 ** BOTH ASSESSMENT AND RQMT CASES WILL BE DONE IN THIS RUN

IOPT2= 1 ** THE FULL SUB PART SETS USED IN ASSESSMENT CASES WILL BE PRINTED

IOPT3= 1 ** THE NO SUB PART SETS USED IN ASSESSMENT CASES WILL BE PRINTED

IOPT4= 1 ** THE UNCONSTR COST RQMTS LISTS WILL BE PRINTED

IOPT5= 1 ** THE CUM RQMT BY DAY COST LISTS WILL BE PRINTED

IPRT= 1 ** THE SCENARIO INPUT DATA SUMMARY WILL BE PRINTED

IPRT1= 1 ** THE FULL SUB AND NO SUB PART SETS (FOR RQMT CASES) WILL BE PRINTED
         AS WILL THE INPUT-ORDERED AND COST-ORDERED PARTS INPUT LISTS

INT= 1 ** THE PARTIAL SUB RQMT ALGORITHM WILL TEST AT INTERVALS OF 1 (ALLOWABLE NMCS ACFT)
```

Figure 3-9. Options Report

(9) **Cost-ordered Parts List (Figure 3-10).** This list shows part number, part description, and part unit cost ranked in decreasing order of part unit cost. RANK denotes the rank order (over all processed part types). PART denotes the associated part number (as defined in paragraph 3-3a(1)). Also shown is the designation of the part as either a full-sub or a no-sub part, as specified by Record Set 2 of the Scenario Data Base.

CASE= PART SUB DOC EX

ITEMS RANK ORDERED BY DECREASING PART COST

RANK	PART	MSN	DESCRIPTION	COST	
1	3	PART 3	PART 3 GUN	400.	NO SUB
2	2	PART 2	PART 2 GUN	50.	FULL SUB
3	1	PART 1	PART 1 GUN	40.	FULL SUB
4	4	PART 4	PART 4 GUN	30.	NO SUB

Figure 3-10. Cost-ordered Parts List

b. Total Requirements Case Results. The following outputs are for the case with zero initial inventory. The computed requirements are assumed stocked in theater (this is in contrast to the residual requirements case in which initial stocks are distributed over a specified schedule). Results for total requirements are generated only if ISEL = 0 or 2 in the Scenario Data Base.

(1) Unconstrained Dollar Total Requirements Total Cost List (Figure 3-11). The output shows the total cost of the least-cost total requirements unconstrained cost solution (based on zero initial inventory) for the specified partial-sub policy. Costs are computed by cumulating the product of part unit cost and total units (of part) required. The partial-sub policy is defined by the full-sub/no-sub partition of parts, as specified by the user in Record Set 2 of the Scenario Data Base.

```
              CASE= PART SUB DOC EX
     TOTAL(INIT STK= 0) COST OF RQMTS
      POLICY          TOT COST
     PART  SUB         118600.
```

Figure 3-11. Unconstrained Dollar Total Requirements Total Cost List

(2) Unconstrained Dollar Total Requirements Parts List (Figure 3-12). The output shows the composition of the total unconstrained cost requirement solution mixes (zero initial inventory) for the specified policy. Parts requirements are listed here in order of decreasing amount of requirements (because IORD = 1 in this example). For each part and policy is listed:

(a) The Extended PARCOM part number and part description.

(b) The number of units of that part required to achieve the case objective under the indicated policy. A zero initial inventory is assumed in the "total requirements" case.

(c) The cost of the requirement computed as the product of units required and part unit cost.

(d) The percent of the overall (i.e., overall parts) requirement represented by the requirement for the part type.

CASE= PART SUB DOC EX

TOTAL(INIT STK=0) STK RQMTS

	PART NR	PART		RQMNT	COST	%COST
1	1	PART 1	PART 1 GUN	320.0	12800.	10.79
2	3	PART 3	PART 3 GUN	250.0	100000.	84.32
3	2	PART 2	PART 2 GUN	80.0	4000.	3.37
4	4	PART 4	PART 4 GUN	60.0	1800.	1.52

Figure 3-12. Unconstrained Dollar Total Requirements Parts List

(3) Selected Items Cumulative Total Requirement List (Figure 3-13). The output consists of the total (zero initial inventory) unconstrained cost requirement for each of up to 100 selected part types for a truncated scenario of length N days, where N = 1, 2, ... through the last day of the base case scenario. Each row of output corresponds to the unconstrained cost total requirement for a "war" of length N as noted in the leftmost (DAY) column. Excluding that column, each column gives the requirement for the part identified, by description and NSN, in the heading of each column. The selected parts are specified by user input in Record Set 10 of the Scenario Input Data Base. The tabulated requirements represent an extract from the requirements computed over the full part data base (not over just the part types shown). Therefore, the last entry for each part in this list should be the same as the requirement in the Unconstrained Dollar Total Requirements Parts List. The purpose of the output list is to allow the user to examine the changing demand, over time, for certain key parts under the specified partial-sub policy.

CASE= PART SUB DOC EX

CUM TOTAL RQMT(INIT STK=0) REQUIRED THRU GIVEN DAY

PART NR 1		PART NR 2		PART NR 0		PART NR 0		PART NR 0	
PART 1	PART 1 GUN	PART 2	PART 2 GUN						
DAY		DAY		DAY		DAY		DAY	
1	.0	1	.0	1	.0	1	.0	1	.0
2	110.0	2	20.0	2	.0	2	.0	2	.0
3	200.0	3	50.0	3	.0	3	.0	3	.0
4	280.0	4	70.0	4	.0	4	.0	4	.0
5	320.0	5	80.0	5	.0	5	.0	5	.0

Figure 3-13. Selected Items Cumulative Total Requirement List

(4) Total Requirement Cumulative Cost List (Figure 3-14). The output consists of the total cost (all parts) of the total unconstrained cost requirements solution (zero initial stock) applied in a truncated scenario consisting of the first N days of the base scenario, where N = 1, 2, ... through the last day of the base scenario. The leftmost column shows the last day of the truncated scenario while the entry on the same line shows the total requirement cost. As before, total cost consists of the product of units required and part unit cost, summarized over all part types processed. The cost on the last line (day) of the output list should be the same as that in the Unconstrained Dollar Total Requirements Total Cost List (Figure 3-11). Another interpretation of this output is that it gives, for each policy, the expected cost for total requirements required to sustain the flying hour/availability objective through any specified day of the scenario. After the last day's entry on the table, a summary of the cost limit applied in the constrained cost algorithm 2 is given. That algorithm computes a sustainability solution, i.e., one which maximizes consecutive days of flying hour program achievement. The input cost limit is printed, along with the cumulative cost entry and the last day for which the associated cost is less than the input cost limit (see paragraph 2-1a(4)).

```
            CASE= PART SUB DOC EX

 CUM TOTAL(INIT STK=0) COST OF REQ THRU GIVEN DAY


     DAY       PART SUB
       1             0.
       2          6300.
       3         31700.
       4         92200.
       5        118600.

           COST LIMIT OF       93000. APPROXIMATED BY       92200.

           WHICH IS THE CUM RQMT COST THRU DAY    4
```

Figure 3-14. Total Requirement Cumulative Cost List

(5) Unconstrained Dollar Total Requirements Force Capability List (Figure 3-15). The output shows, as discussed below, expected achievable daily aircraft availability, the "driving" factor in determination of availability objective, and flying hours per available aircraft per day for the specified partial-substitution policy, assuming that the computed "unconstrained dollar total requirement" (listed in Figure 3-12) is stocked and available on Day 1. The input used to distribute current stock over time is not applied in this case, in which a zero current stock is assumed. However, it is applied in the residual (add-on) requirements case.

CASE= PART SUB DOC EX

** FORCE CAPABILITY GIVEN THAT THE COMPUTED REQUIREMENT (FOR EACH POLICY) IS STOCKED **

*** ASSUMES TOTAL(INIT STK=0) REQMTS STOCKED AT RETAIL(NO POST D-DAY PARTS DEPLOYED) ***

	AIRCRAFT AVAILABILITY					
DAY	ACHIEVED AVAIL	REQ AVAIL	AVAIL SOURCE	AVAIL	ACHIEVED FLY HRS/AC /DAY	DAY
1	1.000	.333	FLYING HR PROG	.10	3.3	1
2	1.000	.500	FLYING HR PROG	.09	5.0	2
3	1.000	.500	FLYING HR PROG	.09	5.0	3
4	1.000	.750	FLYING HR PROG	.09	7.5	4
5	.750	.750	FLYING HR PROG	.09	10.0	5
AVERAGE=	.947	.579			6.1	

Figure 3-15. Unconstrained Dollar Total Requirements Force Capability List

(a) **Aircraft Availability.** Aircraft availability, as applied in Extended PARCOM, is defined as the fraction of surviving aircraft which are not in NMCS status. The minimum aircraft availability required on each day in order to meet the case objective is shown under the REQ AVAIL heading. The required availability must equal the larger of the availability reflected in the daily flying hour program and that specified by the input availability constraints. An initial aircraft availability of 1.00 is assumed.

(b) **Availability Source.** The "driving" source of the daily availability requirement is listed under the AVAIL SOURCE heading. FLYING HR PROGRAM denotes the daily flying hour program while AVAIL CONSTRAIN denotes an input availability constraint. In the AVAIL column immediately to the right of the AVAIL SOURCE entries are the daily input availability constraints input by the user. When the AVAIL SOURCE is AVAIL CONSTRAIN, these availabilities should be identical to corresponding entries in the REQ AVAIL column.

(c) **Flying Hours per (Available) Aircraft per Day.** These entries are computed by dividing the number of program flying hours for the day by the number of available aircraft on that day. The number of available aircraft is just the product of the tabulated aircraft availability and the number of surviving aircraft.

(d) **Averages Over Time.** After all daily status figures are listed, Extended PARCOM prints averages for achieved aircraft availability, minimum required availability, and achieved flying hours per aircraft per day. These are all weighted averages over time. In calculating the weighted averages, each daily availability entry is weighted by the number of surviving aircraft on that day, and each daily "flying hour per aircraft per day" entry is weighted by the number of available aircraft on that day.

(6) **Constrained Cost Total Requirements Solution Evaluation Report (Figure 3-16).** This output summarizes the process by which a constrained cost solution is computed for the total requirements case. The process is described in a technical paper (see reference 1-2e in Chapter 1). If the input cost limit exceeds the cost of the unconstrained cost solution, then this report states that the unconstrained cost solution is also the constrained cost solution and stops further constrained cost processing. In the more typical case (shown), two different constrained cost algorithms, denoted herein as algorithm 1 and algorithm 2, will be applied to produce two separate solutions and the preferred solution will be returned and listed on the report following this one. Algorithm 1 first "buys" as many no-sub parts from the unconstrained cost solution as are affordable. The first line of the report then indicates how much of the cost limit can be used to do this. Algorithm 1 then uses the money left over to "buy" full-sub parts from the unconstrained cost solution. If not all no-sub parts are affordable, the amount "spent" is shown (as here) followed by a statement that no full-sub parts are affordable. However, if all no-sub parts are affordable, the first report line then simply notes that, and is followed by a line indicating how much of the cost limit can then be used to buy full-sub parts. The algorithm 2 requirements solution is also computed, but no reports on its calculation process are printed. The last two report lines show the average fraction of flying program achieved based on stockage of the requirements solution from each constrained cost algorithm. The model selects the requirements solution associated with the larger value of fraction flying program achieved. The requirements parts list for the selected solution is shown in the output report (Figure 3-17) following this one.

```
                        CASE= PART SUB DOC EX

              *** CONSTRAINED COST SOLUTION EVALUATION REPORT ***


     CONSTR COST LIMIT=       93000.   OF WHICH     93000.   CAN BE USED
     TO BUY (NO SUB) PARTS FROM THE UNCONSTR COST SOLUTION


     NO  FULL SUB  PARTS ARE AFFORDABLE IN CONSTRAINED COST SOLUTION 1

  THE FIRST CONSTR COST SOL YIELDS AN AVG FRAC PGM FLY HRS ACH= .545

  THE 2ND(SUSTNBLTY) CONSTR COST SOL YIELDS AN AVG FRAC FH ACH= .951
```

Figure 3-16. Constrained Cost Total Requirements Solution Evaluation Report

(7) Constrained Dollar Total Requirements Parts List (Figure 3-17). This output is only printed if the input cost limit is less than the cost of the unconstrained cost solution. Since the "buy" implied by the constrained cost algorithm often only approximates (but never exceeds) the input cost limit, both the input cost limit and the amount used in the solution are given in the table header. The type solution is also given in that header as either a "cheapest no-sub parts/sustainability solution" (denoting an algorithm 1 solution) or a "sustainability solution for cost through N days" (denoting an algorithm 2 solution). N denotes the period of flying program sustainability reflected by that solution. As noted previously, the constrained cost methodology computes two solutions using two algorithms and chooses the one yielding the higher flying hour productivity in terms of fraction total flying program achieved. Only the chosen solution is printed in this output list. Parts are listed either in order of decreasing amount of requirement or in order of decreasing part unit cost, depending on the value of IORD in the Scenario Data Base (Table 2-5). Each processed part NSN and description are listed, along with the solution amount required, the cost of that amount and the percent of total cost represented by that amount. The listed solution tends heuristically toward the maximally productive (in terms of supportable program flying hours) constrained cost parts mix which is priced at the input cost limit. A zero initial inventory and use of the input-specified partial-substitution policy are assumed.

CASE= PART SUB DOC EX

TOTAL(INIT STK=0) STK RQMTS

COST LIMIT OF 93000. APPROXIMATED BY 92200.

USING A SUSTAINIBILITY SOLUTION FOR COST THRU 4 DAYS

	PART NR	PART		RQMNT	COST	%COST
1	1	PART 1	PART 1 GUN	280.0	11200.	12.15
2	3	PART 3	PART 3 GUN	190.0	76000.	82.43
3	2	PART 2	PART 2 GUN	70.0	3500.	3.80
4	4	PART 4	PART 4 GUN	50.0	1500.	1.63

Figure 3-17. Constrained Dollar Total Requirements Parts List

(8) Constrained Dollar Total Requirements Force Capability List (Figure 3-18). The output shows, under the specified partial-sub policy and for an initial spare pool stock equal to the previously computed (Figure 3-17 above) constrained cost total stock requirement:

- Expected achievable daily and average aircraft availability.
- The daily and average minimum aircraft availability required to meet the base case objective.

- Expected daily and average fraction of program flying hours flown.

- Expected daily and average program hours flown per available aircraft per day.

In addition, since the achieved flying hours are computed by means of a daily iterative convergence process, information on the closeness of the overall convergence is printed in the header TOTAL FLY HRS CONVERGED TO WITHIN X.XX PERCENT. On each day, each iteration produces a pair of "achieved flying hour" estimates, an initial one and a final one. After all days are processed, the overall convergence closeness, denoted by X.XX PERCENT, is expressed as the sum (over all days) of the absolute differences between initial and final estimates divided by the sum of the final daily estimates. The value of X.XX is determined by inputs CONVF and LIMIT in Record Sets 1 and 4, respectively, of the Scenario Input Data Base. Closeness can be improved by reducing the input value of CONVF and/or increasing the input value of LIMIT. The cost limit used in the case is printed in the header format.

CASE= PART SUB DOC EX

** FORCE CAPABILITY WITH CONSTR COST TOTAL RQMT SOLUTION STOCKED AT RETAIL

* (NO POST D-DAY PARTS DEPLOYED) *

COST LIMIT OF 93000.

TOTAL FLY HRS CONVERGED TO WITHIN 5.354 PERCENT

DAY	ACHIEVED ACFT AVAIL	REQ AVAIL	DAY	ACHIEVED FRACTION FH PGM	FLY HRS/AC /DAY
1	1.000	.333	1	1.000	3.3
2	1.000	.500	2	1.000	5.0
3	1.000	.500	3	1.000	5.0
4	.750	.750	4	1.000	10.0
5	.615	.750	5	.820	10.0
AVERAGES	.866	.579		.951	6.4

Figure 3-18. Constrained Dollar Total Requirements Force Capability List

c. **Residual Requirements Case Results.** The following outputs are for the case with initial inventory = current inventory. Results are add-on to current inventory. In this case, initial stocks are distributed in theater over the schedule specified in the Parts Data Base. Results for residual requirements are generated only if ISEL = 1 or 2 in the Scenario Data Base.

(1) **Unconstrained Dollar Residual Requirements Total Cost List (Figure 3-19).** The output shows the total cost of the least-cost residual requirements unconstrained cost solution (add-on based on input initial inventory). The format is virtually identical to that of the Unconstrained Dollar Total Requirements Total Cost List (Figure 3-11). Add-on costs have been computed by cumulating the product of part unit cost and total add-on units (of the part) required. As in all requirements cases, the partial-sub policy specified in Record Set 2 of the scenario data base applies.

CASE= PART SUB DOC EX

RESIDUAL(INIT STK=CURR STK) COST OF RQMTS

POLICY	TOT COST
PART SUB	6300.

Figure 3-19. Unconstrained Dollar Residual Requirements Total Cost List

(2) **Unconstrained Dollar Residual Requirements Parts List (Figure 3-20).** The output shows the composition of the residual unconstrained cost requirements solution mix (based on input initial inventory). Format is virtually identical to that of the Total Requirements Parts List (Figure 3-12), i.e., parts are listed in the same order (by decreasing requirement amount). Add-on units required, cost of add-on requirement, and associated percent of overall requirement are listed for each part.

CASE= PART SUB DOC EX

RESIDUAL(INIT STK=CURR STK) STK RQMTS

	PART NR	PART		RQMNT	COST	%COST
1	2	PART 2	PART 2 GUN	60.0	3000.	47.62
2	1	PART 1	PART 1 GUN	60.0	2400.	38.10
3	4	PART 4	PART 4 GUN	30.0	900.	14.29
4	3	PART 3	PART 3 GUN	.0	0.	.00

Figure 3-20. Unconstrained Dollar Residual Requirements Parts List

(3) Selected Items Cumulative Residual Requirements List (Figure 3-21). This output consists of residual unconstrained cost requirements for each of up to 100 selected part types for a truncated scenario of length N days, where N = 1, 2, ... through the last day of the Base Case Scenario. It is an exact analogue of the Selected Items Cumulative Total Requirement List (Figure 3-13) except that the residual requirements are treated.

CASE: PART SUB DOC EX

CUM ADD-ON RQMT(INIT STK=CURR INV) REQUIRED THRU GIVEN DAY

PART NR 1		PART NR 2		PART NR 0		PART NR 0		PART NR 0	
PART 1 DAY	PART 1 CUM	PART 2 DAY	PART 2 CUM	DAY		DAY		DAY	
1	.0	1	.0	1	.0	1	.0	1	.0
2	.0	2	.0	2	.0	2	.0	2	.0
3	.0	3	.0	3	.0	3	.0	3	.0
4	20.0	4	11.0	4	.0	4	.0	4	.0
5	60.0	5	40.0	5	.0	5	.0	5	.0

Figure 3-21. Selected Items Cumulative Residual Requirements List

(4) Residual Requirement Cumulative Cost List (Figure 3-22). Output consists of total costs (all parts) of the residual unconstrained cost requirements solution (add-on based on initial inventory) for each policy applied in a truncated scenario of N days, N = 1, 2, ... through the last day of the base scenario. It is an analogue of the Total Requirement Cumulative Cost List (Figure 3-14). These are add-on costs. Initial inventory is not costed here, but is treated as a "sunk" asset. The costs on the last line (day) of the output list should be the same as those in the Unconstrained Dollar Residual Requirements Cost List (Figure 3-19, above). Another interpretation of this output is that it gives, for each policy, the expected cost for residual (add-on) requirements required to sustain the flying hour/availability objective through any specified day of the scenario. After the list, a summary of the cost limit approximation used in constrained cost algorithm 2 for this case is also given.

CASE= PART SUB DOC EX

CUM RESIDUAL(INIT STK= CURR STK) COST OF REQ THRU GIVEN DAY

DAY	PART SUB
1	0.
2	0.
3	0.
4	1950.
5	6300.

COST LIMIT OF 2300. APPROXIMATED BY 1950.

WHICH IS THE CUM RQMT COST THRU DAY 4

Figure 3-22. Residual Requirement Cumulative Cost List

(5) **Unconstrained Dollar Residual Requirements Force Capability List (Figure 3-23).** The output is analogous to the comparable list for total requirements (Figure 3-15), i.e., it shows, for each day, expected aircraft availability, required availability (and source), and flying hours per aircraft per day, assuming that the computed residual unconstrained cost requirement (Figure 3-20) is added to the stocks in the theater war reserve.

CASE= PART SUB DOC EX

** FORCE CAPABILITY GIVEN THAT THE COMPUTED REQUIREMENT (FOR EACH POLICY) IS STOCKED **

*** CASES ASSUME RESIDUAL(INIT STK=CURR STK) REQMTS ARE STOCKED AND DEPLOYED ***

	AIRCRAFT AVAILABILITY				ACHIEVED	
DAY	ACHIEVED AVAIL	REQ AVAIL	AVAIL SOURCE	AVAIL	FLY HRS/AC /DAY	DAY
1	1.000	.333	FLYING HR PROG	.10	3.3	1
2	1.000	.500	FLYING HR PROG	.09	5.0	2
3	1.000	.500	FLYING HR PROG	.09	5.0	3
4	.950	.750	FLYING HR PROG	.09	7.9	4
5	.750	.750	FLYING HR PROG	.09	10.0	5
AVERAGE=	.937	.579			6.2	

Figure 3-23. Unconstrained Dollar Residual Requirements Force Capability List

(6) **Constrained Dollar Residual Requirements Solution Evaluation Report (Figure 3-24).** This output is exactly analogous to the Total Requirements Solution Evaluation Report (Figure 3-16) except that residual (add-on to current inventory) requirements are treated here.

```
                         CASE= PART SUB DOC EX

             *** CONSTRAINED COST SOLUTION EVALUATION REPORT ***


      ALL (NO SUB)  PARTS ARE AFFORDABLE IN CONSTRAINED COST SOLUTION 1

       1400.   APPROXIMATED BY        1350.  CUM FULL SUB PART COST THRU DAY   4  IS USED TO BUY FULL SUB PARTS

      CONSTR COST LIMIT=        2300.   OF WHICH        900.   CAN BE USED
      TO BUY (NO SUB) PARTS FROM THE UNCONSTR COST SOLUTION

   THE FIRST CONSTR COST SOL YIELDS AN AVG FRAC PER FLY HRS ACH= .947

   THE 2ND(SUSTNBLTY) CONSTR COST SOL YIELDS AN AVG FRAC FH ACH= .946
```

Figure 3-24. Constrained Dollar Residual Requirements Solution Evaluation Report

(7) **Constrained Dollar Residual Requirements Parts List (Figure 3-25).** This list is exactly analogous to the Constrained Dollar Total Requirements List (Figure 3-17). It is only printed if the input cost limit for residual requirements is less than the cost of the corresponding unconstrained cost solution. Each processed part NSN and part description are listed, along with the solution amount required, the cost of that amount, and the percent of total cost represented by that amount.

```
                          CASE= PART SUB DOC EX
                          RESIDUAL(INIT STK=CURR STK) STK RQMTS


      COST LIMIT OF        2300. APPROXIMATED BY        2250.
      USING A COMBINED (CHEAPEST NO SUB PARTS)/SUSTNBLTY SOL

      PART NR               PART                        RQMNT        COST  %COST

 1        4              PART 4      PART 4 GUN         30.0         900.  40.00
 2        1             PART 1       PART 1 GUN         20.0         800.  35.56
 3        2              PART 2      PART 2 GUN         11.0         550.  24.44
 4        3             PART 3       PART 3 GUN           .0           0.    .00
```

Figure 3-25. Constrained Dollar Residual Requirements Parts List

(8) **Constrained Dollar Residual Requirements Force Capability List (Figure 3-26).** The output shows the same information as in Figure 3-18, above, but for an initial spare pool stock equal to the sum of the previously computed (Figure 3-25) constrained cost residual stock requirement and the original initial stock. The computed requirement is assumed to be added to the theater war reserve. Information on the closeness of convergence of achieved flying hours is printed in the table header.

CASE: PART SUB DOC EX

** FORCE CAPABILITY WITH CONSTR COST RESIDUAL RQMT SOLUTION STOCKED & DEPLOYED **

COST LIMIT OF 2300.

TOTAL FLY HRS CONVERGED TO WITHIN .941 PERCENT

DAY	ACHIEVED ACFT AVAIL	REQ AVAIL	DAY	ACHIEVED FRACTION FH PGM	FLY HRS/AC /DAY
1	1.000	.333	1	1.000	3.3
2	.940	.500	2	1.000	5.3
3	.845	.500	3	1.000	5.9
4	.750	.750	4	1.000	10.0
5	.603	.750	5	.804	10.0
AVERAGES	.819	.579		.947	6.7

Figure 3-26. Constrained Dollar Residual Requirements Force Capability List

d. Current Inventory Capability Assessment Results (Figure 3-27). After all requirements results are printed, Extended PARCOM prints capability assessment results for current inventory under the partial-substitution policy specified for requirements cases as well as optional results under a variety of additional user-specified partial-substitution policies. Outputs are as shown in the paragraphs following.

CASE= PART SUB DOC EX

** FORCE CAPABILITY GIVEN THE CURRENT INVENTORY STKED & DEPLOYED FOR POLICY 1 **

TOTAL FLY HRS CONVERGED TO WITHIN .610 PERCENT

DAY	ACHIEVED ACFT AVAIL	REQ AVAIL	DAY	ACHIEVED FRACTION FH PGM	FLY HRS/AC /DAY
1	.973	.333	1	1.000	3.4
2	.885	.500	2	1.000	5.6
3	.740	.500	3	1.000	6.8
4	.635	.750	4	.847	10.0
5	.575	.750	5	.767	10.0
AVERAGES	.751	.579		.895	6.9

Figure 3-27. Current Inventory Capability Assessment Under Policy 1

(1) Current Inventory Capability Assessment Under Policy 1 (Base). The output consists of the daily and average achieved availability, achieved fraction of flying program and achieved program flying hours per aircraft per day for current inventory under the partial-substitution policy used in the requirements cases. That policy is specified in Record Set 2 of the Scenario Data Base. The format and general content of the list is the same as in the Constrained Dollar Force Capability Lists (Figures 3-18 and 3-26) for Requirements Cases.

(2) Full-sub Parts List for Policy 2 (Figure 3-28). This list displays, in order of input, data for those parts in the full-sub parts set used in Policy 2. Policy 2 refers to the first partial-substitution policy defined by the user in Record Set 11 of the Scenario Data Base. This output is printed only if a positive value for IOPT2 is set in Record Set 5 of the Scenario Data Base.

CASE= PART SUB DOC EX

FULL SUB ITEMS FOR POLICY 2

PART	NSN	DESCRIPTION	COST	OST	FAIL RT	MRTS	BCY	DCY	DRT	BCON	DCON	QPA	ESS	CLASS	INIT STK
3	PART 3	PART 3 GUN	400.		.060000	1.00	1.	4.		.00	.00			FULL SUB	220.
4	PART 4	PART 4 GUN	30.		.020000	.00	2.	0.		.00	.00			FULL SUB	30.

Figure 3-28. Full-sub Parts List for Policy 2

(3) **No-sub Parts List for Policy 2 (Figure 3-29).** This list displays, in order of input, data for those parts in the no-sub parts set used in Policy 2. (Policy 2 is described above.) This output is printed only if a positive value for IOPT3 is set in Record Set 5 of the Scenario Data Base.

CASE= PART SUB DOC EX

NO SUB ITEMS FOR POLICY 2

PART	NSN	DESCRIPTION	COST	DST	FAIL RT	MRTS	BCY	DCY	DRT	BCON	DCON	OPA	ESS	CLASS	INIT STK
1	PART 1	PART 1 SUN	50.		.080000	1.00	1.	1.		.00	.00			NO SUB	50.
2	PART 2	PART 2 SUN	50.		.020000	.00	3.	0.		.00	.00			NO SUB	5.

Figure 3-29. No-sub Parts List for Policy 2

(4) **Current Inventory Capability Assessment Under Policy 2 (Figure 3-30).** *This output shows daily and average achieved availability,* achieved fraction of flying program, and achieved program flying hours per aircraft per day for current inventory under the partial-substitution Policy 2 described previously.

CASE= PART SUB DOC EX

** FORCE CAPABILITY GIVEN THE CURRENT INVENTORY STKED & DEPLOYED FOR POLICY 2 **

TOTAL FLY HRS CONVERGED TO WITHIN .672 PERCENT

DAY	ACHIEVED ACFT AVAIL	REQ AVAIL	DAY	ACHIEVED FRACTION FH PGM	FLY HRS/AC /DAY
1	.973	.333	1	1.000	3.4
2	.885	.500	2	1.000	5.6
3	.590	.500	3	1.000	8.5
4	.529	.750	4	.705	10.0
5	.607	.750	5	.809	10.0
AVERAGES	.703	.579		.867	7.1

Figure 3-30. Current Inventory Capability Assessment Under Policy 2

END

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