NASA Contractor Report 174979

Evaluation of Spacecraft Technology Programs (Effects on Communication Satellite Business Ventures)—Volume II

Joel S. Greenburg, Carole Gaelick
Princeton Synergetics, Inc.
Princeton, New Jersey

Marshall Kaplan
Spacetech Inc.
State College, Pennsylvania

Janis Fishman
Princeton Synergetics, Inc.
Princeton, New Jersey

and

Charles Hopkins
Econ, Inc.
San Jose, California

September 1985

Prepared for the
Lewis Research Center
Under Contract NAS 3-23886

NASA
National Aeronautics and Space Administration

SUMMARY

Commercial organizations as well as government agencies invest in spacecraft (S/C) technology programs that are aimed at increasing the performance of communications satellites. The value of these programs must be measured in terms of their impacts on the financial performance of the business ventures that may ultimately utilize the communications satellites. An economic evaluation and planning capability has been developed and used to assess the impact of NASA on-orbit propulsion and space power programs on typical fixed satellite service (FSS) and direct broadcast service (DBS) communications satellite business ventures. The developed methodology is based upon a stochastic financial simulation model (i.e., DOMSAT II) that allows for the explicit and quantitative consideration of reliability and various market, performance and cost uncertainties. The Model developes financial performance measures, including quantitative risk measures, that allow the impacts of the technology programs to be determined.

Typical FSS and DBS spin and three-axis stabilized spacecraft were configured in the absence of NASA technology programs. These spacecraft were reconfigured taking into account the anticipated results of NASA specified on-orbit and space power programs. Nonrecurring and unit recurring costs were estimated (using the PRICE cost model) for all of the spacecraft configurations and financial analyses performed of FSS and DBS business ventures utilizing these spacecraft. In general, the NASA technology programs resulted in spacecraft with increased capability — this was taken into account in the analysis.

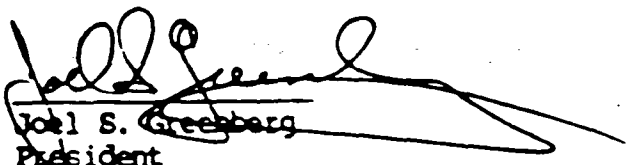
This report describes the developed methodology for assessing the value of spacecraft technology programs in terms of their impact on the financial performance of communications satellite business ventures. Results of the assessment of NASA specified on-orbit and space power technology programs are presented for typical FSS and DBS business ventures. These results are extrapolated to indicate the potential market for the developed technology and the possible implications of the programs on spacecraft imports and exports.

This report consists of two volumes. Volume 1 describes the methodology and contains the results of the analyses performed for the on-orbit propulsion and space power technology programs. Volume 2 contains appendices describing the DOMSAT II Model and data base and includes user and programmer documentation.

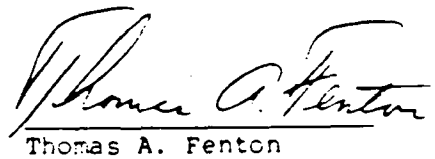
ACKNOWLEDGEMENTS

The reported work was performed by Ms. Carole Gaelick and Mr. Joel S. Greenberg, Princeton Synergetics, Inc., Dr. Marshall Kaplan, Consultant, Mrs. Janis Fishman, Consultant, and Mr. Charles Bopkins, ECON, Inc. Mr. Greenberg directed the team efforts and was responsible for the methodological development; Ms. Gaelick was responsible for data collection, market estimation and the analysis of results; Dr. Kaplan was responsible for the spacecraft configuration analysis and technology assessment and Mr. Bopkins was responsible for the cost analysis. Mrs. Fishman was responsible for the software development. This report was also authored by the above individuals.

This work was performed under the guidance of Mr. Karl Faymon, NASA Lewis Research Center. The NASA Lewis Research Center technical staff provided valuable assistance with respect to the considered technology programs. Numerous commercial organizations including RCA Americom, Fairchild, Comsat, Direct Broadcasting Satellite Corp. and GT&E provided valuable information with respect to the structuring of the business scenarios that were considered in the analysis.



Joel S. Greenberg
President
Princeton Synergetics, Inc.



Thomas A. Fenton
Vice President
ECON, Inc.

TABLE OF CONTENTS

APPENDIX A: THE DOMSAT II MODEL DESCRIPTION (A COMMUNICATIONS SATELLITE FINANCIAL PLANNING MODEL)

A.1 Introduction

Based upon discussions with the carriers, a stochastic financial simulation model was developed by Princeton Synergetics, Inc. for NASA's LeRC. The DOMSAT II Model allows the impact of S/C technology programs to be evaluated for a broad range of communications satellite business ventures providing a multiplicity of communications services.

The DOMSAT II Model is currently operational on the IBM PC with the input data provided via a user friendly LOTUS 123 system. The mathematical computations are performed in FORTRAN. The Model has been used to assess the impact of LeRC on-orbit propulsion and spacecraft power technology programs on both FSS and DBS business ventures using both spin and three-axis stabilized spacecraft. User and programmer documentation are provided in Appendix B.

The methodology developed will allow a broad range of fixed satellite services and direct broadcast communication satellite business scenarios to be analyzed through the use of the DOMSAT II financial simulation model. The Model allows a broad range of communications satellite business ventures to be simulated explicitly and quantitatively taking into account uncertainty, unreliability and resulting risk. It specifically allows for the consideration of hybrid (i.e., C- and Ku-band) satellite configurations. The objective is to assess the impact of NASA

spacecraft technology programs (for example, on-orbit propulsion and power programs) upon commercial communications business ventures by planning typical business ventures utilizing satellites without and with the technology being considered for development. The value of the technology programs is then related to the changes in financial or economic performance measures which provide insights into the likelihood that the technology will be utilized by the business ventures.

The Model provides the means for evaluating the financial impacts of S/C technology programs, space transportation programs and related policies, on private sector communications satellite business ventures. This is accomplished by reconfiguring S/C taking into account the anticipated results of S/C technology programs. The resulting S/C configurations are communicated to the DOMSAT II Model through specific estimates of cost, performance and reliability. These estimates are then combined with a business scenario (i.e., number of satellites as a function of time, number and type of transponders, demand for transponders by type of service provided, pricing, price elasticity, launch system scenario as a function of time, likely launch time delays, transfer time from LEO to GEO, cost of insurance, satellite control operations expense, G&A expense, etc.) to establish annual profit (loss), annual cash flow, cumulative cash flow, ROA, payback period, and ROI. The financial performance measures are all described by probability distributions (i.e., risk profiles) since cost uncertainties (i.e., uncertainty profiles) and subsystem reliability are considered.

The impact of S/C technology programs can be assessed in terms of the differences that result in financial performance measures which are the result of differences in S/C performance and cost attributes resulting from the S/C technology programs and new services made possible by the technology programs. Two analyses are necessary for assessing the financial impacts; one analysis based upon a satellite configuration in the absence of the S/C technology program (i.e., the base case), and a second analysis based upon a setellite configuration incorporating the assumed results of the S/C technology program. The difference in the financial results is therefore assumed to be directly attributable to the S/C technology programs.

The establishment of a business scenario consists of specifying the following information (a typical data base used in the analysis of a FSS business venture is presented in Appendix B):

* number of years in the business plan
* maximum number of operational satellites
* desired launch schedule
* possible launch delays
* time to transfer from LEO to GEO
* number of narrow-band transponder groups/satellite
* number of wide-band transponder groups/satellite
* number of transponders per narrow-band group
* number of transponders per wide-band group
* number of spare transponders per narrow-band group
* number of spare transponders per wide-band group

* transponder reliability characteristics (mean time to failure, expected wearout life, variability of wearout life)

* S/C support subsystem (up to 5) reliability characteristics

* types of communications services provided (protected, protected/preemptible, unprotected, and preemptible)

* tariffs per narrow and wide-band transponders for each type of communications service

* annual demand for narrow- and wide-band transponders in terms of type of service

* relaunch threshold in terms of number of operational transponders

* annual cost of S/C operations

* annual G&A expense (fixed and variable)

* annual R&D expense (fixed and variable)

* other annual expenses (fixed and variable)

* insurance cost

* S/C cost spreading

* S/C unit recurring cost

* S/C nonrecurring cost

* S/C unit recurring cost learning rate

* launch cost

* launch scenario as a function of time (described in terms of the probability of success of each of the major steps in the launch sequence)

* depreciation lives

* interest rates

* tax related data

* discount rates

* balance sheet related data.

Many of the above variables are considered as uncertainty variables requiring the specification of the range of uncertainty

and the form of uncertainty.

The Model allows uncertainty and unreliability to be considered explicitly and quantitatively. This is absolutely necessary when considering programs which are specifically aimed at reducing uncertainty and altering reliability both of which effect perceived risk and hence effect investment decisions. To establish the quantitative measures of risk, the Model utilizes Monte Carlo techniques wherein the complete business scenario is repeated a large number of times (typically 1000 or more) each time randomly sampling from the uncertainty profiles and the reliability characteristics which are specified. The results of all the business analyses are saved and appropriate statistics developed. Financial performance measures are summarized in terms of expected values and standard deviations. Typical financial reports are illustrated in Figures B.13 and B.14 with detailed launch and S/C purchase statistics illustrated in Figures B.15 and B.16. It should be noted that the financial documents contain expected values except for those items which are noted with * indicating standard deviations. The particular form of the financial statements is the result of discussions with several carriers.

The Model develops many financial performance measures including annual after tax profit, annual cash flow, cumulative cash flow, return on sales, return on assets, payback period, and net present value. Expected values and standard deviations are established for all of these. The net present value is established at a number of discount rates so that the internal

rate of return (or discounted return on investment - ROI) can easily be established.

The Model consists basically of two parts. The first, utilizing the desired schedule of events, demand for communications services, the satellite configuration, specified launch scenario and reliability characteristics, establishes the specific timing and number of events and their costs. The availability of transponders (taking into account failures, sparing concepts and services offered) is matched against launch decision criteria in order to establish the schedule for replacement launches and the timing of additional capital expenditures for replacement satellites and launches. The timing and cost information is then passed to the second part of the Model which performs the financial computations and establishes values of the economic performance measures.

The Model is implemented such that certainty conditions can be easily analyzed as well as the uncertainty situations. For example, the number of desired runs is an input parameter and can be set to one when all ranges of uncertainty are set to zero (i.e., minimum and maximum values are set equal), mean-time-to-failure set to very large values and expected wearout time set to desired failure time (i.e., force replacement) — this is a useful approach for model verification. A user friendly system has been developed for entering this data into the Model. The data is entered via LOTUS 123 and the DOMSAT II Model is in FORTRAN. The system has been designed for operation on the IBM PC.

A.2 The Monte Carlo Concept

The simulation of communications satellite business ventures requires the explicit consideration of uncertainty and unreliability and resulting risk. The areas of uncertainty include performance, market, cost, and timing. The areas of unreliability include both transportation system and spacecraft. The DOMSAT II Model incorporates these uncertainties and unreliabilities into a set of financial computations by utilizing Monte Carlo simulation techniques.

Monte Carlo implies the performance of an experiment or simulation many times, such as rolling two dice (either actually or through the use of a simulation model) repeatedly to determine the chance of seven or more occurring. In the DOMSAT II Model the experiment consists of simulating a communications satellite business venture for up to 15 years. This business is simulated for about a thousand different situations where each of the specific situations is developed by random sampling of a set of probability density functions, or uncertainty profiles, and establishing from specified random and wearout failure characteristics specific event timing. The specific values obtained from the sampling of the uncertainty profiles and the reliability characteristics then establish the parameters of the business venture that is simulated. Results from all of the simulations are saved and histograms developed (or summarized by expected values and standard deviation) of pertinent financial or other performance measures. These histograms represent the result of combining all of the areas of uncertainty and transportation system and S/C reliability attributes in the

business scenario.

The Monte Carlo concept is illustrated in Figure A.1 through the use of a simplified financial model. Basic input data to this model consists of deterministic and probabilistic data. Examples of deterministic data are the number of time periods to be considered, the discount rates, and tax rates. Probabilistic data consist of "uncertainty profiles" associated with the variables whose values cannot be predicted or known exactly in advance. Typical uncertainty variables are sales, selling price, expense items and capital expenditures. Uncertainty profiles are subjective estimates that describe the range and form (shape) of the uncertainty. The creation of uncertainty profiles is discussed in following paragraphs.

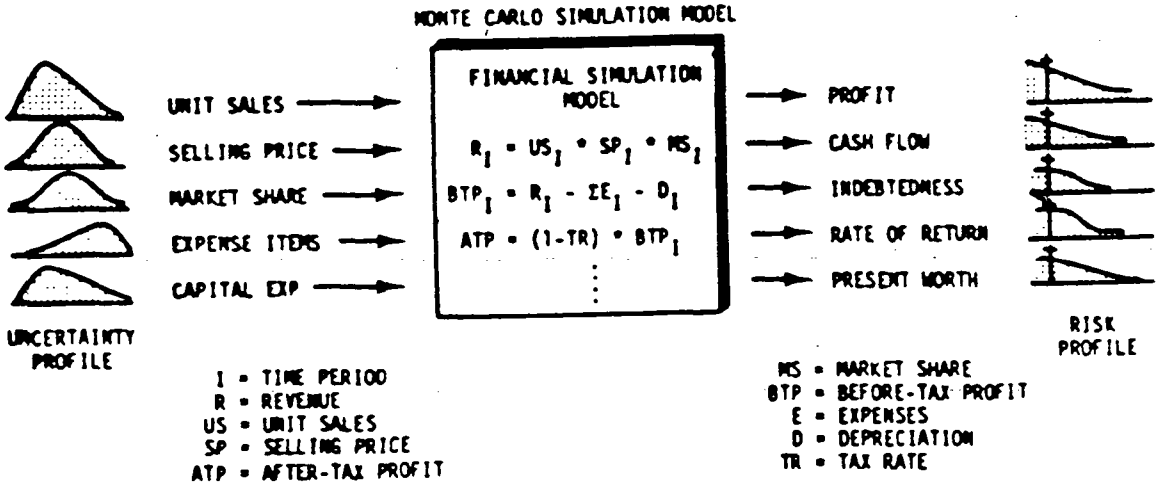


FIGURE A.1 FINANCIAL PLANNING MODEL: MONTE CARLO CONCEPT

These data are input to a financial simulation model that represents the real world situation being evaluated. The illustrated model (Figure A.1) states that revenue at a given time, I, is equal to the product of unit sales, selling price and market share; before-tax profit is equal to revenue less the sum of all expense items less the depreciation expense; after-tax profit is the before-tax profit multiplied by one minus the tax rate.

Risk analysis is performed by the random sampling of the input data (according to the weighting of the uncertainty profiles), performing computations contained within the simulation model, saving the results, then repeating the process. This process is repeated many times until a reasonable set of histograms can be developed from the saved output. These histograms are worked into the desired form to indicate the variability of performance measures, such as profit, cash flow, indebtedness, rate of return and net present value. The DOMSAT II Model summarizes the financial performance measures in terms of expected values and standard deviations and establishes the probability density functions of launch and S/C purchase events. The performance measures may be displayed, as indicated, in the form of "risk profiles" which indicates the chance of a performance measure exceeding specific levels (i.e., the complementary cumulative probability distribution).

At the heart of the DOMSAT II Model is a financial model that is driven by data obtained from "event" (i.e., launch times, S/C failures, transponder failures, etc.) computations. The whole process, both the events and the financial computations,

are included in a Monte Carlo model. The basic structure of the financial computations is illustrated in simplified form in Figure A.2. Unit sales is multiplied by unit selling price and the product is in turn multiplied by market share to produce revenue. Each of these quantities may be provided in the form of an uncertainty profile, which are then sampled randomly to produce a value of the revenue random variable.

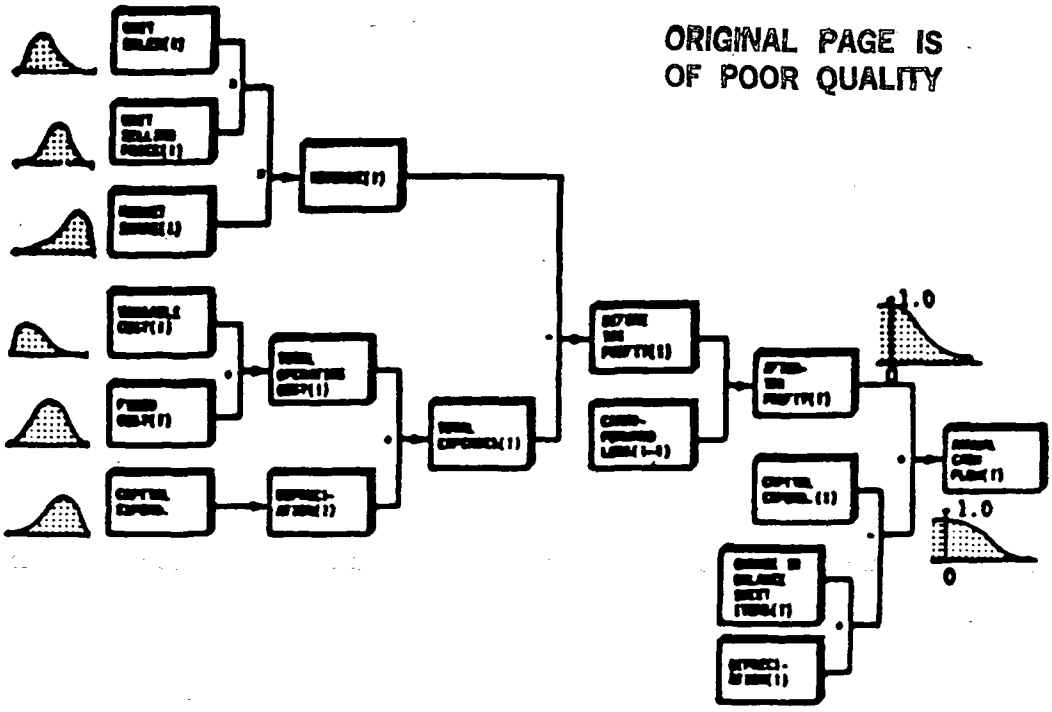


FIGURE A.2 FINANCIAL PLANNING MODEL: SIMPLIFIED CASH FLOW COMPUTATION

Variable cost (which may be related to unit sales) is added to fixed cost to obtain total annual operating cost. The variable and fixed costs may also be uncertainty variables. Capital expenditures are specified (and may be in the form of uncertainty variables) and depreciation is computed and added to total operating cost to yield total expenses. Revenue less annual expenses yields before-tax profit. This, when multiplied by one minus the tax rate and modified by carry forward losses and tax credits, yields after-tax profit. Annual cash flow is obtained by adding depreciation and changes in the balance sheet items to after-tax profit and subtracting capital expenditures.

A.2 Uncertainty and Risk Profiles

Uncertainty estimates are subjective. They express quantitatively attitudes regarding uncertainties, reflecting past experience with similar efforts, types of problems encountered in the past, and insights into problem areas that might develop. Uncertainty profiles, being subjective estimates, call for expert opinion in each area. Ordinarily, manufacturing personnel estimate the uncertainty surrounding manufacturing cost (both recurring and nonrecurring); market personnel estimate uncertainty surrounding the sales forecast and marketing costs; and so on through each category of input.

A useful and frequently used procedure for estimating the shape of an uncertainty profile is as follows (see Figure A.3): [1,2]

A. Estimate the range of uncertainty — minimum and maximum bounds (little or no chance of falling outside these bounds). Divide this range into a number of

equal intervals — 5 has been found, through experimentation, to be useful.

B. Make a relative ranking of the likelihood of the variables falling into each of the intervals: this establishes the general shape of the uncertainty profile (e.g., skewed left, central, etc.).

C. Set relative values for the chance of falling into each interval. (For the Figure A.3 case, the chance of falling into interval 1 is half that of falling into interval 2.)

D. Having assumed the probability of falling within the range is 1.0, the chance of falling in each of the five intervals can be summed and set equal to unity. This equation can be solved (by substituting the relative values as obtained in paragraph C) for the probabilities associated with each interval.

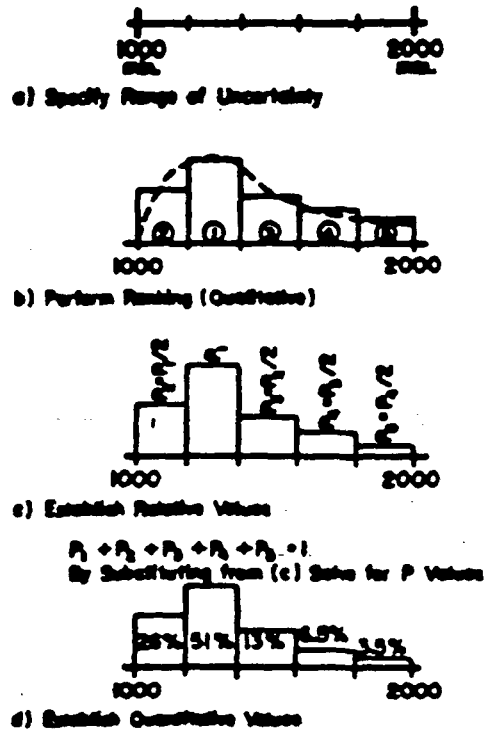


FIGURE A.3 FINANCIAL PLANNING MODEL: UNCERTAINTY PROFILES

This can become a tedious procedure when many uncertainty variables and/or many intervals must be dealt with in making assessments. To minimize this problem, many uncertainty profiles are stored in the data base. The evaluation then need specify only the minimum and maximum values and the name of the applicable uncertainty profile. If the appropriate uncertainty profile has not been stored, it can be created by the process described above and entered into the data base.

A.3 DOMSAT II Computational Procedures

Figure A.4 presents an overview of the DOMSAT II Model. The input data provided via LOTUS 123 (see Appendix B) is read by the DOMSAT II FORTRAN Model. The DOMSAT II Model consists of a number of computational procedures or sections (not to be confused with subroutines). These include:

A. A section concerned with simulating the launch sequence whenever a launch is required as determined by desired launch dates, and launch and spacecraft failures.

B. A section concerned with the determination of spacecraft subsystem failures.

C. A section concerned with the determination of transponder failures that takes into account operating as well as spare transponders.

D. A section concerned with the estimation of satellite replacement time as determined by considerations of specified launch criteria and number of available transponders (this feeds results back to the launch sequence simulation).

E. A section concerned with establishing the demand for transponders as a function of time. As will be discussed, the demand is disaggregated into "narrow-band" and "wide-band" transponder demand, type of service (four levels considered) and satellite. When demand exceeds supply, this section allocates transponders according to service.

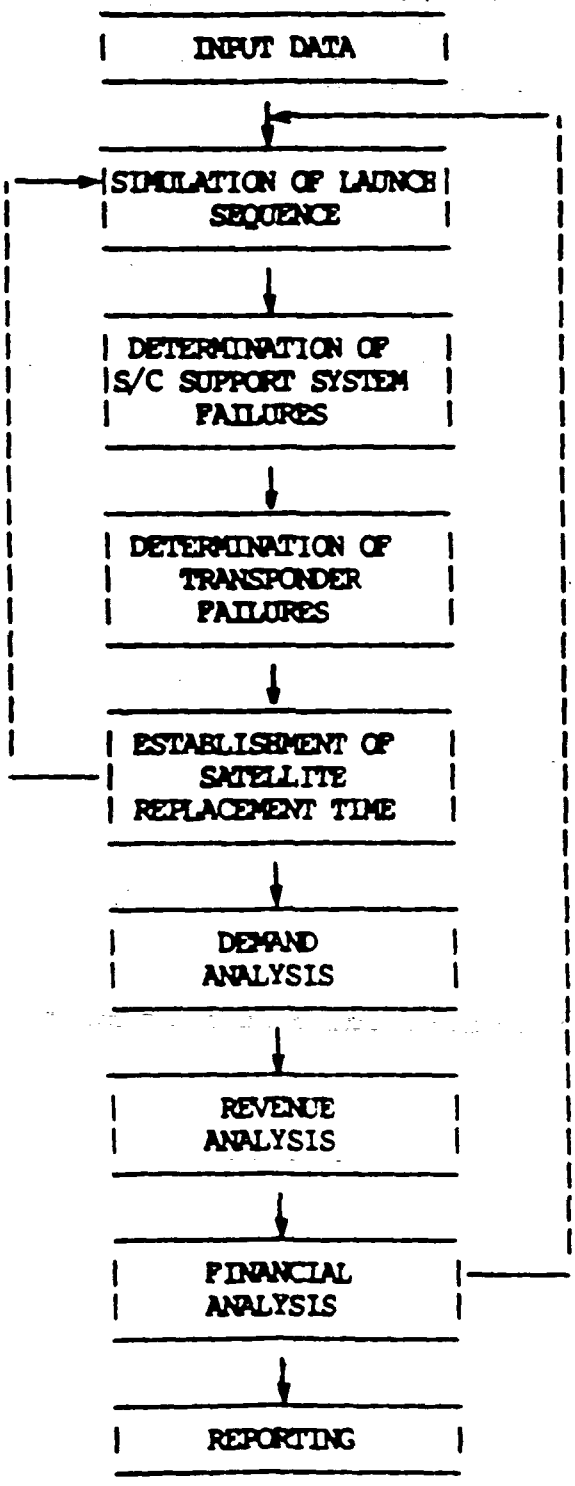


FIGURE A.4 DOMSAT II MODEL: OVERVIEW

F. A section concerned with revenue analysis that develops total revenue by considering number of transponders assigned to each service, the demand and the price per transponder.

G. A section concerned with the overall financial analysis given a set of events and revenue (as determined in the other sections). The financial analysis develops proforma income projections, cash flow projections, and net present value at a number of discount rates. A number of financial performance measures are developed with both expected values and standard deviations determined so that risk profiles may be developed.

H. A section concerned with report generation that includes the proforma income statements, cash flow projections and statistics on launch attempts and satellite purchases.

A more detailed computational flow is illustrated in Figure A.5. It should be noted that even this flow chart has been grossly simplified in order to present a general overview of the computional process. Actually, within the computational flow there are many levels of disaggregation and hence many computational loops. These may be visualized by referring to Table A.1 wherein the different indices that are utilized are identified and their functions indicated. Pertinent details of the Model are described below with reference to Figure A.4.

Simulation of Launch Sequence

The first step in the computational procedure is the simulation of the launch sequence which establishes the specific timing of satellite launches. Input data establish desired launch dates — the Model establishes actual launch dates. A general launch scenario (based upon the Space Shuttle) as illustrated in Figure A.6 is included in the Model. Inputs to the launch scenario include launch delays (i.e., the range of uncertainty associated with the timing of a rescheduled launch

TABLE A.1 IDENTIFICATION OF INDICES UTILIZED

INDEX	FUNCTION
* Monte Carlo Run Index	* Establish the number of simulation runs to be performed
* Operational Satellite Index	* Multiple satellites may be considered as comprising the business system
* Replacement Satellite Index	* Used to keep track of the replacement satellites required for each of the desired operational satellites (i.e.,an index within the operational satellite index)
* Primary Time Index	* Used to keep track of each of the time periods (years) of the analysis
* Secondary Time Index	* Time index within the year index (each year is subdivided to allow more accurate demand and revenue computations)
* S/C Subsystem Index	* Identifies each of the S/C support subsystems that are considered in the revenue analysis
* Transponder Group Index	* A number of transponder groups, each with their own spares may be considered for both the narrow- and wide-band services
* Transponder Index	* Identifies each of the transponders within each group
* Service Index	* Identifies each of the four (4) services that may be considered
* Capital Expenditure Index	* Used to keep track of capital expenditures

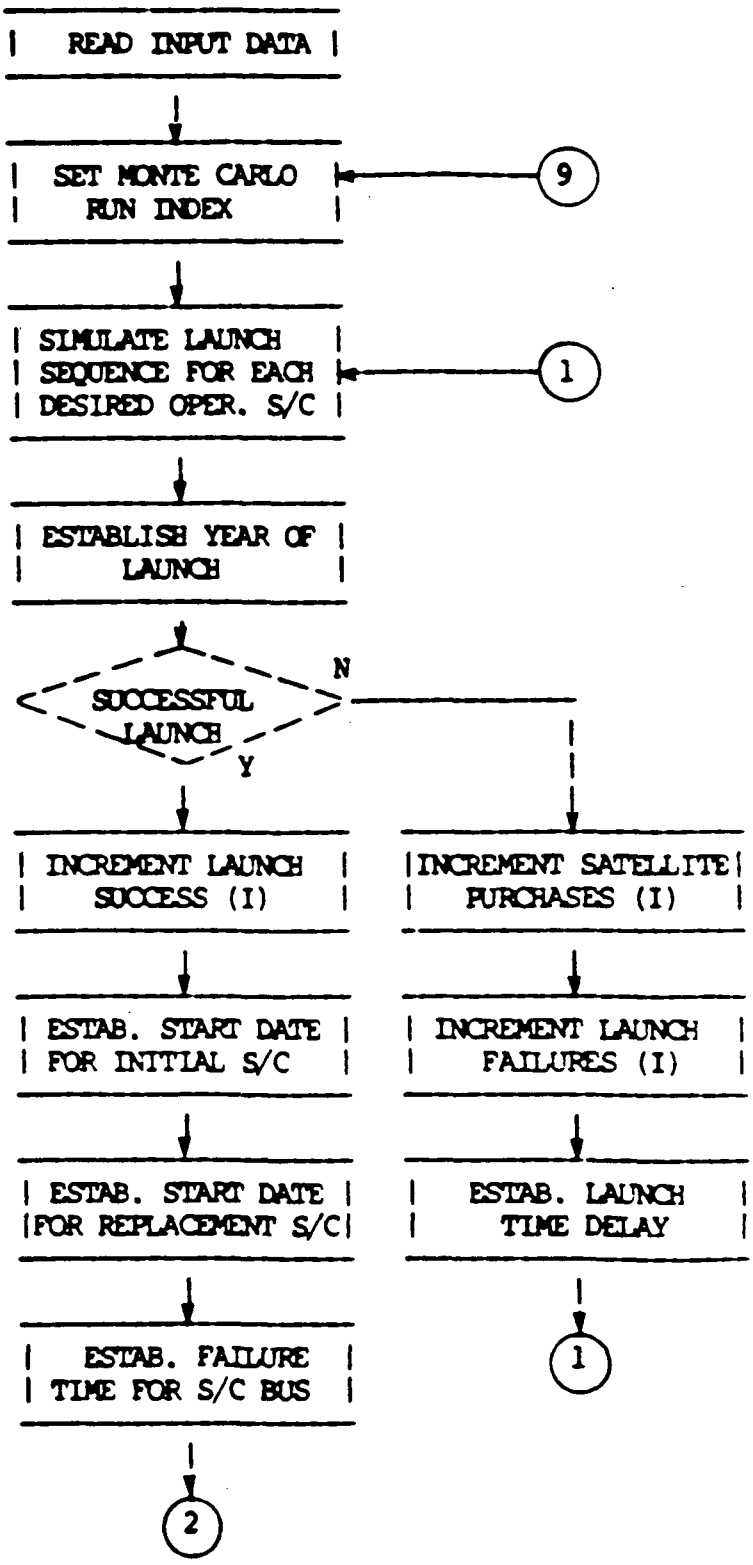


FIGURE A.5 DOMSAT II MODEL: COMPUTATIONAL FLOW

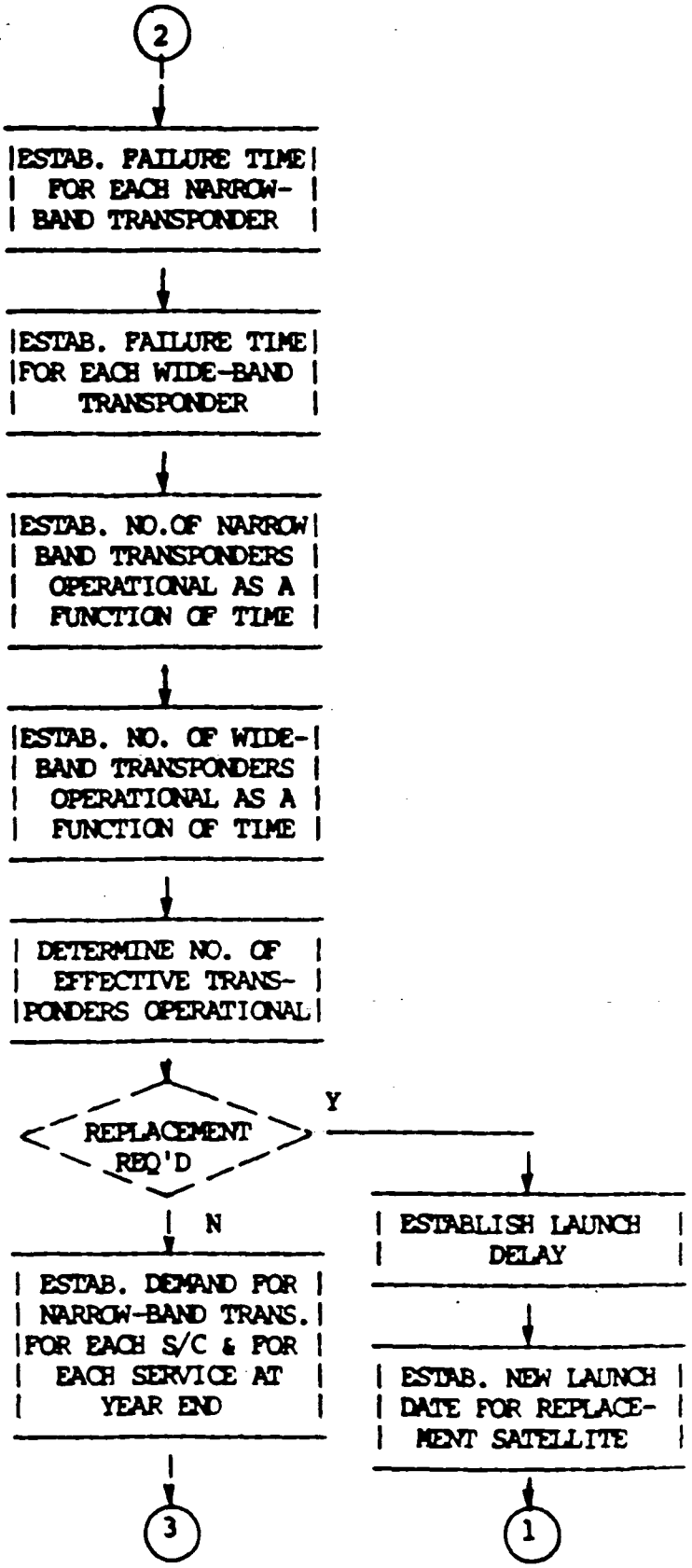


FIGURE A.5 DOMSAT II MODEL: COMPUTATIONAL FLOW (CONTINUED)

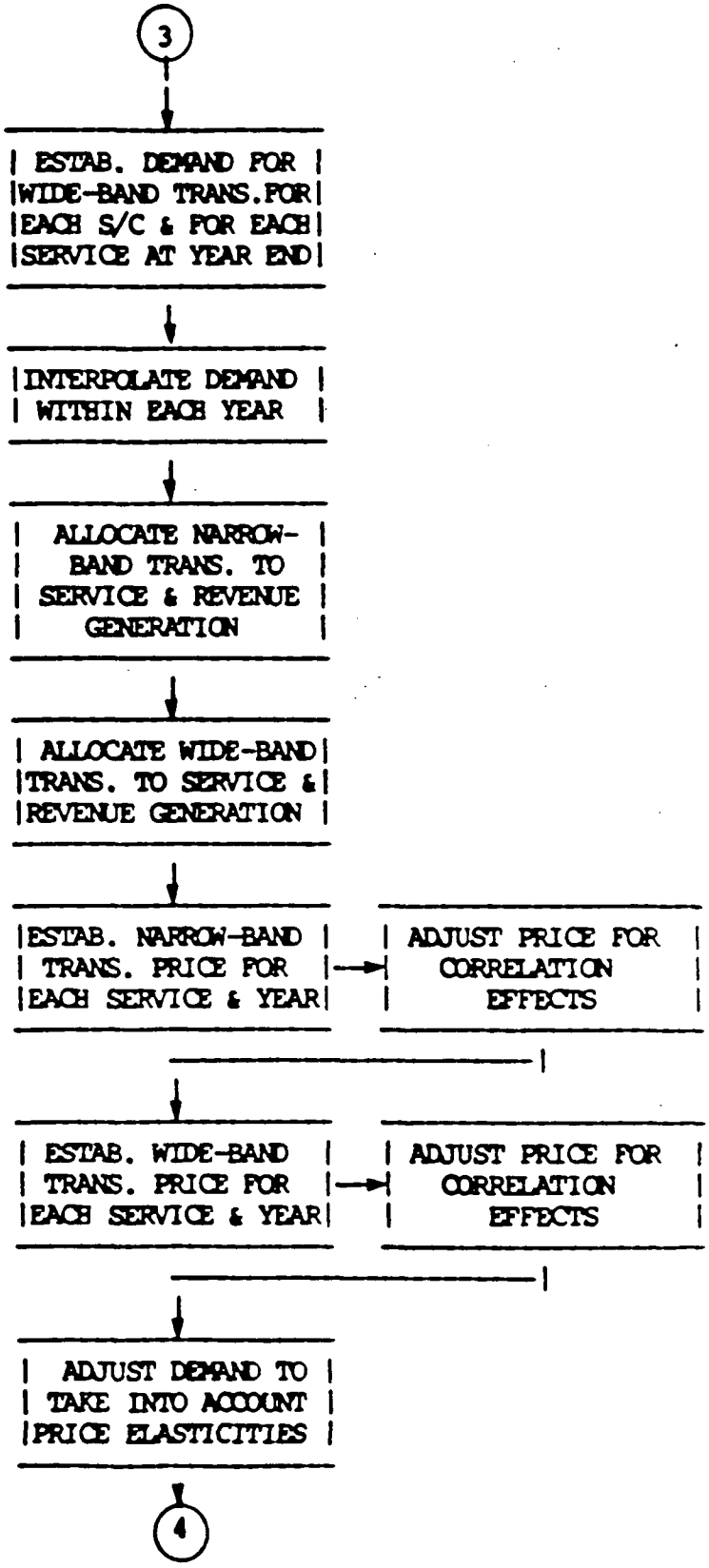


FIGURE A.5 DOMSAT II MODEL: COMPUTATIONAL FLOW (CONTINUED)

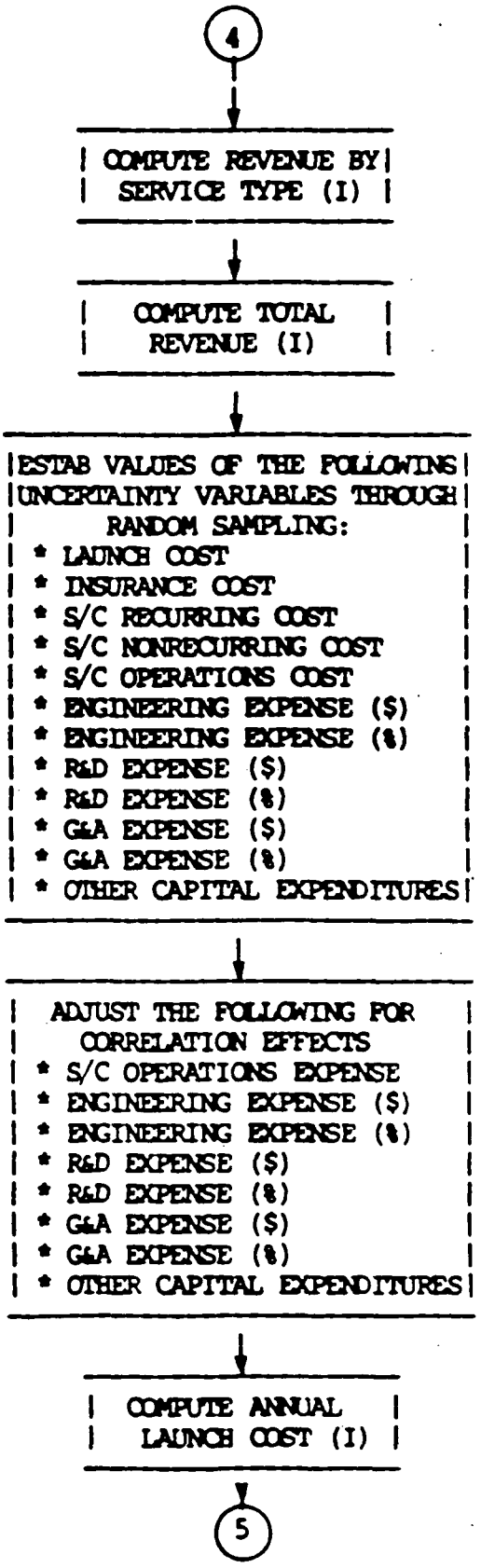


FIGURE A.5 DOMSAT II MODEL: COMPUTATIONAL FLOW (CONTINUED)

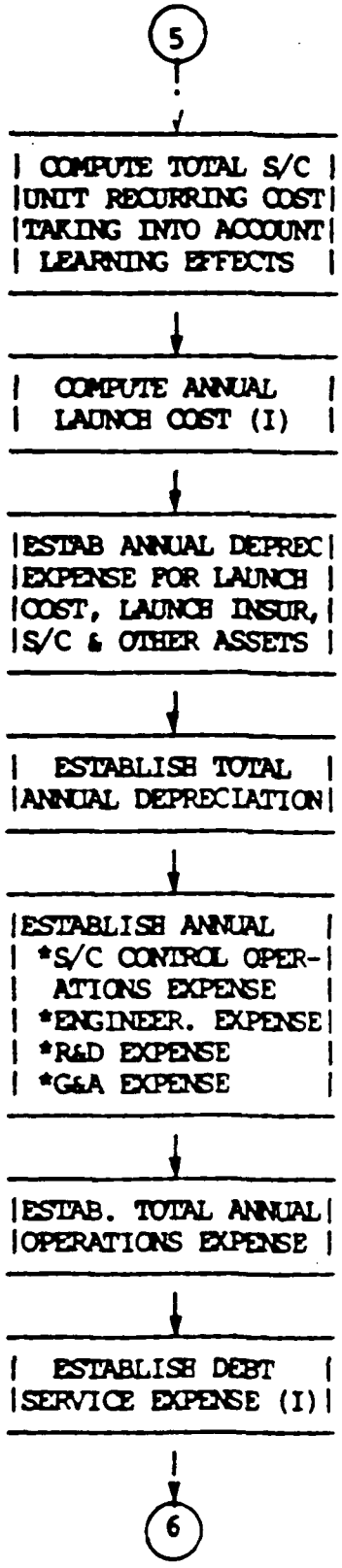


FIGURE A.5 DOMSAT II MODEL: COMPUTATIONAL FLOW (CONTINUED)

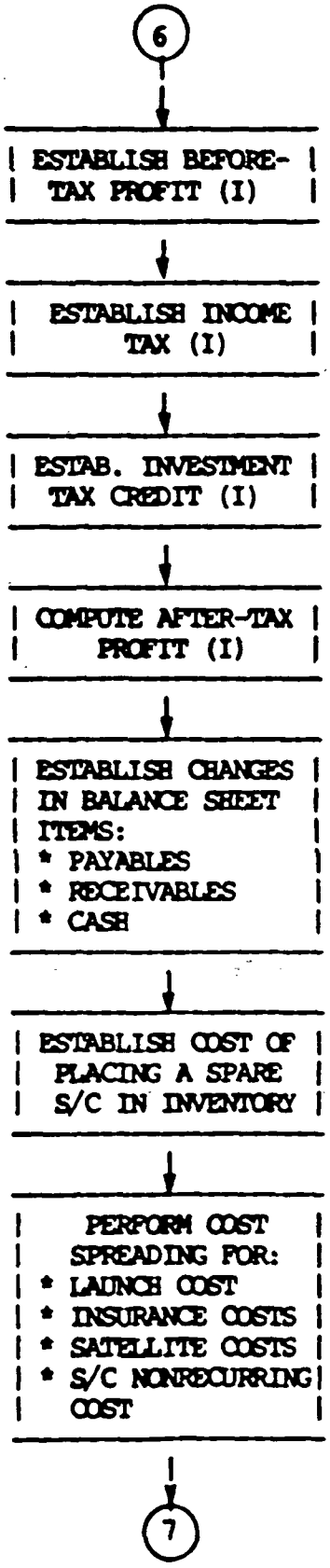


FIGURE A.5 DOMSAT II MODEL: COMPUTATIONAL FLOW (CONTINUED)

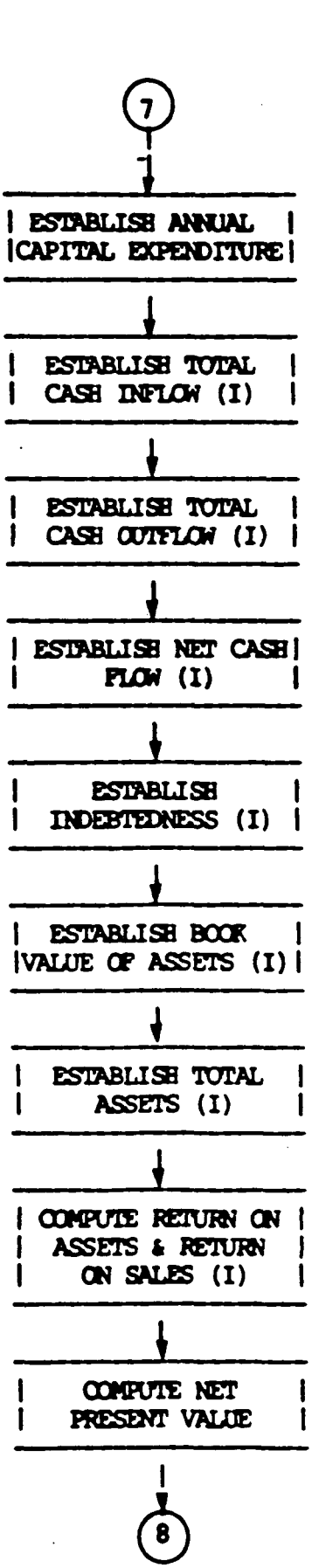


FIGURE A.5 DOMSAT II MODEL: COMPUTATIONAL FLOW (CONTINUED)

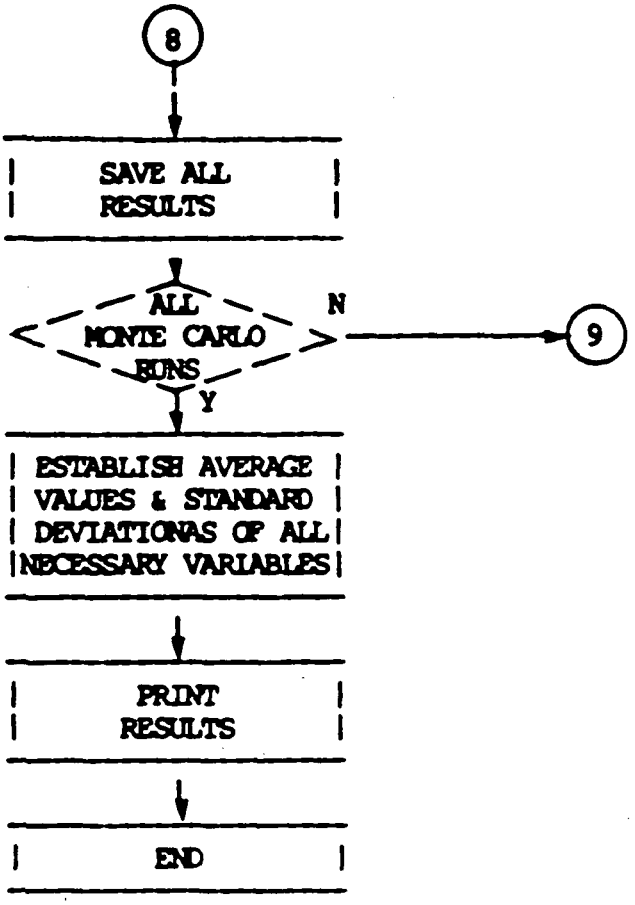


FIGURE A.5 DOMSAT II MODEL: COMPUTATIONAL FLOW (CONTINUED)

the before-tax profit multiplied by the tax rate. Investment tax credits are considered for the launch costs, insurance costs, annual spacecraft recurring costs and other capital expenditures. After-tax profit is the before-tax profit plus the tax credits less the income tax. It is assumed that the business venture is part of a larger corporation with other cash flows, profits and losses. Therefore no carry forward losses are taken into account since it is assumed that they are used to offset other corporate profits.

Changes in annual receivables, payables, and cash are established with receivables being a percentage of annual revenue and cash and payables being percentages of annual expenses (not including depreciation). The computation of annual cash flow takes into accout these changes in balance sheet items, satellite inventory and the expenditures made for assets as the expenditures actually occur. Thus cost spreading is performed on the annual launch, insurance, and satellite costs with the annual capital expenditures consisting of these spread costs. It is assumed that a spare satellite is acquired during the first year of service and that a satellite is maintained as a spare to ensure the availability of a satellite when needed. The satellite is a ground spare.

Annual cash flow is computed as the sum of annual profit (loss), changes in balance sheet items, capital expenditures and inventory. Indebtedness is established as the negative of the cumulative annual cash flow. A positive indebtedness indicates that cumulative cash outflows have exceeded cumulative cash

inflows. A negative indebtedness indicates that cumulative cash inflows have exceeded cumulative cash outflows.

The present value of annual cash flows is established at up to five different discount rates. The present value is computed in two parts. The first comprises the present value contribution resulting from cash flows during the detailed planning horizon of the business venture. The second comprises the present value contribution from the end of the planning horizon to infinity — the infinite horizon contribution. The infinite horizon computation assumes that the cash flow achieved in the final year of the analysis will continue in all future time periods.

The book value of assets is established as the capital expenditures less the accumulated depreciation. Total assets is established as the book value of assets plus receivables, cash and inventory. Return on assets is established as the annual profit divided by assets and the return on sales is established as the annual profit divided by annual sales.

Reporting

The financial and event results are summarized in four reports: a proforma income statement, a cash flow projection, and statistics associated with annual launch attempts and satellite purchases. Typical reports are presented in Appendix B. All data presented in the proforma income statement and cash flow projection are expected or average values with the exception of those items indicated with an * — this implies that the values are standard deviations. The expected values and standard deviations are the result of utilizing the results obtained from

all of the Monte Carlo runs (for example, the average profit in year 10 is obtained as the sum of the profits obtained in year 10 from all of the Monte Carlo runs divided by the number of Monte Carlo runs).

Further insights into the computational details can be obtained from a detailed review of the inputs and outputs described in Appendix B.

A.4 References

[1] Greenberg, J.S., Risk Analysis, Astronautics/Aeronautics, November 1974.

[2] Greenberg, J.S., and Hazelrigg, G.A., Methodology for Reliability-Cost-Risk Analysis of Satellite Networks, Journal of Spacecraft and Rockets, Vol. 11, No. 9., September 1974.

APPENDIX B: DOMSAT II USER / PROGRAMMER DOCUMENTATION

B.1 System Considerations

The Communications Satellite Business Financial Planning Model, DOMSAT II, is programmed to operate on the IBM PC. To utilize this Model the following hardware configuration is required:

* IBM PC with two (2) floppy disk drives (360 K/disk DS/DD)
* 256K memory plus A.S.T. six pack plus (640K memory)
* Printer (OKIDATA 92 P)
* Display (AMDEK 300 A)
* PERSYST Color Graphics Adapter
* 8087 Co-Processor (Hardware Math).

In addition the following software is required:

* MS-DOS 2.1 (or higher) Operating System
* LOTUS 123 for the IBM PC.

DOMSAT II is written in FORTRAN for the IBM PC. The FORTRAN code consists of a main routine and ten (10) subroutines (or functions). The program flow and module descriptions are summarized in Figure B.1. Two functions generally available in libraries on large computers were not available — random number function and an error function. These functions are coded and included in the program.

The FORTRAN program has been compiled and combined with a LOTUS 123 spread sheet data base on a single diskette for ease of use. LOTUS 123 is used to prepare the input data for the DOMSAT

MAIN

CALL Subroutine SETUP

- Seed Random Number
- Initialize variables to be accumulated over all runs
- Set default values
- Initialize tables of:

  Launch Attempts

  Spacecraft Purchases

CALL Subroutine INPUT

- Read input data
- Make up tables of failure probabilities (use function ERFC)
- Compute expected values of narrow and wide using uncertainty profiles not 0 for all prices by service type (use function EV)

Start Monte Carlo Runs

Initialize variables dependent upon each Monte Carlo Run

CALL Subroutine RUNSAT

- Determine number of launch sucesses/failures (use function RAND)

If launch failure

CALL Subroutine RDIST

Establish time delay for next launch

Establish new launch date

FIGURE B.1 MODEL FLOW AND MODULE DESCRIPTIONS

- CALL Subroutine TFAIL

  Establish:

    Spacecraft Bus time of failure

    Narrow Band Transponder time of failure

    Wide Band Transponder time of failure

- Establish:

  Number of operational narrow band transponders as a function of time

  Number of operational wide band transponders as a function of time

- Determine satellite replacement time

- CALL Subroutine RDIST

  Establish time delay for next launch

- Establish new launch date

CALL Subroutine DEMAND

- Establish transponder demand

  CALL Subroutine CORREL

    CALL Subroutine RDIST

      Generate Random Number (use function RAND)

      Sample probability distribution (use input array PPP)

      Establish uncorrelated value

    Establish correlated value based upon current value and previous value

- Determine first year of launch over all satellites

FIGURE B.1 MODEL FLOW AND MODULE DESCRIPTIONS (CONTINUED)

- Establish demand within each year

- Allocate narrow band transponders to service and revenue generation

- Allocate wide band transponders to service and revenue generation

Establish narrow and wide band prices

CALL Subroutine CORREL
(see preceding description of CORREL) .
Adjust demand to take into account price elasticities

Compute REVENUE by service type *
Compute TOTAL ANNUAL REVENUE * **

Compute: INSURANCE, S/C RECURRING, S/C NON-RECURRING, and LAUNCH COSTS with no correlation
CALL Subroutine RDIST
(see preceding description of RDIST)

Compute Annual: LAUNCH, SATELLITE, INSURANCE COSTS, and OTHER CAPITAL EXPENDITURES

Establish ANNUAL DEPRECIATION for:
LAUNCH COST *
INSURANCE *
SPACECRAFT *
OTHER ASSETS *

Accumulate TOTAL DEPRECIATION

Establish: S/C OPERATING EXPENSES *
ENGINEERING EXPENSES *
R & D EXPENSES *
G & A EXPENSES *
in the same manner as narrow & wide band prices

Compute ANNUAL:
TOTAL OPERATIONS EXPENSE * **
GROSS MARGIN * **
DEBT SERVICE *
BEFORE TAX PROFIT *

FIGURE B.1 MODEL FLOW AND MODULE DESCRIPTIONS (CONTINUED)

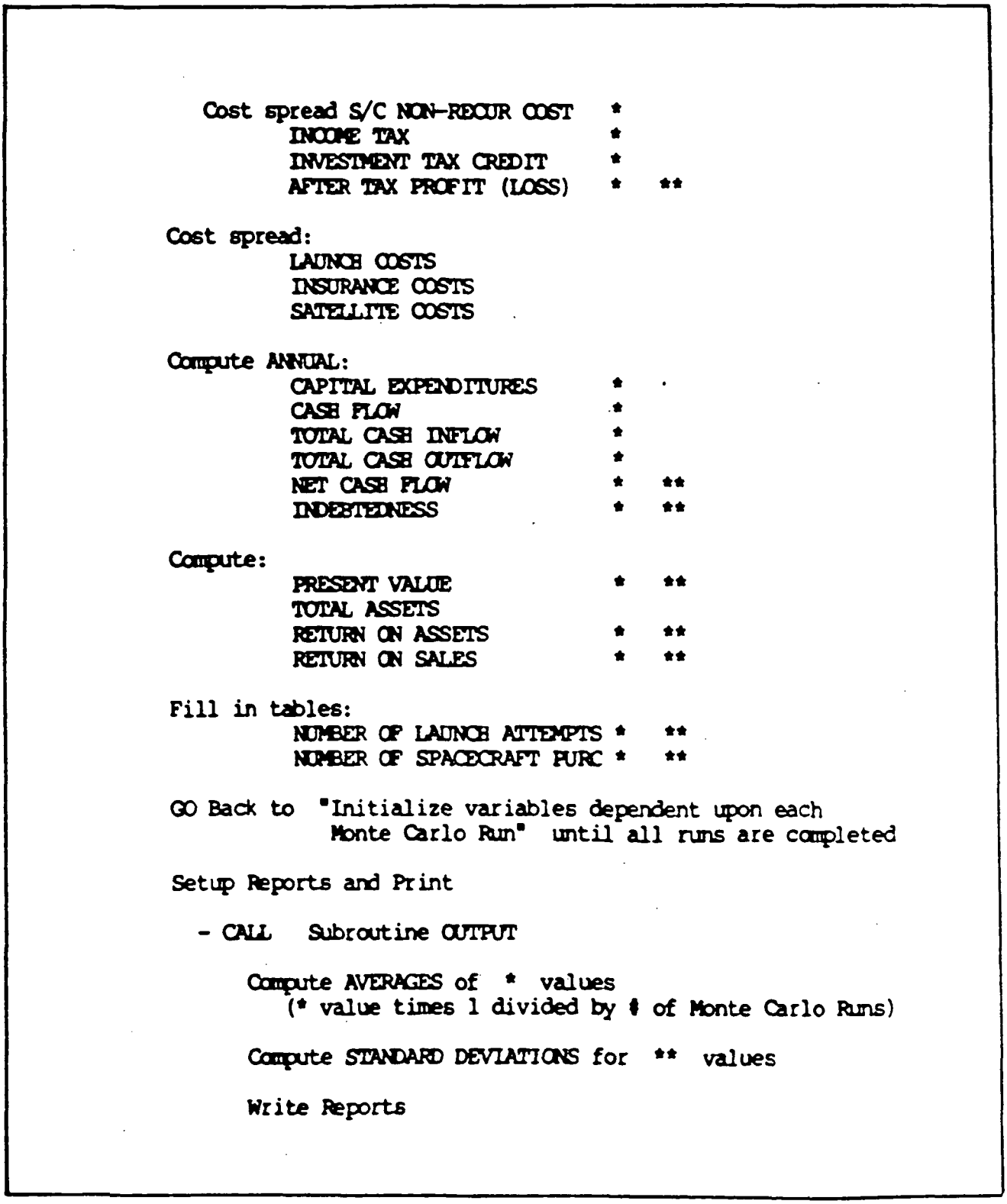


FIGURE B.1 MODEL FLOW AND MODULE DESCRIPTIONS (CONTINUED)

II Model. It is assumed that the user of the Model is familiar with the LOTUS 123 command set. The specific LOTUS macro commands necessary to enter the data in the worksheet, print the worksheet, save the worksheet, write the file for input to the DOMSAT II Model and to run the Model are described in following paragraphs.

Approximate execution time for the sample worksheet data provided in the following pages is about 235 minutes — two (2) minutes to read the input data and about 14 seconds per Monte Carlo run (1000 runs). Printing the results takes about 3 minutes more. Thus, the fixed or overhead time is approximately 5 minutes with a variable time of 14 seconds per run. Run time is actually a function of the scenario being analyzed. For example, increasing the number of satellites, and/or the number of groups and transponders per group, and/or the number of Monte Carlo runs will increase the running time. Also, the more uncertainty data the longer the run time.

B.2 LOTUS 123 Macro Commands and Their Use

In order to enter the data in the worksheet, print the worksheet, save the worksheet, write the file for input to the DOMSAT II Model and to run the Model, the following procedures should be followed and the following commands utilized:

* Insert the LOTUS 123 System Diskette in Drive A
* Insert the DOMDEL (i.e., the data base and the compiled FORTRAN code) Diskette in Drive B
* Type [123] (note that [and] do not get typed but are used to denote the specific required keystrokes) when the A> appears on the screen.

* Type any key to bring up a blank worksheet

* Type [/FR] to retrieve the worksheet (DOM2.WKS)

The user may now use the following MACRO COMMANDS:

* Type [<alt key>L] and the worksheet is listed on the printer. Make sure the printer is on and the forms are at the top of the page.

* Type [<alt key>M] and the MENU (see footnote) is brought up to be used in changing the worksheet. The MENU is illustrated in Figure B.2. Changing the worksheet uses the standard set of LOTUS commands.

* Type [/FS] and the changed worksheet is saved.

* Type [<alt key>D] and the input file (INDOM.PRN) is made up for the model and is written on Diskette B.

  If an INDOM.PRN already exists on Diskette B, type [/FE P] to ERASE it.

* Type [/Q] to EXIT from LOTUS.

The following is the procedure for RUNNING THE MODEL (i.e., performing the FORTRAN computations, saving the results and writing the results to the printer).

* After EXITING LOTUS and A appears on the screen, REMOVE the LOTUS system diskette from Drive A.

* Type [B:] and the MODEL is now set up to run with the input data just provided via LOTUS.

* Type [DOMDEL] and the Model will read the input data (notice the light on Drive B).

From the MENU the user selects an area of the worksheet that he wishes to look at and/or change. This area will appear on the screen much like the printout of the worksheet. After any changes have been made (using standard LOTUS commands) to the values on the screen, the user returns to the MENU [<alt key>M] or QUITS [/Q].

The screen will display the number of runs as they are completed — a message after the first run and every 10th run thereafter. This provides a status report on progress. When all runs are completed the results will go directly to the printer. Make sure the printer is on and that the paper is lined up to begin printing at the top of the page — one blank sheet will come out before actual printing begins.

B.3 Input Data Description

Inputting of data is accomplished through the use of the LOTUS 123 user friendly input data system. Predefined formats (i.e., spread sheets) have been defined into which the input data is placed. The data base for a communications satellite business venture analysis consists of up to 38 screens of data. Individual data elements may be changed or an entire data base may be created using the LOTUS 123 facilities. Any screen of data may be reached by scrolling or a particular screen may be selected for editing by using the MENU as indicated in Figure B.2. Typing <ALT>M brings up the MENU screen; typing a number brings up the desired data screen (for example, typing the number 5 results in the display of the launch scenario data).

Figures B.3 through B.12 illustrate a typical data base for a communications satellite business venture. The definitions of the line-items comprising the data base, consisting of the 38 screens (indicated by the numbers in [ ]), are indicated below and organized on a screen-by-screen basis.

```
DOMSAT MODEL.  DATA GROUPS
TYPE NUMBER FOR GROUP;  (ALT)M TO GET BACK TO THIS LIST.  (ALT)Q TO QUIT

[1]              GLOBAL DATA (SYSTEM)
[2]              GLOBAL DATA (FINANCIAL)
[3]              TRANSPONDER DATA
[4]              SPACECRAFT SUPPORT SUBSYSTEM DATA
[5]              LAUNCH SCENARIO DATA
[6]              DEMAND:  BY SERVICE TYPE AND SATELLITE
[26]             PRICE ($/YR):  BY SERVICE TYPE
[30]             PRICE ELASTICITY DATA
[31]             CORRELATION DATA
[32]             COST/EXPENSE DATA S/C CONTROL UNIT COST(%)
[33]                      "          S/C CONTROL OPERATIONS COST(%)
[34]                      "           ENGINEERING EXPENSE
[35]                      "                R$D EXPENSE
[36]                      "                G&A EXPENSE
[37]             CAPITAL EXPENDITURE DATA
[38]             UNCERTAINTY PROFILE DATA
```

FIGURE B.2 MENU FOR ENTERING DATA INTO THE DOMSAT MODEL

Screen [1] - Global Data (System) (Refer to Figure B.3)

The Global System Data describes the broad parameters of the business system that will be described by data in the following sections.

1. NO. YRS ANALYZED.....The number of years to be considered in in the business plan (must be equal to or less than 15).

2. MAX. # OPER. SATS....The maximum number of operational satellites to be considered in the business plan (must be equal to or less than 5).

3. LAUNCH DATES (YRS)...The desired initial launch date for each of the operational satellites (i.e., 5.5 indicates that the initial launch attempt for the second operational satellite will occur half-way through year 5). When an operational satellite fails it will be replaced. For example, with the indicated data the objective is to maintain 3 operational satellites after year 7.5.

4. LAUNCH DELAYS.....If a failure occurs during a launch another launch will be attempted. This will occur after a specified period of time—the launch delay. The launch delay may be specified in terms of a range of uncertainty (i.e., maximum and minimum anticipated delays) and the form of the uncertainty (i.e., the name or number of the uncertainty profile that describes the probability density function within the range of uncertainty—the uncertainty profiles are defined in figure B.13). If there is no uncertainty then the max. and min. values should be set equal to each other and the uncertainty profile is immaterial.

5. LEO to GEO
   TRANSFER TIME.....The time to transfer from LEO to GEO must be specified for each year (as specified in (1)) of the analysis. 0.25 indicates a quarter of a year delay—the time to check out the satellite in GEO is included (i.e., typically about 3 months).

[1] GLOBAL DATA (SYSTEM)

1. NO. YRS. ANALYZED	15				
2. MAX. # OPER. SATS	3				
3. LAUNCH DATES (YRS)					
SATELLITE NO. 1	4.5				
SATELLITE NO. 2	5.5				
SATELLITE NO. 3	7.5				
SATELLITE NO. 4	0.0				
SATELLITE NO. 5	0.0				
4. LAUNCH DELAYS					
MAX. DELAY(YRS)	0.8				
MIN. DELAY(YRS)	0.5				
UNCERT. PROFILE	2				
5. LEO TO GEO -	0.25	0.25	0.25	0.25	0.25
TRANSFER TIME +	0.25	0.25	0.25	0.25	0.25
(YRS 1 THRU 15)	0.25	0.25	0.25	0.25	0.25
6. NO. SIMUL. RUNS	1000				

[2] GLOBAL DATA (FINANCIAL)

1. DEBT SVC INT RT %	12.0				
2. EFFECT TAX RATE %	36.0				
3. INVEST TAX CRDT %	10.0				
4. TAX CREDIT ON ...					
LAUNCH COST	1				
INSURANCE COST	1				
S/C RECUR. COST	1				
OTHER CAP. EXP.	1				
5. PAYABLES (% EXP.)	8.3				
6. RCVS (% REV.)	16.7				
7. CASH (% EXP.)	1.5				
8. INSUR? (0=N/1=Y)	1				
9. S/C LEARN. RATE %	88.0				
10. DEPRECIATION LIFE (YRS)					
LAUNCH, INS., S/C	10.0				
OTHER CAP. EXP.	12.0				
11. DISCOUNT RATE (%)	10.0	15.0	20.0	25.0	40.0

FIGURE B.3 INPUT DATA FORMAT: GLOBAL DATA (SYSTEM & FINANCIAL)

6. NO. SIMUL. RUNS.....The number of simulation runs to be performed in the Monte Carlo analysis.

Screen [2] Global Data (Financial) (Refer to Figure B.3)

The Global Financial Data establishes the underlying financial parameters to be used in the planning and evaluation of the business venture.

1. DEBT SVC INT RT %....Debt service interest rate expressed as a percentage.

2. EFFECT TAX RATE %....Effective tax rate expressed as a percentage. It is assumed that the communications satellite business venture is part of a large corporation where profits and losses are consolidated.

3. INVEST TAX CRDT %....Investment tax credit expressed as a percentage.

4. TAX CREDIT ON.....The input data specifies whether or not investment tax credits are taken on launch cost, insurance cost, spacecraft recurring cost, and other capital expenditures. A "1" indicates that tax credits are taken and a "0" indicates that tax credits are not taken.

5. PAYABLES (% EXP.)....Average number of weeks of outstanding payables expressed as a percentage (for expamle, 6 weeks of payables is equal to 11.5%—6/52 of a year).

6. RCVS (% REV.).....Average number of weeks of outstanding receivables expressed as a percentage (for example, 6 weeks of receivables is equal to 11.5%).

7. CASH (% REV.).....Amount of cash, expressed as a percentage of annual revenue, required to meet current expenses.

8. INSUR? (0=N/1=Y).....When launch insurance is to be taken then enter "1", otherwise enter "0."

9. S/C LEARN. RATE %....Spacecraft learning rate expressed as a percentage. The S/C unit recurring cost is reduced by a percentage equal to 100 minus the learning rate every time the quantity doubles.

10. DEPRECIATION LIFE (YRS).....The depreciation life (years) for launch, insurance and spacecraft, and other capital expenditures. Straight line depreciation is utilized.

11. DISCOUNT RATE (%)...Discount rates (%) utilized in the computation of net present value of cash flow. The present value is established at each of these discount rates.

Screen [3] - Transponder Data (Refer to Figure B.4)

The spacecraft may consist of both "narrow-" and "wide-band" transponders that may operate in two different frequency bands (for example, C- and Ku-bands). Within each of these frequency bands there may be a number of groups of transponders (maximum of 5) with a specified number of active transponders per group (maximum of 25) and a specified number of spare transponders per group (maximum of 10). The reliability characteristics of each of these transponders is described in terms of random and wearout phenomena. Data for both the narrow- and wide-band transponders is similar and consists of the following:

1. NO. OF GROUPS.....Number of groups of transponders within the frequency band. It is assumed that spare transponders within a group may replace any of the active transponders within the group.

2. NO. TRANS/GRP.....Number of active transponders per group.

3. SPARE TRANS/GRP.....Number of spare transponders provided initially per group. As active transponders fail these spares are then utilized.

4. MEAN TIME FAIL-YR....Mean-time-to-failure (year) of a transponder.

5. EXP. WEAROUT-YRS.....Transponder expected wear-out time (year).

[3] TRANSPONDER DATA

	NARROW BAND	
1.	NO. OF GROUPS	0
2.	NO. TRANS/GRP	0
3.	SPARE TRANS/GRP	0
4.	MEAN TME FAIL-YR	0.0
5.	EXP. WEAROUT-YRS	0.0
6.	STD WEAROUT-YRS	0.0
	WIDE BAND	
	NO. OF GROUPS	1
	NO. TRANS/GRP	16
	SPARE TRANS/GRP	4
	MEAN TME FAIL-YR	60.0
	EXP. WEAROUT-YRS	15.0
	STD WEAROUT-YRS	1.0
7.	W/N BAND REL IMP.	1
8.	TRNSPNDR THRSHLD	RELAUNCH
	SATELLITE NO. 1	15
	SATELLITE NO. 2	15
	SATELLITE NO. 3	15
	SATELLITE NO. 4	0
	SATELLITE NO. 5	0

[4] SPACECRAFT SUPPORT SUBSYSTEM DATA

	SUBSYSTEM				
	POWER	AVCS	TT&C	STRUCTURE	OTHER
1. MEAN TME FAIL-YR	250.0	160.0	220.0	1000.0	75.0
2. EXP. WEAROUT-YRS	15.0	8.0	15.0	20.0	20.0
3. STD WEAROUT-YRS	1.0	0.5	1.0	1.0	1.0

FIGURE B.4 INPUT DATA FORMAT: TRANSPONDER DATA AND SPACECRAFT SUPPORT SUBSYSTEM DATA

6. STD WEAROUT-YRS.....The wear-out characteristics are described in terms of a normal distribution having a specified expected value (previous response) and standard deviation (current response) about the expected value.

7. W/N BAND REL IMP.....Relative importance of a wide-band transponder to a narrow-band transponder. This is used in making a relaunch decision based upon the number of narrow- and wide-band transponders that are still available for use> The relative importance may be based upon the relative revenue production of the wide- and narrow-band transponders.

8. TRNSPNDR THRSHLD RELAUNCH.....Effective number of transponders (narrow-band plus wide-band adjusted to reflect the relative importance) that triggers a relaunch. When the effective number of transponders falls below the specified value the particular spacecraft will be replaced as soon as possible with another spacecraft. The specific time of replacement will depend upon launch delays and launch failures.

Screen [4] = Spacecraft Support Subsystem Data (Refer to Figure B.4)

In addition to individual transponders, the reliability characteristics of five major subsystems (i.e., power, on-orbit propulsion (AVCS), tracking, telemety and command (TT&C), structure, and other) may be considered. These may be any subsystems but with the general characteristics that the failure of one of these subsystems for all practical purposes makes the satellite inoperative and thus sets in motion the launch of a replacement. As with the transponders, the reliability characteristics of each subsystem are described in terms of random and wearout phenomena as follows:

1. MEAN TIME FAIL-YR....Mean-time-to-failure (years) of each subsystem.

2. EXP. WEAROUT-YRS.....Subsystem expected wear out time (years).

3. STD WEAROUT-YRS.....Variability, expressed as the standard deviation, of wear out time (year) about the mean or expected value.

Screen [5] = Launch Scenario Data (Refer to Figure B.5)

The launch scenario is described for each of the years to be considered in the business plan. The launch scenario contains a statement of the estimated probability of success of each of the major steps in the launch sequence and launch cost data. The consideration of this data on an annual basis provides the mechanism for utilizing different transportation systems (for example, expendables such as Ariane and reusables such as the Space Shuttle with either reusable or expendable upper stages). The following data must be provided for each year of the analysis:

PROBABILITY OF:

1. BOOSTER SUCCESS.....Booster or first-stage success.

2. ORB SUC-NO ABORT.....Second stage (i.e., orbiter) success given a first stage or booster success.

3. P/L OK FINAL ORB.....Payload operating successfully when placed-in final orbit.

4. PRPLSN MOD CKOUT.....LEO to GEO transfer stage checking out successfully in LEO.

5. XFER LEO TO GEO.....Successful transfer from LEO to GEO given that all previous steps were successful.

6. ORB RCVRY-ABORT.....Recovering the second stage (i.e., orbiter) given a second stage abort.

7. ORB RCVRY-B FAIL.....Recovering the second stage (i.e., orbiter) given that there was a booster failure.

8. ORB RCVRY-FLT OK.....Recovering the second stage given an otherwise successful flight.

[5] LAUNCH SCENARIO DATA

ORIGINAL PAGE IS OF POOR QUALITY

PROBABILITY OF:	YEAR 1	2	3	4	5
1. BOOSTER SUCCESS	0.995	0.995	0.995	0.995	0.995
2. ORB SUC-NO ABORT	0.995	0.995	0.995	0.995	0.995
3. P/L OK FINAL ORB	0.950	0.950	0.950	0.950	0.950
4. PRPLSN MOD CKOUT	0.950	0.950	0.950	0.950	0.950
5. XFER LEO TO GEO	0.950	0.950	0.950	0.950	0.950
6. ORB RCVRY-ABORT	0.990	0.990	0.990	0.990	0.990
7. ORB RCVRY-B FAIL	0.990	0.990	0.990	0.990	0.990
8. ORB RCVRY-FLT OK	0.999	0.999	0.999	0.999	0.999
9. MAX LNCH COST M$	21.798	21.798	21.798	21.798	21.798
10. MIN LNCH COST M$	21.798	21.798	21.798	21.798	21.798
11. LNCH CST UNCRT PF	1	1	1	1	1

[5] LAUNCH SCENARIO DATA

PROBABILITY OF:	YEAR 6	7	8	9	10
BOOSTER SUCCESS	0.995	0.995	0.995	0.995	0.995
ORB SUC-NO ABORT	0.995	0.995	0.995	0.995	0.995
P/L OK FINAL ORB	0.950	0.950	0.950	0.950	0.950
PRPLSN MOD CKOUT	0.950	0.950	0.950	0.950	0.950
XFER LEO TO GEO	0.950	0.950	0.950	0.950	0.950
ORB RCVRY-ABORT	0.990	0.990	0.990	0.990	0.990
ORB RCVRY-B FAIL	0.990	0.990	0.990	0.990	0.990
ORB RCVRY-FLT OK	0.999	0.999	0.999	0.999	0.999
MAX LNCH COST M$	21.798	21.798	21.798	21.798	21.798
MIN LNCH COST M$	21.798	21.798	21.798	21.798	21.798
LNCH CST UNCRT PF	1	1	1	1	1

[5] LAUNCH SCENARIO DATA

PROBABILITY OF:	YEAR 11	12	13	14	15
BOOSTER SUCCESS	0.995	0.995	0.995	0.995	0.995
ORB SUC-NO ABORT	0.995	0.995	0.995	0.995	0.995
P/L OK FINAL ORB	0.950	0.950	0.950	0.950	0.950
PRPLSN MOD CKOUT	0.950	0.950	0.950	0.950	0.950
XFER LEO TO GEO	0.950	0.950	0.950	0.950	0.950
ORB RCVRY-ABORT	0.990	0.990	0.990	0.990	0.990
ORB RCVRY-B FAIL	0.990	0.990	0.990	0.990	0.990
ORB RCVRY-FLT OK	0.999	0.999	0.999	0.999	0.999
MAX LNCH COST M$	21.798	21.798	21.798	21.798	21.798
MIN LNCH COST M$	21.798	21.798	21.798	21.798	21.798
LNCH CST UNCRT PF	1	1	1	1	1

FIGURE B.5 INPUT DATA FORMAT: LAUNCH SCENARIO DATA

The launch cost is treated as an uncertainty variable and must be specified in terms of the range of uncertainty and the form of the uncertainty (i.e., the name of the uncertainty profile as indicated in screen [38]). The launch cost data must be specified for each year of the analysis thus allowing for changes in transportation systems, pricing policies and levels of uncertainty associated with future pricing policies. Note that certainty is considered by setting the range of uncertainty to zero. When this is done the uncertainty profile is immaterial.

9. MAX LNCH COST M$.....The maximum estimated cost per launch (in millions of dollars) for each year of the analysis.

10. MIN LNCH COST M$.....The minimum estimated cost per launch (in millions of dollars) for each year of the analysis.

11. LNCH CST UNCRT PF....The name (from screen [38]) of the uncertainty profile to be associated with the range of uncertainty for each year of the analysis.

Screen [6 through 25] - Demand Data (Refer to Figure B.6)

Demand data must be provided for each year of the analysis, for narrow-band and wide-band transponders, for each satellite considered and for service type. The following four specific service types may be considered:

1. Protected Service - protection is provided through provision of spares and preemptible transponders.

2. Protected/Preemptible Service - protection is provided through available spares and preemptible transponders. This service may be preempted if protected users require transponders.

3. Unprotected/Non-Preemptible - replacement transponders are not guaranteed but service may not be interrupted to provide service for other users.

[6]

DEMAND: SERVICE TYPE #1
SATELLITE # 1

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
	(1)	(2)	(3)	(4)	(5)	(6)
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	8	6	1
5	0	0	0	13	10	3
6	0	0	0	15	11	8
7	0	0	0	16	12	14
8	0	0	0	17	12	9
9	0	0	0	18	12	8
10	0	0	0	19	12	8
11	0	0	0	20	12	7
12	0	0	0	20	12	7
13	0	0	0	20	12	7
14	0	0	0	20	12	7
15	0	0	0	20	12	7

[7]

DEMAND: SERVICE TYPE #1
SATELLITE # 2

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	7	5	1
6	0	0	0	11	8	3
7	0	0	0	14	10	8
8	0	0	0	16	12	14
9	0	0	0	17	12	9
10	0	0	0	18	12	8
11	0	0	0	19	12	8
12	0	0	0	20	12	7
13	0	0	0	20	12	7
14	0	0	0	20	12	7
15	0	0	0	20	12	7

FIGURE B.6 INPUT DATA FORMAT: DEMAND DATA

DEMAND: SERVICE TYPE #1
SATELLITE # 3

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	10	8	7
9	0	0	0	15	12	15
10	0	0	0	16	12	14
11	0	0	0	17	12	9
12	0	0	0	18	12	8
13	0	0	0	19	12	8
14	0	0	0	20	12	7
15	0	0	0	20	12	7

DEMAND: SERVICE TYPE #1
SATELLITE # 4

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

FIGURE B.6 INPUT DATA FORMAT: DEMAND DATA (CONTINUED)

[100]

DEMAND: SERVICE TYPE #1
SATELLITE # 5

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[110]

DEMAND: SERVICE TYPE #2
SATELLITE # 1

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

FIGURE B.6 INPUT DATA FORMAT: DEMAND DATA (CONTINUED)

[13]

DEMAND: SERVICE TYPE #3
SATELLITE # 2

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[13]

DEMAND: SERVICE TYPE #3
SATELLITE # 3

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

FIGURE B.6 INPUT DATA FORMAT: DEMAND DATA (CONTINUED)

[14]

DEMAND: SERVICE TYPE #3
SATELLITE # 4

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[15]

DEMAND: SERVICE TYPE #3
SATELLITE # 5

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

FIGURE B.6 INPUT DATA FORMAT: DEMAND DATA (CONTINUED)

[16]

DEMAND: SERVICE TYPE #3
SATELLITE # 1

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[17]

DEMAND: SERVICE TYPE #3
SATELLITE # 2

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

FIGURE B.6 INPUT DATA FORMAT: DEMAND DATA (CONTINUED)

[18] DEMAND: SERVICE TYPE #3
SATELLITE # 3

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[19] DEMAND: SERVICE TYPE #3
SATELLITE # 4

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

FIGURE B.6 INPUT DATA FORMAT: DEMAND DATA (CONTINUED)

[20]

DEMAND: SERVICE TYPE #3
SATELLITE # 5

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[21]

DEMAND: SERVICE TYPE #4
SATELLITE # 1

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	3	[illegible]	[illegible]
5	0	0	0	4	[illegible]	[illegible]
6	0	0	0	4	[illegible]	[illegible]
7	0	0	0	4	[illegible]	[illegible]
8	0	0	0	4	[illegible]	[illegible]
9	0	0	0	4	[illegible]	[illegible]
10	0	0	0	4	[illegible]	[illegible]
11	0	0	0	4	[illegible]	[illegible]
12	0	0	0	4	[illegible]	[illegible]
13	0	0	0	4	[illegible]	[illegible]
14	0	0	0	4	[illegible]	[illegible]
15	0	0	0	4	[illegible]	[illegible]

FIGURE B.6 INPUT DATA FORMAT: DEMAND DATA (CONTINUED)

[22]

DEMAND: SERVICE TYPE #4
SATELLITE # 2

	NARROW-BAND			WIDE-BAND		
YEAR	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	3	2	1
6	0	0	0	4	2	2
7	0	0	0	4	2	2
8	0	0	0	4	2	2
9	0	0	0	4	2	2
10	0	0	0	4	2	2
11	0	0	0	4	2	2
12	0	0	0	4	2	2
13	0	0	0	4	2	2
14	0	0	0	4	2	2
15	0	0	0	4	2	2

[23]

DEMAND: SERVICE TYPE #4
SATELLITE # 3

	NARROW-BAND			WIDE-BAND		
YEAR	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	3	2	1
9	0	0	0	4	2	2
10	0	0	0	4	2	2
11	0	0	0	4	2	2
12	0	0	0	4	2	2
13	0	0	0	4	2	2
14	0	0	0	4	2	2
15	0	0	0	4	2	2

FIGURE B.6 INPUT DATA FORMAT: DEMAND DATA (CONTINUED)

[24]

DEMAND: SERVICE TYPE #4
SATELLITE # 4

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[25]

DEMAND: SERVICE TYPE #4
SATELLITE # 5

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

FIGURE B.6 INPUT DATA FORMAT: DEMAND DATA (CONTINUED)

4. Preemptible - not protected. May be preempted if required to provide service for protected users.

The demand data screens proceed across all satellites for each service type. Thus there are 20 screens for demand data (5 satellites x 4 service types). The data required is as follows:

NARROW-BAND

1. MAX. DEMAND.....Maximum estimated demand for narrow-band transponders for each year of the analysis (number of transponders).

2. MIN. DEMAND.....Minimum estimated demand for narrow-band transponders for each year to the analysis (number of transponders).

3. UNCERT. PROFILE.....The name (from screen [38]) of the uncertainty profile to be associated with the narrow-band transponder demand.

WIDE-BAND

4. MAX. DEMAND.....Maximum estimated demand for wide-band transponders for each year of the analysis (number of transponders).

5. MIN. DEMAND.....Minimum estimated demand for wide-band transponders for each year of the analysis (number of transponders).

6. UNCERT. PROFILE.....The name (from screen [38]) of the uncertainty profile to be associated with the wide-band transponder demand.

Screen [26 through 29] - Price Data (Refer to Figure B.7)

Price data must be provided for both the narrow-band and wide-band transponders for each year of the analysis and for each of the four types of service (as designated above). All pricing data is to be provided in thousands of dollars per year.

NARROW-BAND

1. MAX. PRICE.....Maximum estimated price (thousands of dollars) for narrow-band transponders per year for each year of the analysis.

[26] ORIGINAL PAGE IS OF POOR QUALITY

PRICE ($/YR): SERVICE TYPE #1

YEAR	NARROW-BAND MAX. PRICE (1)	NARROW-BAND MIN. PRICE (2)	NARROW-BAND UNCERT. PROFILE (3)	WIDE-BAND MAX. PRICE (4)	WIDE-BAND MIN. PRICE (5)	WIDE-BAND UNCERT. PROFILE (6)
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	3700	3330	6
5	0	0	0	3700	3330	6
6	0	0	0	3600	3240	6
7	0	0	0	3500	3150	6
8	0	0	0	3400	3060	6
9	0	0	0	3300	2970	6
10	0	0	0	3200	2880	6
11	0	0	0	3100	2790	6
12	0	0	0	3000	2700	6
13	0	0	0	3000	2700	6
14	0	0	0	3000	2700	6
15	0	0	0	3000	2700	6

[27]

PRICE ($/YR): SERVICE TYPE #2

YEAR	NARROW-BAND MAX. PRICE	NARROW-BAND MIN. PRICE	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. PRICE	WIDE-BAND MIN. PRICE	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

FIGURE B.7 INPUT DATA FORMAT: PRICE DATA

[28]

PRICE ($/YR): SERVICE TYPE #3

YEAR	NARROW-BAND MAX. PRICE	NARROW-BAND MIN. PRICE	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. PRICE	WIDE-BAND MIN. PRICE	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[29]

PRICE ($/YR): SERVICE TYPE #4

YEAR	NARROW-BAND MAX. PRICE	NARROW-BAND MIN. PRICE	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. PRICE	WIDE-BAND MIN. PRICE	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	1450	1305	6
5	0	0	0	1450	1305	6
6	0	0	0	1450	1305	6
7	0	0	0	1450	1305	6
8	0	0	0	1450	1305	6
9	0	0	0	1450	1305	6
10	0	0	0	1450	1305	6
11	0	0	0	1450	1305	6
12	0	0	0	1450	1305	6
13	0	0	0	1450	1305	6
14	0	0	0	1450	1305	6
15	0	0	0	1450	1305	6

FIGURE B.7 INPUT DATA FORMAT: PRICE DATA (CONTINUED)

2. MIN. PRICE.....Minimum estimated price (thousands of dollars) for narrow-band transponders per year for each year of the analysis.

3. UNCERT. PROFILE.....The name (from screen [38]) of the uncertainty profile to be associated with the price for narrow-band transponders.

WIDE-BAND

4. MAX. PRICE.....Maximum estimated price (thousands of dollars) for wide-band transponders per year for each year of the analysis.

5. MIN. PRICE.....Minimum estimated price (thousands of dollars) for wide-band transponders per year for each year of the analysis.

6. UNCERT. PROFILE.....The name (from screen [38]) of the uncertainty profile to be associated with the price for wide-band transponders.

Screen [30] - Price Elasticity Data (Refer to Figure B.8)

Price elasticity data must be provided for both the narrow- and wide-band services. The price elasticity is represented by the percent demand decrease resulting from a 25 percent price increase. Thus, when it is estimated that a 25 percent price increase will result in a 25 percent decrease in demand the price elasticity is one (i.e., unit elasticity).

Screen [31] - Correlation Data (Refer to Figure B.8)

Because of the random sampling used to establish the value of the uncertainty variables (i.e., demand, price, G&A Expense, etc.) for each year of the analysis, it is possible that unreasonable year-to-year fluctuations will occur in the values of these variables. To smooth out unwarranted fluctuations year-to-year correlation coefficients have been introduced. The correlation coefficient relates the current year value of a variable to all previous years values of the variable. A

[30]

		PRICE ELASTICITY DATA	
1.	% DEMAND DECREASE RESULTING FROM A 25% PRICE INCREASE	NARROW-BAND	WIDE-BAND
	1. PROTECTED	0.0	25.0
	2. PROTECTED/PREEMPTIBLE	0.0	25.0
	3. UNPROTECTED/NON-PREEMPTIBLE	0.0	25.0
	4. PREEMPTIBLE	0.0	25.0

[31]

		CORRELATION DATA CORRELATION COEFFICIENT	
	TYPE OF SERVICE	NARROW-BAND	WIDE-BAND
1.	DEMAND DATA		
	1. PROTECTED	0.0	0.8
	2. PROTECTED/PREEMPTIBLE	0.0	0.8
	3. UNPROTECTED/NON-PREEMPTIBLE	0.0	0.8
	4. PREEMPTIBLE	0.0	0.8
2.	PRICE DATA		
	1. PROTECTED	0.0	0.8
	2. PROTECTED/PREEMPTIBLE	0.0	0.8
	3. UNPROTECTED/NON-PREEMPTIBLE	0.0	0.8
	4. PREEMPTIBLE	0.0	0.8
3.	S/C CONTROL OPERATIONS	0.8	
4.	ENGINEERING EXPENSE	0.8	
5.	R&D EXPENSE	0.8	
6.	G&A EXPENSE	0.8	
7.	OTHER CAPITAL EXPENDITURES	0.8	

FIGURE B.8 INPUT DATA FORMAT: PRICE ELASTICITY DATA AND CORRELATION DATA

correlation coefficient of zero implies that there is no dependence on previous year's values whereas a correlation coefficient of unity implies that this years deviation from the expected value (the result of a random sample) cannot exceed the previous year's deviation from its expected value. This is discussed in detail in Appendix A.

TYPE OF SERVICE

1. DEMAND DATA.....The correlation coefficient (in range of 0. to 1.0) must be specified for both the narrow- and wide-band demand for the (1) Protected, (2) Protected/Preemptible, (3) Unprotected/Non-Preemptible, and (4) Preemptible Services.

2. PRICE DATA.....The correlation coefficient (in the range of 0. to 1.0) must be specified for both the narrow- and wide-band pricing for the (1) Protected, (2) Protected/Preemptible, (3) Unprotected/Non-Preemptible, and (4) Preemptible Services.

3. S/C CONTROL OPERATIONS.....Correlation coefficient (in the range of 0. to 1.0) for annual spacecraft control operations.

4. ENGINEERING EXPENSE..Correlation coefficient (in the range of 0. to 1.0) for annual engineering expenses.

5. R & D EXPENSE.....Correlation coefficient (in the range of 0. to 1.0) for annual R&D expenses.

6. G & A EXPENSE.....Correlation coefficient (in the range of 0. to 1.0) for annual general and administrative expenses.

7. OTHER CAPITAL EXPENDITURES.....Correlation coefficient (in the range of 0. to 1.0) for "other" capital expenditures.

Screen [321 = Cost/Expense Data (Refer to Figure B.9)

This portion of the Cost/Expense data is concerned with

spacecraft unit cost, spacecraft nonrecurring cost and the cost of launch insurance. The launch insurance, if taken, is the specified percentage of launch cost and spacecraft unit cost.

1. MAX S/C UNIT COST (K$).....Maximum estimated spacecraft unit cost (thousands of dollars). Learning effects are taken into account when additional satellites are purchased.

2. MIN. S/C UNIT COST (K$).....Minimum estimated spacecraft unit cost (thousands of dollars). Learning effects are taken into account when additional satellites are purchased.

3. S/C UNIT COST UNCERTAINTY PROFILE.The name (from screen [38]) of the uncertainty profile to be associated with the s/c unit recurring cost.

4. MAX. S/C NONRECURRING COST (K$).....Maximum estimated spacecraft nonrecurring cost (thousands of dollars).

5. MIN. S/C NONRECURRING COST (K$).....Minimum estimated spacecraft nonrecurring cost (thousands of dollars).

6. S/C NONREC. COST UNCERT. PROFILE.....The name (from screen [38]) of the uncertainty profile to be associated with the spacecraft nonrecurring cost.

7. MAX. INSURANCE %.....When insurance is taken (see screen [2]) this represents the maximum estimated insurance cost expressed as a percentage of launch cost and spacecraft unit cost.

8. MIN. INSURANCE %.....When insurance is taken (see screen [2]) this represents the minimum estimated insurance cost expressed as a percentage of launch cost and spacecraft unit cost.

9. INSURANCE UNCERTAINTY PROFILE.....The name (from screen [38]) of the uncertainty profile to be associated with the cost of launch insurance.

[32] COST/EXPENSE DATA

1.	MAX. S/C UNIT COST (K$)	40900.0
2.	MIN. S/C UNIT COST (K$)	36400.0
3.	S/C UNIT COST UNCERTAINTY PROFILE	16
4.	MAX. S/C NONRECURRING COST (K$)	25000.0
5.	MIN. S/C NONRECURRING COST (K$)	19800.0
6.	S/C NONREC. COST UNCERT. PROFILE	1
7.	MAX. INSURANCE %	18.0
8.	MIN. INSURANCE %	12.0
9.	INSURANCE UNCERTAINTY PROFILE	13

[33] COST/EXPENSE DATA (CONTINUED)

S/C CONTROL OPERATIONS COST(%)

YEAR	MAX. COST(%)	MIN. COST(%)	UNCERT. PROFILE
1	(1) 0.0	(2) 0.0	(3) 1
2	0.0	0.0	1
3	0.0	0.0	1
4	6.7	6.7	1
5	3.6	3.6	1
6	1.7	1.7	1
7	2.0	2.0	1
8	1.8	1.8	1
9	1.8	1.8	1
10	1.9	1.9	1
11	2.1	2.1	1
12	2.3	2.3	1
13	2.5	2.5	1
14	2.8	2.8	1
15	3.5	3.5	1

FIGURE B.9 INPUT DATA FORMAT: COST/EXPENSE DATA

Screen [33] - S/C Control Operations Cost (%) (Refer to Figure B.9)

Annual spacecraft control operations cost is computed as a percentage of annual revenue. The range of uncertainty (of the percentage amount) and the associated uncertainty profile is provided for each year of the analysis.

1. MAX. COST (%).....Maximum estimated annual spacecraft control operations cost expressed as a percentage of annual revenue.

2. MIN. COST (%).....Minimum estimated annual spacecraft control operations cost expressed as a percentage of annual revenue.

3. UNCERT. PROFILE.....The name (from screen [38]) of the uncertainty profile to be associated with the spacecraft control and operations cost.

Screen [34 through 36] - Engineering, R&D, and G&A Expenses (Refer to Figure B.10 and B.11)

Engineering, R&D and General and Administrative Expense data are provided, respectively, in screens 34, 35 and 36. A common format and method for computing these annual expenses are used; therefore, only the Engineering expense data is described in detail. In all cases the expense is established as having both a fixed component (a dollar amount specified for each year of the analysis) and a variable component (a percentage of revenue where the percentage is specified for each year of the analysis). Both the fixed and variable components are considered as uncertainty variables. The annual expense is established as either the sum of the fixed and variable components or as the larger of the two components.

1. MAX. (K$).....Maximum estimated annual expense (fixed component) expressed as a dollar amount (in thousands of dollars).

[34] ENGINEERING EXPENSE

YEAR	MAX. (K$)	MIN. (K$)	UNCERT. PROFILE	MAX. (%)	MIN. (%)	UNCERT. PROFILE
	(1)	(2)	(3)	(4)	(5)	(5)
1	1000.0	1000.0	1	2.0	2.0	1
2	1000.0	1000.0	1	2.0	2.0	1
3	1000.0	1000.0	1	2.0	2.0	1
4	1000.0	1000.0	1	2.0	2.0	1
5	1000.0	1000.0	1	2.0	2.0	1
6	1000.0	1000.0	1	2.0	2.0	1
7	1000.0	1000.0	1	2.0	2.0	1
8	1000.0	1000.0	1	2.0	2.0	1
9	1000.0	1000.0	1	2.0	2.0	1
10	1000.0	1000.0	1	2.0	2.0	1
11	1000.0	1000.0	1	2.0	2.0	1
12	1000.0	1000.0	1	2.0	2.0	1
13	1000.0	1000.0	1	2.0	2.0	1
14	1000.0	1000.0	1	2.0	2.0	1
15	1000.0	1000.0	1	2.0	2.0	1

7. SUM K$ & % AMTS 0

[35] R&D EXPENSE

YEAR	MAX. (K$)	MIN. (K$)	UNCERT. PROFILE	MAX. (%)	MIN. (%)	UNCERT. PROFILE
1	1000.0	1000.0	1	2.0	2.0	1
2	1000.0	1000.0	1	2.0	2.0	1
3	1000.0	1000.0	1	2.0	2.0	1
4	1000.0	1000.0	1	2.0	2.0	1
5	1000.0	1000.0	1	2.0	2.0	1
6	1000.0	1000.0	1	2.0	2.0	1
7	1000.0	1000.0	1	2.0	2.0	1
8	1000.0	1000.0	1	2.0	2.0	1
9	1000.0	1000.0	1	2.0	2.0	1
10	1000.0	1000.0	1	2.0	2.0	1
11	1000.0	1000.0	1	2.0	2.0	1
12	1000.0	1000.0	1	2.0	2.0	1
13	1000.0	1000.0	1	2.0	2.0	1
14	1000.0	1000.0	1	2.0	2.0	1
15	1000.0	1000.0	1	2.0	2.0	1

SUM K$ & % AMTS 0

FIGURE B.10 INPUT DATA FORMAT: ENGINEERING EXPENSE DATA AND R&D EXPENSE DATA

[36]

G&A EXPENSE

YEAR	MAX. (K$)	MIN. (K$)	UNCERT. PROFILE	MAX. (%)	MIN. (%)	UNCERT. PROFILE
1	500.0	500.0	1	0.0	0.0	1
2	500.0	500.0	1	0.0	0.0	1
3	500.0	500.0	1	0.0	0.0	1
4	500.0	500.0	1	7.3	7.3	1
5	500.0	500.0	1	1.3	1.3	1
6	500.0	500.0	1	0.8	0.8	1
7	500.0	500.0	1	0.8	0.8	1
8	500.0	500.0	1	0.6	0.6	1
9	500.0	500.0	1	0.6	0.6	1
10	500.0	500.0	1	0.7	0.7	1
11	500.0	500.0	1	0.8	0.8	1
12	500.0	500.0	1	1.0	1.0	1
13	500.0	500.0	1	1.0	1.0	1
14	500.0	500.0	1	1.4	1.4	1
15	500.0	500.0	1	2.9	2.9	1
SUM K$ & % AMTS	1					

[37]

CAPITAL EXPENDITURE DATA
OTHER CAPITAL EXPENDITURES

YEAR	MAX. (K$)	MIN. (K$)	UNCERT. PROFILE
1	(1) 0.0	(2) 0.0	(3) 1
2	5500.0	4500.0	13
3	10560.0	8640.0	13
4	0.0	0.0	1
5	0.0	0.0	1
6	3410.0	2790.0	13
7	2090.0	1710.0	13
8	0.0	0.0	1
9	0.0	0.0	1
10	0.0	0.0	1
11	0.0	0.0	1
12	0.0	0.0	1
13	0.0	0.0	1
14	0.0	0.0	1
15	0.0	0.0	1

COST SPREADING FUNCTIONS

	YEAR 1	2	3	4	5
4. LAUNCH COST	35.2	55.0	9.8	0.0	0.0
5. INSURANCE	100.0	0.0	0.0	0.0	0.0
6. S/C RECUR COST	20.0	48.5	31.5	0.0	0.0
7. NONRECUR COST	79.0	21.0	0.0	0.0	0.0

FIGURE B.11 INPUT DATA FORMAT: G&A EXPENSE DATA, CAPITAL EXPENDITURE DATA, AND COST SPREADING FUNCTIONS DATA

2. MIN. (K$).....Minimum estimated annual expense (fixed component) expressed as a dollar amount (in thousands of dollars).

3. UNCERT. PROFILE.....The name (from screen [38]) of the uncertainty profile to be associated with the fixed component of the annual expense.

4. MAX. (%).....Maximum estimated annual expense (variable component) expressed as a percentage of revenue.

5. MIN. (%).....Minimum estimated annual expense (variable component) expressed as a percentage of revenue.

6. UNCERT. PROFILE.....The name (from screen [38]) of the uncertainty profile to be associated with the variable (%) component of the annual expense.

7. SUM K$ & % AMTS.....When set equal to 0, the expense is the larger of the fixed and variable components. When set equal to 1, the expense is the sum of the fixed and variable components.

Screen [37] - Capital Expenditure Data (Refer to Figure B.11)

Spacecraft recurring cost, launch cost and other launch related costs are treated as capital expenditures (i.e., depreciated). These costs occur as a result of satellite purchases and launches and therefore their timing depends upon the timing of launches which is basically demand driven. There may be other capital expenditures that are not directly related to satellite launches (for example, the acquisition of TT&C ground terminals). These may be specified as dollar amounts (i.e., range of uncertainty) in the year of acquisition. Cost spreading is not imposed upon these expenditures which are depreciated starting in the year of acquisition.

OTHER CAPITAL EXPENDITURES

1. MAX. (K$).....Maximum estimated "other" capital expenditure each year of the analysis (thousands of dollars).

2. MIN. (K$).....Minimum estimated "other" capital expenditure each year of the analysis (thousand of dollars).

3. UNCERT. PROFILE.....The name (from screen [38]) of the uncertainty profile to be associated with each year's "other" capital expenditures.

Cost spreading functions may be imposed upon launch cost, insurance cost, spacecraft unit recurring cost and nonrecurring costs. The cost spreading is performed in two different ways: in relative time (i.e., relative to when launches occur) and in absolute time. Launch, insurance and spacecraft recurring cost are spread backward in time relative to the year of launch. Thus, year 1 is the year that a launch takes place, year 2 is the year prior to launch, year 3 is two years prior to launch, etc. Nonrecurring costs are spread in absolute time with a specified percentage of the nonrecurring costs occurring in year 1, year 2, etc. of the analysis.

COST SPREADING FUNCTIONS

4. LAUNCH COST.....The percentage of the launch cost spent each year relative to the year of launch. Year 1 is the year of launch, year 2 is the year prior to launch, etc.

5. INSURANCE.....The percentage of the insurance cost spent each year relative to the year of launch. Year 1 is the year of launch, year 2 is the year prior to launch, etc.

6. S/C RECUR COST.....The percentage of the spacecraft recurring cost spent each year relative to the year of launch. Year 1 is the year of launch, year 2 is the year prior to launch, etc.

7. NONRECUR COST.....The percentage of the nonrecurring cost

C38]

UNCERTAINTY PROFILE DATA

PROFILE I.D.	PROFILE INTERVAL 1	2	3	4	5
1	0.50	0.25	0.15	0.07	0.03
2	0.30	0.25	0.20	0.15	0.10
3	0.30	0.30	0.20	0.13	0.07
4	0.35	0.40	0.15	0.07	0.03
5	0.31	0.32	0.27	0.15	0.05
6	0.23	0.30	0.33	0.16	0.08
7	0.25	0.35	0.25	0.10	0.05
8	0.16	0.49	0.24	0.09	0.02
9	0.12	0.32	0.32	0.17	0.07
10	0.15	0.34	0.37	0.12	0.02
11	0.20	0.20	0.20	0.20	0.20
12	0.15	0.22	0.26	0.22	0.15
13	0.10	0.25	0.30	0.25	0.10
14	0.08	0.25	0.34	0.25	0.08
15	0.05	0.25	0.40	0.25	0.05
16	0.10	0.20	0.40	0.20	0.10
17	0.03	0.30	0.34	0.30	0.03
18	0.05	0.20	0.50	0.20	0.05
19	0.02	0.20	0.54	0.20	0.02
20	0.03	0.07	0.80	0.07	0.03

FIGURE B.12 INPUT DATA FORMAT: UNCERTAINTY PROFILE DATA

spent each year with year 1 being the first year of the analysis, year 2 the second year of the analysis, etc.

Screen [38] - Uncertainty Profile Data (Refer to Figure B.12)

The uncertainty profiles represent the probability density functions that may be used for one or more of the uncertainty variables. They represent the probability distributions in the range of uncertainty. The range of uncertainty is in turn segmented into five equal intervals. Thus, for Uncertainty Profile #1 there is a 0.50 chance of selecting a value in the first of the five equal intervals, 0.25 chance of selecting a value in the second of the five equal intervals, etc. Linear interpolation is used to select a specific value within each interval.

All of the uncertainty profile data may be changed to create new uncertainty profiles. Caution: each row must add to unity! In other words, the probabilities associated with each profile must add to 1.00. Twenty uncertainty profiles are stored in the data base. However a total of thirty (30) profiles are available for use with profiles #21 to #30 being mirror images of profiles 1 through 10, respectively.

B.4 Reports

The input data is provided via LOTUS 123 and used to create a data file which is read by the DOMSAT II financial simulation model programmed in FORTRAN. After the FORTRAN computations are completed a number of reports are printed. These include a proforma income statement (Figure B.13), a cash flow projection (Figure B.14), a probability distribution of annual launch

attempts (Figure B.15) and a probability distribution of annual spacecraft purchases (Figure B.16).

The proforma income statement and cash flow projections contain a column for each year of the analysis. All numbers are in thousands of dollars except where otherwise specifically indicated. All numbers are expected values with the exception of those marked with an asterik (*) which designates these as standard deviations. In addition, the first page of the cash flow projection also contains the net present value as computed at each of the discount rates specified via the input data. The present value is indicated as Net Present Value "A", Net Present Value "B" and Net Present Value. NPV "A" represents the present value contribution during the specific years of the analysis, NPV "B" represents the infinite horizon contribution (i.e., after the specific years of the analysis) to present value, and NPV represents the sum of NPV "A" and NPV "B". The standard deviation is that of NPV.

The Probability of Annual Launch Attempts (Figure B.15) and the Probability of Annual Spacecraft Purchases (Figure B.16) indicate the launch attempts and spacecraft purchase statistics for each year of the analysis. The numbers in the table represent the probability of the specific number of events indicated in the left-hand scale (thus the data in the tables represent the probability density functions of annual launch attempts and spacecraft purchases). Also indicated are the expected or average number of annual launch attempts and spacecraft purchases and the associated standard deviations.

PROFORMA INCOME STATEMENT ($ THOUSANDS)

	YEAR 1	2	3	4	5
PROTECTED	0.	0.	0.	9373.	62770.
PROTECTED/PREEMPT.	0.	0.	0.	0.	0.
UNPROTECTED/NON-PREEMPT.	0.	0.	0.	0.	0.
PREEMPTIBLE	0.	0.	0.	1277.	3255.
TOTAL REVENUE	0.	0.	0.	10651.	66025.
	0.*	0.*	0.*	4895.*	17871.*
LAUNCH OPERATIONS	0.	0.	0.	1816.	4043.
LAUNCH INSURANCE	0.	0.	0.	753.	1623.
SATELLITE	0.	0.	0.	3220.	6826.
OTHER	0.	415.	1228.	1228.	1228.
DEPRECIATION EXPENSE	0.	415.	1228.	7016.	13720.
S/C CONTROL OPERATIONS	0.	0.	0.	714.	1717.
ENGINEERING EXPENSE	1000.	1000.	1000.	1000.	1382.
RESEARCH & DEVELOPMENT	1000.	1000.	1000.	1000.	1382.
TOTAL OPERATIONS EXPENSE	2000.	2415.	3228.	9730.	18201.
	0.*	20.*	48.*	2915.*	3124.*
GROSS MARGIN ($)	-2000.	-2415.	-3228.	921.	47824.
	0.*	20.*	48.*	2130.*	16009.*
S/C NONRECURRING COST	16766.	4457.	0.	0.	0.
G & A EXPENSE	500.	500.	500.	1277.	1358.
DEBT SERVICE EXPENSE	0.	1322.	4995.	13063.	20163.
BEFORE TAX PROFIT	-19266.	-8695.	-8723.	-13420.	26302.
INCOME TAX	-6936.	-3130.	-3140.	-4831.	9469.
INVESTMENT TAX CREDIT	0.	498.	975.	5788.	6704.
AFTER TAX PROFIT	-12330.	-5066.	-4608.	-2801.	23537.
	586.*	196.*	710.*	2230.*	8327.*
RETURN ON ASSETS (%)	-4267.	-31.	-5.	-2.	13.
	0.*	34.*	1.*	2.*	5.*
RETURN ON SALES (%)	0.	0.	0.	-14.	34.
	0.*	0.*	0.*	25.*	12.*

* STANDARD DEVIATION

FIGURE B.13 PROFORMA INCOME STATEMENT

PROFORMA INCOME STATEMENT ($ THOUSANDS)

	YEAR				
	6	7	8	9	10
PROTECTED	81095.	92431.	133799.	135767.	128973.
PROTECTED/PREEMPT.	0.	0.	0.	0.	0.
UNPROTECTED/NON-PREEMPT.	0.	0.	0.	0.	0.
PREEMPTIBLE	6213.	5858.	3793.	1923.	3045.
TOTAL REVENUE	87309.	98289.	137592.	137690.	132018.
	11586. •	8694. •	15679. •	15522. •	14749. •
LAUNCH OPERATIONS	4449.	6498.	7034.	7422.	7806.
LAUNCH INSURANCE	1774.	2504.	2690.	2822.	2950.
SATELLITE	7432.	10273.	10984.	11482.	11958.
OTHER	1487.	1648.	1648.	1648.	1648.
DEPRECIATION EXPENSE	15142.	20923.	22357.	23374.	24363.
S/C CONTROL OPERATIONS	1484.	1966.	2477.	2478.	2508.
ENGINEERING EXPENSE	1749.	1966.	2752.	2754.	2640.
RESEARCH & DEVELOPMENT	1749.	1966.	2752.	2754.	2640.
TOTAL OPERATIONS EXPENSE	20124.	26822.	30337.	31360.	32152.
	1953. •	3532. •	3886. •	4660. •	5759. •
GROSS MARGIN ($)	67184.	71467.	107255.	106330.	99866.
	11415. •	10088. •	16690. •	18196. •	18539. •
S/C NONRECURRING COST	0.	0.	0.	0.	0.
G & A EXPENSE	1198.	1286.	1326.	1326.	1424.
DEBT SERVICE EXPENSE	21846.	21135.	18073.	10811.	1926.
BEFORE TAX PROFIT	44140.	49046.	87857.	94193.	96516.
INCOME TAX	15891.	17656.	31628.	33909.	34746.
INVESTMENT TAX CREDIT	1474.	5813.	1433.	1017.	989.
AFTER TAX PROFIT	29724.	37203.	57661.	61301.	62759.
	7146. •	6947. •	11949. •	14408. •	15987. •
RETURN ON ASSETS (%)	15.	17.	28.	32.	36.
	4. •	4. •	8. •	10. •	13. •
RETURN ON SALES (%)	33.	37.	41.	44.	47.
	7. •	6. •	6. •	8. •	10. •

• STANDARD DEVIATION

FIGURE B.13 PROFORMA INCOME STATEMENT (CONTINUED)

PROFORMA INCOME STATEMENT ($ THOUSANDS)

	YEAR				
	11	12	13	14	15
PROTECTED	125080.	110119.	97509.	103237.	94715.
PROTECTED/PREEMPT.	0.	0.	0.	0.	0.
UNPROTECTED/NON-PREEMPT.	0.	0.	0.	0.	0.
PREEMPTIBLE	1699.	943.	455.	508.	280.
TOTAL REVENUE	126779.	111063.	97965.	103745.	94996.
	17046. *	20016. *	24366. *	23501. *	30998. *
LAUNCH OPERATIONS	8205.	8922.	10368.	10128.	8109.
LAUNCH INSURANCE	3082.	3315.	3781.	3532.	2727.
SATELLITE	12442.	13293.	14972.	13555.	10184.
OTHER	1648.	1648.	1648.	1233.	420.
DEPRECIATION EXPENSE	25377.	27178.	30768.	28447.	21440.
S/C CONTROL OPERATIONS	2662.	2554.	2449.	2905.	3325.
ENGINEERING EXPENSE	2536.	2222.	1966.	2079.	1926.
RESEARCH & DEVELOPMENT	2536.	2222.	1966.	2079.	1926.
TOTAL OPERATIONS EXPENSE	33111.	34178.	37150.	35509.	28617.
	6440. *	7559. *	8168. *	8206. *	7771. *
GROSS MARGIN ($)	93668.	76885.	60815.	68236.	66379.
	21097. *	23364. *	25628. *	25237. *	30978. *
S/C NONRECURRING COST	0.	0.	0.	0.	0.
G & A EXPENSE	1514.	1611.	1480.	1952.	3255.
DEBT SERVICE EXPENSE	-7200.	-15869.	-23094.	-29983.	-38953.
BEFORE TAX PROFIT	99353.	91143.	82429.	96266.	102117.
INCOME TAX	35767.	32811.	29674.	34656.	36762.
INVESTMENT TAX CREDIT	1015.	1801.	3590.	3882.	510.
AFTER TAX PROFIT	64601.	60133.	56344.	65492.	65865.
	18939. *	20464. *	21888. *	23102. *	26662. *
RETURN ON ASSETS (%)	40.	37.	35.	42.	48.
	16. *	17. *	17. *	18. *	21. *
RETURN ON SALES (%)	50.	53.	56.	62.	69.
	13. *	16. *	24. *	21. *	40. *

* STANDARD DEVIATION

FIGURE B.13 PROFORMA INCOME STATEMENT (CONTINUED)

CASH FLOW PROJECTION ($ THOUSANDS)

	YEAR 1	2	3	4	5
AFTER TAX PROFIT	0.	0.	0.	1.	23665.
INCREASE IN PAYABLES	1599.	1416.	3208.	540.	130.
DECREASE IN RECEIVABLES	0.	0.	0.	0.	0.
DECREASE IN CASH	0.	15.	0.	22.	200.
DEPRECIATION	0.	415.	1228.	7016.	13720.
TOTAL CASH INFLOW	1599.	1847.	4436.	7579.	37715.
LOSS	12330.	5066.	4608.	2802.	128.
DECREASE IN PAYABLES	0.	83.	0.	123.	1107.
INCREASE IN RECEIVABLES	0.	0.	0.	1779.	9248.
INCREASE IN CASH	289.	256.	580.	98.	23.
CAPITAL EXPENDITURES	0.	27047.	66483.	61946.	41229.
TOTAL CASH OUTFLOW	12619.	32453.	71671.	66747.	51734.
NET CASH FLOW	-11020.	-30606.	-67235.	-59168.	-14019.
	523.*	9223.*	11278.*	12505.*	21276.*
INDEBTEDNESS	11020.	41626.	108861.	168028.	182047.
	523.*	9247.*	19933.*	17476.*	19544.*

	1	2	3	4	5
DISCOUNT RATE (%)	10.	15.	20.	25.	40.
NET PRESENT VALUE "A"	71795.	11268.	-20471.	-36691.	-47683.
NET PRESENT VALUE "B"	185841.	60837.	23094.	9614.	983.
NET PRESENT VALUE	257636.	72105.	2623.	-27076.	-46703.
	102318.*	55922.*	35407.*	24284.*	10331.*

* STANDARD DEVIATION

FIGURE B.14 CASH FLOW PROJECTION

CASH FLOW PROJECTION ($ THOUSANDS)

	YEAR 11	12	13	14	15
AFTER TAX PROFIT	64688.	60353.	56679.	65717.	66234.
INCREASE IN PAYABLES	237.	534.	222.	16.	0.
DECREASE IN RECEIVABLES	1415.	3098.	3403.	1709.	2779.
DECREASE IN CASH	75.	65.	136.	314.	333.
DEPRECIATION	25377.	27178.	30768.	28447.	21440.
TOTAL CASH INFLOW	91792.	91228.	91208.	96201.	90785.
LOSS	87.	220.	335.	224.	369.
DECREASE IN PAYABLES	414.	360.	752.	1735.	1843.
INCREASE IN RECEIVABLES	540.	473.	1216.	2674.	1318.
INCREASE IN CASH	43.	96.	40.	3.	0.
CAPITAL EXPENDITURES	18471.	29868.	31457.	16477.	1862.
TOTAL CASH OUTFLOW	19555.	31018.	33800.	21113.	5392.
NET CASH FLOW	72238.	60210.	57409.	75088.	85393.
	22869.*	22774.*	24650.*	21511.*	20183.*
INDEBTEDNESS	-132239.	-192449.	-249858.	-324945.	-410339.
	115489.*	128627.*	138810.*	150465.*	164252.*

CASH FLOW PROJECTION ($ THOUSANDS)

	YEAR 6	7	8	9	10
AFTER TAX PROFIT	29765.	37216.	57661.	61302.	62792.
INCREASE IN PAYABLES	271.	231.	31.	83.	104.
DECREASE IN RECEIVABLES	69.	89.	31.	856.	1464.
DECREASE IN CASH	110.	107.	303.	148.	131.
DEPRECIATION	15142.	20923.	22357.	23374.	24363.
TOTAL CASH INFLOW	45357.	58567.	80382.	85764.	88855.
LOSS	41.	13.	0.	1.	34.
DECREASE IN PAYABLES	610.	592.	1676.	816.	726.
INCREASE IN RECEIVABLES	3624.	1923.	6594.	873.	517.
INCREASE IN CASH	49.	42.	6.	15.	19.
CAPITAL EXPENDITURES	35111.	30476.	11593.	10017.	11509.
TOTAL CASH OUTFLOW	39435.	33046.	19869.	11723.	12804.
NET CASH FLOW	5922.	25521.	60514.	74041.	76051.
	19906.*	17288.*	21472.*	22369.*	21900.*
INDEBTEDNESS	176125.	150604.	90091.	16049.	-60001.
	34476.*	47908.*	63213.*	81480.*	98935.*

* STANDARD DEVIATION

FIGURE B.14 CASH FLOW PROJECTION (CONTINUED)

PROBABILITY OF ANNUAL LAUNCH ATTEMPTS

LAUNCH ATTEMPTS	PROBABILITY OF INDICATED QUANTITY (PERCENT)							
10	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	1	0
2	0	0	0	0	18	1	11	2
1	0	0	0	100	82	20	89	26
0	100	100	100	0	0	79	0	72
YEAR	1	2	3	4	5	6	7	8
AVERAGE VALUE	.00	.00	.00	1.00	1.18	.22	1.12	.30
STANDARD DEVIATION	.00	.00	.00	.00	.39	.44	.34	.51

PROBABILITY OF ANNUAL LAUNCH ATTEMPTS

LAUNCH ATTEMPTS	PROBABILITY OF INDICATED QUANTITY (PERCENT)						
10	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
3	0	0	0	0	2	2	0
2	2	2	1	4	14	15	1
1	18	17	19	30	47	49	10
0	80	81	80	66	38	34	89
YEAR	9	10	11	12	13	14	15
AVERAGE VALUE	.21	.21	.22	.38	.80	.85	.12
STANDARD DEVIATION	.45	.45	.44	.57	.75	.75	.34

FIGURE B.15 PROBABILITY OF ANNUAL LAUNCH ATTEMPTS

PROBABILITY OF ANNUAL SPACECRAFT PURCHASES

NUMBER OF SPACECRAFT	PROBABILITY OF INDICATED QUANTITY (PERCENT)							
10	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	1	0
2	0	0	0	0	16	1	10	1
1	0	0	0	94	79	19	83	25
0	100	100	100	6	5	80	6	74
YEAR	1	2	3	4	5	6	7	8
AVERAGE VALUE	.00	.00	.00	.94	1.11	.21	1.05	.28
STANDARD DEVIATION	.00	.00	.00	.24	.44	.43	.43	.49

PROBABILITY OF ANNUAL SPACECRAFT PURCHASES

NUMBER OF SPACECRAFT	PROBABILITY OF INDICATED QUANTITY (PERCENT)						
10	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
3	0	0	0	0	2	2	0
2	2	1	1	4	12	14	1
1	17	17	18	28	45	47	10
0	82	82	81	68	42	38	90
YEAR	9	10	11	12	13	14	15
AVERAGE VALUE	.20	.20	.20	.37	.74	.80	.11
STANDARD DEVIATION	.43	.43	.42	.57	.73	.74	.33

FIGURE B.16 PROBABILITY OF ANNUAL SPACECRAFT PURCHASES

APPENDIX C

PSS AND DBS BASE CASE DATA BASES AND ASSOCIATED PROFORMA INCOME PROJECTIONS, CASHFLOW PROJECTIONS, AND LAUNCH AND SPACECRAFT STATISTICS

PSS DATA AND REPORTS (BASE CASE)

[1] GLOBAL DATA (SYSTEM)

NO. YRS. ANALYZED	15				
MAX. # OPER. SATS	3				
LAUNCH DATES (YRS)					
SATELLITE NO. 1	4.5				
SATELLITE NO. 2	5.5				
SATELLITE NO. 3	7.5				
SATELLITE NO. 4	0.0				
SATELLITE NO. 5	0.0				
LAUNCH DELAYS					
MAX. DELAY(YRS)	0.8				
MIN. DELAY(YRS)	0.5				
UNCERT. PROFILE	2				
LEO TO GEO -	0.25	0.25	0.25	0.25	0.25
TRANSFER TIME -	0.25	0.25	0.25	0.25	0.25
(YRS 1 THRU 15)	0.25	0.25	0.25	0.25	0.25
NO. SIMUL. RUNS	1000				

[2] GLOBAL DATA (FINANCIAL)

DEBT SVC INT RT %	12.0				
EFFECT TAX RATE %	36.0				
INVEST TAX CRDT %	10.0				
TAX CREDIT ON ...					
LAUNCH COST	1				
INSURANCE COST	1				
S/C RECUR. COST	1				
OTHER CAP. EXP.	1				
PAYABLES (% EXP.)	8.3				
RCVS (% REV.)	16.7				
CASH (% EXP.)	1.5				
INSUR? (0=N/1=Y)	1				
S/C LEARN. RATE %	88.0				
DEPRECIATION LIFE (YRS)					
LAUNCH, INS., S/C	10.0				
OTHER CAP. EXP.	12.0				
DISCOUNT RATE (%)	10.0	15.0	20.0	25.0	40.0

[3] TRANSPONDER DATA

NARROW BAND	
NO. OF GROUPS	0
NO. TRANS/GRP	0
SPARE TRANS/GRP	0
MEAN TME FAIL-YR	0.0
EXP. WEAROUT-YRS	0.0
STD WEAROUT-YRS	0.0
WIDE BAND	
NO. OF GROUPS	1
NO. TRANS/GRP	16
SPARE TRANS/GRP	4
MEAN TME FAIL-YR	60.0
EXP. WEAROUT-YRS	15.0
STD WEAROUT-YRS	1.0
W/N BAND REL IMP.	1
TRNSPNDR THRSHLD	RELAUNCH
SATELLITE NO. 1	15
SATELLITE NO. 2	15
SATELLITE NO. 3	15
SATELLITE NO. 4	0
SATELLITE NO. 5	0

[4] SPACECRAFT SUPPORT SUBSYSTEM DATA

	SUBSYSTEM				
	POWER	AVCS	TT&C	STRUCTURE	OTHER
MEAN TME FAIL-YR	250.0	160.0	220.0	1000.0	1000.0
EXP. WEAROUT-YRS	15.0	8.0	15.0	20.0	20.0
STD WEAROUT-YRS	1.0	0.5	1.0	1.0	1.0

[5] LAUNCH SCENARIO DATA

PROBABILITY OF:	YEAR 1	2	3	4	5
BOOSTER SUCCESS	0.995	0.995	0.995	0.995	0.995
ORB SUC-NO ABORT	0.995	0.995	0.995	0.995	0.995
P/L OK FINAL ORB	0.950	0.950	0.950	0.950	0.950
PRPLSN MOD CKOUT	0.950	0.950	0.950	0.950	0.950
XFER LEO TO GEO	0.950	0.950	0.950	0.950	0.950
ORB RCVRY-ABORT	0.990	0.990	0.990	0.990	0.990
ORB RCVRY-B FAIL	0.990	0.990	0.990	0.990	0.990
ORB RCVRY-FLT OK	0.999	0.999	0.999	0.999	0.999
MAX LNCH COST M$	21.798	21.798	21.798	21.798	21.798
MIN LNCH COST M$	21.798	21.798	21.798	21.798	21.798
LNCH CST UNCRT PF	1	1	1	1	1

[5] LAUNCH SCENARIO DATA

PROBABILITY OF:	YEAR 6	7	8	9	10
BOOSTER SUCCESS	0.995	0.995	0.995	0.995	0.995
ORB SUC-NO ABORT	0.995	0.995	0.995	0.995	0.995
P/L OK FINAL ORB	0.950	0.950	0.950	0.950	0.950
PRPLSN MOD CKOUT	0.950	0.950	0.950	0.950	0.950
XFER LEO TO GEO	0.950	0.950	0.950	0.950	0.950
ORB RCVRY-ABORT	0.990	0.990	0.990	0.990	0.990
ORB RCVRY-B FAIL	0.990	0.990	0.990	0.990	0.990
ORB RCVRY-FLT OK	0.999	0.999	0.999	0.999	0.999
MAX LNCH COST M$	21.798	21.798	21.798	21.798	21.798
MIN LNCH COST M$	21.798	21.798	21.798	21.798	21.798
LNCH CST UNCRT PF	1	1	1	1	1

[5] LAUNCH SCENARIO DATA

PROBABILITY OF:	YEAR 11	12	13	14	15
BOOSTER SUCCESS	0.995	0.995	0.995	0.995	0.995
ORB SUC-NO ABORT	0.995	0.995	0.995	0.995	0.995
P/L OK FINAL ORB	0.950	0.950	0.950	0.950	0.950
PRPLSN MOD CKOUT	0.950	0.950	0.950	0.950	0.950
XFER LEO TO GEO	0.950	0.950	0.950	0.950	0.950
ORB RCVRY-ABORT	0.990	0.990	0.990	0.990	0.990
ORB RCVRY-B FAIL	0.990	0.990	0.990	0.990	0.990
ORB RCVRY-FLT OK	0.999	0.999	0.999	0.999	0.999
MAX LNCH COST M$	21.798	21.798	21.798	21.798	21.798
MIN LNCH COST M$	21.798	21.798	21.798	21.798	21.798
LNCH CST UNCRT PF	1	1	1	1	1

[6]

DEMAND: SERVICE TYPE #1
SATELLITE # 1

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	8	6	1
5	0	0	0	13	10	3
6	0	0	0	15	11	6
7	0	0	0	16	12	14
8	0	0	0	17	12	9
9	0	0	0	18	12	8
10	0	0	0	19	12	8
11	0	0	0	20	12	7
12	0	0	0	20	12	7
13	0	0	0	20	12	7
14	0	0	0	20	12	7
15	0	0	0	20	12	7

[7]

DEMAND: SERVICE TYPE #1
SATELLITE # 2

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	7	5	1
6	0	0	0	11	8	3
7	0	0	0	14	10	8
8	0	0	0	16	12	14
9	0	0	0	17	12	9
10	0	0	0	18	12	8
11	0	0	0	19	12	8
12	0	0	0	20	12	7
13	0	0	0	20	12	7
14	0	0	0	20	12	7
15	0	0	0	20	12	7

[8] DEMAND: SERVICE TYPE #1
SATELLITE # 3

	NARROW-BAND			WIDE-BAND		
YEAR	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	10	8	7
9	0	0	0	15	12	15
10	0	0	0	16	12	14
11	0	0	0	17	12	9
12	0	0	0	18	12	8
13	0	0	0	19	12	8
14	0	0	0	20	12	7
15	0	0	0	20	12	7

[9] DEMAND: SERVICE TYPE #1
SATELLITE # 4

	NARROW-BAND			WIDE-BAND		
YEAR	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[10] DEMAND: SERVICE TYPE #1
SATELLITE # 5

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[11] DEMAND: SERVICE TYPE #2
SATELLITE # 1

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[12] DEMAND: SERVICE TYPE #2
SATELLITE # 2

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[13] DEMAND: SERVICE TYPE #2
SATELLITE # 3

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[14]

DEMAND: SERVICE TYPE #2
SATELLITE # 4

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[15]

DEMAND: SERVICE TYPE #2
SATELLITE # 5

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[16] DEMAND: SERVICE TYPE #3
SATELLITE # 1

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[17] DEMAND: SERVICE TYPE #3
SATELLITE # 2

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[18]

DEMAND: SERVICE TYPE #3
SATELLITE # 3

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[19]

DEMAND: SERVICE TYPE #3
SATELLITE # 4

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[20] DEMAND: SERVICE TYPE #3
SATELLITE # 5

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[21] DEMAND: SERVICE TYPE #4
SATELLITE # 1

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	3	2	1
5	0	0	0	4	2	2
6	0	0	0	4	2	2
7	0	0	0	4	2	2
8	0	0	0	4	2	2
9	0	0	0	4	2	2
10	0	0	0	4	2	2
11	0	0	0	4	2	2
12	0	0	0	4	2	2
13	0	0	0	4	2	2
14	0	0	0	4	2	2
15	0	0	0	4	2	2

[22] DEMAND: SERVICE TYPE #4
SATELLITE # 2

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	3	2	1
6	0	0	0	4	2	2
7	0	0	0	4	2	2
8	0	0	0	4	2	2
9	0	0	0	4	2	2
10	0	0	0	4	2	2
11	0	0	0	4	2	2
12	0	0	0	4	2	2
13	0	0	0	4	2	2
14	0	0	0	4	2	2
15	0	0	0	4	2	2

[23] DEMAND: SERVICE TYPE #4
SATELLITE # 3

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	3	2	1
9	0	0	0	4	2	2
10	0	0	0	4	2	2
11	0	0	0	4	2	2
12	0	0	0	4	2	2
13	0	0	0	4	2	2
14	0	0	0	4	2	2
15	0	0	0	4	2	2

[24]

DEMAND: SERVICE TYPE #4
SATELLITE # 4

	NARROW-BAND			WIDE-BAND		
YEAR	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[25]

DEMAND: SERVICE TYPE #4
SATELLITE # 5

	NARROW-BAND			WIDE-BAND		
YEAR	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[26] PRICE ($/YR): SERVICE TYPE #1

YEAR	NARROW-BAND MAX. PRICE	NARROW-BAND MIN. PRICE	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. PRICE	WIDE-BAND MIN. PRICE	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	3700	3330	6
5	0	0	0	3700	3330	6
6	0	0	0	3600	3240	6
7	0	0	0	3500	3150	6
8	0	0	0	3400	3060	6
9	0	0	0	3300	2970	6
10	0	0	0	3200	2880	6
11	0	0	0	3100	2790	6
12	0	0	0	3000	2700	6
13	0	0	0	3000	2700	6
14	0	0	0	3000	2700	6
15	0	0	0	3000	2700	6

[27] PRICE ($/YR): SERVICE TYPE #2

YEAR	NARROW-BAND MAX. PRICE	NARROW-BAND MIN. PRICE	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. PRICE	WIDE-BAND MIN. PRICE	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[28]

PRICE ($/YR): SERVICE TYPE #3

YEAR	NARROW-BAND MAX. PRICE	NARROW-BAND MIN. PRICE	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. PRICE	WIDE-BAND MIN. PRICE	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[29]

PRICE ($/YR): SERVICE TYPE #4

YEAR	NARROW-BAND MAX. PRICE	NARROW-BAND MIN. PRICE	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. PRICE	WIDE-BAND MIN. PRICE	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	1450	1305	6
5	0	0	0	1450	1305	6
6	0	0	0	1450	1305	6
7	0	0	0	1450	1305	6
8	0	0	0	1450	1305	6
9	0	0	0	1450	1305	6
10	0	0	0	1450	1305	6
11	0	0	0	1450	1305	6
12	0	0	0	1450	1305	6
13	0	0	0	1450	1305	6
14	0	0	0	1450	1305	6
15	0	0	0	1450	1305	6

C-2

[30]

% DEMAND DECREASE RESULTING FROM A 25% PRICE INCREASE	PRICE ELASTICITY DATA NARROW-BAND	WIDE-BAND
1. PROTECTED	0.0	25.0
2. PROTECTED/PREEMPTIBLE	0.0	25.0
3. UNPROTECTED/NON-PREEMPTIBLE	0.0	25.0
4. PREEMPTIBLE	0.0	25.0

[31]

TYPE OF SERVICE	CORRELATION DATA CORRELATION COEFFICIENT NARROW-BAND	WIDE-BAND
DEMAND DATA		
1. PROTECTED	0.0	0.8
2. PROTECTED/PREEMPTIBLE	0.0	0.8
3. UNPROTECTED/NON-PREEMPTIBLE	0.0	0.8
4. PREEMPTIBLE	0.0	0.8
PRICE DATA		
1. PROTECTED	0.0	0.8
2. PROTECTED/PREEMPTIBLE	0.0	0.8
3. UNPROTECTED/NON-PREEMPTIBLE	0.0	0.8
4. PREEMPTIBLE	0.0	0.8
S/C CONTROL OPERATIONS	0.8	
ENGINEERING EXPENSE	0.8	
R&D EXPENSE	0.8	
G&A EXPENSE	0.8	
OTHER CAPITAL EXPENDITURES	0.8	

[32]

COST/EXPENSE DATA	
MAX. S/C UNIT COST (K$)	40900.0
MIN. S/C UNIT COST (K$)	36400.0
S/C UNIT COST UNCERTAINTY PROFILE	16
MAX. S/C NONRECURRING COST (K$)	25000.0
MIN. S/C NONRECURRING COST (K$)	19800.0
S/C NONREC. COST UNCERT. PROFILE	1
MAX. INSURANCE %	18.0
MIN. INSURANCE %	12.0
INSURANCE UNCERTAINTY PROFILE	13

[33] COST/EXPENSE DATA (CONTINUED)

S/C CONTROL OPERATIONS COST(%)

YEAR	MAX. COST(%)	MIN. COST(%)	UNCERT. PROFILE
1	0.0	0.0	1
2	0.0	0.0	1
3	0.0	0.0	1
4	6.7	6.7	1
5	2.6	2.6	1
6	1.7	1.7	1
7	2.0	2.0	1
8	1.8	1.8	1
9	1.8	1.8	1
10	1.9	1.9	1
11	2.1	2.1	1
12	2.3	2.3	1
13	2.5	2.5	1
14	2.8	2.8	1
15	3.5	3.5	1

ORIGINAL PAGE IS OF POOR QUALITY

[34] ENGINEERING EXPENSE

YEAR	MAX. (K$)	MIN. (K$)	UNCERT. PROFILE	MAX. (%)	MIN. (%)	UNCERT. PROFILE
1	1000.0	1000.0	1	2.0	2.0	1
2	1000.0	1000.0	1	2.0	2.0	1
3	1000.0	1000.0	1	2.0	2.0	1
4	1000.0	1000.0	1	2.0	2.0	1
5	1000.0	1000.0	1	2.0	2.0	1
6	1000.0	1000.0	1	2.0	2.0	1
7	1000.0	1000.0	1	2.0	2.0	1
8	1000.0	1000.0	1	2.0	2.0	1
9	1000.0	1000.0	1	2.0	2.0	1
10	1000.0	1000.0	1	2.0	2.0	1
11	1000.0	1000.0	1	2.0	2.0	1
12	1000.0	1000.0	1	2.0	2.0	1
13	1000.0	1000.0	1	2.0	2.0	1
14	1000.0	1000.0	1	2.0	2.0	1
15	1000.0	1000.0	1	2.0	2.0	1
SUM K$ & % AMTS	0					

[35] R$D EXPENSE

YEAR	MAX. (K$)	MIN. (K$)	UNCERT. PROFILE	MAX. (%)	MIN. (%)	UNCERT. PROFILE
1	1000.0	1000.0	1	2.0	2.0	1
2	1000.0	1000.0	1	2.0	2.0	1
3	1000.0	1000.0	1	2.0	2.0	1
4	1000.0	1000.0	1	2.0	2.0	1
5	1000.0	1000.0	1	2.0	2.0	1
6	1000.0	1000.0	1	2.0	2.0	1
7	1000.0	1000.0	1	2.0	2.0	1
8	1000.0	1000.0	1	2.0	2.0	1
9	1000.0	1000.0	1	2.0	2.0	1
10	1000.0	1000.0	1	2.0	2.0	1
11	1000.0	1000.0	1	2.0	2.0	1
12	1000.0	1000.0	1	2.0	2.0	1
13	1000.0	1000.0	1	2.0	2.0	1
14	1000.0	1000.0	1	2.0	2.0	1
15	1000.0	1000.0	1	2.0	2.0	1
SUM K$ & % AMTS	0					

[36]

G&A EXPENSE

YEAR	MAX. (K$)	MIN. (K$)	UNCERT. PROFILE	MAX. (%)	MIN. (%)	UNCERT. PROFILE
1	500.0	500.0	1	0.0	0.0	1
2	500.0	500.0	1	0.0	0.0	1
3	500.0	500.0	1	0.0	0.0	1
4	500.0	500.0	1	7.3	7.3	1
5	500.0	500.0	1	1.3	1.3	1
6	500.0	500.0	1	0.8	0.8	1
7	500.0	500.0	1	0.8	0.8	1
8	500.0	500.0	1	0.6	0.6	1
9	500.0	500.0	1	0.6	0.6	1
10	500.0	500.0	1	0.7	0.7	1
11	500.0	500.0	1	0.8	0.8	1
12	500.0	500.0	1	1.0	1.0	1
13	500.0	500.0	1	1.0	1.0	1
14	500.0	500.0	1	1.4	1.4	1
15	500.0	500.0	1	2.9	2.9	1
SUM K$ & % AMTS	1					

[37]

CAPITAL EXPENDITURE DATA

OTHER CAPITAL EXPENDITURES

YEAR	MAX. (K$)	MIN. (K$)	UNCERT. PROFILE
1	0.0	0.0	1
2	5500.0	4500.0	13
3	10560.0	8640.0	13
4	0.0	0.0	1
5	0.0	0.0	1
6	3410.0	2790.0	13
7	2090.0	1710.0	13
8	0.0	0.0	1
9	0.0	0.0	1
10	0.0	0.0	1
11	0.0	0.0	1
12	0.0	0.0	1
13	0.0	0.0	1
14	0.0	0.0	1
15	0.0	0.0	1

COST SPREADING FUNCTIONS

	YEAR 1	2	3	4	5
LAUNCH COST	35.2	55.0	9.8	0.0	0.0
INSURANCE	100.0	0.0	0.0	0.0	0.0
S/C RECUR COST	20.0	48.5	31.5	0.0	0.0
NONRECUR COST	79.0	21.0	0.0	0.0	0.0

[38]

UNCERTAINTY PROFILE DATA

PROFILE I.D.	PROFILE INTERVAL 1	2	3	4	5
1	0.50	0.25	0.15	0.07	0.03
2	0.30	0.25	0.20	0.15	0.10
3	0.30	0.30	0.20	0.13	0.07
4	0.35	0.40	0.15	0.07	0.03
5	0.21	0.32	0.27	0.15	0.05
6	0.23	0.30	0.23	0.16	0.08
7	0.25	0.35	0.25	0.10	0.05
8	0.16	0.49	0.24	0.09	0.02
9	0.12	0.32	0.32	0.17	0.07
10	0.15	0.34	0.37	0.12	0.02
11	0.20	0.20	0.20	0.20	0.20
12	0.15	0.22	0.26	0.22	0.15
13	0.10	0.25	0.30	0.25	0.10
14	0.08	0.25	0.34	0.25	0.08
15	0.05	0.25	0.40	0.25	0.05
16	0.10	0.20	0.40	0.20	0.10
17	0.03	0.30	0.34	0.30	0.03
18	0.05	0.20	0.50	0.20	0.05
19	0.03	0.20	0.54	0.20	0.03
20	0.03	0.07	0.80	0.07	0.03

PROFORMA INCOME STATEMENT ($ THOUSANDS)

	YEAR 1	2	3	4	5
PROTECTED	0.	0.	0.	3889.	64779.
PROTECTED/PREEMPT.	0.	0.	0.	0.	0.
UNPROTECTED/NON-PREEMPT.	0.	0.	0.	0.	0.
PREEMPTIBLE	0.	0.	0.	1352.	3320.
TOTAL REVENUE	0.	0.	0.	11241.	68098.
	0. *	0. *	0. *	4400. *	16029. *
LAUNCH OPERATIONS	0.	0.	0.	1903.	4028.
LAUNCH INSURANCE	0.	0.	0.	796.	1630.
SATELLITE	0.	0.	0.	3380.	6802.
OTHER	0.	416.	1229.	1229.	1229.
DEPRECIATION EXPENSE	0.	416.	1229.	7308.	13689.
S/C CONTROL OPERATIONS	0.	0.	0.	753.	1771.
ENGINEERING EXPENSE	1000.	1000.	1000.	1000.	1406.
RESEARCH & DEVELOPMENT	1000.	1000.	1000.	1000.	1406.
TOTAL OPERATIONS EXPENSE	2000.	2416.	3229.	10061.	18272.
	0. *	20. *	48. *	2610. *	2992. *
GROSS MARGIN ($)	-2000.	-2416.	-3229.	1180.	49826.
	0. *	20. *	48. *	1923. *	14148. *
S/C NONRECURRING COST	16756.	4454.	0.	0.	0.
G & A EXPENSE	500.	500.	500.	1321.	1385.
DEBT SERVICE EXPENSE	0.	1322.	5117.	13305.	20225.
BEFORE TAX PROFIT	-19256.	-8692.	-8846.	-13445.	28215.
INCOME TAX	-6932.	-3129.	-3185.	-4840.	10157.
INVESTMENT TAX CREDIT	0.	499.	976.	6079.	6381.
AFTER TAX PROFIT	-12324.	-5064.	-4686.	-2526.	24439.
	591. *	199. *	634. *	2023. *	7551. *
RETURN ON ASSETS (%)	-4267.	-27.	-5.	-2.	13.
	0. *	30. *	1. *	2. *	4. *
RETURN ON SALES (%)	0.	0.	0.	-13.	34.
	0. *	0. *	0. *	18. *	10. *

* STANDARD DEVIATION

PROFORMA INCOME STATEMENT ($ THOUSANDS)

	YEAR				
	6	7	8	9	10
PROTECTED	82387.	92817.	136146.	138503.	131022.
PROTECTED/PREEMPT.	0.	0.	0.	0.	0.
UNPROTECTED/NON-PREEMPT.	0.	0.	0.	0.	0.
PREEMPTIBLE	6394.	6039.	4035.	2231.	3350.
TOTAL REVENUE	88782.	98855.	140181.	140734.	134372.
	10464. *	8386. *	13416. *	12539. *	12664. *
LAUNCH OPERATIONS	4375.	6343.	6819.	7050.	7326.
LAUNCH INSURANCE	1759.	2467.	2633.	2712.	2805.
SATELLITE	7315.	10044.	10674.	10971.	11314.
OTHER	1488.	1649.	1649.	1649.	1649.
DEPRECIATION EXPENSE	14936.	20503.	21774.	22381.	23094.
S/C CONTROL OPERATIONS	1509.	1977.	2523.	2533.	2553.
ENGINEERING EXPENSE	1777.	1977.	2804.	2815.	2687.
RESEARCH & DEVELOPMENT	1777.	1977.	2804.	2815.	2687.
TOTAL OPERATIONS EXPENSE	20001.	26434.	29905.	30544.	31022.
	1617. *	2962. *	2947. *	3600. *	4504. *
GROSS MARGIN ($)	68781.	72421.	110277.	110191.	103350.
	9903. *	8871. *	13896. *	14304. *	15346. *
S/C NONRECURRING COST	0.	0.	0.	0.	0.
G & A EXPENSE	1210.	1291.	1341.	1344.	1441.
DEBT SERVICE EXPENSE	21529.	20471.	17079.	9294.	-215.
BEFORE TAX PROFIT	46041.	50660.	91857.	99552.	102124.
INCOME TAX	16575.	18238.	33068.	35839.	36765.
INVESTMENT TAX CREDIT	1299.	5598.	1272.	607.	713.
AFTER TAX PROFIT	30766.	38021.	60060.	64320.	66072.
	5926. *	6161. *	9336. *	11157. *	12725. *
RETURN ON ASSETS (%)	15.	18.	30.	35.	40.
	3. *	4. *	6. *	8. *	11. *
RETURN ON SALES (%)	34.	38.	43.	45.	49.
	6. *	4. *	5. *	6. *	7. *

* STANDARD DEVIATION

PROFORMA INCOME STATEMENT ($ THOUSANDS)

	YEAR				
	11	12	13	14	15
PROTECTED	127936.	111137.	97531.	105444.	96779.
PROTECTED/PREEMPT.	0.	0.	0.	0.	0.
UNPROTECTED/NON-PREEMPT.	0.	0.	0.	0.	0.
PREEMPTIBLE	1851.	915.	545.	525.	384.
TOTAL REVENUE	129787.	112052.	98076.	105969.	97164.
	14637. *	18583. *	23226. *	23107. *	29145. *
LAUNCH OPERATIONS	7601.	8155.	9781.	9417.	7503.
LAUNCH INSURANCE	2897.	3080.	3611.	3311.	2545.
SATELLITE	11647.	12303.	14197.	12578.	9393.
OTHER	1649.	1649.	1649.	1233.	420.
DEPRECIATION EXPENSE	23794.	25187.	29237.	26539.	19862.
S/C CONTROL OPERATIONS	2726.	2577.	2452.	2967.	3401.
ENGINEERING EXPENSE	2596.	2241.	1966.	2123.	1964.
RESEARCH & DEVELOPMENT	2596.	2241.	1966.	2123.	1964.
TOTAL OPERATIONS EXPENSE	31711.	32247.	35621.	33752.	27191.
	5105. *	6197. *	6967. *	7073. *	6700. *
GROSS MARGIN ($)	98076.	79805.	62455.	72216.	69973.
	17673. *	20468. *	23480. *	23490. *	28365. *
S/C NONRECURRING COST	0.	0.	0.	0.	0.
G & A EXPENSE	1538.	1621.	1481.	1984.	3318.
DEBT SERVICE EXPENSE	-9977.	-19215.	-26639.	-33662.	-42996.
BEFORE TAX PROFIT	106515.	97399.	87613.	103895.	109651.
INCOME TAX	38345.	35064.	31541.	37402.	39474.
INVESTMENT TAX CREDIT	700.	1393.	4050.	3797.	517.
AFTER TAX PROFIT	68870.	63728.	60122.	70289.	70694.
	15392. *	16885. *	18538. *	19581. *	22792. *
RETURN ON ASSETS (%)	44.	40.	38.	46.	53.
	14. *	15. *	15. *	16. *	18. *
RETURN ON SALES (%)	52.	56.	61.	66.	74.
	10. *	12. *	17. *	18. *	25. *

* STANDARD DEVIATION

CASH FLOW PROJECTION ($ THOUSANDS)

	YEAR 1	2	3	4	5
AFTER TAX PROFIT	0.	0.	0.	0.	24540.
INCREASE IN PAYABLES	1598.	1489.	3203.	388.	78.
DECREASE IN RECEIVABLES	0.	0.	0.	0.	2.
DECREASE IN CASH	0.	12.	0.	23.	215.
DEPRECIATION	0.	416.	1229.	7308.	13689.
TOTAL CASH INFLOW	1598.	1916.	4432.	7718.	38525.
LOSS	12324.	5064.	4686.	2526.	101.
DECREASE IN PAYABLES	0.	64.	0.	126.	1189.
INCREASE IN RECEIVABLES	0.	0.	0.	1877.	9498.
INCREASE IN CASH	289.	269.	579.	70.	14.
CAPITAL EXPENDITURES	0.	28148.	67397.	60793.	38588.
TOTAL CASH OUTFLOW	12612.	33544.	72661.	65392.	49390.
NET CASH FLOW	-11014.	-31628.	-68229.	-57674.	-10865.
	528. *	8243. *	9908. *	11262. *	18110. *
INDEBTEDNESS	11014.	42642.	110872.	168545.	179411.
	528. *	8252. *	17582. *	15468. *	15185. *

	1	2	3	4	5
DISCOUNT RATE (%)	10.	15.	20.	25.	40.
NET PRESENT VALUE "A"	86510.	21054.	-13801.	-32055.	-46006.
NET PRESENT VALUE "B"	192851.	63132.	23965.	9977.	1017.
NET PRESENT VALUE	279361.	84186.	10164.	-22078.	-44989.
	83052. *	44304. *	27649. *	18769. *	7874. *

CASH FLOW PROJECTION ($ THOUSANDS)

	YEAR				
	6	7	8	9	10
AFTER TAX PROFIT	30784.	38021.	60061.	64344.	66091.
INCREASE IN PAYABLES	251.	188.	24.	57.	67.
DECREASE IN RECEIVABLES	55.	103.	22.	655.	1373.
DECREASE IN CASH	102.	110.	315.	156.	132.
DEPRECIATION	14936.	20503.	21774.	22381.	23094.
TOTAL CASH INFLOW	46128.	58925.	82197.	87593.	90758.
LOSS	18.	0.	1.	24.	19.
DECREASE IN PAYABLES	567.	607.	1744.	862.	733.
INCREASE IN RECEIVABLES	3509.	1786.	6924.	747.	311.
INCREASE IN CASH	45.	34.	4.	10.	12.
CAPITAL EXPENDITURES	33167.	28233.	8653.	6707.	8329.
TOTAL CASH OUTFLOW	37307.	30660.	17327.	8350.	9404.
NET CASH FLOW	8822.	28265.	64870.	79243.	81354.
	17106. *	14650. *	18177. *	18661. *	18596. *
INDEBTEDNESS	170589.	142323.	77454.	-1789.	-83143.
	26742. *	37266. *	49576. *	64336. *	78947. *

* STANDARD DEVIATION

CASH FLOW PROJECTION ($ THOUSANDS)

	YEAR				
	11	12	13	14	15
AFTER TAX PROFIT	68949.	63842.	60304.	70462.	70940.
INCREASE IN PAYABLES	211.	567.	225.	16.	0.
DECREASE IN RECEIVABLES	1243.	3329.	3386.	1545.	2608.
DECREASE IN CASH	63.	44.	127.	337.	333.
DEPRECIATION	23794.	25187.	29237.	26539.	19862.
TOTAL CASH INFLOW	94261.	92969.	93277.	98899.	93742.
LOSS	79.	113.	182.	173.	246.
DECREASE IN PAYABLES	350.	242.	701.	1862.	1843.
INCREASE IN RECEIVABLES	477.	367.	1052.	2864.	1137.
INCREASE IN CASH	38.	103.	41.	3.	0.
CAPITAL EXPENDITURES	16337.	30274.	32776.	16219.	1902.
TOTAL CASH OUTFLOW	17281.	31099.	34750.	21120.	5128.
NET CASH FLOW	76979.	61870.	58527.	77779.	88615.
	13584. *	20523. *	22648. *	20367. *	18193. *
INDEBTEDNESS	-160122.	-221992.	-280519.	-358298.	-446913.
	92967. *	104069. *	112061. *	121063. *	131860. *

* STANDARD DEVIATION

PROBABILITY OF ANNUAL LAUNCH ATTEMPTS

LAUNCH ATTEMPTS	PROBABILITY OF INDICATED QUANTITY (PERCENT)							
10	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
2	0	0	0	0	14	1	7	2
1	0	0	0	100	86	17	93	21
0	100	100	100	0	0	82	0	77
YEAR	1	2	3	4	5	6	7	8
AVERAGE VALUE	.00	.00	.00	1.00	1.14	.19	1.08	.26
STANDARD DEVIATION	.00	.00	.00	.00	.34	.41	.27	.43

PROBABILITY OF ANNUAL LAUNCH ATTEMPTS

LAUNCH ATTEMPTS	PROBABILITY OF INDICATED QUANTITY (PERCENT)						
10	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
3	0	0	0	0	1	1	0
2	1	1	1	3	16	14	1
1	11	13	13	25	54	48	9
0	88	86	86	72	29	36	90
YEAR	9	10	11	12	13	14	15
AVERAGE VALUE	.13	.15	.15	.31	.90	.82	.12
STANDARD DEVIATION	.35	.39	.37	.53	.70	.75	.35

PROBABILITY OF ANNUAL SPACECRAFT PURCHASES

NUMBER OF SPACECRAFT	PROBABILITY OF INDICATED QUANTITY (PERCENT)							
10	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
2	0	0	0	0	12	1	6	2
1	0	0	0	94	82	17	87	20
0	100	100	100	6	5	83	7	78
YEAR	1	2	3	4	5	6	7	8
AVERAGE VALUE	.00	.00	.00	.94	1.07	.18	1.00	.24
STANDARD DEVIATION	.00	.00	.00	.24	.42	.40	.38	.48

PROBABILITY OF ANNUAL SPACECRAFT PURCHASES

NUMBER OF SPACECRAFT	PROBABILITY OF INDICATED QUANTITY (PERCENT)						
10	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
3	0	0	0	0	1	1	0
2	1	1	1	2	14	13	1
1	11	12	13	24	53	48	9
0	89	87	87	74	32	38	90
YEAR	9	10	11	12	13	14	15
AVERAGE VALUE	.12	.14	.14	.29	.83	.77	.11
STANDARD DEVIATION	.34	.38	.36	.51	.68	.72	.34

[1] GLOBAL DATA (SYSTEM)

NO. YRS. ANALYZED	15				
MAX. # OPER. SATS	2				
LAUNCH DATES (YRS)					
SATELLITE NO. 1	4.5				
SATELLITE NO. 2	5.0				
SATELLITE NO. 3	0.0				
SATELLITE NO. 4	0.0				
SATELLITE NO. 5	0.0				
LAUNCH DELAYS					
MAX. DELAY(YRS)	0.8				
MIN. DELAY(YRS)	0.5				
UNCERT. PROFILE	2				
LEO TO GEO -	0.25	0.25	0.25	0.25	0.25
TRANSFER TIME -	0.25	0.25	0.25	0.25	0.25
(YRS 1 THRU 15)	0.25	0.25	0.25	0.25	0.25
NO. SIMUL. RUNS	1000				

[2] GLOBAL DATA (FINANCIAL)

DEBT SVC INT RT %	12.0				
EFFECT TAX RATE %	36.0				
INVEST TAX CRDT %	10.0				
TAX CREDIT ON ...					
LAUNCH COST	1				
INSURANCE COST	1				
S/C RECUR. COST	1				
OTHER CAP. EXP.	1				
PAYABLES (% EXP.)	8.3				
RCVS (% REV.)	16.7				
CASH (% EXP.)	1.5				
INSUR? (0=N/1=Y)	1				
S/C LEARN. RATE %	88.0				
DEPRECIATION LIFE (YRS)					
LAUNCH, INS., S/C	10.0				
OTHER CAP. EXP.	12.0				
DISCOUNT RATE (%)	10.0	15.0	20.0	25.0	40.0

[3] TRANSPONDER DATA

NARROW BAND	
NO. OF GROUPS	1
NO. TRANS/GRP	1
SPARE TRANS/GRP	1
MEAN TME FAIL-YR	31.2
EXP. WEAROUT-YRS	15.0
STD WEAROUT-YRS	2.0
WIDE BAND	
NO. OF GROUPS	1
NO. TRANS/GRP	2
SPARE TRANS/GRP	2
MEAN TME FAIL-YR	31.2
EXP. WEAROUT-YRS	15.0
STD WEAROUT-YRS	2.0
W/N BAND REL IMP.	1
TRNSPNDR THRSHLD	RELAUNCH
SATELLITE NO. 1	2
SATELLITE NO. 2	2
SATELLITE NO. 3	0
SATELLITE NO. 4	0
SATELLITE NO. 5	0

[4] SPACECRAFT SUPPORT SUBSYSTEM DATA

	SUBSYSTEM				
	POWER	AVCS	TT&C	STRUCTURE	OTHER
MEAN TME FAIL-YR	230.0	166.0	200.0	1000.0	10000.0
EXP. WEAROUT-YRS	15.0	7.0	15.0	20.0	20.0
STD WEAROUT-YRS	1.0	0.5	1.0	1.0	1.0

[5] LAUNCH SCENARIO DATA

PROBABILITY OF:	YEAR 1	2	3	4	5
BOOSTER SUCCESS	0.995	0.995	0.995	0.995	0.995
ORB SUC-NO ABORT	0.995	0.995	0.995	0.995	0.995
P/L OK FINAL ORB	0.900	0.900	0.900	0.900	0.900
PRPLSN MOD CKOUT	0.950	0.950	0.950	0.950	0.950
XFER LEO TO GEO	0.950	0.950	0.950	0.950	0.950
ORB RCVRY-ABORT	0.990	0.990	0.990	0.990	0.990
ORB RCVRY-B FAIL	0.990	0.990	0.990	0.990	0.990
ORB RCVRY-FLT OK	0.999	0.999	0.999	0.999	0.999
MAX LNCH COST M$	19.440	19.440	19.440	19.440	19.440
MIN LNCH COST M$	19.440	19.440	19.440	19.440	19.440
LNCH CST UNCRT PF	1	1	1	1	1

[5] LAUNCH SCENARIO DATA

PROBABILITY OF:	YEAR 6	7	8	9	10
BOOSTER SUCCESS	0.995	0.995	0.995	0.995	0.995
ORB SUC-NO ABORT	0.995	0.995	0.995	0.995	0.995
P/L OK FINAL ORB	0.900	0.900	0.900	0.900	0.900
PRPLSN MOD CKOUT	0.950	0.950	0.950	0.950	0.950
XFER LEO TO GEO	0.950	0.950	0.950	0.950	0.950
ORB RCVRY-ABORT	0.990	0.990	0.990	0.990	0.990
ORB RCVRY-B FAIL	0.990	0.990	0.990	0.990	0.990
ORB RCVRY-FLT OK	0.999	0.999	0.999	0.999	0.999
MAX LNCH COST M$	19.440	19.440	19.440	19.440	19.440
MIN LNCH COST M$	19.440	19.440	19.440	19.440	19.440
LNCH CST UNCRT PF	1	1	1	1	1

[5] LAUNCH SCENARIO DATA

PROBABILITY OF:	YEAR 11	12	13	14	15
BOOSTER SUCCESS	0.995	0.995	0.995	0.995	0.995
ORB SUC-NO ABORT	0.995	0.995	0.995	0.995	0.995
P/L OK FINAL ORB	0.900	0.900	0.900	0.900	0.900
PRPLSN MOD CKOUT	0.950	0.950	0.950	0.950	0.950
XFER LEO TO GEO	0.950	0.950	0.950	0.950	0.950
ORB RCVRY-ABORT	0.990	0.990	0.990	0.990	0.990
ORB RCVRY-B FAIL	0.990	0.990	0.990	0.990	0.990
ORB RCVRY-FLT OK	0.999	0.999	0.999	0.999	0.999
MAX LNCH COST M$	19.440	19.440	19.440	19.440	19.440
MIN LNCH COST M$	19.440	19.440	19.440	19.440	19.440
LNCH CST UNCRT PF	1	1	1	1	1

[6] DEMAND: SERVICE TYPE #1
SATELLITE # 1

	NARROW-BAND			WIDE-BAND		
YEAR	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	1	1	0	1	1	0
5	1	1	0	2	2	0
6	1	1	0	2	2	0
7	2	1	2	3	2	13
8	2	1	2	3	2	13
9	2	1	2	3	2	13
10	2	1	2	3	2	13
11	2	1	2	3	2	13
12	2	1	2	3	2	13
13	2	1	2	3	2	13
14	2	1	2	3	2	13
15	2	1	2	3	2	13

[7] DEMAND: SERVICE TYPE #1
SATELLITE # 2

	NARROW-BAND			WIDE-BAND		
YEAR	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	1	1	0	1	1	0
6	1	1	0	2	2	0
7	2	1	2	3	2	13
8	2	1	2	3	2	13
9	2	1	2	3	2	13
10	2	1	2	3	2	13
11	2	1	2	3	2	13
12	2	1	2	3	2	13
13	2	1	2	3	2	13
14	2	1	2	3	2	13
15	2	1	2	3	2	13

[8] DEMAND: SERVICE TYPE #1
SATELLITE # 3

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[9] DEMAND: SERVICE TYPE #1
SATELLITE # 4

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[10] DEMAND: SERVICE TYPE #1
SATELLITE # 5

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[11] DEMAND: SERVICE TYPE #2
SATELLITE # 1

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[12] DEMAND: SERVICE TYPE #2
SATELLITE # 2

	NARROW-BAND			WIDE-BAND		
YEAR	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[13] DEMAND: SERVICE TYPE #2
SATELLITE # 3

	NARROW-BAND			WIDE-BAND		
YEAR	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[14] DEMAND: SERVICE TYPE #2
SATELLITE # 4

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[15] DEMAND: SERVICE TYPE #2
SATELLITE # 5

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[16] DEMAND: SERVICE TYPE #3
SATELLITE # 1

	NARROW-BAND			WIDE-BAND		
YEAR	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[17] DEMAND: SERVICE TYPE #3
SATELLITE # 2

	NARROW-BAND			WIDE-BAND		
YEAR	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[18] DEMAND: SERVICE TYPE #3
SATELLITE # 3

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[19] DEMAND: SERVICE TYPE #3
SATELLITE # 4

YEAR	NARROW-BAND MAX. DEMAND	NARROW-BAND MIN. DEMAND	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. DEMAND	WIDE-BAND MIN. DEMAND	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[20]

DEMAND: SERVICE TYPE #3
SATELLITE # 5

	NARROW-BAND			WIDE-BAND		
YEAR	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[21]

DEMAND: SERVICE TYPE #4
SATELLITE # 1

	NARROW-BAND			WIDE-BAND		
YEAR	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[22] DEMAND: SERVICE TYPE #4
SATELLITE # 2

	NARROW-BAND			WIDE-BAND		
YEAR	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[23] DEMAND: SERVICE TYPE #4
SATELLITE # 3

	NARROW-BAND			WIDE-BAND		
YEAR	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[24] DEMAND: SERVICE TYPE #4
SATELLITE # 4

	NARROW-BAND			WIDE-BAND		
YEAR	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[25] DEMAND: SERVICE TYPE #4
SATELLITE # 5

	NARROW-BAND			WIDE-BAND		
YEAR	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE	MAX. DEMAND	MIN. DEMAND	UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[26]

PRICE (K$/YR): SERVICE TYPE #1

YEAR	NARROW-BAND MAX. PRICE	NARROW-BAND MIN. PRICE	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. PRICE	WIDE-BAND MIN. PRICE	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	17000	14000	4	17000	14000	4
5	17000	14000	4	17000	14000	4
6	17000	14000	4	17000	14000	4
7	17000	14000	4	17000	14000	4
8	19000	15000	16	19000	15000	16
9	19000	15000	16	19000	15000	16
10	19000	15000	16	19000	15000	16
11	19000	15000	16	19000	15000	16
12	19000	15000	16	19000	15000	16
13	19000	15000	16	19000	15000	16
14	19000	15000	16	19000	15000	16
15	19000	15000	16	19000	15000	16

[27]

PRICE (K$/YR): SERVICE TYPE #2

YEAR	NARROW-BAND MAX. PRICE	NARROW-BAND MIN. PRICE	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. PRICE	WIDE-BAND MIN. PRICE	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[28] PRICE (K$/YR): SERVICE TYPE #3

YEAR	NARROW-BAND MAX. PRICE	NARROW-BAND MIN. PRICE	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. PRICE	WIDE-BAND MIN. PRICE	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[29] PRICE (K$/YR): SERVICE TYPE #4

YEAR	NARROW-BAND MAX. PRICE	NARROW-BAND MIN. PRICE	NARROW-BAND UNCERT. PROFILE	WIDE-BAND MAX. PRICE	WIDE-BAND MIN. PRICE	WIDE-BAND UNCERT. PROFILE
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0

[30] PRICE ELASTICITY DATA

% DEMAND DECREASE RESULTING FROM A 25% PRICE INCREASE	NARROW-BAND	WIDE-BAND
1. PROTECTED	35.0	35.0
2. PROTECTED/PREEMPTIBLE	35.0	35.0
3. UNPROTECTED/NON-PREEMPTIBLE	35.0	35.0
4. PREEMPTIBLE	35.0	35.0

[31] CORRELATION DATA

TYPE OF SERVICE	CORRELATION COEFFICIENT NARROW-BAND	WIDE-BAND
DEMAND DATA		
1. PROTECTED	0.8	0.8
2. PROTECTED/PREEMPTIBLE	0.8	0.8
3. UNPROTECTED/NON-PREEMPTIBLE	0.8	0.8
4. PREEMPTIBLE	0.8	0.8
PRICE DATA		
1. PROTECTED	0.8	0.8
2. PROTECTED/PREEMPTIBLE	0.8	0.8
3. UNPROTECTED/NON-PREEMPTIBLE	0.8	0.8
4. PREEMPTIBLE	0.8	0.8
S/C CONTROL OPERATIONS	0.8	
ENGINEERING EXPENSE	0.8	
R&D EXPENSE	0.8	
G&A EXPENSE	0.8	
OTHER CAPITAL EXPENDITURES	0.8	

[32] COST/EXPENSE DATA

MAX. S/C UNIT COST (K$)	71700.0
MIN. S/C UNIT COST (K$)	62200.0
S/C UNIT COST UNCERTAINTY PROFILE	13
MAX. S/C NONRECURRING COST (K$)	53800.0
MIN. S/C NONRECURRING COST (K$)	35900.0
S/C NONREC. COST UNCERT. PROFILE	11
MAX. INSURANCE %	18.0
MIN. INSURANCE %	12.0
INSURANCE UNCERTAINTY PROFILE	22

[33] COST/EXPENSE DATA (CONTINUED)

S/C CONTROL OPERATIONS COST(%)

YEAR	MAX. COST(%)	MIN. COST(%)	UNCERT. PROFILE
1	0.0	0.0	0
2	0.0	0.0	0
3	0.0	0.0	0
4	7.5	2.5	4
5	6.0	2.0	4
6	5.0	1.7	4
7	5.0	1.7	4
8	4.2	1.4	4
9	4.2	1.4	4
10	4.2	1.4	4
11	4.2	1.4	4
12	4.2	1.4	4
13	5.0	1.7	4
14	5.0	1.7	4
15	5.0	1.7	4

[34] ENGINEERING EXPENSE

YEAR	MAX. (K$)	MIN. (K$)	UNCERT. PROFILE	MAX. (%)	MIN. (%)	UNCERT. PROFILE
1	2000.0	2000.0	1	2.0	2.0	1
2	2000.0	2000.0	1	2.0	2.0	1
3	2000.0	2000.0	1	2.0	2.0	1
4	2000.0	2000.0	1	2.0	2.0	1
5	1500.0	1500.0	1	1.5	1.5	1
6	1500.0	1500.0	1	1.5	1.5	1
7	1500.0	1500.0	1	1.5	1.5	1
8	1500.0	1500.0	1	1.5	1.5	1
9	1500.0	1500.0	1	1.5	1.5	1
10	1500.0	1500.0	1	1.5	1.5	1
11	1500.0	1500.0	1	1.5	1.5	1
12	1500.0	1500.0	1	1.5	1.5	1
13	1500.0	1500.0	1	1.5	1.5	1
14	1500.0	1500.0	1	1.5	1.5	1
15	1500.0	1500.0	1	1.5	1.5	1
SUM K$ & % AMTS	0					

[35] R$D EXPENSE

YEAR	MAX. (K$)	MIN. (K$)	UNCERT. PROFILE	MAX. (%)	MIN. (%)	UNCERT. PROFILE
1	1000.0	1000.0	1	1.5	1.5	1
2	1000.0	1000.0	1	1.5	1.5	1
3	1000.0	1000.0	1	1.5	1.5	1
4	1000.0	1000.0	1	1.5	1.5	1
5	2000.0	2000.0	1	1.5	1.5	1
6	2000.0	2000.0	1	1.5	1.5	1
7	2000.0	2000.0	1	1.5	1.5	1
8	2000.0	2000.0	1	1.5	1.5	1
9	2000.0	2000.0	1	1.5	1.5	1
10	2000.0	2000.0	1	1.5	1.5	1
11	2000.0	2000.0	1	1.5	1.5	1
12	2000.0	2000.0	1	1.5	1.5	1
13	2000.0	2000.0	1	1.5	1.5	1
14	2000.0	2000.0	1	1.5	1.5	1
15	2000.0	2000.0	1	1.5	1.5	1
SUM K$ & % AMTS	0					

[36]

G&A EXPENSE

YEAR	MAX. (K$)	MIN. (K$)	UNCERT. PROFILE	MAX. (%)	MIN. (%)	UNCERT. PROFILE
1	500.0	500.0	1	0.0	0.0	1
2	1000.0	1000.0	1	0.0	0.0	1
3	1500.0	1500.0	1	0.0	0.0	1
4	2000.0	2000.0	1	3.0	3.0	1
5	2500.0	2500.0	1	3.0	3.0	1
6	3000.0	3000.0	1	3.0	3.0	1
7	3000.0	3000.0	1	3.0	3.0	1
8	3000.0	3000.0	1	3.0	3.0	1
9	3000.0	3000.0	1	3.0	3.0	1
10	3000.0	3000.0	1	3.0	3.0	1
11	3000.0	3000.0	1	3.0	3.0	1
12	3000.0	3000.0	1	3.0	3.0	1
13	3000.0	3000.0	1	3.0	3.0	1
14	3000.0	3000.0	1	3.0	3.0	1
15	3000.0	3000.0	1	3.0	3.0	1
SUM K$ & % AMTS	1					

[37]

CAPITAL EXPENDITURE DATA

OTHER CAPITAL EXPENDITURES

YEAR	MAX. (K$)	MIN. (K$)	UNCERT. PROFILE
1	0.0	0.0	0
2	0.0	0.0	0
3	3000.0	2000.0	16
4	3000.0	2000.0	16
5	0.0	0.0	0
6	0.0	0.0	0
7	0.0	0.0	0
8	0.0	0.0	0
9	0.0	0.0	0
10	0.0	0.0	0
11	0.0	0.0	0
12	0.0	0.0	0
13	0.0	0.0	0
14	0.0	0.0	0
15	0.0	0.0	0

COST SPREADING FUNCTIONS

	YEAR 1	2	3	4	5
LAUNCH COST	35.2	55.0	9.8	0.0	0.0
INSURANCE	100.0	0.0	0.0	0.0	0.0
S/C RECUR COST	20.0	48.5	31.5	0.0	0.0
NONRECUR COST	79.0	21.0	0.0	0.0	0.0

[38]

UNCERTAINTY PROFILE DATA

PROFILE I.D.	PROFILE INTERVAL 1	2	3	4	5
1	0.50	0.25	0.15	0.07	0.03
2	0.30	0.25	0.20	0.15	0.10
3	0.30	0.30	0.20	0.13	0.07
4	0.35	0.40	0.15	0.07	0.03
5	0.21	0.32	0.27	0.15	0.05
6	0.23	0.30	0.23	0.16	0.08
7	0.25	0.35	0.25	0.10	0.05
8	0.16	0.49	0.24	0.09	0.02
9	0.12	0.32	0.32	0.17	0.07
10	0.15	0.34	0.37	0.12	0.02
11	0.80	0.10	0.05	0.03	0.02
12	0.15	0.22	0.26	0.22	0.15
13	0.10	0.25	0.30	0.25	0.10
14	0.08	0.25	0.34	0.25	0.08
15	0.05	0.25	0.40	0.25	0.05
16	0.10	0.20	0.40	0.20	0.10
17	0.03	0.30	0.34	0.30	0.03
18	0.05	0.20	0.50	0.20	0.05
19	0.03	0.20	0.54	0.20	0.03
20	0.03	0.07	0.80	0.07	0.03

PROFORMA INCOME STATEMENT ($ THOUSANDS)

	YEAR 1	2	3	4	5
PROTECTED	0.	0.	0.	12117.	72497.
PROTECTED/PREEMPT.	0.	0.	0.	0.	0.
UNPROTECTED/NON-PREEMPT.	0.	0.	0.	0.	0.
PREEMPTIBLE	0.	0.	0.	0.	0.
TOTAL REVENUE	0.	0.	0.	12117.	72497.
	0. *	0. *	0. *	5777. *	19439. *
LAUNCH OPERATIONS	0.	0.	0.	1588.	3713.
LAUNCH INSURANCE	0.	0.	0.	1104.	2482.
SATELLITE	0.	0.	0.	5476.	12169.
OTHER	0.	0.	209.	425.	425.
DEPRECIATION EXPENSE	0.	0.	209.	8593.	18789.
S/C CONTROL OPERATIONS	0.	0.	0.	490.	2468.
ENGINEERING EXPENSE	2000.	2000.	2000.	2000.	1500.
RESEARCH & DEVELOPMENT	1000.	1000.	1000.	1000.	2000.
TOTAL OPERATIONS EXPENSE	3000.	3000.	3209.	12082.	24757.
	0. *	0. *	19. *	4108. *	3553. *
GROSS MARGIN ($)	-3000.	-3000.	-3209.	34.	47740.
	0. *	0. *	19. *	1797. *	17366. *
S/C NONRECURRING COST	31695.	8425.	0.	0.	0.
G & A EXPENSE	500.	1000.	1500.	2363.	4675.
DEBT SERVICE EXPENSE	0.	2416.	7754.	19184.	30158.
BEFORE TAX PROFIT	-35195.	-14841.	-12463.	-21513.	12907.
INCOME TAX	-12670.	-5343.	-4487.	-7745.	4647.
INVESTMENT TAX CREDIT	0.	0.	251.	8427.	10196.
AFTER TAX PROFIT	-22525.	-9498.	-7726.	-5341.	18457.
	2202. *	736. *	1240. *	2552. *	9506. *
RETURN ON ASSETS (%)	-4267.	-798.	-7.	-3.	7.
	0. *	1642. *	11. *	2. *	4. *
RETURN ON SALES (%)	0.	0.	0.	-24.	22.
	0. *	0. *	0. *	25. *	27. *

* STANDARD DEVIATION

PROFORMA INCOME STATEMENT ($ THOUSANDS)

	YEAR				
	6	7	8	9	10
PROTECTED	84668.	83414.	92936.	92633.	91247.
PROTECTED/PREEMPT.	0.	0.	0.	0.	0.
UNPROTECTED/NON-PREEMPT.	0.	0.	0.	0.	0.
PREEMPTIBLE	0.	0.	0.	0.	0.
TOTAL REVENUE	84668.	83414.	92936.	92633.	91247.
	10769. *	10743. *	12212. *	12488. *	13437. *
LAUNCH OPERATIONS	3962.	4102.	4246.	4423.	4578.
LAUNCH INSURANCE	2637.	2718.	2799.	2896.	2978.
SATELLITE	12896.	13273.	13643.	14084.	14460.
OTHER	425.	425.	425.	425.	425.
DEPRECIATION EXPENSE	19920.	20517.	21112.	21826.	22441.
S/C CONTROL OPERATIONS	2503.	2557.	2436.	2490.	2513.
ENGINEERING EXPENSE	1500.	1500.	1508.	1506.	1505.
RESEARCH & DEVELOPMENT	2000.	2000.	2000.	2000.	2000.
TOTAL OPERATIONS EXPENSE	25923.	26574.	27056.	27823.	28458.
	2560. *	3248. *	4225. *	5577. *	6351. *
GROSS MARGIN ($)	58745.	56840.	65880.	64811.	62789.
	11103. *	12672. *	14729. *	15902. *	17617. *
S/C NONRECURRING COST	0.	0.	0.	0.	0.
G & A EXPENSE	5540.	5502.	5788.	5779.	5737.
DEBT SERVICE EXPENSE	32386.	29707.	26267.	22060.	17593.
BEFORE TAX PROFIT	20819.	21630.	33825.	36972.	39458.
INCOME TAX	7495.	7787.	12177.	13310.	14205.
INVESTMENT TAX CREDIT	1131.	597.	595.	715.	614.
AFTER TAX PROFIT	14455.	14441.	22243.	24377.	25867.
	6567. *	8924. *	11257. *	12793. *	15623. *
RETURN ON ASSETS (%)	6.	7.	11.	14.	15.
	3. *	4. *	5. *	7. *	8. *
RETURN ON SALES (%)	16.	16.	22.	25.	26.
	16. *	13. *	15. *	16. *	21. *

* STANDARD DEVIATION

PROFORMA INCOME STATEMENT ($ THOUSANDS)

	YEAR				
	11	12	13	14	15
PROTECTED	72702.	55075.	73464.	85848.	85590.
PROTECTED/PREEMPT.	0.	0.	0.	0.	0.
UNPROTECTED/NON-PREEMPT.	0.	0.	0.	0.	0.
PREEMPTIBLE	0.	0.	0.	0.	0.
TOTAL REVENUE	72702.	55075.	73464.	85848.	85590.
	20025. *	24303. *	23333. *	18930. *	21071. *
LAUNCH OPERATIONS	5025.	6596.	7850.	6709.	4677.
LAUNCH INSURANCE	3212.	4024.	4667.	3787.	2455.
SATELLITE	15514.	19131.	21971.	17490.	11000.
OTHER	425.	425.	425.	425.	216.
DEPRECIATION EXPENSE	24175.	30176.	34913.	28410.	18348.
S/C CONTROL OPERATIONS	2019.	1552.	2505.	2950.	2959.
ENGINEERING EXPENSE	1501.	1500.	1501.	1502.	1502.
RESEARCH & DEVELOPMENT	2000.	2000.	2000.	2000.	2000.
TOTAL OPERATIONS EXPENSE	29695.	35228.	40918.	34862.	24809.
	7551. *	8199. *	7432. *	7658. *	6449. *
GROSS MARGIN ($)	43007.	19847.	32546.	50986.	60781.
	22394. *	24914. *	23753. *	22308. *	24469. *
S/C NONRECURRING COST	0.	0.	0.	0.	0.
G & A EXPENSE	5181.	4652.	5204.	5575.	5568.
DEBT SERVICE EXPENSE	14408.	14088.	14712.	12447.	7584.
BEFORE TAX PROFIT	23418.	1107.	12630.	32963.	47629.
INCOME TAX	8431.	398.	4547.	11867.	17146.
INVESTMENT TAX CREDIT	1735.	6000.	4737.	1666.	343.
AFTER TAX PROFIT	16722.	6709.	12820.	22762.	30826.
	17466. *	18893. *	19209. *	20634. *	23088. *
RETURN ON ASSETS (%)	9.	4.	7.	12.	18.
	8. *	8. *	8. *	10. *	13. *
RETURN ON SALES (%)	16.	-6.	10.	21.	30.
	46. *	80. *	51. *	46. *	41. *

* STANDARD DEVIATION

CASH FLOW PROJECTION ($ THOUSANDS)

	YEAR 1	2	3	4	5
AFTER TAX PROFIT	0.	0.	0.	0.	18649.
INCREASE IN PAYABLES	2921.	1614.	4373.	1268.	32.
DECREASE IN RECEIVABLES	0.	0.	0.	0.	0.
DECREASE IN CASH	0.	56.	0.	1.	524.
DEPRECIATION	0.	0.	209.	8593.	18789.
TOTAL CASH INFLOW	2921.	1670.	4582.	9862.	37995.
LOSS	22525.	9498.	7726.	5341.	192.
DECREASE IN PAYABLES	0.	311.	1.	8.	2902.
INCREASE IN RECEIVABLES	0.	0.	0.	2023.	10084.
INCREASE IN CASH	528.	292.	790.	229.	6.
CAPITAL EXPENDITURES	0.	36053.	91315.	93712.	43375.
TOTAL CASH OUTFLOW	23053.	46154.	99832.	101315.	56559.
NET CASH FLOW	-20132.	-44484.	-95250.	-91452.	-18564.
	1968. *	15952. *	16752. *	17095. *	25350. *
INDEBTEDNESS	20132.	64616.	159866.	251318.	269882.
	1968. *	16144. *	32080. *	25054. *	23101. *

	1	2	3	4	5
DISCOUNT RATE (%)	10.	15.	20.	25.	40.
NET PRESENT VALUE "A"	-104199.	-112052.	-111458.	-106939.	-87386.
NET PRESENT VALUE "B"	102878.	33678.	12784.	5322.	543.
NET PRESENT VALUE	-1321.	-78374.	-98674.	-101616.	-86843.
	95689. *	53308. *	34733. *	24749. *	12361. *

CASH FLOW PROJECTION ($ THOUSANDS)

	YEAR				
	6	7	8	9	10
AFTER TAX PROFIT	14855.	15331.	23077.	25306.	27303.
INCREASE IN PAYABLES	15.	127.	147.	265.	964.
DECREASE IN RECEIVABLES	135.	584.	278.	798.	912.
DECREASE IN CASH	489.	87.	71.	74.	36.
DEPRECIATION	19920.	20517.	21112.	21826.	22441.
TOTAL CASH INFLOW	35414.	36646.	44685.	48270.	51655.
LOSS	400.	890.	834.	929.	1436.
DECREASE IN PAYABLES	2707.	482.	393.	411.	198.
INCREASE IN RECEIVABLES	2168.	374.	1869.	747.	680.
INCREASE IN CASH	3.	23.	27.	48.	174.
CAPITAL EXPENDITURES	7817.	6204.	6506.	8911.	22627.
TOTAL CASH OUTFLOW	13094.	7974.	9628.	11047.	25115.
NET CASH FLOW	22320.	28672.	35057.	37223.	26541.
	19575. *	18680. *	19763. *	20031. *	21248. *
INDEBTEDNESS	247561.	218889.	183832.	146609.	120068.
	35896. *	51412. *	68192. *	83943. *	97630. *

* STANDARD DEVIATION

CASH FLOW PROJECTION ($ THOUSANDS)

	YEAR				
	11	12	13	14	15
AFTER TAX PROFIT	18995.	11201.	16369.	25620.	33486.
INCREASE IN PAYABLES	1405.	638.	137.	35.	1.
DECREASE IN RECEIVABLES	3462.	4036.	1007.	604.	923.
DECREASE IN CASH	21.	94.	302.	286.	165.
DEPRECIATION	24175.	30176.	34913.	28410.	18348.
TOTAL CASH INFLOW	48058.	46145.	52727.	54955.	52923.
LOSS	2273.	4492.	3548.	2857.	2660.
DECREASE IN PAYABLES	117.	519.	1670.	1585.	912.
INCREASE IN RECEIVABLES	365.	1093.	4079.	2672.	880.
INCREASE IN CASH	254.	115.	25.	6.	0.
CAPITAL EXPENDITURES	42379.	45131.	24532.	7308.	1199.
TOTAL CASH OUTFLOW	45388.	51350.	33853.	14429.	5651.
NET CASH FLOW	2670.	-5205.	18874.	40526.	47272.
	22062. *	21919. *	24978. *	20800. *	18020. *
INDEBTEDNESS	117398.	122603.	103729.	63203.	15931.
	106257. *	110355. *	117716. *	130017. *	144771. *

* STANDARD DEVIATION

PROBABILITY OF ANNUAL LAUNCH ATTEMPTS

LAUNCH ATTEMPTS	PROBABILITY OF INDICATED QUANTITY (PERCENT)							
10	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
3	0	0	0	0	3	0	0	0
2	0	0	0	0	30	1	0	0
1	0	0	0	100	67	14	8	9
0	100	100	100	0	0	85	91	91
YEAR	1	2	3	4	5	6	7	8
AVERAGE VALUE	.00	.00	.00	1.00	1.37	.15	.09	.09
STANDARD DEVIATION	.00	.00	.00	.00	.55	.38	.30	.30

PROBABILITY OF ANNUAL LAUNCH ATTEMPTS

LAUNCH ATTEMPTS	PROBABILITY OF INDICATED QUANTITY (PERCENT)						
10	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
3	0	0	0	1	1	0	0
2	1	1	1	24	15	3	0
1	10	9	26	51	48	24	5
0	90	90	73	24	36	74	95
YEAR	9	10	11	12	13	14	15
AVERAGE VALUE	.11	.11	.28	1.01	.81	.30	.06
STANDARD DEVIATION	.32	.34	.47	.71	.73	.52	.25

PROBABILITY OF ANNUAL SPACECRAFT PURCHASES

NUMBER OF SPACECRAFT	PROBABILITY OF INDICATED QUANTITY (PERCENT)							
10	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0
3	0	0	0	0	2	0	0	0
2	0	0	0	0	25	0	0	0
1	0	0	0	94	73	14	8	8
0	100	100	100	6	0	86	92	91
YEAR	1	2	3	4	5	6	7	8
AVERAGE VALUE	.00	.00	.00	.94	1.28	.14	.09	.09
STANDARD DEVIATION	.00	.00	.00	.24	.50	.36	.29	.29

PROBABILITY OF ANNUAL SPACECRAFT PURCHASES

NUMBER OF SPACECRAFT	PROBABILITY OF INDICATED QUANTITY (PERCENT)						
10	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
3	0	0	0	0	1	0	0
2	0	0	1	21	13	2	0
1	10	9	24	52	47	23	5
0	90	91	75	27	40	74	95
YEAR	9	10	11	12	13	14	15
AVERAGE VALUE	.10	.10	.26	.95	.75	.28	.06
STANDARD DEVIATION	.31	.32	.46	.70	.71	.51	.24

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
NASA CR-174979		

4. Title and Subtitle	5. Report Date
Evaluation of Spacecraft Technology Programs (Effects on Communication Satellite Business Ventures) - Volume II	September 1985
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
Joel S. Greenburg, Carole Gaelick, Marshall Kaplan, Janis Fishman, and Charles Hopkins	None
	10. Work Unit No.

9. Performing Organization Name and Address	11. Contract or Grant No.
Econ, Inc. 1800 Diagonal Road, Suite 290 Alexandria, Virginia 22314	NAS 3-23886
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address	Contractor Report
National Aeronautics and Space Administration Washington, D.C. 20546	14. Sponsoring Agency Code
	506-62-22

15. Supplementary Notes

Final Report. Project Manager, Karl A. Faymon, Power Technology Division, NASA Lewis Research Center, Cleveland, Ohio 44135. Joel S. Greenburg, Carole Gaelick, and Janis Fishman, Princeton Synergetics, Inc., Princeton, New Jersey 08540; Marshall Kaplan, Spacetech Inc., P.O. Box 1109, State College, Pennsylvania 16801; Charles Hopkins, Econ, Inc., San Jose, California 95117.

16. Abstract

Commercial organizations as well as government agencies invest in spacecraft (S/C) technology programs that are aimed at increasing the performance of communications satellites. The value of these programs must be measured in terms of their impacts on the financial performance of the business ventures that may ultimately utilize the communications satellites. An economic evaluation and planning capability has been developed and used to assess the impact of NASA on-orbit propulsion and space power programs on typical fixed satellite service (FSS) and direct broadcast service (DBS) communications satellite business ventures. Typical FSS and DBS spin and three-axis stabilized spacecraft were configured in the absence of NASA technology programs. These spacecraft were reconfigured taking into account the anticipated results of NASA specified on-orbit propulsion and space power programs. In general, the NASA technology programs resulted in spacecraft with increased capability. This report describes the developed methodology for assessing the value of spacecraft technology programs in terms of their impact on the financial performance of communication satellite business ventures. Results of the assessment of NASA specified on-orbit propulsion and space power technology programs are presented for typical FSS and DBS business ventures. This report consists of two volumes. Volume 1 describes the methodology and contains the results of the analyses performed for the on-orbit propulsion and space power technology programs. Volume 2 contains appendices describing the DOMSAT II Model and data base and includes user and programmer documentation.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
Communications satellites; On-orbit propulsion; Galium arsenide solar cells; Economic analyses	Unclassified - unlimited STAR Category 32

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of pages	22. Price*
Unclassified	Unclassified	155	A08

*For sale by the National Technical Information Service, Springfield, Virginia 22161

National Aeronautics and
Space Administration

Lewis Research Center
Cleveland, Ohio 44135

SECOND CLASS MAIL

ADDRESS CORRECTION REQUESTED

Official Business
Penalty for Private Use $300

Postage and Fees Paid
National Aeronautics and
Space Administration
NASA-451

NASA