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J. C. Bobick
R. L. Braun
R. E. Denny

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By

SRI International
333 Ravenswood Avenue
Menlo Park, California 94025

For

Ames Research Center
National Aeronautics and Space Administration
Moffett Field, California 94035

Appendix A
COMMON BLOCK AND VARIABLE DEFINITION

Table A.1 presents common block definition and use information for all common blocks in the ABC-ART program. For each common block, the routines where variables in the block are initially defined, redefined, and used are shown.

In Tables A.2, A.3, and A.4 alphabetical lists of all variables in the Fleet Accounting, Airframe Manufacturer, and Air Carrier Modules, respectively, are presented. For each variable, the mode type (real, integer, etc.), the means by which values are assigned (input, calculation, etc.), the dimension if an array, the parameters referenced by each array subscript (aircraft type, year, etc.), the common block membership, the routine where a value was initially assigned, and the definition of the variable are given. The codes used in these tables are given in footnotes to the tables.

Table A.1

COMMON BLOCK DEFINITION AND USAGE

BLOCK NAME	ROUTINES WHERE COMMON BLOCK IS		
	DEFINED	REDEFINED	USED
ACCASHF	CASHFLW		CASHFLW, INRR, INTROR
ACCINCO	REVENUE		REVENUE, CASHFLW, INTROR
ACCOST	CASHFLW		CASHFLW
ACCUMS	SHARE		BET, SHARE, CURVES
CASHFLO	CASHFLW		CASHFLW, INRR, INTROR
COMPCST	COMPCOS		COMPCOS, CASHFLW, INTROR
COSTOT	ACCOST, COMPCOS		ACCOST, COMPCOS, COSTPR
CSHFLO	ACCOST		ACCOST, COMPCOS
CUMOUT	ACCOST		ACCOST, COSTPR
DELAY	RDTE		RDTE
DELIVER	PLANT		PLANT, REVENUE, COMPCOS (inactive)
DEMAND	INPLANT		INPLANT, PLANT
IN			OPLIFE, REPAY, DEPSUB, NETSUB, SUM, CFSUB, DCFSUB, OUTPUT, TAX
INCOME	REVENUE		REVENUE, CASHFLW, INTROR
INDICES	BET		BET, AMORITZ, MODS, BUYS, PLOTSGL, INPLANT
LIFETIM	INPLANT		PLANT, INPLANT
MARKET	BET		BET, BUYS
MAXP	PLANT		PLANT
MODS	BET		BET, MODS
ORDER	PLANT		PLANT, REVENUE, COMPCOS (inactive)
PERIOD	RDTE		RDTE
PLOTDAT	BET		BET, CURVES, PLOTTER
POP	BET		BET, AMORITZ, BUYS, PLOTSGL, INPLANT
PRDSCHL	PLANT		PLANT, COMPCOS (inactive)
PRICEO	ACPRICE	INPLANT	ACPRICE, INPLANT, REVENUE
PRINT	INPLANT		INPLANT, INTROR
PRODIDS	COMPCOS		COMPCOS, INTROR
PRODUCT	PLANT		PLANT, COMPCOS
RDTECMP	RDTE		RDTE, CASHFLW, INTROR

Table A.1

COMMON BLOCK DEFINITION AND USAGE (Concluded)

BLOCK NAME	ROUTINES WHERE COMMON BLOCK IS		
	DEFINED	REDEFINED	USED
RDTELBL	RDTE		RDTE, INTROR
RESULTS	BET		BET, MODS, BUYS, PLOTSGL
SHARES	SHARE		BET, SHARE
STARTER	BET		BET, CURVES, PLOTTER, PLOTSGL
STARTUP	INPLANT		INPLANT, PLANT
STATLIST	BET	MODS	BET, MODS, AMORTIZ, PLOTSGL
TOTAL	PLANT		PLANT, COMPCOS, REVENUE
TOTALS	BET	BET	BET, SHARE
TRDTEC	ACCOST		ACCOST, RDTE, COSTPR, COMPCOS
TTLCMP	ACCOST		ACCOST, COMPCOS, COSTPR
TTS	PLANT	PLANT	PLANT, RDTE, COMPCOS (inactive)

Table A.2

DEFINITION OF FLEET ACCOUNTING MODULE VARIABLES

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
BUY	R	C				BET	Cumulative number of aircraft brought up through a given year of a particular type or in a market or in all markets.
CARD	A	I	8	DI		UNIT04	Data on an input card.
CURVE	R	C	33	C		PLOTTER	Storage array for RPM or fuel consumption data to be plotted next.
D1	R				STARTER		Not defined.
D2	R				STARTER		Not defined.
DUMMY	R	A	15	DI	STARTER	CURVES	Temporary designation for unused variables in common starter.
DYEAR	I	C				AMORTIZ	Past year such that aircraft bought in that year are of retirement age in the current year.
FBURNED	R	C			TOTALS	BET	Fuel consumed in given year by aircraft of a given type; or cumulative fuel consumed up through a given year by aircraft of a particular type or in a market or in all markets.
FBURNED	R	C	31	Y		PLOTSGL	Fuel consumed in a year by aircraft of a specific type.
FCTFUEL	R	C				BET	Fraction of fuel burned in a given year in a specific market relative to total fuel burned in the year.
FCTPOPL	R	C				BET	Fraction of the number of aircraft in service in a given year in a specific market relative to total aircraft in service in the year.
FCTRPMS	R	C				BET	Fraction of the RPMs generated in a given year in a specific market relative to the total RPMs generated in the year.
FCTSMIS	R	C				BET	Fraction of the seat miles flown in a given year in a specific market relative to the total seat miles flown in the year.

Table A.2 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
FUELBRN	R	C	10,31	A,Y	RESULTS	BET	Fuel consumed per aircraft of each type in each year.
FUELBRN	R	C	30,31	C,Y	PLOTDAT	CURVES	Array for storing fuel consumption data for plotting aircraft market share curves.
GROWTH	R	I	31	Y		BET	Growth rate (in percent) of RPMs for each year.
I	I	C				BET	Various uses: Do loop index, array index, etc.
IN	I	C			INDICES	BET	Index equal to number of existing aircraft types plus one.
IT	I	C				BET	Array element index.
J	I	C				BET	Various uses: Do loop index, array index, etc.
LF	R	I	31	Y	STATLIST	BET	Load factor for flights in a market for each year.
LIFETIM	R	I	10	A	STATLIST	BET	Lifetime or nominal retirement age in years for each type of aircraft.
LOADFCT	R	C				BUYS	Computed load factor for flights in a market in a year when seat miles supplied exceeds number needed to maintain input load factor (decimal).
LUN	I	A				BET	Equal to 9, a logical unit number for the plotter.
LUN11	I	A				BET	Equal to 11, a logical unit number for the plotter.
MARKET	R	C	31	Y	MARKET	BET	Projected RPMs demanded in each year.
MAXFBRN	I	C				PLOTSGL	Maximum value of fuel consumption in hundreds of millions of barrels.
MAXRPMS	I	C				PLOTSGL	Maximum value of RPMs flown in hundreds of billions of miles.
MLIFET	R	I	10	A	MODS	BET	Lifetime or nominal retirement age in years for modified aircraft.
MODATA	A,R	I	7	MD		BET	Temporary storage for seven data items pertaining to modified aircraft: MTYPE, MODYR, MSEATS, MSFC, MSPEED, MUTILIZ, MLIFET.

Table A.2 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
MODYR	R	I	10	A	MODS	BET	Year in which aircraft modification to begin.
MRKT	I	A				BET	Number indicator for each market.
MRKTYPE	A2	I	3	MA	STARTER	BET	Alphanumeric name given each market.
MSEATS	R	I	10	A	MODS	BET	Average number of seats in modified aircraft.
MSFC	R	I	10	A	MODS	BET	Average fuel consumption per seat mile for modified aircraft.
MSPEED	R	I	10	A	MODS	BET	Average speed in miles per hour for modified aircraft.
MTYPE	A	I	10	A	MODS	BET	Alpha descriptor of aircraft type to be modified.
MUTILIZ	R	I	10	A	MODS	BET	Utilization in hours per year for modified aircraft.
NAME	A	C				BET	Alpha descriptor of aircraft type from MODATA(1).
NOBUYS	R	I	10,46	A,Y	POP	BET	Number of aircraft of each type placed in service (bought) in each year.
NOBYS	R	C			TOTALS	BET	Number of aircraft of a specific type bought in a given year.
NOCRVS	I	C			STARTER	CURVES	Number of curves to be plotted.
NOEXPLS	I	I			INDICES	BET	Number of existing aircraft types in a market.
NOMODS	I	I				BET	Number of aircraft types to be modified.
NOMRKSF	I	I,A				PLOTSGL	Number of tick marks on the fuel consumption axis (Y-axis) of plots.
NOMRKSR	I	I,A				PLOTSGL	Number of tick marks on the RPMs axis (Y-axis) of plots.
NONEW	I	I				BET	Number of new aircraft types in a market.
NORETIR	R	I	10,46	A,Y	POP	BET	Number of aircraft retired from service of each type in each year.
NORTR	R	C			TOTALS	BET	Number of aircraft of a given type retired in a given year.

Table A.2 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
OUT	I	C			INDICES	BET	Index equal to total number of existing and new types of aircraft in a market.
PASS	I					AMORTIZ	Variable not used.
PERCENT	R	C			STARTER	BET	RPM growth rate for a market in the base year.
PLOTS	A	I	10	A	STATLIST	BET	Flag indicating whether plots of fuel consumed and RPMs flown versus time are to be provided for an aircraft type.
PLTFUEL	R	C	3	MA	STARTER	BET	Total fuel consumed by all aircraft in a market in 2005.
PLTRPMS	R	C	3	MA	STARTER	BET	Total revenue passenger miles flown by all aircraft in a market in 2005.
POPUL	R	C	10,31	A,Y	POP	BET	Number of aircraft in service of each type in each year.
POPULNO	R	C			TOTALS	BET	Number of aircraft of a given type in service in a specific year.
RETIR	R	C				BET	Cumulative number of aircraft retired up through a given year of a particular type or in a market or in all markets.
RPM	R	C	10,31	A,Y	RESULTS	BET	Revenue passenger statute miles flown per aircraft of each type in each year.
RPMDIFF	R	C				BUYS	Difference between RPMs demanded and those available in a market before aircraft buys in a given year.
RPMS	R	C			TOTALS	BET	RPMs flown in a given year by aircraft of a given type; or cumulative RPMs flown up through a given year by aircraft of a particular type or in a market or in all markets.
RPMS	R	C	31	Y		PLOTSGL	RPMs flown in a year by aircraft of a specific type.
RPMS	R	C	30,31	C,Y	PLOTDAT	CURVES	Array for storing RPMs flown for plotting market share curves.

Table A.2 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
SEATMI	R	C	10,31	A,Y	RESULTS	BET	Number of seat miles flown per aircraft of each type for each year.
SEATS	R	I	10	A	STATLIST	BET	Average number of seats per aircraft of each type.
SFC	R	I	10	A	STATLIST	BET	Average fuel consumption per seat mile flown for each aircraft type.
SHRBUYS	R	C	3,31	MA,Y	SHARES	SHARE	Number of aircraft placed in service in a market in each year.
SHRETIR	R	C	3,31	MA,Y	SHARES	SHARE	Number of aircraft retired from service in a market in each year.
SHRFUEL	R	C	3,31	MA,Y	SHARES	SHARE	Fuel consumption in a market in each year.
SHRPOPL	R	C	3,31	MA,Y	SHARES	SHARE	Number of aircraft in service in a market for each year.
SHRRPMS	R	C	3,31	MA,Y	SHARES	SHARE	RPMs flown in a market in each year.
SHRSMIS	R	C	3,31	MA,Y	SHARES	SHARE	Seat miles flown in a market in each year.
SMILES	R	C			TOTALS	BET	Seat miles flown in a given year by aircraft of a given type; or cumulative seat miles flown up through a given year by aircraft of a particular type or in a market or in all markets.
SPEED	R	I	10	A	STATLIST	BET	Average block-to-block speed for each type of aircraft.
TOPFBRN	R	I,C				PLOTSGL	Maximum value on the fuel consumption axis (Y-axis) of plots.
TOPRPMS	R	I,C				PLOTSGL	Maximum value on the RPMs axis (Y-axis) of plots.
TOTAL	R	C				BUYS	Total RPMs available in a market in a given year before aircraft buys in the year.
TOTLBUY	R	C	31	Y	ACCUMS	SHARE	Total number of aircraft bought in all markets for each year.
TOTLFLB	R	C	31	Y	ACCUMS	SHARE	Total fuel consumed in all markets in each year.

Table A.2 (Concluded)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
TOTLMIS	R	C	31	Y	ACCUMS	SHARE	Total seat miles flown in all markets in each year.
TOTLPOP	R	C	31	Y	ACCUMS	SHARE	Total number of aircraft in service for all markets in each year.
TOTLRPM	R	C	31	Y	ACCUMS	SHARE	Total revenue passenger miles flown in all markets in each year.
TOTLRTR	R	C	31	Y	ACCUMS	SHARE	Total number of aircraft retired from service in all markets for each year.
TYPE	A	I	10	A	STATLIST	BET	Alpha name given to each aircraft type.
UTILIZ	R	I	10	A	STATLIST	BET	Utilization in hours per year per aircraft of each type.
XO	R	A				PLOTSGL	X-coordinate starting value for plots.
XSC	R	C				PLOTSGL	X-coordinate scaling factor for plots.
YEAR	I	C				BET	Index denoting the calendar year.
YEARS	R	C	31	C		PLOTSGL	Calendar year from 1975 through 2005.
YR	I	C				BET	Index indicating the number of the year.
YRINTRO	R	I	10	A	STATLIST	BET	Year of introduction for each aircraft type.
YSC	R	C	31	Y		PLOTSGL	Y-coordinate scaling factor.

FOOTNOTES

[1]Type of variable classification:

- A = Alphanumeric
- A2 = Double precision alphanumeric
- I = Integer
- R = Real

[2]Value mode classifications:

- C = Value calculated in program
- I = Read from input file
- A = Value assigned in program

[3]Indexed parameter for arrays:

- A = Aircraft Type
- MA = Market type
- Y = Number of years
- C = Number of curves
- MD = Modification data
- DI = Data items

Table A.3

DEFINITION OF AIRFRAME MANUFACTURER MODULE VARIABLES

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
ACCASHF	R	C	372	MO		CASHFLW	Accumulated monthly cash flow.
ACCINCO	R	C	372	MO		REVENUE	Accumulated revenue (income) by month.
ACCMP	R	C	11,372	CM,MO		INTROR	Accumulated production costs by component and month.
ACCOST	R	C	372	MO		CASHFLW	Accumulated sum of RDT&E and production costs by month.
ACCUM	R	C				PLANT	Sum of demand at end of each demand year.
ACRDTE	R	C	5,372	CM,MO		INTROR	Accumulated RDT&E costs by component and month.
AD	R	C			COSTOT	ACCOST	Avionics development cost.
ADDE	R	C			COSTOT	ACCOST	Total airframe design and development engineering cost, includes concept formulation and contract definition.
ADI	R	DSD,I				ACCOST	Avionics development cost.
AFSPAO	R	DSD				ACCOST	Airframe spares factor, production phase.
AGEO	R	C			COSTOT	ACCOST	Operational ground support equipment cost.
AGEOI	R	DSD,I				ACCOST	Operational ground support equipment cost.
AGEP	R	C			COSTOT	ACCOST	Ground support equipment development cost.
AGEPI	R	DSD,I				ACCOST	Ground support equipment development cost.
AMFG	R	C			CSHFLO	ACCOST	Airframe manufacturing cost.
AP	R	C			CUMOUT	ACCOST	Average airplane price for Q units.
API	R	C				ACPRICE	Fractional form of average national price/cost index over period of interest.
AQ	R	C			COSTOT	ACCOST	Production total cost for NV airplanes.
AQFEE	R	C			COSTOT	ACCOST	Production phase contractor fee.
ASTOP	R	A				ACPRICE	Indicator for end of data.

Table A.3 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
AVGDIF	R	C				PLANT	Months start of production to be offset to improve production schedule.
BBRKPT	I	C				PLANT	Temporary save for "best" period breakpoint.
BIMCI	R	C	31	Y		INRR	Cash flow for each year.
BRKPT	I	C				PLANT	Loop indicator--year in demand schedule.
BSTOP	R	A				ACPRICE	Set equal to blank word.
C	R	C	37,5	CM,LC	COSTOT	ACCOST	Production cost factors by learning curve step.
C	R	A				ACPRICE	Constant to convert to millions (1.0E-6).
CACS	R	C				ACCOST	Air conditioning system cost.
CAERO	R	C				ACCOST	Aerodynamic control system cost.
CAFCT	R	C				ACCOST	Cumulative total airframe costs for Q units.
CAFCTI	R	C				ACCOST	Cumulative total airframe costs for Q-1 units.
CAFFV	R	C				ACCOST	Flight test vehicle airframe cost.
CAFO	R	C				ACCOST	Production aircraft airframe cost.
CAFO	R	C				COMPCOS	Airframe cost for each unit based on learning curve.
CAFOG	R	C				COMPCOS	Airframe learning curve factor for Nth unit.
CAFO1	R	C				COMPCOS	Airframe learning curve factor for N+1st unit.
CAFUCA	R	C			CUMOUT	ACCOST	Cumulative average unit airframe cost for Q units.
CANTIC	R	C				ACCOST	Anti-icing cost.
CASHFLO	R	C	372	MO		CASHFLW	Cash flow by month.
CAVCT	R	C				ACCOST	Cumulative total avionics costs for Q units.
CAVCTI	R	C				ACCOST	Cumulative total avionics costs for Q-1 units.
CAVFV	R	C				ACCOST	Flight test vehicle avionics cost.
CAVION	R	C			CSHFLO	ACCOST	Avionics system cost.

Table A.3 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
CAVO	R	C				ACCOST	Production aircraft avionics cost.
CAVO	R	C				COMPCOS	Avionics cost for each unit based on learning curve.
CAVOO	R	C				COMPCOS	Avionics learning curve factor for Nth unit.
CAVO1	R	C				COMPCOS	Avionics learning curve factor for N+1st unit.
CAVONE	R	C				ACCOST	Avionics equipment cost.
CAVONI	R	C				ACCOST	Avionics installation cost.
CAVONT	R	C				ACCOST	Total avionics equipment and installation cost.
CAVUCA	R	C			CUMOUT	ACCOST	Cumulative average unit avionics cost for Q units.
CBODY	R	C				ACCOST	Aircraft fuselage cost.
CD	R	C			COSTOT	ACCOST	Contract definition phase cost.
CELCAD	R	C				ACCOST	Electrical distribution system cost.
CEMP	R	C				ACCOST	Empennage cost.
CENACC	R	C				ACCOST	Engine accessories cost.
CENGS	R	C				ACCOST	Airplane engines cost.
CF	R	C			COSTOT	ACCOST	Concept formulation phase cost.
CFACS	R	DSD,I				ACCOST	Complexity factor air conditioning system.
CFAERO	R	DSD,I				ACCOST	Complexity factor aerodynamic control system.
CFANTC	R	DSD,I				ACCOST	Complexity factor anti-icing system.
CFASSY	R	C				ACCOST	Final assembly and checkout cost.
CFAVON	R	DSD,I				ACCOST	Complexity factor avionics system.
CFBODY	R	DSD,I				ACCOST	Complexity factor aircraft fuselage.
CFELCD	R	DSD,I				ACCOST	Complexity factor electrical distribution system.
CFEMP	R	DSD,I				ACCOST	Complexity factor empennage structure.

Table A.3 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
CFENAC	R	DSD,I				ACCOST	Complexity factor engine accessories.
CFENG	R	DSD,I				ACCOST	Complexity factor airbreathing engines.
CFFUSY	R	DSD,I				ACCOST	Complexity factor fuel system.
CFHNDL	R	DSD,I				ACCOST	Complexity factor for loading and handling.
CFHYCD	R	DSD,I				ACCOST	Complexity factor hydraulic system.
CFINST	R	DSD,I				ACCOST	Complexity factor instrument system.
CFLG	R	DSD,I				ACCOST	Complexity factor alighting gear system.
CFNAC	R	DSD,I				ACCOST	Complexity factor engine nacelles.
CFPACC	R	DSD,I				ACCOST	Complexity factor passenger accommodations.
CFPNCD	R	DSD,I				ACCOST	Complexity factor pneumatic system.
CFPOW	R	DSD,I				ACCOST	Complexity factor auxiliary power system.
CFTREV	R	DSD,I				ACCOST	Complexity factor thrust reverser.
CFUSYS	R	C				ACCOST	Fuel system cost.
CFWING	R	DSD,I				ACCOST	Complexity factor wing structure.
CHANDL	R	C				ACCOST	Load and handling system cost.
CHYCAD	R	C				ACCOST	Hydraulic system cost.
CINST	R	C				ACCOST	Instrument system cost.
CINSTE	R	C				ACCOST	Instrument equipment cost.
CINSTI	R	C				ACCOST	Instrument installation cost.
CLG	R	C				ACCOST	Alighting gear cost.
CNACEL	R	C				ACCOST	Engine nacelles cost.
COMENT	R	I	8	DI		ACPRICE	Input card comments.
COMPCST	R	C	11,372	CM,MO	COMPCST	COMPCOS	Summary array of production costs by component and month.
CONFIG	R	DSD,I				ACCOST	Engineering complexity factor.

Table A.3 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
COST	R	C	372	MO		CASHFLW	Sum of RDT&E and production costs each month.
CPACCO	R	C				ACCOST	Passenger accommodations and furnishing cost.
CPCT	R	C				ACCOST	Cumulative total propulsion costs for Q units.
CPCTI	R	C				ACCOST	Cumulative total propulsion costs for Q-1 units.
CPFC	R	C				ACCOST	Flight test vehicle propulsion system cost.
CPNCAD	R	C				ACCOST	Pneumatic system cost.
CPO	R	C				ACCOST	Production aircraft propulsion system cost.
CPO	R	C					Propulsion cost for each unit based on learning curve.
CPOO	R	C					Propulsion learning curve factor for Nth unit.
CPO1	R	C					Propulsion learning curve factor for N+1st unit.
CPOWER	R	C				ACCOST	Auxiliary power system cost.
CPUCA	R	C			CPMOUT	ACCOST	Cumulative average unit propulsion cost for Q units.
CSTRUC	R	C				ACCOST	Assembled airplane cost.
CTJ	R	C				ACCOST	Airplane engine unit cost.
CTJI	R	DSD,I				A_COST	Input value for airplane engine unit cost.
CTREVS	R	C				ACCOST	Thrust reverser cost.
CV	R	C				ACCOST	Total aircraft manufacturing cost.
CWING	R	C				ACCOST	Wing cost.
DCF	R	C	31	Y		INRR	Discounted cash flow for each year.
DDEL	R	C			COSTOT	ACCOST	Airframe design and development engineering cost.
DEITHPL	I	C				RDTE	Last month before delivery month.
DELAY	I	A	5	CM		RDTE	Delay before RDTE component cost starts (5 factors).

Table A.3 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
DELIVER	I	C	4000	NA	DELIVER	PLANT	Month in which each unit will be delivered (same as PRODUCT).
DELTAP	R	C				INPLANT	Increment for aircraft price.
DELTAR	R	A				INRR	Change in rate for present value calculations.
DELSCHL	I	C	396	MO		PLANT	Cumulative number of units delivered each month (same as PRDSCHL).
DEMAND	R	C	31	Y	DEMAND	INPLANT	No. of one new aircraft type demanded each year.
DISCREP	I	C	29	Y		PLANT	Discrepancy between production possible and demanded.
DS	R	C			COSTOT	ACCOST	Research, development, test and evaluation support.
EAIRFP	R	C				ACPRICE	Estimated airframe price.
EAIRPR	R	C				ACPRICE	Estimated airplane price.
EDEVC	R	C				ACPRICE	Estimated airplane development cost.
EENGPR	R	C				ACPRICE	Estimated engines total price.
EN	R	I				ACPRICE	Number of main engines
EN	R	DSD,I				ACCOST	Number of main engines.
END1	I	C				PLANT	Last month in production schedule for period 1.
END1	I					COMPCOS	Not used.
END2	I	C				PLANT	Last month in production schedule for period 2.
ENSPAO	R	DSD,I			CSHFLO	ACCOST	Main engine spares factor, production phase.
ENSPAR	R	DSD,I				ACCOST	Main engine spares factor, RDT&E phase.
EPRICE	R	C			PRICED	ACPRICE	Estimated airplane market place price.
ESEPRI	R	C	3	A		ACPRICE	Estimated airplane price by seat cost, millions.

Table A.3 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
FAC	R	C			COSTOT	ACCOST	Production facilities cost.
FACI	R	DSD,I				ACCOST	Input value of production facilities cost.
FEE	R	DSD,I			CUMOUT	ACCOST	Manufacturer fee factor.
FEE	R	I				ACPRICE	Not used.
FIRSTPR	I	C				PLANT	No. of years in first period.
FP1	I	C				PLANT	Pointer to first year of period 2.
FPROD1	R	C				PLANT	Actual monthly production rate for period 1.
FPROD2	R	C				PLANT	Actual monthly production rate for period 2.
FTO	R	C			COSTOT	ACCOST	Flight test operation cost.
FTOI	R	DSD,I				ACCOST	Input value for flight test operation cost.
FTS	R	C			COSTOT	ACCOST	Flight test aircraft spares cost.
FV	R	C			COSTOT	ACCOST	Flight test vehicles cost.
FVCT	R	C			CUMOUT	ACCOST	Cumulative total airplane costs for Q units.
FVCTI	R	C				ACCOST	Cumulative total airplane costs for Q-1 units.
FVSPAR	R	DSD,I				ACCOST	Flight test vehicle spares.
FVUC	R	C			CUMOUT	ACCOST	Unit airplane cost of Q-th unit.
FVUCA	R	C			CUMOUT	ACCOST	Cumulative average unit airplane cost for Q units.
GTS	R	C			CUMOUT	ACCOST	Ground test vehicle spares cost.
GTSPAR	R	DSD,I				ACCOST	Ground test vehicle spares factor.
GTV	R	C			COSTOT	ACCOST	Ground test vehicles cost.
HP	R	I				ACPRICE	Engine design shaft horsepower.
I	I	LI				INPLANT	Loop index (multiple uses).
IA	I	C	3	DI		ACPRICE	Indicator used in estimating airplane cost.
IACCUM	I	C				PLANT	Rounded (up by .67) sum of units demanded.

Table A.3 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
IAIRPL	I	I				ACPRICE	Indicator for airplane type. IAIRPL=1 for conventional jet transports. IAIRPL=2 for small jet transports. IAIRPL=3 for wide body jet transports. IAIRPL=4 for turbo-prop transports. IAIRPL=5 for general aviation types. IAIRPL=6 for supersonic transports.
IB	I	LI				PLANT	Loop index - starts at 2.
ICNT	I	C				INRR	Counter to find every 10th cycle.
ICONFG	I	DSD,I				ACCOST	Indicator for aircraft type, (6 = subsonic production, 7 = prototype, 8 = supersonic production).
ICUM	I	C			CUMOUT	ACCOST	Indicator for cumulative quantity.
IDATA	I	DSD,I				ACCOST	Not used.
IDIFF	I	C				PLANT	Difference between last month of each demand year and month last unit scheduled for production.
IENGS	I	I				ACPRICE	Indicator for type of engines. IENGS=1 for turbojet and turbofan. IENGS=2 for turboprop. IENGS=3 for reciprocating. IENGS=4 for airbreathing.
II	I	LI				ACPRICE	Loop index.
IL	I	C				INRR	Last value of loop index.
IMAX1	I	C				PLANT	Temporary to find largest differences in period 1.
IMAX2	I	C				PLANT	Temporary to find largest differences in period 2.
IMIN1	I	C				PLANT	Temporary to find largest differences in period 1.
IMIN2	I	C				PLANT	Temporary to find largest differences in period 2.

Table 4.3 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
IMNTH	I	C			STARTUP	INPLANT	Month in which demand begins (years since 1974 x 12).
IN	I	C				RDTE	Starting month for each RDTE component.
INCOME	R	C	372	MO		REVENUE	Total revenue (income) each separate month.
IOPS	I	DSD,I				ACCOST	Indicator for type operational program, 1 = commercial airline, 0 = other.
IP	I	C			PRINT	INPLANT	Print flag for monthly cost, income, and cash-flow tables in INTROR (0=print, 1=no print).
IPOWER	I	DSD,I				ACCOST	Not used.
IPROD	I	DSD,I			CUMOUT	ACCOST	Indicator for prototype or production tooling; 1 = production, 0 = prototype.
IQ	I	DSD,I	33	NA	CUMOUT	ACCOST	Indicator for aircraft quantity matrix.
IR	I	LI				INTROR	Pointer to month within loops.
IS	I	C				INRR	Starting value of loop index.
IT	R	C				ACCOST	Initial flight crew training cost for NV airplanes.
ITH	I	LI				CASHFLW	Component loop index.
ITHPL	I	LI				PLANT	Unit loop index pointer.
ITOTAL	I	C			TOTAL	PLANT	Number of units in period 1.
ITOTAL1	I	C				PLANT	Upward rounded (by .67) number of whole aircraft demanded in period 1.
ITOTAL2	I	C				PLANT	Upward rounded (by .67) number of whole aircraft demanded in period 2.
IV	R	C				ACCOST	Total aircraft production costs for NV airplanes.
IWLG	I	DSD,I				ACCOST	Indicator for landing gear component breakdown.
IYEAR	I	C				PLANT	Loop index for each year of demand.
IYR	I	C				INPLANT	Indicator for first year of demand (since 1974).

Table A.3 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
J	I	LI				INPLANT	Loop index.
JMNTHPL	I	C				PLANT	Offset pointer to month of production for each unit.
K	R	C				INRR	Temporary for accumulated discounted cash flow.
KICKOFF	I	C	29	Y		PLANT	Startup date of production for each period.
KK	R	C				INRR	Temporary for accumulated discounted cash flow.
KKK	R	C				INRR	Temporary for accumulated discounted cash flow.
LB	I	C				PLANT	Loop index.
LEARN	R	DSD,I			CSHFLO	ACCOST	Airframe learning curve.
LEARNA	R	DSD,I			CSHFLO	ACCOST	Avionics learning curve.
LEARNP	R	DSD,I			CSHFLO	ACCOST	Engine learning curve.
LN	I	C				RDTE	Months before production that RDTE component cost starts.
LTIME	I	DSD	372	MO		PLANT	Lead time in months on delivery from order times.
MACH	R	DSD,I			CUMOUT	ACCOST	Maximum design flight mach number for engines.
MAXP	I	C			MAXP	PLANT	Maximum monthly production rate.
MEQ	R	C			COSTOT	ACCOST	Miscellaneous equipment cost.
MIN	I	A				PLANT	Not used.
MINIMAX	I	C				PLANT	Largest difference (in absolute value) for each subdivision.
MNTH	I	LI				CASHFLW	Month loop index.
MNTHPAY	I	C				REVENUE	Monthly payments between order and delivery.
N	I	LI				ACCOST	Loop index.
NCREW	R	DSD,I				ACCOST	Number in flight crew per airplane.

Table A.3 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
NDATA	I	DSD,I			COSTOT	ACCOST	Number of positions (from 1 to 5) on learning curve.
NFV	R	DSD,I			COSTOT	ACCOST	Number flight test vehicles.
NG	R	DSD,I			COSTOT	ACCOST	Number of ground test vehicles.
NL	I	C				INRR	Calculated last value of loop index.
NOCOMP	I	A				COMPCOS	Number of production cost components.
NOCON	R	DSD,I				ACCOST	Number of concept formulation contractors.
NOCON1	R	DSD,I				ACCOST	Number of contract definition contractors.
NOENG	R	DSD,I				ACCOST	Number of concept formulation engineers.
NOENG1	R	DSD,I				ACCOST	Number of contract definitions engineers.
NOYRS	R	DSD,I				ACCOST	Number of years for concept formulation.
NOYRS1	R	DSD,I				ACCOST	Number of years for contract definitions.
NPL	R	C				ACCOST	Total number flight crew personnel to be trained.
NTRY	I	C				PLANT	Program control index.
NV	R	DSD,I,C			COSTOT	ACCOST	Number of operational vehicles.
NVEH	R	DSD,I	5	LC	COSTOT	ACCOST	Number of vehicles for which costs to be corputed.
NVHF	R	C			COSTOT	ACCOST	Total number flight test and operational vehicles.
NVHF	I	I				ACPRICE	Total number flight test & operational vehicles.

Table A.3 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
ORDER	I	C	4000	NA	ORDER	PLANT	Month in which each unit is ordered.
ORITHPL	I	C				REVENUE	Next month after order month.
OS	R	C			COSTOT	ACCOST	Operational vehicles spares cost.
OSA	R	C				ACCOST	Production airframe spares.
OSP	R	C				ACCOST	Production engine spares.
OSPO	R	C				COMPCOS	Engine spares learning cost factor for Nth unit.
OSP1	R	C				COMPCOS	Engine spares learning cost factor for N+1st unit.
OT	R	C			COSTOT	ACCOST	Training equipment cost.
OUT	I	C				RDTE	Ending month for each RDTE component.
OV	R	C			COSTOT	ACCOST	Operational vehicles costs.
PDTJ	R	C			COSTOT	ACCOST	Propulsion development cost turbo-jet engines.
PDTJI	R	DSD,I				ACCOST	Input value for propulsion development cost turbo-jet engines.
PERIOD	I	C			LIFETIM	INPLANT	No. of years new aircraft is demanded.
PERIOD	I	A	5	CM		RDTE	Duration of each RDTE cost component.
PN	R	DSD,I				ACCOST	Total number of passengers.
PN	R	I,A				ACPRICE	Total passenger capacity.
PO	R	I				INPLANT	Base market price of aircraft type.
PP	R	C	20	PE		INPLANT	Array of aircraft price estimates used.
PRODIDS	R	A			PRODIDS	COMPCOS	Array of alphabetic titles for production cost factors.
PRI	R	C				COSTPR	Indicator for vehicle type.
PRICEO	R	C			PRICEO	INPLANT	Price of aircraft.
PRODUCT	I	C	4000	NA	PRODUCT	PLANT	Month in which each unit will be produced.

Table A.3 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
PROD1	I	C				PLANT	Upward rounded (by .67) monthly production rate in first period.
PROD2	I	C				PLANT	Upward rounded (by .67) monthly production rate in first period.
PROPU	R	C			CSHFLO	ACCOST	Total propulsion system cost.
PROSCHL	I	C	396	MO	PRDSCHL	PLANT	Cumulative number of units produced each month.
PV	R	C	31	Y		INRR	Present value factor.
Q	R	C				ACCOST	Total number of vehicles manufactured.
R	R	C				INRR	Rate of return difference.
RATE	R	DSD,I			CUMOUT	ACCOST	Vehicle production rate, number/month.
RDFEE	R	C			COSTOT	ACCOST	Contractor fee, RDT&E phase.
RDTE	R	C				ACCOST	Research, development, testing and engineering cost.
RDTECMP	R	C	5,372	CM,MO		RDTE	Monthly breakdown of RDT&E costs by component.
RDTELBL	R	A	5	CM		RDTE	Alphabetic descriptor of RDT&E cost components.
RE	R	DSD,I				ACCOST	Engineering labor rate.
RR	R	C	20	PE		INPLANT	Array of rate of return values based on aircraft price.
RR	R	C				INRR	Rate of return difference.
RT	R	DSD,I				ACCOST	Tooling labor rate.
RRR	R	C				INRR	Rate of return difference.
SC	R	C			CUMOUT	ACCOST	Total manufacturing sustaining costs for Q units.
SE	R	C			COSTOT	ACCOST	Sustaining engineering costs.
SEO	R	C				COMPCOS	Sustaining engineering cost factor for Nth unit.

Table A.3 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
SE1	R	C				COMPCOS	Sustaining engineering cost fact for N+1st unit.
SPARES	R	C				COMPCOS	Total spares cost based on learning curve (same as OS).
ST	R	C			COSTOT	ACCOST	Sustaining tooling cost.
STO	R	C				COMPCOS	Tooling and special equipment learning cost factor for Nth unit.
ST1	R	C				COMPCOS	Tooling and special equipment learning cost factor for N+1st unit.
SUBSYS	R	C			COSTOT	ACCOST	Subsystem development cost.
SUBSYI	R	DSD,I				ACCOST	Input value for subsystem development cost.
SUM	R	C				CASHFLW	Used for totaling RDT&E and production costs.
SUM	R	C				INRR	Temporary sum of discounted cash flow.
SUM	R	C				REVENUE	Temporary to accumulate sum by month.
SUM	R	C				INTROR	Temporary to accumulate sum by month.
SUM1	R	C				CASHFLW	Used for totaling RDT&E costs.
SUM2	R	C				CASHFLW	Used for totaling production costs.
SUMDIF	R	C				ACCOST	Sum of differences for each period subdivision.
T	R	I				ACCOST	Thrust per engine at sea level.
TDO	R	C			COSTOT	ACCOST	Production aircraft technical data cost.
TDP	R	C			COSTOT	ACCOST	RDT&E technical data cost.
TITLE	R	I	10	DI		COSTPR	Input title for printouts.
TMC	R	C			CUMOUT	ACCOST	Total of all manufacturing costs for Q units.
TOOLC	R	DSD,I				ACCOST	Complexity factor tooling.
TOTAL	R	C				PLANT	Actual total number of aircraft demanded in both periods.

Table A.3 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
TOTAL1	R	C				PLANT	Actual number of craft demanded in 1st period.
TOTAL2	R	C				PLANT	Actual number of craft demanded in 2nd period.
TOVERW	R	C				ACCOST	Total engine thrust over airplane takeoff gross weight.
TPEREN	R	C				ACCOST	Thrust in pounds per engine.
TRDTE	R	C			COSTOT	ACCOST	Total research, development, tooling & engineering cost.
TRDTEC	R	C	5	CM		ACCOST	Array of RDT&E cost factors.
TRI	R	C			COSTOT	ACCOST	Initial transportation cost.
TS	I	C			STARTUP	INPLANT	Same as IMNTH in INPLANT. Month demand for aircraft type starts.
TST	R	C			COSTOT	ACCOST	Tooling and special equipment cost.
TTLCMP	R	C	5	CM		ACCOST	Array of production cost factors.
TTS	I	C			TTS	PLANT	Modified start of production month.
UMC	R	C				COMPCOS	Operational vehicles cost (same as OV).
VMAX	R	C				ACCOST	Maximum vehicle speed, knots.
WA	R	C			CUMOUT	ACCOST	Vehicle AMPR weight.
WACS	R	DSD,I				ACCOST	Air conditioning system weight.
WAERO	R	DSD,I				ACCOST	Aerodynamic control system weight.
WAIRFR	R	C				ACPRICE	Airframe weight.
WANTIC	R	DSD,I				ACCOST	Anti-icing system weight.
WAVION	R	DSD,I				ACCOST	Avionics system weight.
WAVIOT	R	C				ACCOST	Total avionics and instrument weight.
WBODY	R	DSD,I				ACCOST	Fuselage weight.
WE	R	C				ACCOST	Aircraft empty weight.

Table A.3 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
WE	R	I				ACPRICE	Aircraft empty weight.
WELCAD	R	DSD,I				ACCOST	Electric power conversion and distribution system weight.
WEMP	R	DSD,I				ACCOST	Empennage weight.
WENACC	R	DSD,I				ACCOST	Engine accessories weight.
WENGS	R	DSD,I				ACCOST	Engines total weight.
WENGS	R	I				ACPRICE	Engines total weight.
WFUSYS	R	DSD,I				ACCOST	Fuel system weight.
WFUTOT	R	DSD,I				ACCOST	Total fuel weight.
WGROSS	R	DSD,I			CUMOUT	ACCOST	Aircraft gross take-off weight (= WG = WTO).
WHANDL	R	DSD,I				ACCOST	Load and handling system weight.
WHYCAD	R	DSD,I				ACCOST	Hydraulic power conversion and distribution system weight.
WINST	R	DSD,I				ACCOST	Instrument system weight.
WLG	R	DSD,I				ACCOST	Alighting gear system weight.
WLGCON	R	DSD,I				ACCOST	Alighting gear controls weight.
WLGSTR	R	DSD,I				ACCOST	Alighting gear structure weight.
WLGTIRS	R	DSD,I				ACCOST	Tire weight.
WLGWHL	R	DSD,I				ACCOST	Wheels and brake weight.
WNACEL	R	DSD,I				ACCOST	Engine nacelle weight.
WPACCO	R	DSD,I				ACCOST	Passenger accommodations (and equipment) weight.
WPAYL	R	DSD,I				ACCOST	Payload weight.
WPNCAD	R	DSD,I				ACCOST	Pneumatic power and distribution system weight.
WPOWER	R	DSD,I				ACCOST	Auxiliary power system weight.
WPPROV	R	C				ACCOST	Crew size related subsystem development cost factor.

Table A.3 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
WTREVS	R	DSD,I				ACCOST	Thrust reverser weight.
WWING	R	DSD,I				ACCOST	Wing weight.
SAVD	R	DSD,I				ACCOST	Avionics development factor.
XFASSY	R	DSD,I			CSHFLO	ACCOST	Final assembly-check out cost fraction.
XNEW	R	DSD,I				ACCOST	Miscellaneous equipment development factor.
YEAR	I	LI				INPLANT	Loop index.
YR	I	LI				INPLANT	Loop index.
Z	R	C				ACCOST	Airframe production learning curve cost factor.
ZA	R	C				ACCOST	Avionics production learning curve cost factor.
ZAF	R	C				COMPCOS	Airframe learning curve factor.
ZAV	R	C				COMPCOS	Avionics learning curve factor.
ZETA	R	C				ACCOST	Airframe learning curve exponent.
ZETAA	R	C				ACCOST	Avionics learning curve exponent.
ZETAP	R	C				ACCOST	Engine learning curve exponent.
ZP	R	C				ACCOST	Engine production learning curve cost factor.

FOOTNOTES

[1]Type of variable classification:

I = Integer
R = Real

[2]Value mode classifications:

C = Value calculated in program
I = Read from input file
DSD = Data statement definition
A = Value assigned in program
LI = Loop index

[3]Indexed parameter for arrays:

Y = Number of Years
DI = Data items
CM = Component number
MO = Number of months
NA = Number of aircraft
PE = Price estimates
LC = Learning curve step

Table A.4

DEFINITION OF AIR CARRIER MODULE VARIABLES

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
ADDC	R	I				DIRECT	Costs of added flight crew (over 2), dollars.
AI1	R	I				INDIR	Flight operations expense (less rentals) in dollars per block hour.
AI2	R	I				INDIR	Maintenance expense for flight equipment in dollars per block hour.
AI4	R	I				INDIR	Flight operations expense for rentals in dollars per block hour.
AI5	R	I				INDIR	Cost per stewardess per block hour, dollars.
AI6	R	I				INDIR	Food expense in dollars per passenger per block hour.
AI7	R	I				INDIR	Cost of other passenger in-flight expenses in dollars per passenger-mile.
AI8	R	I				INDIR	Aircraft line servicing expense in dollars per departure.
AI9	R	I				INDIR	Aircraft control servicing expense in dollars per block hour.
AI10	R	I				INDIR	Landing fee per departure in dollars.
AI11	R	I				INDIR	Passenger traffic servicing expense in dollars per passenger.
AI12	R	I				INDIR	Baggage traffic servicing expense in dollars per ton.
AI12A	R	I				INDIR	Cargo traffic servicing expense in dollars per ton.
AI13	R	I				INDIR	Reservation and sales expense per passenger in dollars.
AI14	R	I				INDIR	Reservation and sales expense per passenger-mile in dollars.
AI15	R	I				INDIR	Reservation and sales expense for property in dollars per ton-mile.

Table A.4 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
AI16	R	I				INDIR	Advertising and publicity expense per passenger-mile in dollars.
AI17	R	I				INDIR	Advertising and publicity expense for property in dollars per ton-mile.
AI18	R	I				INDIR	Maintenance expense for ground property and equipment per departure in dollars.
AI19	R	I				INDIR	Expense for depreciation and amortization of general ground property and equipment in dollars per departure.
AI20	R	I				INDIR	Maintenance equipment depreciation factor.
AI21	R	I				INDIR	General and administrative expense factor.
ALOSS	R	C				TAX	Yearly total earnings before taxes (where there is a loss), dollars.
AMT	R	A/I				DIRECT/ INDIR	Air maneuver time, hours.
AREV	R	A	25,100	Y,A	IN	INPUTS	Annual revenue, dollars.
BAG	R	I				INDIR	Baggage per passenger in pounds.
BF	R	C	12	ST		DIRECT	Block fuel, pounds.
BS	R	C	12	ST		DIRECT	Block speed, mph.
BT	R	C	12	ST		DIRECT	Block time, hours.
BVALUE	R	C	25,100	Y,A	IN	DEPSUB	Book value of aircraft in specific year, dollars.
C1	R	C	17	ST		INDIR	Flying operations (less rentals) expense, dollars.
C2	R	C	17	ST		INDIR	Maintenance flight equipment expense, dollars.
C4	R	C	17	ST		INDIR	Rentals of flight equipment, dollars.
C6	R	C	17	ST		INDIR	Stewardess expense (first class), dollars.
C7	R	C	17	ST		INDIR	Stewardess expense (coach), dollars.

Table A.4 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
C8	R	C	17	ST		INDIR	Stewardess expense (total), dollars.
C9	R	C	17	ST		INDIR	Food expense (first class), dollars.
C10	R	C	17	ST		INDIR	Food expense (coach), dollars.
C11	R	C	17	ST		INDIR	Passenger in flight food expense (total), dollars.
C12	R	C	17	ST		INDIR	Other passenger in-flight expenses (first class), dollars.
C13	R	C	17	ST		INDIR	Other passenger in-flight expenses (coach), dollars.
C14	R	C	17	ST		INDIR	Other passenger in-flight expenses (total), dollars.
C15	R	C	17	ST		INDIR	Aircraft line servicing expense, dollars.
C16	R	C	17	ST		INDIR	Aircraft control servicing expense, dollars.
C17	R	C	17	ST		INDIR	Landing fees, dollars.
C18	R	C	17	ST		INDIR	Passenger traffic servicing expense (first class), dollars.
C19	R	C	17	ST		INDIR	Passenger traffic servicing expense (coach), dollars.
C20	R	C	17	ST		INDIR	Baggage traffic servicing expense (first class), dollars.
C21	R	C	17	ST		INDIR	Baggage traffic servicing expense (coach), dollars.
C22	R	C	17	ST		INDIR	Traffic servicing expense (passengers and baggage), dollars.
C23	R	C	17	ST		INDIR	Traffic servicing expense (cargo), dollars.
C24	R	C	17	ST		INDIR	Reservation and sales expense (first class), dollars.
C25	R	C	17	ST		INDIR	Reservation and sales expense (coach), dollars.

Table A.4 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
C26	R	C	17	ST		INDIR	Reservation and sales expense (passenger total), dollars.
C27	R	C	17	ST		INDIR	Reservation and sales expense (property), dollars.
C28	R	C	17	ST		INDIR	Advertising and publicity expense (first class), dollars.
C29	R	C	17	ST		INDIR	Advertising and publicity expense (coach), dollars.
C30	R	C	17	ST		INDIR	Advertising and publicity expense (passenger total), dollars.
C31	R	C	17	ST		INDIR	Advertising and publicity expense (property), dollars.
C32	R	C	17	ST		INDIR	Maintenance expense (ground property and equipment), dollars.
C33	R	C	17	ST		INDIR	Depreciated general ground property and equipment, dollars.
C34	R	C	17	ST		INDIR	Depreciation of maintenance equipment, dollars.
C35	R	C	17	ST		INDIR	General and administrative expense, dollars.
C36	R	C	17	ST			Total indirect operating expense, dollars.
CACM	R	C				DIRECT/ INDIR	Total indirect operating expense, dollars.
CAM	R	C	12/17	ST		DIRECT/ INDIR	Cost per aircraft mile, dollars.
CASM	R	C	12/17	ST		DIRECT/ INDIR	Operating cost per available seat mile, dollars.
CBH	R	C	12/17	ST		DIRECT/ INDIR	Cost per block hour, dollars.
CD	R	A	12	ST		DIRECT	Depreciation on flight equipment, dollars.
CF	R	I	17	ST		INDIR	Passenger trip circuitry factor.

Table A.4 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
CF	R	C	25	Y	IN	CFSUB	Net cash flow, dollars.
CFC	R	C	12	ST		DIRECT	Flight crew costs, dollars.
CFH	R	C	12/17	ST		DIRECT/ INDIR	Cost per flight hour, dollars.
CFO	R	C	12	ST		DIRECT	Fuel and oil costs, dollars.
CFOP	R	C	12	ST		DIRECT	Total flying operations cost, dollars.
CG	R	C	25,100	Y,A		TAX	Capital gains, dollars.
CGTAX	R	A				TAX	Capital gains tax rate.
CGTX	R	C	25,100	Y,A		TAX	Capital gains tax, dollars.
CI	R	C	12	ST		DIRECT	Insurance costs, dollars.
CLA	R	C	12	ST		DIRECT	Airframe labor costs, dollars.
CLE	R	I	12	ST		DIRECT	Engine labor costs, dollars.
CLF	R	I	17	ST		INDIR	Coach load factor (decimal).
CLS	R	I				DIRECT	Climb speed, mph.
CLT	R	C				DIRECT/ INDIR	Climb time, hours.
CM	R	C	12	ST		DIRECT	Total direct maintenance costs, dollars.
CMA	R	C	12	ST		DIRECT	Airframe material costs, dollars.
CMB	R	C	12	ST		DIRECT	Maintenance burden, dollars.
CME	R	C	12	ST		DIRECT	Engines material cost, dollars.
COFL	R	I				DIRECT	Cost of fuel, dollars per pound
COIL	R	I				DIRECT	Cost of oil, dollars per gallon.
COST	R	A	25,100	Y,A	IN	QPLIFE INPUTS	Amount of aircraft price financed, dollars.
CRS	R	I				DIRECT INDIR	Cruise speed, mph.

Table A.4 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
CRT	R	C	12/17	ST		DIREC./ INDIR	Cruise time, hours.
CS	R	I				INDIR	Number of coach seats.
CSAREV	R	C			IN	SUM	Cumulative total annual revenue, dollars.
CSCF	R	C			IN	CFSUB	Cumulative total net cash flow, dollars.
CSCM	R	C				DIRECT INDIRECT	Cost per cruise mile per seat, dollars.
CSDCF	R	C			IN	DCFSUB	Cumulative total discounted net cash flow, dollars.
CSDEPR	R	C			IN	SUM	Cumulative total depreciation (double-declining), dollars.
CSEBIT	R	C			IN	SUM	Cumulative total earnings before taxes and interest, dollars.
CSEBT	R	C			IN	SUM TAX	Cumulative total earnings before taxes, dollars.
CSINTI	R	C			IN	SUM	Cumulative total initial investment, dollars.
CSINTX	R	C				SUM,TAX	Cumulative income tax sum, dollars.
CSNTRN	R	C			IN	SUM,TAX	Cumulative total net earnings, dollars.
CSOPCT	R	C			IN	SUM	Cumulative total operating cost, dollars.
CSPRIN	R	C			IN	SUM	Cumulative total yearly principal payment, dollars.
CSTEW	R	I				INDIR	Average number of stewardesses in coach.
CSTO	R	C				DIRECT INDIR	Cost per takeoff per seat, dollars.
CSYNTR	R	C			IN	SUM	Cumulative total yearly interest payment, dollars.
CTO	R	C				DIRECT INDIR	Cost per takeoff, dollars.

Table A.4 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
D1	R	I				DIRECT	Distance at maximum payload point on range-payload diagram in miles.
D2	R	I				DIRECT	Distance at maximum fuel point on range-payload diagram in miles.
DIS	R	I	17	ST		INDIR	Passenger trip distance, miles.
DCF	R	C	25	Y	IN	DCFSUB	Discounted cashflow, dollars.
DEPR	R	C	25,100	Y,A	IN	DEPSUB	Depreciation (double-declining), dollars.
DEPREC	R	C	25	Y	IN	SUM,TAX	Total depreciation (straight-line and double-declining), dollars.
DESS	R	I				DIRECT INDIR	Descent speed, mph.
DEST	R	C				DIRECT INDIR	Descent time, hours.
DOC	R	C	25,100	Y,A		INPUTS	Direct operating costs per plane per year, dollars.
DOC1	R	C	100	A		DIRECT	Direct operating costs per plane, dollars.
DPT	R	I	17	ST		INDIR	Departures per passenger trip (flight basis).
EBT	R	C	25,100	Y,A	IN	NETSUB	Earning before taxes, dollars.
EBIAT	R	C	25,100	Y,A	IN	NETSUB	Earnings before interest and taxes, dollars.
ECLIFE	R	A	100	A	IN	INPUTS	Economic life, years.
EXP	R	I	17	ST		INDIR	Fraction of RTP that is express cargo.
F1	R	I				DIRECT	Fuel at maximum payload point on range-payload diagram in pounds.
F2	R	I				DIRECT	Fuel at maximum fuel point on range-payload diagram in pounds.
FCAL	R	C				DIRECT	Coefficient in maintenance labor cost equations.
FCAM	R	C				DIRECT	Coefficient in airframe maintenance material cost equations.

Table A.4 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
FCEL	R	C				DIRECT	Coefficient in engine maintenance labor cost equation.
FCEM	R	C				DIRECT	Coefficient in engine maintenance materials cost equation.
FCK	R	I				DIRECT	Flight crew cost factor (for a crew of 2) in dollars.
FHAL	R	C				DIRECT	Coefficient in airframe maintenance labor cost equations.
FHAM	R	C				DIRECT	Coefficient in airframe maintenance material cost equation.
FHEL	R	C				DIRECT	Coefficient in engine labor cost equations.
FHEM	R	C				DIRECT	Coefficient in engine maintenance materials cost equation.
FLF	R	I	17	ST		ANDIR	First class load factor (decimal).
FLTT	R	C				DIRECT INDIR	Flight time, hours.
FOODR	R	I				INDIR	Food expense factor for first class.
FS	R	I				INDIR	Number of first class seats.
FSTEW	R	I				INDIR	Average number of stewardesses in first class.
GMT	R	I,A				DIRECT INDIR	Ground maneuver time, hours.
H	R	I				DIRECT INDIR	Cruise altitude, feet.
HINFL	R	A	25	Y		INPUTS	Inflation rate applied to price of aircraft.
I	I	LI			IN	OPLIFE	Pointer indicating year number; also miscellaneous loop index.
IECLIF	I	C				DEPSUB	Midyear of economic life.

Table A.4 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
II	I	C				DEPSUB	Loop indicator for year value.
INCTAX	R	C	25,100	Y,A	IN	NETSUB	Income tax, dollars.
INTINV	R	A	25,100	Y,A	IN	OPLIFE INPUTS	Initial investment, dollars.
IOC	I	C	25,100	Y,A		INPUTS	Indirect operating costs per plane per year. dollars.
IOC1	I	C	100	A		INDIR	Indirect operating costs per plane, dollars.
IYEAR	I	A			IN	INPUTS	Total number of years under consideration (set at 15).
J	I	LI				REPAY	Loop index.
K	I	A				DIRECT DEPSUB	Counter, loop index.
L	I	LI				DEPSUB	Loop index.
LL	I	C				DEPSUB	Beginning year of second half of economic life.
M	I	LI				OPLIFE INPUTS	Loop indicator for number of aircraft.
MM	I	C				DEPSUB	Loop indicator for year value.
MPLANE	I	I,A				DIRECT INDIR	Aircraft number for particular input data set.
N	I	LI				REPAY	Loop index.
NAC	I	A			IN	INPUTS	Number of aircraft being considered.
NAME	I		122			INPUTS	Not used.
NLIFE	I	C				DEPSUB	Economic life, years.
NLIFE	I	C				REPAY	Economic life, years.
NN	I	C				REPAY	Loop end indicator for number of years.
NRCREW	I	I				DIRECT	Number in crew.

Table A.4 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
NRENGN	I					DIRECT	Number of engines.
NRSEAT	I	I				DIRECT INDIR	Number of seats.
NSL	I	I				DIRECT INDIR	Number of stage lengths (up to 12 for DIRECT, up to 17 for INDIR).
NTEARN	R	C	25,100	Y,A	IN	NETSUB	Net earnings, dollars.
NUSTAG	I,A					DIRECT	Flag to reread name list NSTAGE.
OPCOST	R	C	25,100	Y,A	IN	INPUTS	Operating cost, dollars.
PBCOST	R	C				REPAY	Amount of aircraft price financed, dollars.
PRICE	R	A,C	25,100	Y,A	IN	OPLIFE INPUTS	Price of new aircraft, dollars.
PRIN	R	C	25,100	Y,A	IN	REPAY	Yearly principal payment, dollars.
PV	R	C	25	Y	IN	DCFSUB	Present value discount factor
R	R	A			IN	DCFSUB	Interest rate for PV calculation (ROI).
RATE	R	C				DEPSUB	Rate of depreciation.
RCH	R	I				DIRECT INDIR	Rate of climb at cruise altitude, feet per minute.
RCSL	R	I				DIRECT INDIR	Rate of climb (sea level), feet per minute.
RES	R	A	100	A	IN	INPUTS	Residual fraction of aircraft price for salvage.
RL	R	I				DIRECT	Maintenance labor rate, dollars per hour.
RRATE	R	A	100	A	IN	INPUTS	Interest rate for repayment of purchase loan.
RTE	R	C				INDIR	Express tons enplaned.
RTF	R	C				INDIR	Freight tons enplaned.
RTM	R	I				INDIR	Tons of mail carried per flight.

Table A.4 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
RTP	R	I				INDIR	Tons of property (cargo) carried per flight.
SALVAG	R	C	25,100	Y,A	IN	DEPSUB TAX	Value of aircraft at end of economic life, dollars.
SAREV	R	C	25	Y	IN	SUM	Yearly total annual revenue, dollars.
SB	R	C	17	ST		INDIR	Block speed, mph.
SCG	R	C	25	Y		TAX	Total yearly capital gains, dollars.
SCGTX	R	C	25	Y		TAX	Total yearly capital gains tax, dollars.
SDEPR	R	C	25	Y	IN	SUM	Yearly total depreciation (double-declining), dollars.
SEBIAT	R	C	25	Y	IN	SUM	Yearly total earnings before interest and taxes, dollars.
SEBT	R	C	25	Y	IN	SUM	Yearly total earnings before taxes, dollars
SEXP	R	C	25	Y		TAX	Total yearly expenses (excluding taxes), dollars.
SINCOM	R	C	25	Y		TAX	Total yearly earnings before taxes, dollars.
SINCTX	R	C	25	Y	IN	SUM	Yearly income tax sum, dollars.
SL	R	I	12/17	ST		DIRECT/ INDIR	Flight stage length in miles.
SNTERN	R	C	25	Y	IN	SUM	Yearly sum of net earnings, dollars.
SOPCST	R	C	25	Y	IN	SUM	Yearly sum of operating costs, dollars.
SPRIN	R	C	25	Y	IN	SUM	Yearly sum of principal payments, dollars.
SSALVG	R	C	25	Y	IN	SUM,TAX	Yearly sum of salvage value, dollars.
SSTDP	R	C	25	Y	IN	SUM	Yearly sum of straight-line depreciation, dollars.
STDEP	R	C	100	A	IN	DEPSUB	Straight line depreciation, dollars.
STLIFE	R	C				DEPSUB	Economic life for straight line depreciation, years.
SYNTRS	R	C	25	Y	IN	SUM	Yearly sum of interest payments, dollars.
SUM	R	C				DCFSUB	Total accumulated present value of cash flow, dollars.

Table A.4 (Continued)

VARIABLE NAME	TYPE[1]	VALUE MODE[2]	ARRAY DIMENSION	INDEXED PARAMETER[3]	COMMON BLOCK	DEFINING ROUTINE	DESCRIPTION
T	R	I				DIRECT	Time factor in engine labor cost equations.
TAP	R	C	17	ST		INDIR	Advertising and publicity expense (total), dollars.
TAS	R	C	17	ST		INDIR	Total aircraft servicing expense, dollars.
TB	R	C	17	ST		INDIR	Block time, hours.
TRS	R	C	17	ST		INDIR	Total reservation and sales expense, dollars.
TTS	R	C	17	ST		INDIR	Total traffic servicing expense, dollars.
TXRATE	R	A				INPUTS	Tax rate for income tax.
U	R	I				DIRECT INDIR	Annual utilization per aircraft in block hours.
VA	R	I				DIRECT	Airframe cost, dollars.
VE	R	I				DIRECT	Unit engine cost, dollars.
VT	R	C				DIRECT	Aircraft total cost, dollars.
WA	R	C				DIRECT	Airframe weight, pounds.
WEM	R	C				DIRECT	Aircraft empty weight, pounds.
WEN	R	C				DIRECT	Unit engine weight, pounds.
WGR	R	I				DIRECT	Gross vehicle weight, pounds.
XNAME	A	I	20	DI		DIRECT INDIR	Comment card label for output table headings.
YNTRST	R	C	25,100	Y,A		REPAY	Yearly interest payments, dollars.
YRPPAY	R	C	25,100	Y,A		REPAY	Yearly principal payment, dollars.

Table A.4 (Concluded)

[1]Type of variable classification:

A = Alphanumeric
I = Integer
R = Real

[2]Value mode classifications:

C = Value calculated in program
I = Read from input file
A = Value assigned in program
LI = Loop index

[3]Indexed parameter for arrays:

ST = Stage length
A = Aircraft type
Y = Number of years
DI = Data items

Appendix B

DESCRIPTION OF PLOTTER SOFTWARE ROUTINES

Appendix B

DESCRIPTION OF PLOTTER SOFTWARE ROUTINES

The plotted output of the Fleet Accounting Module is generated on the ZETA PLOTTER 230, using a CDC 7600 computer. The plotter software used by the Fleet Accounting Module is described in this appendix. This software includes subroutines PLOT, SYMBOL, PLOTS, RSTR, LINAXS, and NUMBER. The descriptions provided here were extracted from internal NASA Ames documentation*. Listings of the source code for the routines are provided in Appendix C.

SUBROUTINE PLOT(X,Y,IPEN)

PLOT performs the basic plotting function of moving the pen from its current location to a specified location with the pen either up or down.

X,Y - The coordinates (in inches) of the point to which the pen is to be moved. The positive X direction is defined as parallel to the margin of the plotting paper and toward the clean roll (package) of paper (i.e., from left to right in the normal fashion as one stands alongside the plotter in the indicated position).

*L. C. Evans, "Memorandum for Systems Studies Divison Staff on Plotter Software," NASA-Ames MS:202-8, Moffett Field, California (April 1974).

IPEN - The magnitude of IPEN specifies the operation to be performed:

IPEN = 0 No change in pen position; present pen location is redefined as (X,Y).

= 1 Pen is moved to (X,Y) without raising or lowering the pen.

= 2 Pen is moved to (X,Y) with pen down.

= 3 Pen is moved to (X,Y) with pen up.

= 4 No pen movement; the current location of the pen is returned in (X,Y).

= 5 Initialization call; used by PLOTS.

= 6 Pen is moved to a new "page", the plotter buffer is dumped, and the pertinent parameters are re-initialized, readying the plot software either for termination of the program or for a new plot.

= 7 Used to change the plotting factor (if X > 0) or the plotter grain (if X < 0 and Y > 0); no operation if X < 0 and Y < 0. This value of IPEN should not be used unless the user is familiar enough with the coding of PLOT to understand what effects changes in these values will have.

= 8 Pen is raised but not moved.

= 9 Pen is lowered but not moved.

= 10 (not currently used).

= 11,12,13,14 Same as IPEN = 1,2,3,4, except that plot is offset, scaled, and rotated.

= 20 Same as OPEN = 13, except that pen position is saved.

= 21,22,23 Same as IPEN = 11,12,13, except that pen movement is calculated relative to the pen position saved from the last call to PLOT with IPEN = 20.

In the case of IPEN = -1,-2,-3,-11,-12,-13,-21,-22,-23, the action is the same as that described above, but after the new pen location has been reached, it is redefined as the origin.

SUBROUTINE SYMBOL(XLLHC,YLLHC,HEIGHT,BCD,ORIENT,NCHAR)

SYMBOL causes a string of alphanumeric information to be plotted.

XLLHC,YLLHC - For the purposes of visualization, each character can be thought of as being drawn inside a rectangle whose size is determined by the value of HEIGHT. The size of the rectangle is the same for all characters involved in a given call to SYMBOL. The value of (XLLHC,YLLHC) gives the coordinates of the lower left-hand corner of the rectangle associated with the first character to be plotted.

HEIGHT - The height of the characters (in inches). The width of each character, for the purposes of determining the length of a plotted character string, is 0.8*HEIGHT.

BCD - An array containing the character string to be plotted.

ORIENT - The orientation at which the string is to be plotted, measured CCW in degrees from the +X axis.

NCHAR - The number of characters to be plotted.
If NCHAR is less than zero, one of a series of plotting symbols is drawn centered on the point given by (XLLHC,YLLHC). Fifteen symbols are available, and the one drawn is determined by the absolute value of NCHAR (taken modulo 15) according to:

-NCHAR	Plotting Symbol
1	square
2	circle
3	triangle
4	cross ("plus" sign)
5	cross ("X")
6	diamond
7	tilted hourglass
8	upside-down teepee
9	Z
10	Y
11	lozenge
12	asterisk (comb. of 4 & 5)
13	hourglass
14	vertical line
15	star

The standard character set, as represented by the symbols on the 029 keyboard, is available through SYMBOL, with the exception of the following nine symbols: _,|,',@,¬,&,¢,#,0-8-2.

SUBROUTINE PLOTS(LUN)

PLOTS performs all of the necessary initialization for the plotting software. It should be called prior to calling any other routine in the package.

LUN - Logical unit number. In addition to transmitting this information to the plotting routines, a tape of this number must be declared in the user's PROGRAM statement.

SUBROUTINE RSTR(IARG)

RSTR generates the call CALL PLOT(0.,0.,6) in order to clear the plotting buffers and move to a new page.

IARG - A dummy argument; it is ignored.

```
SUBROUTINE LINAXS(XO,YO,X1,Y1,LABSIZ,WHICH,NTIC,NLFREQ,VALO,VALMAX,
     NDIGIT,NLABEL,LABEL)
```

LINAXS plots and labels a linear axis.

XO - X coordinate of the left-hand edge of the plot in inches.

YO - Y coordinate of the lower edge of the plot in inches.

X1 - X coordinate of the right-hand edge of the plot in inches.

Y1 - Y coordinate of the upper edge of the plot in inches.

LABSIZ - (REAL) Size of the labels in inches.

WHICH - (INTEGER) Indicates whether a horizontal or vertical axis is to be plotted:

```
WHICH = +1  vertical
      = -1  horizontal
```

NTIC - Number of tick marks, including one at the end of the axis. This is also, therefore the number of intervals into which the tick marks divide the axis.

NLFREQ - Frequency with which tick marks are to be labeled.

VALO - Value of the axis variable at the beginning of the axis.

VALMAX - Value of the axis variable at the end of the axis.

NDIGIT - Number of significant digits to be used in writing tick mark labels.

NLABEL - Number of characters in axis label.

LABEL - Array containing the axis label.

SUBROUTINE NUMBER(XLLHC,YLLHC,HEIGHT,A,ORIENT,N)

NUMBER converts a number to its EBCDIC representation and plots it.

XLLHC,YLLHC - The coordinates in inches of the lower left-hand corner of the character string to be plotted. (See the write-up for SYMBOL for a more complete explanation.)

HEIGHT - The height in inches of the number on the plot.

A - The number which is to be converted and plotted; is considered to be an array if N is a FORMAT.

ORIENT - The orientation at which he number is to be plotted.

N - If the absolute value of N is less than 20, then the value of N is the number of decimal places to be included. If the absolute value of N is not less than 20, then N is assumed to be an array containing the FORMAT with which the number(s) in A are to be plotted. If N contains a format, then the element of the array following the end of the format must contain all EBCDIC blanks, and the next word must contain the number of values in the array A which are to be written. The character string generated by the format must be no more than 1000 characters long and must be terminated by an "@" symbol.

If HEIGHT is less than zero, (XLLHC,YLLHC) is assumed to specify the lower right-hand corner of the last character to be plotted.

Appendix C

LISTING OF PROGRAM SOURCE CODE FOR THE FLEET ACCOUNTING MODULE

```
      PROGRAM RET (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT,                RET      2
     * TAPE2,TAPE4,TAPE7,TAPE8,TAPE9,TAPE11)                            RET      3
C                                                                        RET      4
C     RET IS THE MAJOR COMPONENT IN THE FLEET ACCOUNTING MODULE OF THE   RET      5
C     ARC-ART MODELS.  THE BASIC FUNCTION OF THIS MODULE IS TO PROJECT   RET      6
C     THE FLEET COMPOSITION NECESSARY TO MEET TRAFFIC DEMAND.  RET ALSO  RET      7
C     IS USED TO DRIVE THE AIRFRAME MANUFACTURER MODULE.                 RET      8
C                                                                        RET      9
      DIMENSION TYPE(20),YRINTRO(10),SEATS(10),SFC(10),SPEED(10),        RET     10
     *UTILIZ(10),LIFETIM(10),PLOTS(10)                                   RET     11
      DIMENSION LF(31)                                                   RET     12
      DIMENSION GROWTH(31),MARKET(31)                                    RET     13
      DIMENSION MODATA(7),NOBUYS(10,46),NORETIR(10,46)                   RET     14
      DIMENSION MTYPE(10),MODYR(10),MSEATS(10),MSFC(10),MSPEED(10),      RET     15
     *MUTILIZ(10),MLIFET(10)                                             RET     16
      DIMENSION SEATMI(10,31),FUELBRN(10,31),RPM(10,31),POPUL(10,31)     RET     17
      DIMENSION TOTLMIS(31),TOTLFLB(31),TOTLRPM(31),TOTLPOP(31)          RET     18
      DIMENSION SHRSMIS(3,31),SHRFUEL(3,31),SHRRPMS(3,31),SHRPOPL(3,31)  RET     19
      DIMENSION TOTLBUY(31),TOTLRTR(31)                                  RET     20
      DIMENSION MRKTYPE(3)                                               RET     21
      DIMENSION SHRBUYS(3,31),SHRETIR(3,31)                              RET     22
      DIMENSION PLTRPMS(3),PLTFUEL(3)                                    RET     23
      DOUBLE PRECISION MRKTYPE                                           RET     24
      REAL NOBUYS,NORETIR,NOBYS,NORTR                                    RET     25
      COMMON /MARKET/ MARKET                                             RET     26
      COMMON /STATIST/ TYPE,YRINTRO,SEATS,SFC,SPEED,UTILIZ,LF,LIFETIM    RET     27
     *,PLOTS                                                             RET     28
      COMMON /MODS/ MTYPE,MODYR,MSEATS,MSFC,MSPEED,MUTILIZ,MLIFET        RET     29
      COMMON /RESULTS/ SEATMI,FUELBRN,RPM                                RET     30
      COMMON /POP/ NOBUYS,NORETIR,POPUL                                  RET     31
      COMMON /INDICES/ NOEXPLS,IN,OUT                                    RET     32
      COMMON /SHARES/ SHRSMIS,SHRFUEL,SHRRPMS,SHRPOPL,SHRBUYS,SHRETIR    RET     33
      COMMON /TOTALS/ SMILES,FBURNED,RPMS,POPULNO,NOBYS,NORTR            RET     34
      COMMON /ACCUMS/ TOTLMIS,TOTLFLB,TOTLRPM,TOTLPOP,TOTLBUY,TOTLRTR    RET     35
      COMMON /STARTER/ NOCRVS,MRKTYPE,D1,D2,PLTRPMS,PLTFUEL,PERCENT      RET     36
      INTEGER YEAR,YR                                                    RET     37
      INTEGER IN,OUT                                                     RET     38
      REAL LF,LIFETIM,MARKET,MODATA                                      RET     39
      REAL MTYPE,MODYR,MSEATS,MSFC,MSPEED,MUTILIZ,MLIFET                 RET     40
C                                                                        RET     41
C     SET UP IDENTIFICATION OF LOGICAL UNITS FOR PLOTTING ROUTINES       RET     42
C                                                                        RET     43
      LUN=9                                                              RET     44
      LUN11=11                                                           RET     45
      REWIND LUN                                                         RET     46
      REWIND LUN11                                                       RET     47
      CALL INIT,4                                                        RET     48
      CALL SETUP(LUN11)                                                  RET     49
      NOCRVS=0                                                           RET     50
      MRKT=1                                                             RET     51
      GO TO 96                                                           RET     52
   95 CONTINUE                                                           RET     53
      MRKT=MRKT+1                                                        RET     54
   96 CONTINUE                                                           RET     55
      DO 15 I=1,10                                                       RET     56
      MTYPE(I)=0.0                                                       RET     57
   15 CONTINUE                                                           RET     58
```

```
C
C     READ MARKET NAME
C
      READ (5,8) MRKTYPE(MRKT)
    8 FORMAT (2A10)
      IF (EOF(5)) 999,94
   94 CONTINUE
      WRITE (6,7) MRKTYPE(MRKT)
    7 FORMAT (1H1,T5,,*MARKET = *,2A10)
C
C     READ RPM GROWTH RATES FOR EACH YEAR FROM 1975-2035
C
      READ (5,1) GROWTH
    1 FORMAT (8F10.0)
      IF (EOF(5)) 999,97
   97 CONTINUE
      WRITE (6,11)
   11 FORMAT(1H0,*GROWTH*)
      WRITE (6,5) GROWTH
    5 FORMAT(1X,8F10.4)
      PERCENT=GROWTH(1)
C
C     READ LOAD FACTOR FOR EACH YEAR FROM 1975-2035
C
      READ (5,1) LF
      IF (EOF(5)) 999,93
   93 CONTINUE
      WRITE (6,13)
   13 FORMAT(1H0,* LF *)
      WRITE (6,5) LF
*
C
C     READ IN PARAMETERS DEFINING EXISTING AIRCRAFT CURRENTLY IN SERVICE
C
*
      READ (5,2) NOEXPLS
    2 FORMAT(I5)
      IF (EOF(5)) 999,98
   98 CONTINUE
      WRITE (6,12)
   12 FORMAT(* EXISTING FLEET *)
      WRITE (6,2) NOEXPLS
      DO 10 I=1,NOEXPLS
      READ (5,3) TYPE(I),YRINTRO(I),SEATS(I),SFC(I),SPEED(I),UTILIZ(I),
     X           LIFETIM(I),PLOTS(I)
    3 FORMAT(A10,6F10.0,A10)
      IF (EOF(5)) 999,99
   99 CONTINUE
      WRITE (6,6) TYPE(I),YRINTRO(I),SEATS(I),SFC(I),SPEED(I),UTILIZ(I),
     X            LIFETIM(I),PLOTS(I)
    6 FORMAT(1X,A11,6F10.4,A10)
C
C     CONVERT FUEL BURNED FROM POUNDS PER SEAT MILE TO BARRELS PER
C     SEAT MILE
C
      SFC(I)=SFC(I)/2A1.4
*
```

RET 59 RET 60 RET 61 RET 62 RET 63 RET 64 RET 65 RET 66 RET 67 RET 68 RET 69 RET 70 RET 71 RET 72 RET 73 RET 74 RET 75 RET 76 RET 77 RET 78 RET 79 RET 80 RET 81 RET 82 RET 83 RET 84 RET 85 RET 86 RET 87 RET 88 RET 89 RET 90 RET 91 RET 92 RET 93 RET 94 RET 95 RET 96 RET 97 RET 98 RET 99 RET 100 RET 101 RET 102 RET 103 RET 104 RET 105 RET 106 RET 107 RET 108 RET 109 RET 110 RET 111 RET 112 RET 113 RET 114 RET 115

```
      C     READ IN PAST 10 YEAR HISTORY OF BUYS AND RETIREMENTS           RET   116
      C     OF EXISTING AIRCRAFT                                           RET   117
      *                                                                    RET   118
            READ (5,4) (NOBUYS(I,J),J=1,15,1)                              RET   119
      4     FORMAT(8F10.0)                                                 RET   120
            IF (EOF(5)) 999,101                                            RET   121
      101   CONTINUE                                                       RET   122
            WRITE (6,5) (NOBUYS(I,J),J=1,15,1)                             RET   123
            READ (5,4) (NORETIR(I,J),J=1,16,1)                             RET   124
            IF (EOF(5)) 999,9                                              RET   125
      9     CONTINUE                                                       RET   126
            WRITE (6,5) (NORETIR(I,J),J=1,16,1)                            RET   127
      10    CONTINUE                                                       RET   128
      C                                                                    RET   129
      C     READ DATA DEFINING FUTURE MODIFICATIONS TO EXISTING AIRCRAFT   RET   130
      C     TYPES                                                          RET   131
      C                                                                    RET   132
            READ (5,2) NOMODS                                              RET   133
            IF (EOF(5)) 999,102                                            RET   134
      102   CONTINUE                                                       RET   135
            WRITE (6,25)                                                   RET   136
      26    FORMAT(* MODIFICATIONS *)                                      RET   137
            WRITE (6,2) NOMODS                                             RET   138
      C                                                                    RET   139
      C     CHECK TO SEE IF THERE ARE ANY MODIFICATIONS TO BE MADE TO THE  RET   140
      C     EXISTING AIRCRAFT                                              RET   141
      C                                                                    RET   142
            IF (NOMODS.EQ.0)  GO TO 35                                     RET   143
            DO 30 J=1,NOMODS                                               RET   144
            READ (5,3) MODATA                                              RET   145
            IF (EOF(5)) 999,103                                            RET   146
      103   CONTINUE                                                       RET   147
            WRITE (6,6) MODATA                                             RET   148
            NAME=SHIFT(MODATA(1),6)                                        RET   149
            NAME=NAME.OR.[illegible]                                       RET   150
            DO 20 I=1,NOEXPLS                                              RET   151
            IF (NAME.NE.TYPE(I))  GO TO 20                                 RET   152
            IT=I                                                           RET   153
            GO TO 25                                                       RET   154
      20    CONTINUE                                                       RET   155
      25    CONTINUE                                                       RET   156
            MTYPE  (IT)=MODATA(1)                                          RET   157
            MODYR  (IT)=MODATA(2)                                          RET   158
            MSEATS (IT)=MODATA(3)                                          RET   159
            MSFC   (IT)=MODATA(4)/281.4                                    RET   160
            MSPEED (IT)=MODATA(5)                                          RET   161
            MUTILIZ(IT)=MODATA(6)                                          RET   162
            MLIFET (IT)=MODATA(7)                                          RET   163
      30    CONTINUE                                                       RET   164
      35    CONTINUE                                                       RET   165
      *                                                                    RET   166
      C     READ PARAMETERS DEFINING NEW AIRCRAFT TO BE ENTERED INTO SERVICE RET 167
      *                                                                    RET   168
            OUT=NOEXPLS                                                    RET   169
            READ (5,2) NONEW                                               RET   170
            IF (EOF(5)) 999,37                                             RET   171
      37    CONTINUE                                                       RET   172
```

```
                      WRITE (6,41)                                              RET       173
                41    FORMAT(* NEW AIRCRAFT TYPES *)                            RET       174
                      WRITE (6,2) NONEW                                         RET       175
      175             IN=NOEXPLS+1                                              RET       176
                      OUT=NOEXPLS+NONEW                                         RET       177
                      IF (NONEW.EQ.0)  GO TO 45                                 RET       178
                      DO 40 I=IN,OUT,1                                          RET       179
                      READ (5,3) TYPE(I),YRINTRO(I),SEATS(I),SFC(I),SPEED(I),UTILIZ(I),  RET  180
                     *                  LIFETIME(I),PLOTS(I)                   RET       181
      180             IF (EOF(5)) 999,104                                       RET       182
                104   CONTINUE                                                  RET       183
                      WRITE (6,6) TYPE(I),YRINTRO(I),SEATS(I),SFC(I),SPEED(I),UTILIZ(I),  RET  184
                     *                  LIFETIME(I),PLOTS(I)                   RET       185
      185             SFC(I)=SFC(I)/281.4                                       RET       186
                      DO 38 J=1,46                                              RET       187
                      NOBUYS(I,J)=0.0                                           RET       188
                      NORETIR(I,J)=0.0                                          RET       189
                38    CONTINUE                                                  RET       190
      190       40    CONTINUE                                                  RET       191
                45    CONTINUE                                                  RET       192
                      *                                                         RET       193
                C     FROM INPUT BUY AND RETIREMENT HISTORY, COMPUTE AIRCRAFT    RET       194
                C     POPULATION BY TYPE IN BASE YEAR                           RET       195
      195       *                                                               RET       196
                      DO 55 I=1,NOEXPLS                                         RET       197
                      POPUL(I,1)=0.0                                            RET       198
                      DO 55 J=1,16,1                                            RET       199
                      POPUL(I,1)=POPUL(I,1)+NOBUYS(I,J)-NORETIR(I,J)            RET       200
      200       55    CONTINUE                                                  RET       201
                *                                                               RET       202
                *     COMPUTE SEAT-MILES/YR/PLANE, REVENUE-PASSENGER MILES/YR/PLANE  RET  203
                *     AND FUEL-BURNED/YR/PLANE FOR BASE YEAR 1975.              RET       204
                *                                                               RET       205
      205             DO 53 I=1,NOEXPLS                                         RET       206
                      SEATMI(I,1)=SPEED(I)*UTILIZ(I)*SEATS(I)                   RET       207
                      RPM(I,1)=SEATMI(I)*LF(1)                                  RET       208
                      FUELBRN(I,1)=SFC(I)*SEATMI(I,1)                           RET       209
                53    CONTINUE                                                  RET       210
      210       *                                                               RET       211
                *     COMPUTE RPMS GENERATED FOR BASE YEAR 1975                 RET       212
                *                                                               RET       213
                      DO 57 I=IN,OUT,1                                          RET       214
                      POPUL(I,1)=0.0                                            RET       215
      215       57    CONTINUE                                                  RET       216
                      MARKET(1)=0.0                                             RET       217
                      DO 60 I=1,NOEXPLS                                         RET       218
                      MARKET(1)=MARKET(1)+RPM(I,1)*POPUL(I,1)                   RET       219
                60    CONTINUE                                                  RET       220
      220       *                                                               RET       221
                C     COMPUTE PROJECTED RPMS DEMANDED IN FUTURE YEARS (1975-2005)  RET  222
                *                                                               RET       223
                      DO 70 I=2,31                                              RET       224
                      MARKET(I)=(1.+GROWTH(I)*.01)*MARKET(I-1)                  RET       225
      225       70    CONTINUE                                                  RET       226
                      WRITE (6,71)                                              RET       227
                71    FORMAT(* MARKET *)                                        RET       228
                      WRITE (6,72) MARKET                                       RET       229
```

```
   76  FORMAT(1X,4E30.20)
*
C      PROJECT FLEET COMPOSITION FOR EACH YEAR BY DETERMINING
C      RETIREMENTS, MODIFICATIONS, AND BUYS
*
       DO 200 YEAR=1976,2005,1
       YR=YEAR-1974
*
*      ADJUST POPULATION OF EXISTING AIRCRAFTS ACCORDING TO THEIR
*      LIFE-CYCLE
*
       CALL AMORTIZ (YR)
*
*      CHECK FOR WHETHER MODIFICATION ARE TO BE MADE TO ANY EXISTING
*      AIRCRAFT TYPES
*
       CALL MODS (YR)
*
C      DETERMINE NEW AIRCRAFT NEEDED TO MEET DEMAND
*
*
       CALL BUYS (YR)
*
  200  CONTINUE
C
C      PRINT FOR EACH AIRCRAFT TYPE YEARLY VALUES FOR SEAT MILES
C      FLOWN, FUEL BURNED, RPMS FLOWN, AIRCRAFT POPULATION, BUYS,
C      AND RETIREMENTS
C
       DO 400 I=1,OUT,1
       WRITE (6,201) TYPE(I)
  201  FORMAT(1H1,T50,* AIRCRAFT TYPE = *,A10)
       WRITE (6,299)
  299  FORMAT(1H0,* YEAR *,T23,*SEAT-MILES*,T40,*FUELBURNED*,T63,
      X *RPMS*,T80,*POPULATION*,T101,*# BUYS/YR*,T120,*# RETIRED/YR*)
       WRITE (6,298)
  298  FORMAT(T22,*(YEAR)*,T42,*(YEAR)*,T62,*(YEAR)*,T78,*AS OF MID-YEAR*
      X,T98,*(THRU MID-YEAR)*,T118,*(THRU MID-YEAR)*/)
       DO 300 YEAR=1975,2005,1
       YR=YEAR-1974
       SMILES=SEATMI(I,YR)*POPUL(I,YR)
       FBURNED=FUELRPN(I,YR)*POPUL(I,YR)
       RPMS=RPM(I,YR)*POPUL(I,YR)
       POPULNO=POPUL(I,YR)
       NOBYS=NOBUYS(I,15+YR)
       NORTR=NORETIR(I,15+YR)
       WRITE (6,301) YEAR,SMILES,FBURNED,RPMS,POPULNO,NOBYS,NORTR
  301  FORMAT (I6,12X,5(E10.4,10X),E10.4)
       CALL SHARE (MRKT,YR)
  300  CONTINUE
C
C      CALL SUBROUTINE CURVES TO STORE DATA FOR LATER PLOTTING
C      (SUBROUTINE PLOTTER)
C
       CALL CURVES
  400  CONTINUE
       IF (NONEW.EQ.1)  GO TO 410
```

```
                C                                                               RET     287
                C     SUBROUTINE INPLANT IS THE INTERFACE WITH THE AIRFRAME     RET     288
                C     MANUFACTURER MODULE WHICH ESTIMATES THE AIRCRAFT MANUFACTURING RET 289
                C     RATES OF RETURN ON INVESTMENT                             RET     290
          295   C                                                               RET     291
                      CALL INPLANT                                              RET     292
                410   CONTINUE                                                  RET     293
                      PLTRPMS(MRKT)=SHRRPMS(MRKT,31)                            RET     294
                      PLTFUEL(MRKT)=SHRFUEL(MRKT,31)                            RET     295
          295         CALL PLOTSGL (MRKT)                                       RET     296
                C                                                               RET     297
                C     FOR EACH AIRCRAFT TYPE BY YEAR, PRINT CUMULATIVE VALUES FOR RET   298
                C     SEAT MILES FLOWN, FUEL CONSUMED, RPMS FLOWN, BUYS, AND    RET     299
                C     RETIREMENTS                                               RET     300
          300   C                                                               RET     301
                      DO 440 I=1,OUT,1                                          RET     302
                      SMILES =0.0                                               RET     303
                      FBURNED=0.0                                               RET     304
                      RPMS   =0.0                                               RET     305
          305         POPULAT=0.0                                               RET     306
                      BUY=0.0                                                   RET     307
                      RETIR=0.0                                                 RET     308
                      WRITE (6,2??) TYPE(I)                                     RET     309
                      WRITE (6,451)                                             RET     310
          310         DO 435 YEAR=1975,2045,1                                   RET     311
                      YR=YEAR-1974                                              RET     312
                      SMILES = SMILES+SEATMI(I,YR)*POPUL(I,YR)                  RET     313
                      FBURNED = FBURNED+FUELBRN(I,YR)*POPUL(I,YR)               RET     314
                      RPMS = RPMS+RPM(I,YR)*POPUL(I,YR)                         RET     315
C-6       315         BUY=BUY+NOBUYS(I,15+YR)                                   RET     316
                      RETIR=RETIR+NORETIR(I,15+YR)                              RET     317
                      WRITE (6,452) YEAR,SMILES,FBURNED,RPMS,BUY,RETIR          RET     318
                435   CONTINUE                                                  RET     319
                440   CONTINUE                                                  RET     320
          320   C                                                               RET     321
                C     GO CONSIDER NEXT MARKET                                   RET     322
                C                                                               RET     323
                      GO TO 95                                                  RET     324
                999   CONTINUE                                                  RET     325
          325         MRKT=MRKT-1                                               RET     326
                C                                                               RET     327
                C     PRINT CUMULATIVE FLEET COMPOSITION AND ACTIVITY PROJECTS FOR RET   328
                C     EACH MARKET                                               RET     329
                C                                                               RET     330
          330   C     DO 450 I=1,MRKT                                           RET     331
                      SMILES =0.0                                               RET     332
                      FBURNED=0.0                                               RET     333
                      RPMS   =0.0                                               RET     334
                      BUY=0.0                                                   RET     335
          335         RETIR=0.0                                                 RET     336
                      WRITE (6,601) MRKTYPE(I)                                  RET     337
                      WRITE (6,451)                                             RET     338
                451   FORMAT(//T10,*YEAR*,T22,*ACCUMULATIVE*,T44,*ACCUMULATIVE*,T65, RET 339
                     X*ACCUMULATIVE*,T88,*ACCUMULATIVE*,T110,*ACCUMULATIVE*,    RET     340
          340        Y/T22,* SEAT-MILES*,T44,*FUEL-BURNED*,T66,*     RPMS*,T88,*   = BUYS* RET 341
                     X,T110,* = RETIRED*)                                       RET     342
                      WRITE (6,449)                                             RET     343
```

```
                449   FORMAT(T21,*(TO END OF YEAR)*,T43,*(TO END OF YEAR)*,                BET   344
                     X,T65,*(TO END OF YEAR)*,T87,*(THRU MID-YEAR)*,                       BET   345
      345            XT109,*(THRU MID-YEAR)*/)                                            BET   346
                     DO 430 YEAR=1975,2005,1                                              BET   347
                     YR=YEAR-1974                                                         BET   348
                     SMILES = SMILES+SHRSMIS(I,YR)                                        BET   349
                     FBURNED=FBURNED+SHRFUEL(I,YR)                                        BET   350
      350            RPMS   = RPMS  +SHRRPMS(I,YR)                                        BET   351
                     BUY=BUY+SHRBUYS(I,YR)                                                BET   352
                     RETIR=RETIR+SHRETIR(I,YR)                                            BET   353
                     WRITE (6,452) YEAR, SMILES, FBURNED, RPMS, BUY, RETIR                BET   354
                452  FORMAT(I13,T20,E12.4,T42,E12.4,T64,E12.4,T86,E12.4,T108,E12.4)       BET   355
      355       430  CONTINUE                                                             BET   356
                450  CONTINUE                                                             BET   357
                     SMILES =0.0                                                          BET   358
                     FBURNED=0.0                                                          BET   359
                     RPMS   =0.0                                                          BET   360
      360            BUY=0.0                                                              BET   361
                     RETIR=0.0                                                            BET   362
                     WRITE (6,481)                                                        BET   363
                481  FORMAT(1H1,T45,*ACCUMULATIVE TOTALS FOR ALL MARKETS*)                BET   364
                     WRITE (6,451)                                                        BET   365
      365            WRITE (6,449)                                                        BET   366
                C                                                                         BET   367
                C    PRINT TOTAL CUMULATIVE FLEET COMPOSITION AND ACTIVITY                BET   368
                C    PROJECTIONS FOR ALL MARKETS                                          BET   369
                C                                                                         BET   370
      370       DO 480 YEAR=1975,2005,1                                                  BET   371
                YR=YEAR-1974                                                             BET   372
                DO 460 I=1,MRKT                                                          BET   373
                SMILES = SMILES+SHRSMIS(I,YR)                                            BET   374
                FBURNED=FBURNED+SHRFUEL(I,YR)                                            BET   375
      375       RPMS   = RPMS  + SHRRPMS(I,YR)                                           BET   376
                BUY=BUY+SHRBUYS(I,YR)                                                    BET   377
                RETIR=RETIR+SHRETIR(I,YR)                                                BET   378
                460  CONTINUE                                                            BET   379
                WRITE (6,452) YEAR, SMILES, FBURNED, RPMS, BUY, RETIR                    BET   380
      380       480  CONTINUE                                                            BET   381
                C                                                                        BET   382
                C    PRINT FRACTIONAL MARKET SHARE OF CUMULATIVE FLEET COMPOSITION       BET   383
                C    AND ACTIVITY PROJECTIONS FOR EACH MARKET                            BET   384
                C                                                                        BET   385
      385       DO 600 I=1,MRKT                                                          BET   386
                WRITE (6,601) MRKTYPE(I)                                                 BET   387
                601  FORMAT(1H1,T52,*MARKET = *,2A10)                                    BET   388
                WRITE (6,602)                                                            BET   389
                602  FORMAT(//T11,*YEAR*,T25,*FRACTIONAL*,T55,*FRACTIONAL*,T95,*FRACTIO  BET   390
      390      XNAL*,T115,*FRACTIONAL*,          /T25,*SEAT-MILES*,T55,*FUEL-BU          BET   391
               XRNED*,T88,*RPMS*,T115,*POPULATION*/)                                     BET   392
                     DO 500 YEAR=1975,2005,1                                             BET   393
                     YR=YEAR-1974                                                        BET   394
                     FCTSMIS = SHRSMIS(I,YR)/TOTLMIS(YR)                                 BET   395
      395            FCTFUEL = SHRFUEL(I,YR)/TOTLFLB(YR)                                 BET   396
                     FCTRPMS = SHRRPMS(I,YR)/TOTLRPM(YR)                                 BET   397
                     FCTPOPL = SHRPOPL(I,YR)/TOTLPOP(YR)                                 BET   398
                     WRITE (6,501) YEAR, FCTSMIS, FCTFUEL, FCTRPMS, FCTPOPL              BET   399
                501  FORMAT(I14,4(E20.4,10X))                                            BET   400
```

```
                  500   CONTINUE                                                  BET       401
                  600   CONTINUE                                                  BET       402
                        C                                                         BET       403
                        C     PRINT YEARLY FLEET COMPOSITION AND ACTIVITY PROJECTIONS FOR  BET       404
                        C     EACH MARKET                                         BET       405
                        C                                                         BET       406
                        DO 700 I=1,MRKT                                           BET       407
                        WRITE (6,601) MRKTYPE(I)                                  BET       408
                        WRITE (6,299)                                             BET       409
                        WRITE (6,298)                                             BET       410
                        DO 650 YEAR=1975,2005,1                                   BET       411
                        YR=YEAR-1974                                              BET       412
                        WRITE (6,301) YEAR,SHRSMIS(I,YR),SHRFUEL(I,YR),SHRRPMS(I,YR),  BET       413
                       X                SHRPOPL(I,YR),SHRBUYS(I,YR),SHRETIR(I,YR)  BET       414
                  650   CONTINUE                                                  BET       415
                  700   CONTINUE                                                  BET       416
                        WRITE (6,301)                                             BET       417
                  601   FORMAT(1H1,T56,*TOTALS FOR ALL MARKETS*)                  BET       418
                        WRITE (6,299)                                             BET       419
                        WRITE (6,298)                                             BET       420
                        C                                                         BET       421
                        C     PRINT TOTAL YEARLY FLEET COMPOSITION AND ACTIVITY PROJECTIONS  BET       422
                        C     FOR ALL MARKETS                                     BET       423
                        C                                                         BET       424
                        DO 800 YEAR=1975,2245,1                                   BET       425
                        YR=YEAR-1974                                              BET       426
                        WRITE (6,301) YEAR,TOTLMIS(YR),TOTLFLR(YR),TOTLRPM(YR),TOTLPOP(YR)  BET       427
                       X,               TOTLBUY(YR),TOTLRTR(YR)                   BET       428
                  800   CONTINUE                                                  BET       429
                        C                                                         BET       430
                        C     CALL SUBROUTINE PLOTTER TO PLOT TOTALS FOR MARKETS  BET       431
                        C                                                         BET       432
                        OPLOT=1                                                   BET       433
                        READ(5,2) OPLOT                                           BET       434
                        IF(OPLOT.EQ.0) STOP                                       BET       435
                        CALL PLOTTER (LUN)                                        BET       436
                        STOP                                                      BET       437
                        END                                                       BET       438
```

```
      1                 SUBROUTINE AMORTIZ (YR)                                 AMORTIZ     2
                      C                                                         AMORTIZ     3
                      C     THIS SUBROUTINE RETIRES AIRCRAFT THAT HAVE REACHED  AMORTIZ     4
                      C     RETIREMENT AGE                                      AMORTIZ     5
      5               C                                                         AMORTIZ     6
                            DIMENSION TYPE(10),YRINTRO(10),SEATS(10),SEC(10),SPEED(10),  AMORTIZ     7
                     X UTILIZ(10),LIFETIM(10)                                   AMORTIZ     8
                            DIMENSION POPUL(10,31),NOBUYS(10,46),NORETIR(10,46)  AMORTIZ     9
                            DIMENSION PLOTS(13)                                 AMORTIZ    10
     10                     DIMENSION LF(31)                                    AMORTIZ    11
                            INTEGER YR,OUT,DYEAR,PASS                           AMORTIZ    12
                            REAL LF,LIFETIM,NOBUYS,NORETIR                      AMORTIZ    13
                            COMMON /STATIST/ TYPE,YRINTRO,SEATS,SEC,SPEED,UTILIZ,LF,LIFETIM  AMORTIZ    14
                     *,PLOTS                                                    AMORTIZ    15
     15                     COMMON /POP/ NOBUYS,NORETIR,POPUL                   AMORTIZ    16
                            COMMON /INDICES/ NOEXPLS,IN,OUT                     AMORTIZ    17
                      C                                                         AMORTIZ    18
                      C     INITIALIZE BUY AND RETIREMENT COUNTS FOR CURRENT YEAR TO ZERO  AMORTIZ    19
                      C                                                         AMORTIZ    20
     20                     DO 5 I=1,OUT                                        AMORTIZ    21
                            NOBUYS(I,15+YR)=0.0                                 AMORTIZ    22
                            NORETIR(I,15+YR)=0.0                                AMORTIZ    23
                      5     CONTINUE                                            AMORTIZ    24
                            DO 30 I=1,OUT                                       AMORTIZ    25
     25               C                                                         AMORTIZ    26
                      C     FIND THE PAST YEAR SUCH THAT AIRCRAFT BOUGHT IN THAT YEAR HAVE  AMORTIZ    27
                      C     REACHED RETIREMENT AGE, RETIRE THOSE AIRCRAFT       AMORTIZ    28
                      C                                                         AMORTIZ    29
                            DYEAR=15+YR-LIFETIM(I)                              AMORTIZ    30
     30                     IF (DYEAR.LE.0)  GO TO 15                           AMORTIZ    31
                            NORETIR(I,15+YR)=NOBUYS(I,DYEAR)                    AMORTIZ    32
                      15    CONTINUE                                            AMORTIZ    33
                            POPUL(I,YR)=POPUL(I,YR-1)-NORETIR(I,15+YR)          AMORTIZ    34
                            IF (POPUL(I,YR).LE.0.0)  POPUL(I,YR)=0.0            AMORTIZ    35
     35                     IF ((POPUL(I,YR-1).EQ.0.0).AND.(POPUL(I,YR).EQ.0.0))  AMORTIZ    36
                     X    NORETIR(I,15+YR)=0.0                                  AMORTIZ    37
                      30    CONTINUE                                            AMORTIZ    38
                            RETURN                                              AMORTIZ    39
                            END                                                 AMORTIZ    40
```

```
      1                 SUBROUTINE MODS (YR)                                    MODS        2
                    C                                                           MODS        3
                    C     THIS SUBROUTINE MODIFIES AIRCRAFT CURRENTLY IN THE FLEET  MODS    4
                    C     THAT ARE SCHEDULED FOR MODIFICATION                   MODS        5
      5             C                                                           MODS        6
                          DIMENSION TYPE(20),YRINTRO(11),SEATS(10),SFC(10),SPEED(20),  MODS 7
                     X    UTILIZ(10),LIFETM(10)                                 MODS        8
                          DIMENSION LF(30)                                      MODS        9
                          DIMENSION MTYPE(10),MODYR(20),MSEATS(20),MSFC(10),MSPEED(10),  MODS 10
     10                   MUTILIZ(10),MLIFET(10)                                MODS        11
                          DIMENSION SEATMI(20,31),FUELBRN(10,31),RPM(10,31)     MODS        12
                          DIMENSION  PLOTS(10)                                  MODS        13
                          INTEGER YR,OUT                                        MODS        14
                          REAL LF,LIFETIM,MTYPE,MODYR,MSEATS,MSFC,MSPEED,MUTILIZ,MLIFET  MODS 15
     15                   COMMON /STATIST/ TYPE,YRINTRO,SEATS,SFC,SPEED,UTILIZ,LF,LIFETIM  MODS 16
                     *,PLOTS                                                    MODS        17
                          COMMON /MODS/ MTYPE,MODYR,MSEATS,MSFC,MSPEED,MUTILIZ,MLIFET  MODS 18
                          COMMON /RESULTS/ SEATMI,FUELBRN,RPM                   MODS        19
                          COMMON /INDICES/ NOEXPLS,IN,OUT                       MODS        20
     20                   YEAR=YR+1974.                                         MODS        21
                    C                                                           MODS        22
                    C     CHECK EACH EXISTING AIRCRAFT FOR POSSIBLE MODIFICATION  MODS      23
                    C                                                           MODS        24
                          DO 200 I=1,NOEXPLS                                    MODS        25
     25                   IF (MTYPE(I).EQ.0.0) GO TO 200                        MODS        26
                          IF (MODYR(I).NE.YEAR) GO TO 100                       MODS        27
                    C                                                           MODS        28
                    C     IN THE YEAR MODIFICATION BEGINS, LET THE AIRCRAFT PARAMETER  MODS 29
                    C     VALUES EQUAL THE AVERAGE OF THE ORIGINAL AND MODIFIED VALUES  MODS 30
     30             C                                                           MODS        31
                          IF (MSEATS(I).EQ.0.0) GO TO 10                        MODS        32
                          SEATS(I)=(SEATS(I)+MSEATS(I))/2.                      MODS        33
                    10    CONTINUE                                              MODS        34
                          IF (MSFC(I).EQ.0.0) GO TO 20                          MODS        35
     35                   SFC(I)=(SFC(I)+MSFC(I))/2.                            MODS        36
                    20    CONTINUE                                              MODS        37
                          IF (MSPEED(I).EQ.0.0) GO TO 30                        MODS        38
                          SPEED(I)=(SPEED(I)+MSPEED(I))/2.                      MODS        39
                    30    CONTINUE                                              MODS        40
     40                   IF (MUTILIZ(I).EQ.0.0) GO TO 40                       MODS        41
                          UTILIZ(I)=(UTILIZ(I)+MUTILIZ(I))/2.                   MODS        42
                    40    CONTINUE                                              MODS        43
                          IF (MLIFET(I).EQ.0.0) GO TO 100                       MODS        44
                          LIFETM(I)=(LIFETM(I)+MLIFET(I))/2.                    MODS        45
     45             100   CONTINUE                                              MODS        46
                          IF (MODYR(I)+1.NE.YEAR) GO TO 200                     MODS        47
                    C                                                           MODS        48
                    C     IN THE YEAR AFTER MODIFICATION BEGINS, THE AIRCRAFT PARAMETER  MODS 49
                    C     VALUES TAKE ON THE MODIFIED VALUES                    MODS        50
     50             C                                                           MODS        51
                          IF (MSEATS(I).EQ.0.0 ) GO TO 110                      MODS        52
                          SEATS(I)=MSEATS(I)                                    MODS        53
                    110   CONTINUE                                              MODS        54
                          IF (MSFC(I).EQ.0.0) GO TO 120                         MODS        55
     55                   SFC(I)=MSFC(I)                                        MODS        56
                    120   CONTINUE                                              MODS        57
                          IF (MSPEED(I).EQ.0.0 ) GO TO 130                      MODS        58
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                SPEED(I)=MSPEED(I)                                      MODS      59
            130 CONTINUE                                                MODS       6
      60        IF (MUTILIZ(I).EQ.0.0) GO TO 140                        MODS      61
                UTILIZ(I)=MUTILIZ(I)                                    MODS      62
            140 CONTINUE                                                MODS      63
                IF (MLIFET(I).EQ.0.0) GO TO 200                         MODS      64
                LIFETIM(I)=MLIFET(I)                                    MODS      65
      65    200 CONTINUE                                                MODS      66
                C                                                       MODS      67
                C     COMPUTE SEAT MILES, RPMS, AND FUEL BURN PER AIRCRAFT OF EACH  MODS  68
                C     TYPE FOR THE CURRENT YEAR                         MODS      69
                C                                                       MODS      70
      70        DO 300 I=2,OUT                                          MODS      71
                SEATMI(I,YR)=SPEED(I)*UTILIZ(I)*SEATS(I)                MODS      72
                RPM(I,YR)=SEATMI(I,YR)*LF(YR)                           MODS      73
                FUELBRN(I,YR)=SFC(I)*SEATMI(I,YR)                       MODS      74
            300 CONTINUE                                                MODS      75
      75        RETURN                                                  MODS      76
                END                                                     MODS      77
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      1                 SUBROUTINE BUYS (YR)                                    BUYS      2
                  C                                                             BUYS      3
                  C     THIS SUBROUTINE COMPUTES THE NUMBER OF RPMS DEMANDED, AND THE   BUYS      4
                  C     NUMBER OF RPMS THAT CAN BE GENERATED BY THE CURRENT FLEET, AND  BUYS      5
                  C     IF CURRENT FLEET DOES NOT MEET THE DEMAND, PURCHASES THE        BUYS      6
                  C     ADDITIONAL AIRCRAFT REQUIRED                                    BUYS      7
                  C                                                             BUYS      8
                        INTEGER YR,IN,OUT,YEAR                                  BUYS      9
                        DIMENSION TYPE(10),YRINTRO(10),SEATS(10),SFC(10),SPEED(10),     BUYS     10
      10              * UTILIZ(10),LIFETM(10)                                   BUYS     11
                        DIMENSION LF(31)                                        BUYS     12
                        DIMENSION PLOTS(1.)                                     BUYS     13
                        DIMENSION MARKET(31)                                    BUYS     14
                        DIMENSION NOBUYS(1,,46),NORETIR(10,46)                  BUYS     15
      15                DIMENSION SEATMI(10,31),FUELBRN(10,31),RPM(10,31),POPUL(10,31)  BUYS     16
                        REAL MARKET,LF,LIFETM,LOADFCT,NOBUYS,NORETR             BUYS     17
                        COMMON /STATIST/ TYPE,YRINTRO,SEATS,SFC,SPEED,UTILIZ,LF,LIFETM  BUYS     18
                       *,PLOTS                                                  BUYS     19
                        COMMON /RESULTS/ SEATMI,FUELBRN,RPM                     BUYS     20
      20                COMMON /MARKET/ MARKET                                  BUYS     21
                        COMMON /INDICES/ NOEXPLS,IN,OUT                         BUYS     22
                        COMMON /POP/ NOBUYS,NORETIR,POPUL                       BUYS     23
                        TOTAL=0.0                                               BUYS     24
                  C                                                             BUYS     25
      25          C     COMPUTE TOTAL RPMS AVAILABLE FOR THIS YEAR              BUYS     26
                  C                                                             BUYS     27
                        DO 100 I=1,OUT                                          BUYS     28
                        TOTAL=TOTAL+RPM(I,YR)*POPUL(I,YR)                       BUYS     29
                  100   CONTINUE                                                BUYS     30
      30          C                                                             BUYS     31
                  C     COMPUTE DIFFERENCE BETWEEN DEMANDED AND AVAILABLE RPMS  BUYS     32
                  C                                                             BUYS     33
                        RPMDIFF=MARKET(YR)-TOTAL                                BUYS     34
                        IF (RPMDIFF.LT.0.0)  GO TO 999                          BUYS     35
      35                YEAR=YR+1974.                                           BUYS     36
                  C                                                             BUYS     37
                  C     DETERMINE WHICH TYPE OF AIRCRAFT IS TO BE PURCHASED     BUYS     38
                  C                                                             BUYS     39
                        DO 200 I=1,OUT,1                                        BUYS     40
      40                J=OUT-I+1                                               BUYS     41
                        IF ((YRINTRO(J).GT.YEAR).OR.(YRINTRO(J).EQ.0.0))  GO TO 200   BUYS     42
                        IT=J                                                    BUYS     43
                        GO TO 300                                               BUYS     44
                  200   CONTINUE                                                BUYS     45
      45                RETURN                                                  BUYS     46
                  300   CONTINUE                                                BUYS     47
                  C                                                             BUYS     48
                  C     ADJUST POPULATION TO ACCOUNT FOR BUYS                   BUYS     49
                  C                                                             BUYS     50
      50                NOBUYS(IT,15+YR)=RPMDIFF/RPM(IT,YR)                     BUYS     51
                        POPUL(IT,YR)=POPUL(IT,YR)+NOBUYS(IT,15+YR)              BUYS     52
                        IF (POPUL(IT,YR).LT.0.0)  POPUL(IT,YR)=0.3              BUYS     53
                        RETURN                                                  BUYS     54
                  999   CONTINUE                                                BUYS     55
      55          C                                                             BUYS     56
                  C     COMPUTE ACTUAL LOAD FACTOR FOR THE CASE OF OVER SUPPLY OF       BUYS     57
                  C     SEAT MILES                                              BUYS     58
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      C
            LOADFCT=MARKET(YR)/TOTAL                                    RIIYS     50
      60    YEAR=YR+1974                                                RIIYS     60
            WRITE (5,1) LOADFCT,YEAR                                    RIIYS     61
            FORMAT(' LF = ',F5.3,' WILL SATISFIED RPM REQUIREMENT FOR YEAR ',   RIIYS     62
           *I5)                                                         RIIYS     63
            RETURN                                                      RIIYS     64
      65    END                                                         RIIYS     65
                                                                        RIIYS     66
```

```
      SUBROUTINE SHARE (MRKT,YR)                                        SHARE      2
C                                                                       SHARE      3
C     THIS SUBROUTINE STORES MARKET SHARE RESULTS FOR FLEET COMPOSITION SHARE      4
C     AND ACTIVITY STATISTICS                                           SHARE      5
C                                                                       SHARE      6
      INTEGER MRKT,YR                                                   SHARE      7
      DIMENSION TOTLMIS(31),TOTLFLB(31),TOTLRPM(31),TOTLPOP(31)         SHARE      8
      DIMENSION TOTLBUY(31),TOTLRTR(31)                                 SHARE      9
      DIMENSION SHRSMIS(3,31),SHRFUEL(3,31),SHRRPMS(3,31),SHRPOPL(3,31) SHARE     10
      DIMENSION SHRBUYS(3,31),SHRETIR(3,31)                             SHARE     11
      REAL NODAYS,NORTR                                                 SHARE     12
      COMMON /SHARES/ SHRSMIS,SHRFUEL,SHRRPMS,SHRPOPL,SHRBUYS,SHRETIR   SHARE     13
      COMMON /TOTALS/ SMILES,FBURNED,RPMS,POPULNO,NODAYS,NORTR          SHARE     14
      COMMON /ACCUMS/ TOTLMIS,TOTLFLB,TOTLRPM,TOTLPOP,TOTLBUY,TOTLRTR   SHARE     15
C                                                                       SHARE     16
C     UPDATE COUNT BY MARKET AND YEAR OF THE SEAT MILES FLOWN, FUEL     SHARE     17
C     BURNED, RPMS FLOWN, AIRCRAFT POPULATION, BUYS, AND RETIREMENTS    SHARE     18
C                                                                       SHARE     19
      SHRSMIS(MRKT,YR) = SHRSMIS(MRKT,YR)+SMILES                        SHARE     20
      SHRFUEL(MRKT,YR) = SHRFUEL(MRKT,YR)+FBURNED                       SHARE     21
      SHRRPMS(MRKT,YR) = SHRRPMS(MRKT,YR)+RPMS                          SHARE     22
      SHRPOPL(MRKT,YR) = SHRPOPL(MRKT,YR)+POPULNO                       SHARE     23
      SHRBUYS(MRKT,YR)=SHRBUYS(MRKT,YR)+NODAYS                          SHARE     24
      SHRETIR(MRKT,YR)=SHRETIR(MRKT,YR)+NORTR                           SHARE     25
C                                                                       SHARE     26
C     UPDATE COUNT OF OVERALL TOTAL OF SEAT MILES FLOWN, FUEL BURNED,   SHARE     27
C     RPMS FLOWN, AIRCRAFT POPULATION, BUYS, AND RETIREMENTS            SHARE     28
C                                                                       SHARE     29
      TOTLMIS(YR) = TOTLMIS(YR)+SMILES                                  SHARE     30
      TOTLFLB(YR) = TOTLFLB(YR)+FBURNED                                 SHARE     31
      TOTLRPM(YR) = TOTLRPM(YR)+RPMS                                    SHARE     32
      TOTLPOP(YR) = TOTLPOP(YR)+POPULNO                                 SHARE     33
      TOTLBUY(YR) = TOTLBUY(YR)+NODAYS                                  SHARE     34
      TOTLRTR(YR) = TOTLRTR(YR)+NORTR                                   SHARE     35
      RETURN                                                            SHARE     36
      END                                                               SHARE     37
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```
      SUBROUTINE CURVES                                                 CURVES     2
C                                                                       CURVES     3
C     THIS SUBROUTINE SETS UP REVENUE PASSENGER MILES AND FUEL          CURVES     4
C     CONSUMPTION DATA FOR PLOTTING                                     CURVES     5
C                                                                       CURVES     6
      INTEGER YRNO                                                      CURVES     7
      DIMENSION TOTLMIS(31),TOTLFLB(31),TOTLRPM(31),TOTLPOP(31)         CURVES     8
      DIMENSION RPMS(30,31),FUELBRN(30,31),DUMMY(15)                    CURVES     9
      DIMENSION TOTLBUY(31),TOTLRTR(31)                                 CURVES    10
      COMMON /PLOTDAT/ RPMS,FUELBRN                                     CURVES    11
      COMMON /ACCUMS/ TOTLMIS,TOTLFLB,TOTLRPM,TOTLPOP,TOTLBUY,TOTLRTR   CURVES    12
      COMMON /STARTER/ NOCRVS,DUMMY                                     CURVES    13
C                                                                       CURVES    14
C     INCREMENT NUMBER OF CURVES                                        CURVES    15
C                                                                       CURVES    16
      NOCRVS=NOCRVS+1                                                   CURVES    17
C                                                                       CURVES    18
C     FOR EACH YEAR, LOAD ELEMENTS OF ARRAYS WITH RPMS FLOWN AND        CURVES    19
C     FUEL BURNED BY THE ASSOCIATED AIRCRAFT TYPE                       CURVES    20
C                                                                       CURVES    21
      DO 10 YRNO=1,31,1                                                 CURVES    22
      RPMS    (NOCRVS,YRNO)=TOTLRPM(YRNO)                               CURVES    23
      FUELBRN (NOCRVS,YRNO)=TOTLFLB(YRNO)                               CURVES    24
   10 CONTINUE                                                          CURVES    25
      RETURN                                                            CURVES    26
      END                                                               CURVES    27
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      SUBROUTINE PLOTTER (LUN)                                          PLOTTER    2
C                                                                       PLOTTER    3
C     THIS SUBROUTINE PLOTS REVENUE PASSENGER MILES AND FUEL            PLOTTER    4
C     CONSUMPTION AIRCRAFT MARKET SHARE CURVES                          PLOTTER    5
C                                                                       PLOTTER    6
      DIMENSION YEARS(33),CURVE(33)                                     PLOTTER    7
      DIMENSION RPMS(30,31),FUELBRN(30,31)                              PLOTTER    8
      DIMENSION MRKTYPE(6),PLTRPMS(3),PLTFUEL(3)                        PLOTTER    9
      INTEGER YRNO                                                      PLOTTER   10
      COMMON /STARTER/ NOCRVS,MRKTYPE,D1,D2,PLTRPMS,PLTFUEL,PERCENT     PLOTTER   11
      COMMON /PLOTDAT/ RPMS,FUELBRN                                     PLOTTER   12
C                                                                       PLOTTER   13
C     PLOTS PERFORMS INITIALIZATION OF THE PLOTTING SOFTWARE            PLOTTER   14
C                                                                       PLOTTER   15
      CALL PLOTS(LUN)                                                   PLOTTER   16
      DO 10 YRNO=1,31,1                                                 PLOTTER   17
      YEAR=1974.+YRNO                                                   PLOTTER   18
      YEARS(YRNO)=YEAR                                                  PLOTTER   19
   10 CONTINUE                                                          PLOTTER   20
C                                                                       PLOTTER   21
C     READ IN DATA FOR AXIS SCALING                                     PLOTTER   22
C                                                                       PLOTTER   23
      READ (5,2) TOPFBRN,NOMRKSF,TOPRPMS,NOMRKSR                        PLOTTER   24
    2 FORMAT(2(E10.4,I10))                                              PLOTTER   25
      IF (EOF(5)) 15,18                                                 PLOTTER   26
C                                                                       PLOTTER   27
C     IF NO DATA WAS READ IN, COMPUTE SCALE                             PLOTTER   28
C                                                                       PLOTTER   29
   15 CONTINUE                                                          PLOTTER   30
      MAXFBRN=FUELBRN(NOCRVS,31)/1.E08+.5                               PLOTTER   31
      TOPFBRN=1.E08*MAXFBRN                                             PLOTTER   32
      MAXRPMS=RPMS(NOCRVS,31)/1.E11+.5                                  PLOTTER   33
      TOPRPMS=1.E11*MAXRPMS                                             PLOTTER   34
      NOMRKSF=4                                                         PLOTTER   35
      NOMRKSR=4                                                         PLOTTER   36
   18 CONTINUE                                                          PLOTTER   37
      XSC=(2005.-1975.)/9.                                              PLOTTER   38
      XC=1975.                                                          PLOTTER   39
      YSC=TOPFBRN/6.                                                    PLOTTER   40
C                                                                       PLOTTER   41
C     LINAXS PLOTS AND LABELS A LINEAR AXIS                             PLOTTER   42
C                                                                       PLOTTER   43
      CALL LINAXS (1.,1.,9.,7.,.125,-1.3E.5,1975.,20J5.,4,4.4HYEAR)     PLOTTER   44
      CALL LINAXS (1.,1.,9.,7.,.125,+1.,   NOMRKSF,1E+00,TOPFBRN,3,1J,  PLOTTER   45
     X10HFUELBURNED)                                                    PLOTTER   46
C                                                                       PLOTTER   47
C     PLOT HEADING                                                      PLOTTER   48
C                                                                       PLOTTER   49
      CALL SYMBOL(1.7,7.5,.14,45HFORECAST U.S. AIRLINE FUEL USAGE DISTRI PLOTTER   50
     XBUTION,0.,45)                                                     PLOTTER   51
      CALL NUMBER(4.,7.25,.12,PERCENT,0.,1)                             PLOTTER   52
      CALL SYMBOL(4.3,7.25,.12,17HFY/EYR= RPM GROUTH,0.,15)             PLOTTER   53
      CALL PLOT (.,1.,-3)                                               PLOTTER   54
C                                                                       PLOTTER   55
C     PLOT MARKET NAME                                                  PLOTTER   56
C                                                                       PLOTTER   57
      CALL SYMBOL (3.25,.5*PLTFUEL(1)/YSC+.125,.125,MRKTYPE(1),0.,6)    PLOTTER   58
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                      CALL SYMBOL (8.25,.5*PLTFUEL(1)/YSC-.125,.125,MRKTYPE(2),0.,5)      PLOTTER   59
                      CALL SYMBOL (8.25,.5*(PLTFUEL(1)+PLTFUEL(2))/YSC+.125,.125,MRKTYPE  PLOTTER   61
     60              X       (3),0.,6)                                                    PLOTTER   61
                      CALL SYMBOL (8.25,.5*(PLTFUEL(1)+PLTFUEL(2))/YSC-.125,.125,MRKTYPE  PLOTTER   62
                     X       (4),0.,5)                                                    PLOTTER   63
                      CALL SYMBOL (8.25,.5*(PLTFUEL(2)+PLTFUEL(3))/YSC+.125,.125,MRKTYPE  PLOTTER   64
                     X       (5),0.,6)                                                    PLOTTER   65
     65               CALL SYMBOL (8.25,.5*(PLTFUEL(2)+PLTFUEL(3))/YSC-.125,.125,MRKTYPE  PLOTTER   66
                     X       (5),0.,5)                                                    PLOTTER   67
                C                                                                         PLOTTER   68
                C     PLOT YEARLY FUEL CONSUMPTION FOR EACH AIRCRAFT TYPE, REFERENCING    PLOTTER   69
                C     EACH CURVE TO THE CUMULATIVE FUEL CONSUMED BY AIRCRAFT TYPES        PLOTTER   70
     70         C     ALREADY PLOTTED                                                     PLOTTER   71
                C                                                                         PLOTTER   72
                      DO 50 NO=1,NOCRVS,1                                                 PLOTTER   73
                      DO 40 YRNO=1,31,1                                                   PLOTTER   74
                      CURVE(YRNO)=FUELBRN(NO,YRNO)                                        PLOTTER   75
     75         40    CONTINUE                                                            PLOTTER   76
                      CALL PLOT((YEARS(1)-X0)/XSC,CURVE(1)/YSC,3)                         PLOTTER   77
                      DO 48 I=1,31,1                                                      PLOTTER   78
                      CALL PLOT ((YEARS(I)-X0)/XSC, CURVE(I)/YSC,2)                       PLOTTER   79
                48    CONTINUE                                                            PLOTTER   80
     80         50    CONTINUE                                                            PLOTTER   81
                      CALL RSTR(LUN)                                                      PLOTTER   82
                      CALL PLOT (0.,-1.,-3)                                               PLOTTER   83
                      YSC=TOPRPMS/6.0                                                     PLOTTER   84
                C                                                                         PLOTTER   85
                C     PLOT AXIS LABELS                                                    PLOTTER   86
     85         C                                                                         PLOTTER   87
                      CALL LINAXS (1.,1.,9.,7.,.125,-1.36,5.1975,.2005,.4,4,4HYEAR)       PLOTTER   88
                      CALL LINAXS (1.,1.,9.,7.,.125,91.,  NOMRKSR,10,0.0,TOPRPMS,3,3,3HRP PLOTTER   89
                     XM)                                                                  PLOTTER   90
     90         C                                                                         PLOTTER   91
                C     PLOT HEADING                                                        PLOTTER   92
                C                                                                         PLOTTER   93
                      CALL SYMBOL(2.2,7.50,.18,48HFORECAST U.S. AIRLINE FLEET DISTRIBUTI  PLOTTER   94
                     XON,0.,48)                                                           PLOTTER   95
     95               CALL NUMBER(4.,7.25,.12,PERCENT,0.,3)                               PLOTTER   96
                      CALL SYMBOL(4.3,7.25,.12,17HS/YR RPM GROWTH,0.,15)                  PLOTTER   97
                      CALL PLOT (1.,1.,-3)                                                PLOTTER   98
                C                                                                         PLOTTER   99
                C     PLOT MARKET NAME ON SIDE OF GRAPH                                   PLOTTER  100
    100         C                                                                         PLOTTER  101
                      CALL SYMBOL (8.25,.5*PLTRPMS(1)/YSC+.125,.125,MRKTYPE(1),0.,6)      PLOTTER  102
                      CALL SYMBOL (8.25,.5*PLTRPMS(1)/YSC-.125,.125,MRKTYPE(2),0.,5)      PLOTTER  103
                      CALL SYMBOL (8.25,.5*(PLTRPMS(1)+PLTRPMS(2))/YSC+.125,.125,MRKTYPE  PLOTTER  104
                     X       (3),0.,6)                                                    PLOTTER  105
    105               CALL SYMBOL (8.25,.5*(PLTRPMS(1)+PLTRPMS(2))/YSC-.125,.125,MRKTYPE  PLOTTER  106
                     X       (4),0.,5)                                                    PLOTTER  107
                      CALL SYMBOL (8.25,.5*(PLTRPMS(2)+PLTRPMS(3))/YSC+.125,.125,MRKTYPE  PLOTTER  108
                     X       (5),0.,6)                                                    PLOTTER  109
                      CALL SYMBOL (8.25,.5*(PLTRPMS(2)+PLTRPMS(3))/YSC-.125,.125,MRKTYPE  PLOTTER  110
    110              X       (6),0.,5)                                                    PLOTTER  111
                C                                                                         PLOTTER  112
                C     PLOT YEARLY RPMS FLOWN FOR EACH AIRCRAFT TYPE, REFERENCING          PLOTTER  113
                C     EACH CURVE TO THE CUMULATIVE FUEL CONSUMED BY AIRCRAFT TYPES        PLOTTER  114
                C     ALREADY PLOTTED                                                     PLOTTER  115
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      C
            DO 30 NO=1,NOCRVS,1
            DO 20 YRNO=1,31,1
            CURVE(YRNO)=RPMS(NO,YRNO)
      21    CONTINUE
      CALL PLOT((YEARS(1)-XO)/XSC,CURVE(1)/YSC,3)
            DO 2* I=1,31,1
            CALL PLOT ((YEARS(I)-XO)/XSC, CURVE(I)/YSC,2)
      28    CONTINUE
      30    CONTINUE
      CALL PSTP(LUN)
            RETURN
            END
```

PLOTTER 114
PLOTTER 117
PLOTTER 118
PLOTTER 119
PLOTTER 120
PLOTTER 121
PLOTTER 122
PLOTTER 123
PLOTTER 124
PLOTTER 125
PLOTTER 126
PLOTTER 127
PLOTTER 128

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      1                 SUBROUTINE PLOTSGL (MRKT)                                        PLOTSGL     2
                      C                                                                  PLOTSGL     3
                      C     THIS SUBROUTINE PLOTS REVENUE PASSENGER MILES AND FUEL       PLOTSGL     4
                      C     CONSUMPTION VERSUS TIME FOR EACH AIRCRAFT TYPE               PLOTSGL     5
      5               C                                                                  PLOTSGL     6
                        DIMENSION TYPE(10),YRINTRO(10),SEATS(10),SFC(10),SPEED(10),      PLOTSGL     7
                     *UTILIZ(10),LIFETIM(10),PLOTS(10)                                   PLOTSGL     8
                        DIMENSION SEATMI(10,31),FUELBRN(10,31),RPM(10,31),POPUL(10,31)   PLOTSGL     9
                        DIMENSION MRKTYPE(5),PLTRPMS(3),PLTFUEL(3),NORUYS(10,46),LF(31)  PLOTSGL    10
     10                 DIMENSION YEARS(31),FBURNED(31),RPMS(31),NORETIR(10,46)          PLOTSGL    11
                        REAL NORUYS,NORETIR                                              PLOTSGL    12
                        INTEGER IN,OUT,YR,YEAR,YRNO                                      PLOTSGL    13
                        COMMON /STATIST/ TYPE,YRINTRO,SEATS,SFC,SPEED,UTILIZ,LF,LIFETIM  PLOTSGL    14
                     *,PLOTS                                                             PLOTSGL    15
     15                 COMMON/RESULTS/ SEATMI,FUELBRN,RPM                               PLOTSGL    16
                        COMMON /POP/      NORUYS,NORETIR,POPUL                           PLOTSGL    17
                        COMMON /INDICES/ NOEXPLS,IN,OUT                                  PLOTSGL    18
                        COMMON /STARTER/ NOCRVS,MRKTYPE,D1,D2,PLTRPMS,PLTFUEL,PERCENT    PLOTSGL    19
                        LUN11=11                                                         PLOTSGL    20
     20                 Y0=1975.                                                         PLOTSGL    21
                        XSC=(2005.-1975.)/8.                                             PLOTSGL    22
                        DO 10 YRNO=1,31,1                                                PLOTSGL    23
                        YEAR=1974.+YRNO                                                  PLOTSGL    24
                        YEARS(YRNO)=YEAR                                                 PLOTSGL    25
     25           10    CONTINUE                                                         PLOTSGL    26
                        MAXFBRN=PLTFUEL(MRKT)/1.E10+.5                                   PLOTSGL    27
                        TOPFBRN=1.E+08*MAXFBRN                                           PLOTSGL    28
                        MAXRPMS=PLTRPMS(MRKT)/1.E11+.5                                   PLOTSGL    29
                        TOPRPMS=1.E11*MAXRPMS                                            PLOTSGL    30
     30                 NOMRKSF=40                                                       PLOTSGL    31
                        NOMRKSG=40                                                       PLOTSGL    32
                        YSC=TOPFBRN/6.0                                                  PLOTSGL    33
                      C                                                                  PLOTSGL    34
                      C     PLOT YEARLY FUEL CONSUMPTION FOR EACH AIRCRAFT TYPE          PLOTSGL    35
     35               C                                                                  PLOTSGL    36
                        DO 200 I=1,OUT,1                                                 PLOTSGL    37
                        IF (PLOTS(I).EQ.10H          ) GO TO 200                         PLOTSGL    38
                      C                                                                  PLOTSGL    39
                      C     PLOT AXIS LABELS                                           PLOTSGL    40
     40               C                                                                  PLOTSGL    41
                        CALL LINAXS(1.,1.,9.,7.,.125,-1,30,5,1975.,2005.,4,4,4HYEAR)     PLOTSGL    42
                        CALL LINAXS(1.,1.,9.,7.,.125,+1,   NOMRKSF,10,0.0,TOPFBRN,3,10,10H PLOTSGL    43
                     *FUELBURNED)                                                        PLOTSGL    44
                        CALL PLOT(1.,1.,-3)                                              PLOTSGL    45
     45                 DO 100 YEAR=1975,2005,1                                          PLOTSGL    46
                        YR=YEAR-1974                                                     PLOTSGL    47
                        FBURNED(YR)=FUELBRN(I,YR)*POPUL(I,YR)                            PLOTSGL    48
                        RPMS   (YR)=RPM     (I,YR)*POPUL(I,YR)                           PLOTSGL    49
                  100   CONTINUE                                                         PLOTSGL    50
     50                 CALL PLOT ((YEARS(1)-X0)/XSC,FBURNED(1)/YSC,3)                   PLOTSGL    51
                        DO 150 J=1,31,1                                                  PLOTSGL    52
                        CALL PLOT ((YEARS(J)-X0)/XSC,FBURNED(J)/YSC,2)                   PLOTSGL    53
                  150   CONTINUE                                                         PLOTSGL    54
                        CALL RSTR(LUN11)                                                 PLOTSGL    55
     55                 CALL PLOT (1.,-1.,-3)                                            PLOTSGL    56
                  200   CONTINUE                                                         PLOTSGL    57
                        YSC=TOPRPMS/6.0                                                  PLOTSGL    58
```

```
      C                                                                 PLOTSGL  59
      C     PLOT YEARLY RPMS FLOWN FOR EACH AIRCRAFT TYPE               PLOTSGL  60
   60 C                                                                 PLOTSGL  61
      DO 400 I=1,NUT,1                                                  PLOTSGL  62
      IF (PLOTS(I).EQ.1H+          ) GO TO 400                          PLOTSGL  63
      C                                                                 PLOTSGL  64
      C     PLOT AXIS LABELS                                            PLOTSGL  65
   65 C                                                                 PLOTSGL  66
      CALL LYNAXS(1.,1.,3.,7.,.125,-1,30,5,1975.,2005.,4,4,4HYEAR)      PLOTSGL  67
      CALL LYNAXS(1.,1.,9.,7.,.125,+1,  NOMRMSR,10,0.,TNPRPMS,3,3,3HRPM PLOTSGL  68
     X)                                                                 PLOTSGL  69
      CALL PLOT(1.,1.,-3)                                               PLOTSGL  70
   72 CALL PLOT ((YEARS(1)-X0)/XSC,RPMS(1)/YSC,3)                       PLOTSGL  71
      DO 300 J=1,31,1                                                   PLOTSGL  72
      CALL PLOT ((YEARS(J)-X0)/XSC,RPMS(J)/YSC,2)                       PLOTSGL  73
  300 CONTINUE                                                          PLOTSGL  74
      CALL RSTR(LUN11)                                                  PLOTSGL  75
   75 CALL PLOT (.,.,-1.,-3)                                            PLOTSGL  76
  400 CONTINUE                                                          PLOTSGL  77
      RETURN                                                            PLOTSGL  78
      END                                                               PLOTSGL  79
```

```
      SUBROUTINE SETUP(LUN11)                                          SETUP   2
C                                                                      SETUP   3
C     THIS SUBROUTINE INITIALIZES THE PLOTTING SOFTWARE                SETUP   4
C     ON LOGICAL UNIT LUN11                                            SETUP   5
C                                                                      SETUP   6
      CALL PLOTS (LUN11)                                               SETUP   7
      RETURN                                                           SETUP   8
      END                                                              SETUP   9
```

Appendix D

LISTING OF PROGRAM SOURCE CODE FOR THE AIRFRAME MANUFACTURER MODULE

```
      1                 SUBROUTINE INPLANT                                    INPLANT     2
                      C                                                       INPLANT     3
                      C     THIS SUBROUTINE IS THE DRIVER ROUTINE FOR THE AIRFRAME  INPLANT     4
                      C     MANUFACTURERS MODULE                              INPLANT     5
      5               C                                                       INPLANT     6
                            INTEGER YR,IYR,EYR,YEAR                           INPLANT     7
                            INTEGER PERIOD,NOEXPLS,IN,OUT                     INPLANT     8
                            REAL DEMAND,NOBUYS                                INPLANT     9
                            DIMENSION DEMAND(31)                              INPLANT    10
     10                     DIMENSION NOBUYS(10,46),NORETIR(10,46),POPUL(10,31)  INPLANT    11
                            DIMENSION RR(20),PP(20)                           INPLANT    12
                            COMMON /PRICEO/ PRICEO                            INPLANT    13
                            COMMON /POP/ NOBUYS,NORETIR,POPUL                 INPLANT    14
                            COMMON /DEMAND/ DEMAND                            INPLANT    15
     15                     COMMON/LIFETIM/ PERIOD                            INPLANT    16
                            COMMON /STARTUP/ IMNTH                            INPLANT    17
                            COMMON /INDICES/ NOEXPLS,IN,OUT                   INPLANT    18
                            COMMON /PRINT/ IP                                 INPLANT    19
                      C                                                       INPLANT    20
     20               C     MAIN CYCLE THROUGH NEW AIRCRAFT TYPES             INPLANT    21
                      C                                                       INPLANT    22
                            DO 100 I=IN,OUT,1                                 INPLANT    23
                      C                                                       INPLANT    24
                      C     FIND FIRST YEAR OF DEMAND                         INPLANT    25
     25               C                                                       INPLANT    26
                            DO 10 YEAR=1975,2005,1                            INPLANT    27
                            YR=YEAR-1974                                      INPLANT    28
                            IF (NOBUYS(I,15+YR).EQ.0.0) GO TO 10              INPLANT    29
                            IYR=YR                                            INPLANT    30
     30                     IMNTH=12*IYR                                      INPLANT    31
                            GO TO 20                                          INPLANT    32
                     10     CONTINUE                                          INPLANT    33
                     20     CONTINUE                                          INPLANT    34
                      C                                                       INPLANT    35
     35               C     FIND LAST YEAR OF DEMAND                          INPLANT    36
                      C                                                       INPLANT    37
                            DO 30 YEAR=1975,2005,1                            INPLANT    38
                            YR=2006-YEAR                                      INPLANT    39
                            IF (NOBUYS(I,15+YR).EQ.0.0) GO TO 30              INPLANT    40
     40                     EYR=YR                                            INPLANT    41
                            GO TO 40                                          INPLANT    42
                     30     CONTINUE                                          INPLANT    43
                     40     CONTINUE                                          INPLANT    44
                      C                                                       INPLANT    45
     45               C     SET AND WRITE DEMAND HISTORY                      INPLANT    46
                      C                                                       INPLANT    47
                            DO 50 J=1,30,1                                    INPLANT    48
                            DEMAND(J)=0.0                                     INPLANT    49
                     50     CONTINUE                                          INPLANT    50
     50                     DO 60 YR=IYR,EYR,1                                INPLANT    51
                            DEMAND(YR-IYR+1)=NOBUYS(I,15+YR)                  INPLANT    52
                     60     CONTINUE                                          INPLANT    53
                            WRITE (6,5) (DEMAND(J),J=1,30,1)                  INPLANT    54
                     5      FORMAT(5E21.14)                                   INPLANT    55
     55                     PERIOD=EYR-IYR+1                                  INPLANT    56
                            WRITE (6,6) PERIOD                                INPLANT    57
                     6      FORMAT(' PERIOD = ',I10)                          INPLANT    58
```

```
                C                                                              INPLANT   59
                C     CALL SUBROUTINES TO DEVELOP PRODUCTION SCHEDULES,        INPLANT   60
     5          C     MANUFACTURING COSTS AND MARKET PRICES                    INPLANT   61
                C                                                              INPLANT   62
                      CALL PLANT                                               INPLANT   63
                      CALL ACCOST                                              INPLANT   64
                      CALL APPRICE                                             INPLANT   65
    65                READ (9,1) PW,DELTAP                                     INPLANT   66
                1     FORMAT(2F3.0)                                            INPLANT   67
                      PRICE0=PC-DELTAP                                         INPLANT   68
                      IP=1                                                     INPLANT   69
                C                                                              INPLANT   70
    70          C     INNER LOOP TO CYCLE THROUGH SUBROUTINES DETERMINING CASHFLOW INPLANT   71
                C     AND INTERNAL RATE OF RETURN FOR BASE PRICE PLUS 13 INCREMENTS INPLANT  72
                C                                                              INPLANT   73
                      DO 100 J=1,14,1                                          INPLANT   74
                      IF (J.EQ.14)  IP=0                                       INPLANT   75
    75                PRICE(J)=PRICE(J+DELTAP                                  INPLANT   76
                      CALL CASHFLW                                             INPLANT   77
                      CALL INTRDR(R)                                           INPLANT   78
                      PP(J)=PRICE                                              INPLANT   79
                      PR(J)=R                                                  INPLANT   80
    85                WRITE (6,2) PR(J),PP(J)                                  INPLANT   81
                2     FORMAT(' RDIN = ',F10.5,' PMAX = ',F10.6)                INPLANT   82
                100   CONTINUE                                                 INPLANT   83
                      RETURN                                                   INPLANT   84
                      END                                                      INPLANT   85
```

```
SUBROUTINE RDTE       76/76   OPT=2                FTN 4.6+466      04/27/79  09.12.31      PAGE     1

                      SUBROUTINE RDTE                                                        RDTE       2
                C                                                                            RDTE       3
                C     THIS SUBROUTINE DISTRIBUTES RDTE COSTS OVER LIFE OF                    RDTE       4
                C     PRODUCTION PROGRAM TO ESTIMATE COSTS ON A PER MONTH BASIS              RDTE       5
              5 C                                                                            RDTE       6
                      DIMENSION TRDTEC (5),RDTEL8L(5),DELAY(5),PERIOD(5),RDTECMP(5,372)      RDTE       7
                      INTEGER DELAY,PERIOD                                                   RDTE       8
                      INTEGER IN,OUT,TTS                                                     RDTE       9
                      COMMON /TRDTEC / TRDTEC                                                RDTE      10
             10       COMMON /RDTECMP/ RDTECMP                                               RDTE      11
                      COMMON /RDTEL8L/ RDTEL8L                                               RDTE      12
                      COMMON /TTS/     TTS                                                   RDTE      13
                      COMMON /DELAY/ DELAY                                                   RDTE      14
                      COMMON /PERIOD/ PERIOD                                                 RDTE      15
             15       DATA (DELAY(I),I=1,5,1)/0,3,3,6,12/                                    RDTE      16
                      DATA (PERIOD(I),I=1,5,1)/42,42,42,52,42/                               RDTE      17
                      RDTEL8L(1)=7LAIRFRDE                                                   RDTE      18
                      RDTEL8L(2)=7LSUBSYSD                                                   RDTE      19
                      RDTEL8L(3)=7LAVDNICS                                                   RDTE      20
             20       RDTEL8L(4)=7LPROPULS                                                   RDTE      21
                      RDTEL8L(5)=7LDEVELOP                                                   RDTE      22
                C                                                                            RDTE      23
                C     DISTRIBUTE THE FIVE RDTE COSTS                                         RDTE      24
                C                                                                            RDTE      25
             25       DO 200 ITH=1,5,1                                                       RDTE      26
                      LN=PERIOD(ITH)                                                         RDTE      27
                      IN=TTS-LN+1+DELAY(ITH)                                                 RDTE      28
                      OUT=TTS+DELAY(ITH)                                                     RDTE      29
                      DO 100 MNTH=IN,OUT,1                                                   RDTE      30
             30       RDTECMP(ITH,MNTH)=TRDTEC (ITH)/PERIOD(ITH)                             RDTE      31
               100 C  CONTINUE                                                              RDTE      32
               200 C  CONTINUE                                                              RDTE      33
                      RETURN                                                                 RDTE      34
                      END                                                                    RDTE      35
```

```
      SUBROUTINE COMPCOS                                                COMPCOS     2
C                                                                       COMPCOS     3
C     THIS SUBROUTINE DISTRIBUTES COMPONENT MANUFACTURING COSTS         COMPCOS     4
C     OVER LIFE OF PRODUCTION PROGRAM TO ESTIMATE COST ON A PER         COMPCOS     5
C     MONTH BASIS                                                       COMPCOS     6
C                                                                       COMPCOS     7
      INTEGER PRDSCHL,PRODUCT                                           COMPCOS     8
      INTEGER PROD1,PROD2,END1,TTS                                      COMPCOS     9
      DIMENSION ORDER(4000),PRODUCT(4000),DELIVER(4000)                 COMPCOS    10
      DIMENSION PRDSCHL(396)                                            COMPCOS    11
      DIMENSION PRODIDS(11),COMPCST(11,372),TTLCMP (11)                 COMPCOS    12
      REAL LEARN,LEARNA,LEARNP                                          COMPCOS    13
      COMMON /CSHELO/ CAVION,AMFG,PROPU,XFASSY,ENSPAD,LEARN,LEARNA,     COMPCOS    14
     X        LEARNP                                                     COMPCOS    15
      COMMON / COSTOT / AD, ADDE, AGED, AGEP, AQ, AQFEE, C(37,5),       COMPCOS    16
     X                  CD, CF, DDEL, DS, FAC, FTS, FTO, FV, GTS, GTV, COMPCOS    17
     X                  IT, MEQ, NDATA, NFV, NG, NV, NVEH(5), OS, OT,  COMPCOS    18
     X                  QV, ROTJ, RQFEE, SE, ST, SUBSYS, TDO, TOP, NVHF, COMPCOS    19
     X                  TRDTE, TRI, TST                                COMPCOS    20
      COMMON /PRODUCT/ PRODUCT                                          COMPCOS    21
      COMMON /PRDSCHL/ PRDSCHL                                          COMPCOS    22
      COMMON /TTS/ TTS                                                  COMPCOS    23
      COMMON /ORDER/  ORDER                                             COMPCOS    24
      COMMON /DELIVER/ DELIVER                                          COMPCOS    25
      COMMON /TTLCMP / TTLCMP                                           COMPCOS    26
      COMMON /COMPCST/ COMPCST                                          COMPCOS    27
      COMMON /PRODIDS/ PRODIDS                                          COMPCOS    28
      COMMON /TOTAL/ TTOTAL                                             COMPCOS    29
C                                                                       COMPCOS    30
C     PARAMETER INITIALIZATION                                          COMPCOS    31
C                                                                       COMPCOS    32
      NOCMP=11                                                          COMPCOS    33
      PRODIDS(1)=5HMANUF                                                COMPCOS    34
      PRODIDS(2)=6HSPARES                                               COMPCOS    35
      PRODIDS(3)=8LFACILITI                                             COMPCOS    36
      PRODIDS(4)=7LSUSENGP                                              COMPCOS    37
      PRODIDS(5)=7LSUSTOOL                                              COMPCOS    38
      PRODIDS(6)=7LGSEQUIP                                              COMPCOS    39
      PRODIDS(7)=8LTECHDATA                                             COMPCOS    40
      PRODIDS(8)=8LMISCEQUP                                             COMPCOS    41
      PRODIDS(9)=9LTRAINEQUP                                            COMPCOS    42
      PRODIDS(10)=8LITILTRNG                                            COMPCOS    43
      PRODIDS(11)=9LITILTPANS                                           COMPCOS    44
      WRITE (6,1) (TTLCMP(I),I=1,11,1)                                  COMPCOS    45
    1 FORMAT(1X,11E11.4)                                                COMPCOS    46
      DO 50 I=1,11,1                                                    COMPCOS    47
      DO 50 J=1,372,1                                                   COMPCOS    48
      COMPCST(I,J)=0.0                                                  COMPCOS    49
   50 CONTINUE                                                          COMPCOS    50
      FAV=1.+ALOG(LEARNA/100.)/ALOG(2.)                                 COMPCOS    51
      FP =1.+ALOG(LEARNP/100.)/ALOG(2.)                                 COMPCOS    52
      FAF=1.+ALOG(LEARN/100. )/ALOG(2.)                                 COMPCOS    53
      CAVO=1.                                                           COMPCOS    54
      CAFO=0.                                                           COMPCOS    55
      CPDO=0.                                                           COMPCOS    56
      OSPO=0.                                                           COMPCOS    57
      SEO=0.                                                            COMPCOS    58
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                      STO=0.                                                    COMPCOS   59
                C                                                               COMPCOS   60
      60        C     LOOP THROUGH EACH AIRCRAFT TO BE PRODUCED.                COMPCOS   61
                C     CALCULATE COSTS BASED ON LEARNING CURVES.                 COMPCOS   62
                C                                                               COMPCOS   63
                      DO 100 ITHPL=1,ITOTAL,1                                   COMPCOS   64
                      CAV01=FLOAT(ITHPL)**ZAV                                   COMPCOS   65
      65              CAF01=FLOAT(ITHPL)**ZAF                                   COMPCOS   66
                      CP01=FLOAT(ITHPL)**ZP                                     COMPCOS   67
                      CAV0=CAVION*(CAV01-CAV00)                                 COMPCOS   68
                      CAF0=AMFG*(CAF01-CAF00)                                   COMPCOS   69
                      CP0=PROPU*(CP01-CP00)                                     COMPCOS   70
      70              CAV00=CAV01                                               COMPCOS   71
                      CAF00=CAF01                                               COMPCOS   72
                      CP00=CP01                                                 COMPCOS   73
                      UV=(CAV0+CAF0+CP0)*(1.+XFASSY)                            COMPCOS   74
                      UMC=UV                                                    COMPCOS   75
      75              OSA=.13*(CAF0+CAV0)                                       COMPCOS   76
                      OSP1=(FLOAT(ITHPL)*(1.+ENSPA01))**ZP-FLOAT(ITHPL)**ZP     COMPCOS   77
                      OSP=PROPU*(OSP1-OSP0)                                     COMPCOS   78
                      OSP0=OSP1                                                 COMPCOS   79
                      OS=OSA+OSP                                                COMPCOS   80
      80              SPARES=OS                                                 COMPCOS   81
                      SE1=FLOAT(ITHPL)**.20-1.                                  COMPCOS   82
                      SE=ADDSE*(SE1-SE0)                                        COMPCOS   83
                      SE0=SE1                                                   COMPCOS   84
                      ST1=FLOAT(ITHPL)**.14-1.                                  COMPCOS   85
      85              ST=TST*(ST1-ST0)                                          COMPCOS   86
                      ST0=ST1                                                   COMPCOS   87
                C                                                               COMPCOS   88
                C     SPREAD PRODUCTION COSTS UNIFORMLY OVER SCHEDULED MONTH AND COMPCOS   89
                C     ELEVEN PRECEEDING MONTHS                                  COMPCOS   90
                C                                                               COMPCOS   91
      90              DO 80 MNTH=1,12,1                                         COMPCOS   92
                      J=12-MNTH                                                 COMPCOS   93
                      COMPCST(1,PRODUCT(ITHPL)-J)=COMPCST(1,PRODUCT(ITHPL)-J)+UMC/12.   COMPCOS   94
                      COMPCST(2,PRODUCT(ITHPL)-J)=COMPCST(2,PRODUCT(ITHPL)-J)+SPARES/12.,COMPCOS   95
      95              COMPCST(3,PRODUCT(ITHPL)-J)=COMPCST(3,PRODUCT(ITHPL)-J)   COMPCOS   96
                     X                           +TTLCMP (3)/(12.*ITOTAL)       COMPCOS   97
                      COMPCST(4,PRODUCT(ITHPL)-J)=COMPCST(4,PRODUCT(ITHPL)-J)+SE/12.    COMPCOS   98
                      COMPCST(5,PRODUCT(ITHPL)-J)=COMPCST(5,PRODUCT(ITHPL)-J)+ST/12.    COMPCOS   99
                      DO 60 ITH=5,NOLOMP,1                                      COMPCOS  100
     100              COMPCST(ITH,PRODUCT(ITHPL)-J)=COMPCST(ITH,PRODUCT(ITHPL)-J)       COMPCOS  101
                     V                              +TTLCMP (ITH)/(12.*ITOTAL)         COMPCOS  102
                60    CONTINUE                                                  COMPCOS  103
                80    CONTINUE                                                  COMPCOS  104
               100    CONTINUE                                                  COMPCOS  105
     105              RETURN                                                    COMPCOS  106
                      END                                                       COMPCOS  107
```

```
      1               SUBROUTINE REVENUE                                      REVENUE    2
                C                                                             REVENUE    3
                C     THIS SUBROUTINE COMPUTES INCOME ON A PER MONTH BASIS.  ASSUMED   REVENUE    4
                C     PAYMENT SCHEDULE IS THAT AIRLINES WILL PAY 5% ON ORDER, 70% ON  REVENUE    5
      5         C     DELIVERY AND 25% SPREAD OVER MONTHS BETWEEN ORDER AND DELIVERY  REVENUE    6
                C                                                             REVENUE    7
                      DIMENSION ORDER(4000),DELIVER(4000)                     REVENUE    8
                      DIMENSION INCOME(372),ACCINCO(372)                      REVENUE    9
                      INTEGER TOTAL,ORITHPL,DEITHPL                           REVENUE   10
     10               INTEGER ORDER,DELIVER                                   REVENUE   11
                      REAL INCOME                                             REVENUE   12
                      COMMON /INCOME/ INCOME                                  REVENUE   13
                      COMMON /ACCINCO/ ACCINCO                                REVENUE   14
                      COMMON /ORDER/ ORDER                                    REVENUE   15
     15               COMMON /DELIVER/ DELIVER                                REVENUE   16
                      COMMON /PRICEO/ PRICEO                                  REVENUE   17
                      COMMON /TOTAL/ TOTAL                                    REVENUE   18
                C                                                             REVENUE   19
                C     INITIALIZE ARRAYS TO ZERO                               REVENUE   20
     20         C                                                             REVENUE   21
                      DO 100 I=1,372,1                                        REVENUE   22
                      INCOME(I)=0.0                                           REVENUE   23
                      ACCINCO(I)=0.0                                          REVENUE   24
                100   CONTINUE                                                REVENUE   25
     25         C                                                             REVENUE   26
                C     FOR EACH AIRCRAFT TO BE PRODUCED, ADD REVENUES FROM DOWN  REVENUE   27
                C     PAYMENT, PAYMENTS BETWEEN ORDER AND DELIVERY, AND FINAL  REVENUE   28
                C     PAYMENT ON DELIVERY.                                    REVENUE   29
                C                                                             REVENUE   30
     30               DO 300 ITHPL=1,TOTAL,1                                  REVENUE   31
                      INCOME(ORDER(ITHPL))=INCOME(ORDER(ITHPL))+.05*PRICEO    REVENUE   32
                      INCOME(DELIVER(ITHPL))=INCOME(DELIVER(ITHPL))+.70*PRICEO  REVENUE  33
                      ORITHPL=ORDER(ITHPL)+1                                  REVENUE   34
                      DEITHPL=DELIVER(ITHPL)-1                                REVENUE   35
     35               DO 200 MNTHPAY=ORITHPL,DEITHPL,1                        REVENUE   36
                      INCOME(MNTHPAY)=INCOME(MNTHPAY)+.25/(DEITHPL-ORITHPL+1)*PRICEL  REVENUE  37
                200   CONTINUE                                                REVENUE   38
                300   CONTINUE                                                REVENUE   39
                      SUM=0.0                                                 REVENUE   40
     40         C                                                             REVENUE   41
                C     CALCULATE THE CUMULATIVE REVENUES FOR EACH MONTH        REVENUE   42
                C                                                             REVENUE   43
                      DO 400 MNTH=1,372,1                                     REVENUE   44
                      SUM=SUM+INCOME(MNTH)                                    REVENUE   45
     45               ACCINCO(MNTH)=SUM                                       REVENUE   46
                400   CONTINUE                                                REVENUE   47
                      RETURN                                                  REVENUE   48
                      END                                                     REVENUE   49
```

```
      1                 SUBROUTINE CASHFLW                                    CASHFLW     2
                      C                                                       CASHFLW     3
                      C   THIS SUBROUTINE DETERMINES INDIVIDUAL MONTHLY CASHFLOW AND      CASHFLW     4
                      C   CUMULATIVE MONTHLY CASHFLOW FOR ESTIMATED COSTS AND            CASHFLW     5
      5               C   REVENUES                                              CASHFLW     6
                      C                                                       CASHFLW     7
                        DIMENSION CASHFLO(372),ACCASHF(372)                   CASHFLW     8
                        DIMENSION COST(372),ACCOST(372)                       CASHFLW     9
                        DIMENSION ACCINCO(372)                                CASHFLW    10
     10                 DIMENSION RDTECMP(5,372),COMPCST(11,372),INCOME(372)  CASHFLW    11
                        REAL INCOME                                           CASHFLW    12
                        COMMON /RDTECMP/ RDTECMP                              CASHFLW    13
                        COMMON /COMPCST/ COMPCST                              CASHFLW    14
                        COMMON /INCOME/ INCOME                                CASHFLW    15
     15                 COMMON /ACCINCO/ ACCINCO                              CASHFLW    16
                        COMMON /COST/ COST                                    CASHFLW    17
                        COMMON /ACCOST/ ACCOST                                CASHFLW    18
                        COMMON /CASHFLO/ CASHFLO                              CASHFLW    19
                        COMMON /ACCASHF/ ACCASHF                              CASHFLW    20
     20               C                                                       CASHFLW    21
                      C   CALL SUBROUTINES TO SPREAD INDIVIDUAL RDTE, PRODUCTION COMPONENT  CASHFLW    22
                      C   COSTS AND REVENUES BY MONTH                         CASHFLW    23
                      C                                                       CASHFLW    24
                        CALL RDTE                                             CASHFLW    25
     25                 CALL REVENUE                                          CASHFLW    26
                        CALL COMPCOS                                          CASHFLW    27
                      C                                                       CASHFLW    28
                      C   SUM RDTE AND PRODUCTION COST FACTORS PER MONTH AND  CASHFLW    29
                      C   CUMULATIVE BY MONTH                                 CASHFLW    30
     30               C                                                       CASHFLW    31
                        SUM=0.                                                CASHFLW    32
                        DO 30 MNTH=1,372,1                                    CASHFLW    33
                        SUM1=0.0                                              CASHFLW    34
                        DO 10 ITH=1,5,1                                       CASHFLW    35
     35                 SUM1=SUM1+RDTECMP(ITH,MNTH)                           CASHFLW    36
                     10 CONTINUE                                              CASHFLW    37
                        SUM2=0.0                                              CASHFLW    38
                        DO 20 ITH=1,11,1                                      CASHFLW    39
                        SUM2=SUM2+COMPCST(ITH,MNTH)                           CASHFLW    40
     40                 CONTINUE                                              CASHFLW    41
                        COST(MNTH)=SUM1+SUM2                                  CASHFLW    42
                        SUM=SUM+SUM1+SUM2                                     CASHFLW    43
                        ACCOST(MNTH)=SUM                                      CASHFLW    44
                     30 CONTINUE                                              CASHFLW    45
     45                 C                                                     CASHFLW    46
                        C   CALCULATE CASHFLOW EACH MONTH AND CUMULATIVE BY MONTH  CASHFLW    47
                        C                                                     CASHFLW    48
                        DO 40 MNTH=1,372,1                                    CASHFLW    49
                        CASHFLO(MNTH)=INCOME(MNTH)-COST(MNTH)                 CASHFLW    50
     50                 ACCASHF(MNTH)=ACCINCO(MNTH)-ACCOST(MNTH)              CASHFLW    51
                     40 CONTINUE                                              CASHFLW    52
                        RETURN                                                CASHFLW    53
                        END                                                   CASHFLW    54
```

```
      1                 SUBROUTINE INRR(IW)                                   INRR     2
                  C                                                           INRR     3
                  C     THIS SUBROUTINE CALCULATES INTERNAL RATE OF RETURN FOR INRR     4
                  C     ESTIMATED CASHFLOW                                    INRR     5
      5           C                                                           INRR     6
                        DIMENSION CASHFLO(372),RIMCI(31),PV(31),DCF(31)       INRR     7
                        DIMENSION ACCASHF(372)                                INRR     8
                        REAL K,KK,KKK                                         INRR     9
                        COMMON /CASHFLO/ CASHFLO                              INRR    10
     10                 COMMON /ACCASHF/ ACCASHF                              INRR    11
                  C                                                           INRR    12
                  C     PARAMETER INITIALIZATION                              INRR    13
                  C                                                           INRR    14
                        KK=0.                                                 INRR    15
     15                 KKK=0.                                                INRR    16
                        RR=0.                                                 INRR    17
                        RRR=0.                                                INRR    18
                        NL=31                                                 INRR    19
                        ICNT=1                                                INRR    20
     20                 IF (ACCASHF(372).LT.0.0)  GO TO 10                    INRR    21
                        R=1.E-32                                              INRR    22
                        DELTAR=.001                                           INRR    23
                        GO TO 20                                              INRR    24
                  10    CONTINUE                                              INRR    25
     25                 R=-1.E-32                                             INRR    26
                        DELTAR=.001                                           INRR    27
                  C                                                           INRR    28
                  C     MAIN PROGRAM LOOP POINT.  CYCLE UNTIL ITERATION STOP CRITERIA INRR    29
                  C     ARE MET.  CALCULATE DISCOUNTED PRESENT VALUE SUM OF CASHFLOW INRR    30
     30           C     USING ESTIMATED RATE OF RETURN VALUE.                 INRR    31
                  C                                                           INRR    32
                  20    CONTINUE                                              INRR    33
                        DO 30 I=1,31,1                                        INRR    34
                        RIMCI(I)=0.0                                          INRR    35
     35                 PV(I)=(1.+R)**(-I)                                    INRR    36
                  30    CONTINUE                                              INRR    37
                        DO 40 I=1,372,1                                       INRR    38
                        J=(I-1)/12+1                                          INRR    39
                        RIMCI(J)=RIMCI(J)+CASHFLO(I)                          INRR    40
     40           40    CONTINUE                                              INRR    41
                        IS=1                                                  INRR    42
                        DO 42 I=1,31,1                                        INRR    43
                        IF (RIMCI(I).EQ.0.0)  GO TO 42                        INRR    44
                        IS=I                                                  INRR    45
     45                 GO TO 44                                              INRR    46
                  42    CONTINUE                                              INRR    47
                  44    CONTINUE                                              INRR    48
                        IL=31                                                 INRR    49
                        DO 46 I=1,31,1                                        INRR    50
     50                 I=32-I                                                INRR    51
                        IF (RIMCI(I).EQ.0.0)  GO TO 45                        INRR    52
                        IL=I                                                  INRR    53
                        GO TO 48                                              INRR    54
                  46    CONTINUE                                              INRR    55
     55           48    CONTINUE                                              INRR    56
                        DO 49 I=IS,IL,1                                       INRR    57
                        RIMCI(I-IS+1)=RIMCI(I)                                INRR    58
```

```
                      PIMCI(I)=0.
                   45 CONTINUE                                              INRR  60
              60      NL=IL-IS+1                                            INRR  61
                      SUM=PIMCI(1)                                          INRR  62
                      DCF(1)=SUM                                            INRR  63
                      DO 50 I=2,NL,1                                        INRR  64
                      DCF(I)=PIMCI(I)*PV(I-1)                               INRR  65
              65      SUM=SUM+DCF(I)                                        INRR  66
                   50 CONTINUE                                              INRR  67
                   C                                                        INRR  68
                   C  BEGIN TESTING OF VALUES TO DETERMINE IF ITERATION STOP INRR  69
                   C  CRITERIA ARE MET.  UPDATE VALUES AND CONTINUE IF CRITERIA INRR 70
              70   C  NOT MET.                                              INRR  71
                   C                                                        INRR  72
                      K=ABS(SUM)-0.0009                                     INRR  73
                      IF  (KKK.EQ.K)  GO TO 90                              INRR  74
                      KKK=KK                                                INRR  75
              75      RRP=RR                                                INRR  76
                      KK=K                                                  INRR  77
                      RR=R                                                  INRR  78
                      ICNT=ICNT+1                                           INRR  79
                      IF (MOD(ICNT,10).NE.0)  GO TO 55                      INRR  80
              80      WRITE (6,101) R,K                                     INRR  81
                   55 CONTINUE                                              INRR  82
                      IF (K.LE.IE-32)  GO TO 120                            INRR  83
                      IF (SUM) 60,120,70                                    INRR  84
                   *  ASSUME DELTA R                                        INRR  85
              85   60 CONTINUE                                              INRR  86
                      R=R-DELTAR                                            INRR  87
                      GO TO 80                                              INRR  88
                   70 CONTINUE                                              INRR  89
                      R=R+DELTAR                                            INRR  90
              90   80 CONTINUE                                              INRR  91
                      GO TO 20                                              INRR  92
                   C                                                        INRR  93
                   C  ITERATION STOP CRITERIA HAVE BEEN MET.  FIND PROPER VALUE INRR 94
                   C  FOR INTERNAL RATE OF RETURN AND PRINT RESULTS.        INRR  95
              95   C                                                        INRR  96
                   90 CONTINUE                                              INRR  97
                      IF (KKK-KK) 100,110,120                               INRR  98
                  100 R=RRR                                                 INRR  99
                      GO TO 120                                             INRR 100
             110      110 R=RR                                              INRR 101
                  120 CONTINUE                                              INRR 102
                      WRITE (6,101) R,K                                     INRR 103
                  101 FORMAT(2F20.7)                                        INRR 104
                      RETURN                                                INRR 105
              105     END                                                   INRR 106
```

```
      1                 SUBROUTINE PLANT                                        PLANT      2
                      C                                                         PLANT      3
                      C     THIS SUBROUTINE DETERMINES OPTIMAL PRODUCTION, DELIVERY, AND      PLANT      4
                      C     ORDER SCHEDULES FOR EACH NEW AIRFRAME TYPE BASED ON DEMAND        PLANT      5
                      C     SCHEDULE                                            PLANT      6
                      C                                                         PLANT      7
                            INTEGER LTIME,FIRSTPP,LIFETIM,PROD1,FP1             PLANT      8
                            INTEGER PROD2,TS,TTS,END1,END2                      PLANT      9
                            INTEGER DELSCHL                                     PLANT     10
                     10     INTEGER ORDER,DELIVER,PRODUCT,PRDSCHL               PLANT     11
                            INTEGER IACCUM                                      PLANT     12
                            INTEGER MAXP,MAXAC                                  PLANT     13
                            INTEGER BRKPT,BRKPT,KICKOFF,DISCRE*                 PLANT     14
                            REAL ACCUM,SUMDIF,AVGDIF                            PLANT     15
                     15     DIMENSION KICKOFF(29),DISCREP(29)                   PLANT     16
                            DIMENSION DEMAND(31),PRODUCT(4000),PRDSCHL(3961,DELIVER(4000)     PLANT     17
                            DIMENSION DELSCHL(396),LTIME(372),ORDER(4000)       PLANT     18
                            COMMON /TTS/ TTS                                    PLANT     19
                            COMMON /PRDSCHL/ PRDSCHL                            PLANT     20
                     25     COMMON /PRODUCT/ PRODUCT                            PLANT     21
                            COMMON /ORDER/ ORDER                                PLANT     22
                            COMMON /DELIVER/ DELIVER                            PLANT     23
                            COMMON /TOTAL/ ITOTAL                               PLANT     24
                            COMMON /MAXP/ MAXP                                  PLANT     25
                     25     COMMON /LIFETIM/ LIFETIM                            PLANT     26
                            COMMON /STARTUP/ TS                                 PLANT     27
                            COMMON /DEMAND/ DEMAND                              PLANT     28
                      C                                                         PLANT     29
                      C     INITIALIZATION OF BASIC PARAMETERS                  PLANT     30
                     30     C                                                   PLANT     31
                            DATA (LTIME(I),I=1,372)/372*24/                     PLANT     32
                            MAXAC=4000                                          PLANT     33
                            IR=2                                                PLANT     34
                            LR=LIFETIM                                          PLANT     35
                     35     NTRY=-1                                             PLANT     36
                            DO 4 I=1,29,1                                       PLANT     37
                            KICKOFF(I)=0                                        PLANT     38
                            DISCREP(I)=1                                        PLANT     39
                      4     CONTINUE                                            PLANT     40
                     40     C                                                   PLANT     41
                      C     MAIN PROGRAM LOOP.  DIVIDES TOTAL DEMAND PERIOD INTO ALL          PLANT     42
                      C     2-PART COMBINATIONS TO FIND OPTIMAL PRODUCTION RATES              PLANT     43
                      C                                                         PLANT     44
                      100   CONTINUE                                            PLANT     45
                     45     DO 2.2 BRKPT=18,LR,1                                PLANT     46
                            FIRSTPP=BRKPT-1                                     PLANT     47
                            TOTAL1=0.                                           PLANT     48
                            DO 10 I=1,FIRSTPP                                   PLANT     49
                            TOTAL1=TOTAL1+DEMAND(I)                             PLANT     50
                     51     1.    CONTINUE                                      PLANT     51
                            ITOTAL=TOTAL+.67                                    PLANT     52
                            WRITE (6,3) ITOTAL                                  PLANT     53
                      3     FORMAT(* TOTAL DEMAND FOR FIRST PERIOD = *,I10      PLANT     54
                            FPROD1=TOTAL1/(1.2*FIRSTPP)                         PLANT     55
                     55     PROD1=FPROD1+.67                                    PLANT     56
                            FP1=FIRSTPP+1                                       PLANT     57
                            TOTAL2=0.                                           PLANT     58
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                      DO 24  I=FPL,LIFETIM                                    PLANT      59
                      TOTAL2=TOTAL2+DEMAND(I)                                 PLANT      60
      60          24  CONTINUE                                                PLANT      61
                      ITOTAL2=TOTAL2+.67                                      PLANT      62
                      FPROD2=TOTAL2/(12.*(LIFETIM-FIRSTPR))                   PLANT      63
                      PROD2=FPROD2+.67                                        PLANT      64
                      WRITE (6,4) ITOTAL2                                     PLANT      65
      55              FORMAT(* TOTAL DEMAND FOR SECOND PERIOD = *,I10)        PLANT      66
                      MAXP=MAXC(PROD1,PROD2)                                  PLANT      67
                      TOTAL=TOTAL1+TOTAL2                                     PLANT      68
                      ITOTAL=TOTAL+.67                                        PLANT      69
                      WRITE (6,5) ITOTAL                                      PLANT      70
      70              FORMAT(* TOTAL DEMAND FOR THIS AIRCRAFT = *,I10)        PLANT      71
                      IF(ITOTAL.LE.MAXAC) GO TO 21                            PLANT      72
                      WRITE(6,22) MAXAC                                       PLANT      73
                   22 FORMAT(1HO,*TOTAL DEMAND EXCEEDS ARRAY MAXIMUM OF *,I5) PLANT      74
                      STOP                                                    PLANT      75
      75           21 TOTAL1=12*PROD1*FIRSTPR                                 PLANT      76
                      TOTAL2=ITOTAL-ITOTAL1                                   PLANT      77
                      WRITE (6,5) PROD1,PROD2                                 PLANT      78
                    6 FORMAT(* PRODUCTION RATE FOR 1ST & 2ND PERIOD RESPECTIVELY IS = *, PLANT      79
                     X,I5,*,*,I5)                                             PLANT      80
      80              C                                                       PLANT      81
                      C     SKIP NEXT CODE BLOCK AFTER OPTIMAL PRODUCTION     PLANT      82
                      C     SCHEDULE FOUND,                                   PLANT      83
                      C                                                       PLANT      84
                      IF (NTRY.EQ.2)  GO TO 25                                PLANT      85
      85              TMAX1=0                                                 PLANT      86
                      TMIN1=0                                                 PLANT      87
                      C*    MINMAX=6                                          PLANT      88
                      C*    MIN=240                                           PLANT      89
                      TTS=TS                                                  PLANT      90
      90              C                                                       PLANT      91
                      C     CALCULATE PRODUCTION AND DELIVERY SCHEDULES BASED ON PLANT      92
                      C     TENTATIVE PRODUCTION PERIOD SUBDIVISION           PLANT      93
                      C                                                       PLANT      94
                      25    CONTINUE                                          PLANT      95
      95              DO 24 I=1,4000,1                                        PLANT      96
                      PRODUCT(I)=0                                            PLANT      97
                    24 CONTINUE                                               PLANT      98
                      DO 28 I=1,372,1                                         PLANT      99
                      PROSCHL(I)=0                                            PLANT     100
     100           28 CONTINUE                                                PLANT     101
                      DO 30 ITHPL=1,ITOTAL1,1                                 PLANT     102
                      JMNTHPL=(ITHPL-1)/PROD1+1                               PLANT     103
                      IF((JMNTHPL+TTS).GT.396) GO TO 30                       PLANT     104
                      PRODUCT(ITHPL)=JMNTHPL+TTS                              PLANT     105
     105              PROSCHL(JMNTHPL+TTS)=ITHPL                              PLANT     106
                   30 CONTINUE                                                PLANT     107
                      END1=JMNTHPL+TTS                                        PLANT     108
                      DO 40 ITHPL=1,ITOTAL2,1                                 PLANT     109
                      JMNTHPL=(ITHPL-1)/PROD2+1                               PLANT     110
     110              IF((JMNTHPL+END1).GT.396) GO TO 40                      PLANT     111
                      PRODUCT(ITOTAL1+ITHPL)=JMNTHPL+END1                     PLANT     112
                      PROSCHL(JMNTHPL+END1)=ITOTAL1+ITHPL                     PLANT     113
                   40 CONTINUE                                                PLANT     114
                      END2=JMNTHPL+END1                                       PLANT     115
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                      DO 5  ITHPL=2,ITOTAL                                    PLANT  116
                      DELIVER(ITHPL)=PRODUCT(ITHPL)                           PLANT  117
                5     CONTINUE                                                PLANT  118
                      DO 6  JMNTHPL=1,END2                                    PLANT  119
                      IF(JMNTHPL.GT.396) GO TO 6C                             PLANT  120
                      DELSCHL(JMNTHPL)=PRDSCHE(JMNTHPL)                       PLANT  121
                6C    CONTINUE                                                PLANT  122
                C                                                             PLANT  123
                C     SKIP TO WRAP-UP CODE AFTER OPTIMAL SCHEDULE CALCULATED  PLANT  124
                C                                                             PLANT  125
                      IF (NTRY.EQ.2)  GO TO 500                               PLANT  126
                C*    IF(NTRY.EQ.1) GO TO 129       NOT USED                  PLANT  127
                C                                                             PLANT  128
                C     CALCULATE DIFFERENCES BETWEEN CUMULATIVE PRODUCTION AND DEMAND  PLANT  129
                C     SCHEDULES AT END OF EACH YEAR OF DEMAND                 PLANT  130
                C                                                             PLANT  131
                      ACCUM=0.0                                               PLANT  132
                      IACCUM=0                                                PLANT  133
                      SUMDIF=0.0                                              PLANT  134
                      DO 9C IYEAR=1,FIRSTPP,1                                 PLANT  135
                      ACCUM=ACCUM+DEMAND(IYEAR)                               PLANT  136
                      IACCUM=ACCUM+.67                                        PLANT  137
                      IDIFF=12*IYEAR+TS-DELIVER(IACCUM)                       PLANT  138
                      SUMDIF=SUMDIF+IDIFF                                     PLANT  139
                      IF(IDIFF.GT.IMAX1) GO TO 7C                             PLANT  140
                      IF (IDIFF.LT.IMIN1) GO TO 8C                            PLANT  141
                      GO TO 9C                                                PLANT  142
                7C    CONTINUE                                                PLANT  143
                      IMAX1=IDIFF                                             PLANT  144
                      GO TO 9C                                                PLANT  145
                8C    CONTINUE                                                PLANT  146
                      IMIN1=IDIFF                                             PLANT  147
                9C    CONTINUE                                                PLANT  148
                C*    NTRY=1        NOT USED                                  PLANT  149
                      IMAX2=0                                                 PLANT  150
                      IMIN2=0                                                 PLANT  151
                      DO 120 IYEAR=FP1,LIFETIM,1                              PLANT  152
                      ACCUM=ACCUM+DEMAND(IYEAR)                               PLANT  153
                      IACCUM=ACCUM+.67                                        PLANT  154
                      IDIFF=12*IYEAR+TS-DELIVER(IACCUM)                       PLANT  155
                      SUMDIF=SUMDIF+IDIFF                                     PLANT  156
                      IF(IDIFF.GT.IMAX2) GO TO 105                            PLANT  157
                      IF(IDIFF.LT.IMIN2) GO TO 11C                            PLANT  158
                      GO TO 12C                                               PLANT  159
                105   CONTINUE                                                PLANT  160
                      IMAX2=IDIFF                                             PLANT  161
                      GO TO 120                                               PLANT  162
                11C   CONTINUE                                                PLANT  163
                      IMIN2=IDIFF                                             PLANT  164
                120   CONTINUE                                                PLANT  165
                C                                                             PLANT  166
                C     COMPUTE STARTING MONTH OFFSET TO IMPROVE PRODUCTION     PLANT  167
                C     SCHEDULE.                                               PLANT  168
                C                                                             PLANT  169
                      AVGDIF=SUMDIF/LIFETIM+ .5                               PLANT  170
                      IF(SUMDIF.LT.0.0) AVGDIF=SUMDIF/LIFETIM-.5              PLANT  171
                      IF(AVGDIF.GT.6.0) AVGDIF=6.0                            PLANT  172
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                      IF(AVGDIF.LT.-0.01) AVGDIF=-5.0                          PLANT  173
                      TTS=TTS+AVGDIF                                           PLANT  174
                C                                                              PLANT  175
      175             C     COMPUTE MINIMAX VALUE FOR THIS PRODUCTION PERIOD SUBDIVISION  PLANT  176
                C                                                              PLANT  177
                      MINMAX=MAX0(MAX0(IABS(IMAX1),IABS(IMIN1)),MAX0(IABS(IMAX2),IABS(  PLANT  178
                     XIMIN2)))                                                 PLANT  179
                C*    IMAX1=0                                                  PLANT  180
      180       C*    IMIN1=0                                                  PLANT  181
                C*    IMAX2=0                                                  PLANT  182
                C*    IMIN2=0                                                  PLANT  183
                C*    NTRY=0                                                   PLANT  184
                C*    GO TO 25                                                 PLANT  185
      185       C*129 CONTINUE                                                 PLANT  186
                      KICKOFF(BRKPT-1)=TTS                                     PLANT  187
                      DISCREP(BRKPT-1)=MINMAX                                  PLANT  188
                C*    NTRY=-1                                                  PLANT  189
                C                                                              PLANT  190
      190       C     END OF MAIN PROGRAM LOOP                                 PLANT  191
                C                                                              PLANT  192
                200   CONTINUE                                                 PLANT  193
                C*300 CONTINUE                                                 PLANT  194
                C                                                              PLANT  195
      195       C     EXAMINE MINIMAX VALUES TO FIND OPTIMUM PRODUCTION        PLANT  196
                C     SCHEDULE SUBDIVISION AND OFFSET (SMALLEST MAXIMUM DISCREPANCY)  PLANT  197
                C                                                              PLANT  198
                      MINMAX=372                                               PLANT  199
                      DO 400 BRKPT=IB,LB,1                                     PLANT  200
      200             IF (DISCREP(BRKPT-1).GE.MINMAX)  GO TO 400               PLANT  201
                      MINMAX=DISCREP(BRKPT-1)                                  PLANT  202
                      BRKPT=BRKPT                                              PLANT  203
                      TTS=KICKOFF(BRKPT-1)                                     PLANT  204
                400   CONTINUE                                                 PLANT  205
      205             IB=BRKPT                                                 PLANT  206
                      LB=BRKPT                                                 PLANT  207
                      NTRY=2                                                   PLANT  208
                C                                                              PLANT  209
                C     RECYCLE MAIN LOOP ONCE TO CALCULATE OPTIMUM PRODUCTION   PLANT  210
      210       C     SCHEDULE WITH OFFSET                                     PLANT  211
                C                                                              PLANT  212
                      GO TO 100                                                PLANT  213
                C                                                              PLANT  214
                C     CLEANUP CODE AFTER OPTIMUM PRODUCTION SCHEDULE FOUND.  PRINT  PLANT  215
      215       C     START-UP TIME AND COMPUTE ORDER SCHEDULE (24 MONTHS BEFORE  PLANT  216
                C     DELIVERY)                                                PLANT  217
                C                                                              PLANT  218
                500   CONTINUE                                                 PLANT  219
                      WRITE (6,121) TTS                                        PLANT  220
      220       121   FORMAT(* TIME FOR START-UP OF PRODUCTION = *,I3)         PLANT  221
                      DO 600 ITYPL=1,ITOTAL,1                                  PLANT  222
                      ORDER(ITYPL)=DELIVER(ITYPL)-LTIME(DELIVER(ITYPL)-TTS)    PLANT  223
                600   CONTINUE                                                 PLANT  224
                1     FORMAT(I5)                                               PLANT  225
      225             IF(TTS.LE.372) GO TO 601                                 PLANT  226
                      WRITE(6,603) TTS                                         PLANT  227
                  603 FORMAT(1HO,*MONTH FOR STARTUP OF PR     TION (*,I5,*) IS BEYOND END  PLANT  228
                     1 OF 31 YEAR PERIOD*)                                     PLANT  229
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      STOP                                                              PLANT   230
  231 601 IF(PROSCHL(372),EQ.0) GO TO 602                               PLANT   231
      WRITE(6,604) ITOTAL,PROSCHL(372)                                  PLANT   232
      604 FORMAT(1HO,*TOTAL DEMAND CALCULATED (*,I5,*) CANNOT BE PRODUCED IN PLANT   233
     1 31 YEAR PERIOD*, /,* TOTAL PRODUCED IN THIS PERIOD IS *,I5,/     PLANT   234
     2* THIS NEW TOTAL WILL BE USED IN PRODUCTION COSTS FOR PERIOD*)     PLANT   235
  235 ITOTAL=PROSCH(  372)                                              PLANT   236
      602 RETURN                                                        PLANT   237
      END                                                               PLANT   238
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      1                 SUBROUTINE INTRTP(R)                                    INTRTP     2
                      C                                                         INTRTP     3
                      C     THIS SUBROUTINE PRODUCES MONTHLY ACCUMULATED COSTS, CALLS RATE OF   INTRTP     4
                      C     RETURN CALCULATION AND PRINTS INCOME, COST, AND CASHFLOW  INTRTP     5
      5               C     TABLES WHEN PRINT FLAG SET.                         INTRTP     6
                      C                                                         INTRTP     7
                            DIMENSION ROTECMP(5,372),COMPCST(11,372)            INTRTP     8
                            DIMENSION ACRDTE(5,372),ACCMP(11,372)               INTRTP     9
                            DIMENSION ROTELBL(5),PRODIDS(11)                    INTRTP    10
     10                     DIMENSION INCOME(372),ACCINCO(372),CASHFLO(372),ACCASHF(372)  INTRTP    11
                            REAL INCOME                                         INTRTP    12
                            INTEGER YR,YEAR                                     INTRTP    13
                            COMMON /ROTECMP/ ROTECMP                            INTRTP    14
                            COMMON /COMPCST/ COMPCST                            INTRTP    15
     15                     COMMON /INCOME/ INCOME                              INTRTP    16
                            COMMON /ACCINCO/ ACCINCO                            INTRTP    17
                            COMMON /CASHFLO/ CASHFLO                            INTRTP    18
                            COMMON /ACCASHF/ ACCASHF                            INTRTP    19
                            COMMON /ROTELBL/ ROTELBL                            INTRTP    20
     20                     COMMON /PRODIDS/ PRODIDS                            INTRTP    21
                            COMMON /PRINT/ IP                                   INTRTP    22
                      C                                                         INTRTP    23
                      C     CALCULATE ACCUMULATED MONTHLY SUMS FOR ROTE AND PRODUCTION COSTS  INTRTP    24
                      C                                                         INTRTP    25
     25                     DO 200 ITH=1,5,1                                    INTRTP    26
                            SUM=0.0                                             INTRTP    27
                            DO 100 MNTH=1,372,1                                 INTRTP    28
                            SUM=SUM+ROTECMP(ITH,MNTH)                           INTRTP    29
                            ACRDTE(ITH,MNTH)=SUM                                INTRTP    30
     30            100    CONTINUE                                            INTRTP    31
                   200    CONTINUE                                            INTRTP    32
                            DO 400 ITH=1,11,1                                   INTRTP    33
                            SUM=0.0                                             INTRTP    34
                            DO 300 MNTH=1,372,1                                 INTRTP    35
     35                     SUM=SUM+COMPCST(ITH,MNTH)                           INTRTP    36
                            ACCMP(ITH,MNTH)=SUM                                 INTRTP    37
                   300    CONTINUE                                            INTRTP    38
                   400    CONTINUE                                            INTRTP    39
                      C                                                         INTRTP    40
     40               C     CALL SUBROUTINE TO COMPUTE INTERNAL RATE OF RETURN FOR  INTRTP    41
                      C     ESTIMATED CASHFLOW                                  INTRTP    42
                      C                                                         INTRTP    43
                            CALL IRR(R)                                         INTRTP    44
                            WRITE (6,5) R                                       INTRTP    45
     45             5      FORMAT(' R = ',E10.2)                               INTRTP    46
                            IF (IP.EQ.1) GO TO 700                              INTRTP    47
                      C                                                         INTRTP    48
                      C     WHEN REQUESTED, PRINT TABLES OF INDIVIDUAL MONTHLY INCOME  INTRTP    49
                      C     COST AND CASHFLOW FIGURES FOR EACH YEAR FROM 1975-2009  INTRTP    50
     50               C                                                         INTRTP    51
                            DO 500 YR=1,33,1                                    INTRTP    52
                            IP=12*(YR-1)                                        INTRTP    53
                            YEAR=1974+YR                                        INTRTP    54
                            WRITE (6,4)                                         INTRTP    55
     55             4      FORMAT('0')                                         INTRTP    56
                    6      FORMAT(' ')                                         INTRTP    57
                            WRITE (6,1)                                         INTRTP    58
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                  4     FORMAT(T16,*JAN*,T26,*FEB*,T36,*MAR*,T46,*APR*,T56,*MAY*,T66,*JUN*  INTRDR    59
                 *,T76,*JUL*,T86,*AUG*,T96,*SEP*,T106,*OCT*,T116,*NOV*,T126,*DEC*)        INTRDR    60
        53               WRITE (6,4)                                                      INTRDR    61
                         DO 94 ITH=1,5,1                                                  INTRDR    62
                         WRITE (6,3) RDTEL9L(ITH),YEAR,(RDTECMP(ITH,IR+J),J=1,12,1)       INTRDR    63
                  94     CONTINUE                                                         INTRDR    64
                         WRITE (6,2) YEAR,(INCOME(IP+J),J=1,12,1)                         INTRDR    65
        55               DO 98 ITH=1,11,1                                                 INTRDR    66
                         WRITE (6,3) PRODIDS(ITH),YEAR,(COMPCST(ITH,IR+J),J=1,12,1)       INTRDR    67
                  98     CONTINUE                                                         INTRDR    68
                         WRITE (6,9) YEAR,(CASHFLO(IR+J),J=1,12,1)                        INTRDR    69
                 500     CONTINUE                                                         INTRDR    70
        70               C                                                                INTRDR    71
                         C     PRINT TABLES OF CUMULATIVE MONTLY INCOME, COST AND CASHFLOW INTRDR    72
                         C     FIGURES FOR EACH YEAR FROM 1975-2005                       INTRDR    73
                         C                                                                INTRDR    74
                               DO 600 YR=1,31,1                                           INTRDR    75
        75                     IR=12*(YR-1)                                               INTRDR    76
                               YEAR=1974+YR                                               INTRDR    77
                               WRITE (6,4)                                                INTRDR    78
                               WRITE (6,1)                                                INTRDR    79
                               WRITE (6,6)                                                INTRDR    80
        80                     DO 180 ITH=1,5,1                                           INTRDR    81
                               WRITE (6,3) RDTEL9L(ITH),YEAR,(ACRDTE(ITH,IR+J),J=1,12,1)  INTRDR    82
                 180           CONTINUE                                                   INTRDR    83
                               WRITE (6,2) YEAR,(ACCINCO(IP+J),J=1,12,1)                  INTRDR    84
                               DO 190 ITH=1,11,1                                          INTRDR    85
        85                     WRITE (6,3) PRODIDS(ITH),YEAR,(ACCMP(ITH,IP+J),J=1,12,1)   INTRDR    86
                 190           CONTINUE                                                   INTRDR    87
                               WRITE (6,9) YEAR,(ACCASHF(IR+J),J=1,12,1)                  INTRDR    88
                   3           FORMAT(* *,A7,I4,12(1PE10.3))                              INTRDR    89
                   2           FORMAT(* INCOME *,I4,12(1PE10.3))                          INTRDR    90
        90         9           FORMAT(* CASHFLO*,I4,12(1PE10.3))                          INTRDR    91
                 600           CONTINUE                                                   INTRDR    92
                 700           CONTINUE                                                   INTRDR    93
                               RETURN                                                     INTRDR    94
                               END                                                        INTRDR    95
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      SUBROUTINE ACPRICE                                                ACPRICE    2
C                                                                       ACPRICE    3
C     THIS SUBROUTINE ESTIMATES MARKET PLACE PRICES                     ACPRICE    4
C                                                                       ACPRICE    5
C     API       = AVERAGE NATIONAL PRICE/COST INDEX OVER PERIOD OF INTERS ACPRICE    6
C                 FRACTIONAL FORM (DEFAULT VALUE =0.06)                 ACPRICE    7
C     FAIRFP    = ESTIMATED AIRFRAME PRICE                              ACPRICE    8
C     FAIRPP    = ESTIMATED AIRPLANE PRICE                              ACPRICE    9
C     FDEVP     = ESTIMATED AIRPLANE DEVELOPMENT COST, MILLIONS         ACPRICE   10
C     FENGPR    = ESTIMATED ENGINES TOTAL PRICE                         ACPRICE   11
C     FN        = NUMBER OF MAIN ENGINES                                ACPRICE   12
C     FPRICE    = ESTIMATED AIRPLANE MARKET PLACE PRICE                 ACPRICE   13
C     FSEPRT    = ESTIMATED AIRPLANE PRICE BY SEAT COST, MILLIONS       ACPRICE   14
C     FUPROC    = ESTIMATED AIRPLANE UNIT PRODUCTION COST, MILLIONS     ACPRICE   15
C     HP        = ENGINE DESIGN SHAFT HORSEPOWER                        ACPRICE   16
C     IAIRPL    = INDICATOR FOR AIRPLANE TYPE                           ACPRICE   17
C                   IAIRPL = 1 FOR CONVENTIONAL JET TRANSPORTS           ACPRICE   18
C                   IAIRPL = 2 FOR SMALL JET TRANSPORTS                 ACPRICE   19
C                   IAIRPL = 3 FOR WIDE BODY JET TRANSPORTS             ACPRICE   20
C                   IAIRPL = 4 FOR TURBO-PROP TRANSPORTS                ACPRICE   21
C                   IAIRPL = 5 FOR GENERAL AVIATION TYPES               ACPRICE   22
C                   IAIRPL = 6 FOR SUPERSONIC TRANSPORTS                ACPRICE   23
C     IENGS       INDICATOR FOR TYPE OF ENGINES                         ACPRICE   24
C                   IENG = 1 FOR TURBOJET AND TURBOFAN                  ACPRICE   25
C                   IENG = 2 FOR TURBOPROP                              ACPRICE   26
C                   IENG = 3 FOR RECIPROCATING                          ACPRICE   27
C                   IENG = 4 FOR AIRBREATHING                           ACPRICE   28
C     NVHF      = TOTAL NUMBER FLIGHT TEST + OPERATIONAL VEHICLES       ACPRICE   29
C                 (FROM ACCOST) - NOT USED                              ACPRICE   30
C     PN        = TOTAL PASSENGER CAPACITY > 344 SEAT SPACING           ACPRICE   31
C     T         = THRUST PER ENGINE                                     ACPRICE   32
C     WAIRFR    = AIRFRAME WEIGHT                                       ACPRICE   33
C     WE        = AIRCRAFT EMPTY WEIGHT                                 ACPRICE   34
C     WENGS     = ENGINES TOTAL WEIGHT                                  ACPRICE   35
C     YEAR      = YEAR OF INTRODUCTION INTO SERVICE                     ACPRICE   36
                                                                        ACPRICE   37
      DIMENSION COMENT(8)                                               ACPRICE   38
      DIMENSION FSEPRI(3)                                               ACPRICE   39
      DIMENSION IA(3)                                                   ACPRICE   40
      COMMON / PRICED  / EPRICE                                         ACPRICE   41
                                                                        ACPRICE   42
      DATA ASTOP / 4HZZZZZZZZ  /                                        ACPRICE   43
      DATA BSTOP / 1H          /                                        ACPRICE   44
      DATA C / 1.0E-6/                                                  ACPRICE   45
      NAMELIST / IN / API, EN, FCE, IAIRPL, IENGS, NVHF, PN,            ACPRICE   46
     1                T, WE, WENGS, YEAR, HP                           ACPRICE   47
C                                                                       ACPRICE   48
C     PARAMETER INITIALIZATION,  READ COMMENT CARD AND INPUT VARIABLES  ACPRICE   49
C                                                                       ACPRICE   50
    2 IA(1)   = 1                                                       ACPRICE   51
      IA(2)   = 2                                                       ACPRICE   52
      IA(3)   = 3                                                       ACPRICE   53
      API=0.06                                                          ACPRICE   54
      READ (4,5) COMENT                                                 ACPRICE   55
    5 IF (COMENT(1) .EQ. ASTOP) GO TO 51                                ACPRICE   56
      WRITE (6,55) COMENT                                               ACPRICE   57
      READ (4,IN)                                                       ACPRICE   58
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                  50 FORMAT (8A1,)                                                  ACPRICE    59
                  55 FORMAT (1H1, 10X, 8A10///)                                     ACPRICE    60
      61          C                                                                 ACPRICE    61
                  C     COMPUTE PRICE ESTIMATES FOR AIRCRAFT AS LABELED BELOW       ACPRICE    62
                  C                                                                 ACPRICE    63
                                                                                    ACPRICE    64
                  C        I.   COMPARE AIRPLANE DEVELOPMENT COST                   ACPRICE    65
      65          C                  TO (TRDTE - PD - PDFEE FROM ACCOST)            ACPRICE    66
                                                                                    ACPRICE    67
                        EDEVC   = 129.9 * EXP(0.1097*(YEAR-1940.)) * ME * C         ACPRICE    68
                                                                                    ACPRICE    69
                  C        II.  COMPARE AIRPLANE UNIT PRODUCTION COST              ACPRICE    70
      71          C                  TO (FVUCA / (1.0+FEE)) FOR NVHF AIRPLANES FROM ACCOST ACPRICE 71
                                                                                    ACPRICE    72
                        SUPPDC  =   7.8 * EXP(0.168 *(YEAR-1940.)) * ME * C         ACPRICE    73
                        EPRICE=0.0                                                  ACPRICE    74
                        IF(IAIRPL.GT.3) GO TO 104                                   ACPRICE    75
      75                                                                            ACPRICE    76
                        GO TO (101, 102, 103), IAIRPL                               ACPRICE    77
                                                                                    ACPRICE    78
                  C       III.  COMPARE AIRPLANE MARKET PLACE PRICE                 ACPRICE    79
                  C                  TO AVUAC VALUE FOR NVHF AIRPLANES FROM ACCOST  ACPRICE    80
      80                                                                            ACPRICE    81
                  C                  EST. MARKET PLACE PRICE FOR IAIRPL = 1         ACPRICE    82
          101     EPRICE  =             0.04867 * PN * (1.0+API)**(YEAR-1975.)      ACPRICE    83
                        GO TO 104                                                   ACPRICE    84
                  C                  EST. MARKET PLACE PRICE FOR IAIRPL = 2         ACPRICE    85
      85          102 EPRICE  = 3.5 + 0.0305  * PN * (1.0+API)**(YEAR-1975.)       ACPRICE    86
                        GO TO 104                                                   ACPRICE    87
                  C                  EST. MARKET PLACE PRICE FOR IAIRPL = 3         ACPRICE    88
                  103 EPRICE  = 4.0 + 0.05935 * PN * (1.0+API)**(YEAR-1975.)       ACPRICE    89
                                                                                    ACPRICE    90
      90                                                                            ACPRICE    91
                  C       IV.   COMPARE AIRPLANE PER SEAT PRICE                     ACPRICE    92
                  C                  TO AVUAC VALUE FOR NVHF AIRPLANES FROM ACCOST  ACPRICE    93
                                                                                    ACPRICE    94
                  104 ESEPRI(1) = 3100.0 * PN * EXP(0.0641 * (YEAR-1930.)) * C      ACPRICE    95
      95              IA(1)   = 1                                                   ACPRICE    96
                                                                                    ACPRICE    97
                        IF (IAIRPL .EQ. 3) GO TO 112                                ACPRICE    98
                        IF (IENGS .EQ. 1) GO TO 113                                 ACPRICE    99
                  105 ESEPRI(2) = 4000.0 * PN * EXP(0.0652 * (YEAR-1930.)) * C      ACPRICE   100
      100             IA(2)   = 2                                                   ACPRICE   101
                  112 IF (IENGS .NE. 1) GO TO 113                                   ACPRICE   102
                  106 ESEPRI(3) = 20500. * PN * EXP(0.0352 * (YEAR-1950.)) * C      ACPRICE   103
                        IA(3)   = 3                                                 ACPRICE   104
                        EENGPR=0.0                                                  ACPRICE   105
      105               IF(IENGS.GT.3) GO TO 130                                    ACPRICE   106
                                                                                    ACPRICE   107
                  113 GO TO (121, 122, 123), IENGS                                  ACPRICE   108
                                                                                    ACPRICE   109
                  C        V.   COMPARE AIRPLANE MANUFACTURERS PRICE                ACPRICE   110
      110         C                  TO AVUAC VALUE FOR NVHF AIRPLANES FROM ACCOST  ACPRICE   111
                                                                                    ACPRICE   112
                  C                  ENGINE PRICE FOR IENG = 1                      ACPRICE   113
                  121 EENGPR  = 1.1.114 * EN *  T**0.452  * (1.0+API)**(YEAR-1975.)* C ACPRICE 114
                        GO TO 131                                                   ACPRICE   115
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115         C                    ENGINE PRICE FOR IENG = 2                                  ACPRICE  116
            122 EENGPR  = 473.475 * EN * HP**1.9283 * (1.0+API)**(YEAR-1975.) * C          ACPRICE  117
                GO TO 130                                                                  ACPRICE  118
            C                    ENGINE PRICE FOR IENG = 3                                 ACPRICE  119
            123 EENGPR  =  4.693 * EN * HP**1.3917 * (1.0+API)**(YEAR-1975.) * C           ACPRICE  120
120                                                                                        ACPRICE  121
            130 WAIRFR  = WE - WENGS                                                       ACPRICE  122
                                                                                           ACPRICE  123
                GO TO (131, 132, 133, 134, 135, 136), IAIRPL                               ACPRICE  124
                                                                                           ACPRICE  125
125         C                    AIRFRAME PRICE FOR IAIRPL = 1                             ACPRICE  126
            131 EAIRFR  = 2653.67 * WAIRFR**0.7300 * (1.0+API)**(YEAR-1975.) * C           ACPRICE  127
                GO TO 140                                                                  ACPRICE  128
            C                    AIRFRAME PRICE FOR IAIRPL = 2                             ACPRICE  129
            132 EAIRFR  =  436.43 * WAIRFR**0.8936 * (1.0+API)**(YEAR-1975.) * C           ACPRICE  130
130             GO TO 140                                                                  ACPRICE  131
            C                    AIRFRAME PRICE FOR IAIRPL = 3                             ACPRICE  132
            133 EAIRFR  = 3663.35 * WAIRFR**0.69823* (1.0+API)**(YEAR-1975.) * C           ACPRICE  133
                GO TO 140                                                                  ACPRICE  134
            C                    AIRFRAME PRICE FOR IAIRPL = 4                             ACPRICE  135
135         134 EAIRFR  = 4878.64 * WAIRFR**0.659894 (1.0+API)**(YEAR-1975.) * C           ACPRICE  136
                GO TO 140                                                                  ACPRICE  137
            C                    AIRFRAME PRICE FOR IAIRPL = 5                             ACPRICE  138
            135 EAIRFR  = .003458 * WAIRFR**2.1938 * (1.0+API)**(YEAR-1975.) * C           ACPRICE  139
                GO TO 140                                                                  ACPRICE  140
140         C                    AIRFRAME PRICE FOR IAIRPL = 6                             ACPRICE  141
            136 EAIRFR  = 176890. * WAIRFR**0.4506 * (1.0+API)**(YEAR-1975.) * C           ACPRICE  142
                                                                                           ACPRICE  143
            140 EAIRPR  = EAIRFR + EENGPR                                                  ACPRICE  144
                                                                                           ACPRICE  145
145             WRITE (6,200) EDEVC, EUPROC, EPRICE, ESEPRI(1)                             ACPRICE  146
            200 FORMAT (1H0, T10, *ESTIMATED AIRPLANE DEVELOPMENT COST, MILLIONS *         ACPRICE  147
               1, T75, F20.4//                                                             ACPRICE  148
               1T10, *ESTIMATED AIRPLANE UNIT PRODUCTION COST, MILLIONS *, T75,            ACPRICE  149
               3F20.4//                                                                    ACPRICE  150
150            4T10, *ESTIMATED AIRPLANE MARKET PLACE PRICE *, T75, F20.4//                ACPRICE  151
               5T10,*ESTIMATED AIRPLANE PRICE BY SEAT COST, MILLIONS,(ESEPRI(1))*,         ACPRICE  152
               6T85,F10.4/)                                                                ACPRICE  153
                IF (IA(2) .EQ. 0) GO TO 20)                                                ACPRICE  154
                WRITE (6,205) ESEPRI(2)                                                    ACPRICE  155
155         201 IF (IA(3) .EQ. 6) GO TO 202                                                ACPRICE  156
                WRITE (6,206) ESEPRI(3)                                                    ACPRICE  157
            202 WRITE (6,210)          EENGPR, EAIRFR, WAIRFR, EAIRPR                      ACPRICE  158
            210 FORMAT (1H ,                                                               ACPRICE  159
               3T10, *ESTIMATED ENGINES TOTAL PRICE*,T75,F20.4//                           ACPRICE  160
160            4T10, *ESTIMATED AIRFRAME PRICE*, T75, F20.4//                              ACPRICE  161
               5T10, *AIRFRAME WEIGHT*, T75, F10.4//                                       ACPRICE  162
               6T10, *ESTIMATED AIRPLANE PRICE*, T75, F20.4/)                              ACPRICE  163
                DO 400 II=1,9                                                              ACPRICE  164
            400 COMENT(II) = BSTOP                                                         ACPRICE  165
165             GO TO 20                                                                   ACPRICE  166
            205 FORMAT (                                                                   ACPRICE  167
               1T10,*ESTIMATED AIRPLANE PRICE BY SEAT COST, MILLIONS,(ESEPRI(2))*,         ACPRICE  168
               2T85, F10.4/)                                                               ACPRICE  169
            206 FORMAT (                                                                   ACPRICE  170
170            1T10,*ESTIMATED AIRPLANE PRICE BY SEAT COST, MILLIONS,(ESEPRI(3))*,         ACPRICE  171
               2T85, F10.4/)                                                               ACPRICE  172
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*C3 RETURN                                        ACPRICE   173
      END                                         ACPRICE   174
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      SUBROUTINE ACCOST                                                 ACCOST     2
C                                                                       ACCOST     3
C     ACCOST IS THE MAJOR COMPONENT IN THE AIRFRAME MANUFACTURERS       ACCOST     4
C     MODULE IN THE ARC-ART MODELS.  THIS SUBROUTINE CONSISTSOF A       ACCOST     5
C     SERIES OF EXPONENTIAL EQUATIONS THAT ESTIMATE ROTE AND COMPONENT  ACCOST     6
C     MANUFACTURING COSTS FOR EACH SPECIFIC TYPE OF AIRCRAFT            ACCOST     7
C                                                                       ACCOST     8
C                                                                       ACCOST     9
C     AD        = AVIONICS DEVELOPMENT COST                           ACCOST    10
C     ADDE      = TOTAL AIRFRAME DESIGN AND DEVELOPMENT ENGINEERING COST, ACCOST  11
C                 INCLUDES CONCEPT FORMULATION AND CONTRACT DEFINITION ACCOST    12
C     ADI       = AVIONICS DEVELOPMENT COST, INPUT VALUE              ACCOST    13
C     AFSPAO    = AIRFRAME SPARES FACTOR, PRODUCTION PHASE, (DEFAULT VALU ACCOST  14
C     AGEO      = OPERATIONAL GROUND SUPPORT EQUIPMENT COST           ACCOST    15
C     AGEOI     = OPERATIONAL GROUND SUPPORT EQUIPMENT COST, INPUT    ACCOST    16
C     AGEP      = GROUND SUPPORT EQUIPMENT DEVELOPMENT COST           ACCOST    17
C     AGEPI     = GROUND SUPPORT EQUIPMENT DEVELOPMENT COST,  INPUT   ACCOST    18
C     AMFG      = AIRFRAME TOTAL COST,  F.U.M.C.                      ACCOST    19
C     AP        = AVERAGE AIRPLANE PRICE FOR 40# UNITS                ACCOST    20
C     AQ        = PRODUCTION TOTAL COST FOR  NV  AIRPLANES            ACCOST    21
C     AQFEE     = PRODUCTION PHASE CONTRACTOR FEE                     ACCOST    22
C     C         = ARRAY                                               ACCOST    23
C     CACS      = AIR CONDITIONING  SYSTEM COST, F.U.M.C.             ACCOST    24
C     CAERO     = AERODYNAMIC CONTROL SYSTEM COST,  F.U.M.C.          ACCOST    25
C     CAFCT     = CUMMULATIVE TOTAL AIRFRAME COSTS FOR 40# UNITS      ACCOST    26
C     CAFCTI    = CUMMULATIVE TOTAL AIRFRAME COSTS FOR 40-1# UNITS    ACCOST    27
C     CAFFV     = FLIGHT TEST VEHICLE AIRFRAME COS.                   ACCOST    28
C     CAFO      = PRODUCTION AIRCRAFT AIRFRAME COST                   ACCOST    29
C     CAFUCA    = CUMMULATIVE AVERAGE UNIT AIRFRAME COST FOR #0# UNITS ACCOST   30
C     CANTIC    = ANTI-ICING COST, F.U.M.C.                           ACCOST    31
C     CAVCT     = CUMMULATIVE TOTAL AVIONICS COSTS FOR 40# UNITS      ACCOST    32
C     CAVCTI    = CUMMULATIVE TOTAL AVIONICS COSTS FOR 40-1# UNITS    ACCOST    33
C     CAVFV     = FLIGHT TEST VEHICLE AVIONICS COST                   ACCOST    34
C     CAVION    = AVIONICS COST,  F.U.M.C.                            ACCOST    35
C     CAVO      = PRODUCTION AIRCRAFT AVIONICA COST                   ACCOST    36
C     CAVONE    = AVIONICS EQUIPMENT COST, F.U.M.C.                   ACCOST    37
C     CAVONI    = AVIONICS INSTALLATION COST, F.U.M.C.                ACCOST    38
C     CAVONT    = TOTAL AVIONICS EQUIPMENT AND INSTALLATION COST      ACCOST    39
C     CAVUCA    = CUMMULATIVE AVERAGE UNIT AVIONICS COST FOR 40# UNITS ACCOST   40
C     CBODY     = AIRCRAFT FUSELAGE COST,  F.U.M.C.                   ACCOST    41
C     CD        = CONTRACT DEFINITION PHASE COST                      ACCOST    42
C     CELCAD    = ELECTRICAL DISTRIBUTION SYSTEM COST                 ACCOST    43
C     CEMP      = EMPENNAGE COST, F.U.M.C.                            ACCOST    44
C     CENACC    = ENGINE ACCESSORIES COST,  F.U.M.C.                  ACCOST    45
C     CENGS     = AIRPLANE ENGINES COST,  F.U.M.C.                    ACCOST    46
C     CF        = CONCEPT FORMULATION PHASE COST                      ACCOST    47
C     CFACS     = COMPLEXITY FACTOR AIR CONDITIONING SYSTEM           ACCOST    48
C     CFAERO    = COMPLEXITY FACTOR AERODYNAMIC CONTROL SYSTEM        ACCOST    49
C     CFANTC    = COMPLEXITY FACTOR ANTI-ICING SYSTEM                 ACCOST    50
C     CFASSY    = FINAL ASSEMBLY AND CHECK-OUT COST                   ACCOST    51
C     CFAVON    = COMPLEXITY FACTOR AVIONICS SYSTEM                   ACCOST    52
C     CFBODY    = COMPLEXITY FACTOR AIRCRAFT FUSELAGE                 ACCOST    53
C     CFELCD    = COMPLEXITY FACTOR ELECTRICAL DISTRIBUTION SYSTEM    ACCOST    54
C     CFEMP     = COMPLEXITY FACTOR EMPENNAGE STRUCTURE               ACCOST    55
C     CFENAC    = COMPLEXITY FACTOR ENGINE ACCESSORIES                ACCOST    56
C     CFENG     = COMPLEXITY FACTOR AIRBREATHING ENGINES              ACCOST    57
C     CFFUSY    = COMPLEXITY FACTOR FUEL SYSTEM                       ACCOST    58
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C     CEHNDL  = COMPLEXITY FACTOR FOR LOADING AND HANDLING                ACCOST   59
C     CEHYCO  = COMPLEXITY FACTOR HYDRAULIC SYSTEM                        ACCOST   60
      CEINST  = COMPLEXITY FACTOR INSTRUMENT SYSTEM                       ACCOST   61
C     CELG    = COMPLEXITY FACTOR ALIGHTING GEAR SYSTEM                   ACCOST   62
C     CENAC   = COMPLEXITY FACTOR ENGINE NACELLES                         ACCOST   63
C     CEPACC  = COMPLEXITY FACTOR PASSENGER ACCOMMODATIONS                ACCOST   64
C     CEPNCO  = COMPLEXITY FACTOR PNEUMATIC SYSTEM                        ACCOST   65
      CEPOW   = COMPLEXITY FACTOR AUXILIARY POWER SYSTEM                  ACCOST   66
C     CETREV  = COMPLEXITY FACTOR THRUST REVERSER                         ACCOST   67
C     CEUSYS  = FUEL SYSTEM COST, F.U.M.C.                                ACCOST   68
C     CEWING  = COMPLEXITY FACTOR WING STRUCTURE                          ACCOST   69
C     CHANDL  = LOAD AND HANDLING SYSTEM COST, F.U.M.C.                   ACCOST   70
      CHYCAO  = HYDRAULIC SYSTEM COST, F.U.M.C.                           ACCOST   71
C     CINST   = INSTRUMENT SYSTEM COST, F.U.M.C.                          ACCOST   72
C     CINSTE  = INSTRUMENT EQUIPMENT COST, F.U.M.C.                       ACCOST   73
C     CINSTI  = INSTRUMENT INSTALLATION COST, F.U.M.C.                    ACCOST   74
C     CLG     = ALIGHTING GEAR COST, F.U.M.C.                             ACCOST   75
      CNACEL  = ENGINE NACELLES COST, F.U.M.C.                            ACCOST   76
C     CONFIG  = ENGINEERING COMPLEXITY FACTOR, NOMINALLY IS 1.0           ACCOST   77
C     CPACCO  = PASSENGER ACCOMMODATIONS AND FURNISHING COST, F.U.M.C.    ACCOST   78
C     CPCT    = CUMMULATIVE TOTAL PROPULSION COSTS FOR 404 UNITS          ACCOST   79
C     CPCTT   = CUMMULATIVE TOTAL PROPULSION COSTS FOR 40-14 UNITS        ACCOST   80
      CPFV    = FLIGHT TEST VEHICLE PROPULSION SYSTEM COST                ACCOST   81
C     CPNCAO  = PNEUMATIC SYSTEM COST, F.U.M.C.                           ACCOST   82
C     CPO     = PRODUCTION AIRCRAFT PROPULSION SYSTEM COST                ACCOST   83
C     CPOWER  = AUXILIARY POWER SYSTEM COST, F.U.M.C.                     ACCOST   84
C     CPUCA   = CUMMULATIVE AVERAGE UNIT PROPULSION COST FOR 404 UNITS    ACCOST   85
      CSTRUC  = ASSEMBLED AIRPLANE COST, F.U.M.C.                         ACCOST   86
C     CTJ     = AIRPLANE ENGINE UNIT COST, F.U.M.C.                       ACCOST   87
C     CTJI    = AIRPLANE ENGINE UNIT COST, INPUT VALUE, F.U.M.C.          ACCOST   88
C     CTREVS  = THRUST REVERSER COST, F.U.M.C.                            ACCOST   89
C     CV      = TOTAL AIRCRAFT COST, F.U.M.C.                             ACCOST   90
      CWING   = WING COST, F.U.M.C.                                       ACCOST   91
C     DDEL    = AIRFRAME DESIGN AND DEVELOPMENT ENGINEERING COST          ACCOST   92
C     DS      = RESEARCH, DEVELOPMENT, TEST & EVALUATION SUPPORT          ACCOST   93
C     EN      = NUMBER OF MAIN ENGINES = NENG                             ACCOST   94
C     ENSPAO  = MAIN ENGINE SPARES FACTOR, PRODUCTION PHASE               ACCOST   95
      ENSPAR  = MAIN ENGINE SPARES FACTOR, ROTABLE PHASE                  ACCOST   96
C     FAC     = PRODUCTION FACILITIES COST                                ACCOST   97
C     FACT    = PRODUCTION FACILITIES COST, INPUT VALUE                   ACCOST   98
C     FEE     = MANUFACTURER FEE FACTOR, NOMINAL VALUE = 0.10             ACCOST   99
C     FTO     = FLIGHT TEST OPERATION COST                                ACCOST  100
      FTOI    = FLIGHT TEST OPERATION COST, INPUT VALUE                   ACCOST  101
C     FTS     = FLIGHT TEST AIRCRAFT SPARES COST                          ACCOST  102
C     FV      = FLIGHT TEST VEHICLES COST                                 ACCOST  103
C     FVCT    = CUMMULATIVE TOTAL AIRPLANE COSTS FOR 404 UNITS            ACCOST  104
C     FVCTT   = CUMMULATIVE TOTAL AIRPLANE COSTS FOR 40-14 UNITS          ACCOST  105
      FVSPAR  = FLIGHT TEST VEHICLE SPARES, NOMINAL VALUE = 0.23          ACCOST  106
C     FVUC    = UNIT AIRPLANE COST OF 40-TH4 UNIT                         ACCOST  107
C     FVUCA   = CUMMULATIVE AVERAGE UNIT AIRPLANE COST FOR 404 UNITS      ACCOST  108
C     GTS     = GROUND TEST VEHICLE SPARES COST                           ACCOST  109
      GTSPAR  = GROUND TEST VEHICLE SPARES, NOMINAL VALUE = 0.10          ACCOST  110
C     GTV     = GROUND TEST VEHICLES                                      ACCOST  111
C     I       = INDICATOR FOR QUANTITIES MATRIX                           ACCOST  112
C     ICONFG  = INDICATOR FOR AIRCRAFT TYPE, (  =6  FOR SUBSONIC          ACCOST  113
C               PRODUCTION, =7  PROTOTYPE, =8  SUPERSONIC PRODUCTION)     ACCOST  114
C     ICUM    = INDICATOR FOR CUMMULATIVE QUANTITY                        ACCOST  115
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C     IDATA  = INDICATOR FOR PRINTOUT FORMAT                                ACCOST  116
C              =1 FOR NORMAL PRINT OUT                                      ACCOST  117
C     IOPS   = INDICATOR FOR TYPE OPERATIONAL PROGRAM                       ACCOST  118
C              =1 FOR COMMERCIAL AIRLINE, =0 FOR OTHER                      ACCOST  119
C     IPOWER = INDICATOR FOR TYPE ELECTRICAL POWER SYSTEM                   ACCOST  120
C              =1 FOR BATTERY, =2 FOR AIRCRAFT APU                          ACCOST  121
C     IPROD  = INDICATOR FOR PROTOTYPE OR PRODUCTION TOOLING                ACCOST  122
C              =1 FOR PRODUCTION, (NORMAL SETTING)  =0 FOR PROTOTYPE        ACCOST  123
C     IQ     = INDICATOR FOR QUANTITY MATRIX                                ACCOST  124
C     IT     = INITIAL FLIGHT CREW TRAINING COST FOR  NV  AIRPLANES         ACCOST  125
C     IV     = TOTAL AIRCRAFT PRODUCTION COSTS FOR  NV  AIRPLANES           ACCOST  126
C     IWLG   = INDICATOR FOR LANDING GEAR COMPONENT BREAKDOWN               ACCOST  127
C     J      = INDICATOR                                                    ACCOST  128
C     LEARN  = AIRFRAME LEARNING CURVE, PERCENT                             ACCOST  129
C     LEARNA = AVIONICS LEARNING CURVE, PERCENT                             ACCOST  130
C     LEARNP = ENGINE LEARNING CURVE, PERCENT                               ACCOST  131
C     MACH   = MAXIMUM DESIGN FLIGHT MACH NUMBER FOR ENGINES                ACCOST  132
C     MEQ    = MISCELLANEOUS EQUIPMENT COST                                 ACCOST  133
C     N      = INDICATOR                                                    ACCOST  134
C     NCREW  = NUMBER IN FLIGHT CREW, PER AIRPLANE                          ACCOST  135
C     NDATA  = NUMBER OF POSITIONS ON LEARNING CURVE                        ACCOST  136
C              AT LEAST 1 POSITION,  ( < OR = 5 )                           ACCOST  137
C     NFV    = NUMBER FLIGHT TEST VEHICLES                                  ACCOST  138
C     NG     = NUMBER OF GROUND TEST VEHICLES                               ACCOST  139
C     NDCON  = NUMBER OF CONCEPT FORMULATION CONTRACTORS                    ACCOST  140
C     NDCON1 = NUMBER OF CONTRACT DEFINITION CONTRACTORS                    ACCOST  141
C     NDENG  = NUMBER OF CONCEPT FORMULATION ENGINEERS                      ACCOST  142
C     NDENG1 = NUMBER OF CONTRACT DEFINITIONS ENGINEERS                     ACCOST  143
C     NDYRS  = NUMBER OF YEARS FOR CONCEPT FORMULATION                      ACCOST  144
C     NDYRS1 = NUMBER OF YEARS FOR CONTRACT DEFINITIONS                     ACCOST  145
C     NPL    = TOTAL NUMBER FLIGHT CREW PERSONNEL TO BE TRAINED             ACCOST  146
C     NV     = NUMBER OPERATIONAL VEHICLES                                  ACCOST  147
C     NVEH   = NUMBER OF VEHICLE AT EACH POINT ON LEARNING CURVE            ACCOST  148
C              =1 FOR FIRST UNIT COST                                       ACCOST  149
C     NVHF   = TOTAL NUMBER FLIGHT TEST & OPERATIONAL VEHICLES              ACCOST  150
C     OS     = OPERATIONAL VEHICLES SPARES COST                             ACCOST  151
C     OSA    = PRODUCTION AIRFRAME SPARES                                   ACCOST  152
C     OSP    = PRODUCTION ENGINE SPARES                                     ACCOST  153
C     OT     = TRAINING EQUIPMENT COST                                      ACCOST  154
C     OV     = OPERATIONAL VEHICLES COSTS                                   ACCOST  155
C     PDTJ   = PROPULSION DEVELOPMENT COST TURBO-JET ENGINES                ACCOST  156
C     PDTJI  = PROPULSION DEVELOPMENT COST TURBO-JET ENGINES, INPUT VA      ACCOST  157
C     PN     = TOTAL NUMBER OF PASSENGERS                                   ACCOST  158
C     PROPU  = TOTAL PROPULSION SYSTEM COST,  F.Y.M.C.                      ACCOST  159
C     Q      = TOTAL NUMBER OF VEHICLES MANUFACTURED IN QUANTITY MATRI      ACCOST  160
C     RATE   = VEHICLE PRODUCTION RATE, NUMBER/MONTH                        ACCOST  161
C     RDFEE  = CONTRACTOR FEE,  RDT & E PHASE                               ACCOST  162
C     RDTE   = RESEARCH, DEVELOPMENT, TESTING & ENGINEERING COST            ACCOST  163
C     RE     = ENGINEERING LABOR RATE,  $/ HR.                              ACCOST  164
C     RT     = TOOLING LABOR RATE,  $/ HR.                                  ACCOST  165
C     SC     = TOTAL MANUFACTURING SUSTAINING COSTS FOR 404 UNITS           ACCOST  166
C     SF     = SUSTAINING ENGINEERING COSTS                                 ACCOST  167
C     ST     = SUSTAINING TOOLING COST                                      ACCOST  168
C     SUBSYS = SUBSYSTEM DEVELOPMENT COST                                   ACCOST  169
C     SUBSYI = SUBSYSTEM DEVELOPMENT COST,  INPUT VALUE                     ACCOST  170
C     T      = THRUST PER ENGINE = TPEREN (SEA LEVEL)                       ACCOST  171
C     TDD    = PRODUCTION AIRCRAFT TECHNICAL DATA COST                      ACCOST  172
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C     TDP      = TOTAL TECHNICAL DATA COST                                    ACCOST  173
C     TMC      = TOTAL OF ALL MANUFACTURING COSTS FOR 700 UNITS               ACCOST  174
C     TOOLC    = COMPLEXITY FACTOR TOOLING                                    ACCOST  175
C     TOVERW   = TOTAL ENGINE THRUST OVER AIRPLANE TAKE OFF GROSS WEIGHT      ACCOST  176
C     TPEREN   = THRUST IN POUNDS PER ENGINE                                  ACCOST  177
C     TRDTE    = TOTAL RESEARCH, DEVELOPMENT, TOOLING & ENGINEERING COST      ACCOST  178
C     TRDTEC   = ARRAY OF RDTE COST FACTORS                                   ACCOST  179
C     TRI      = INITIAL TRANSPORTATION COST                                  ACCOST  180
C     TST      = TOOLING AND SPECIAL EQUIPMENT COST                           ACCOST  181
C     TTLCMP   = ARRAY OF PRODUCTION COST FACTORS                             ACCOST  182
C     VMAX     = MAXIMUM VEHICLE SPEED, KNOTS                                 ACCOST  183
C     WA       = VEHICLE AMPR WEIGHT                                          ACCOST  184
C     WACS     = AIR CONDITIONING SYSTEM WEIGHT                               ACCOST  185
C     WAERO    = AERODYNAMIC CONTROL SYSTEM WEIGHT                            ACCOST  186
C     WANTIC   = ANTI-ICING SYSTEM WEIGHT                                     ACCOST  187
C     WAVION   = AVIONICS SYSTEM WEIGHT                                       ACCOST  188
C     WAVIOT   = TOTAL AVIONICS AND INSTRUMENT WEIGHT                         ACCOST  189
C     WBODY    = FUSELAGE WEIGHT                                              ACCOST  190
C     WE       = AIRCRAFT EMPTY WEIGHT                                        ACCOST  191
C     WELCAD   = ELECTRIC POWER CONVERSION & DISTRIBUTION SYSTEM WEIGHT       ACCOST  192
C     WEMP     = EMPENNAGE WEIGHT                                             ACCOST  193
C     WENACC   = ENGINE ACCESSORIES WEIGHT                                    ACCOST  194
C     WENGS    = ENGINES TOTAL WEIGHT                                         ACCOST  195
C     WFUSYS   = FUEL SYSTEM WEIGHT                                           ACCOST  196
C     WFUTOT   = TOTAL FUEL WEIGHT                                            ACCOST  197
C     WGROSS   = AIRCRAFT GROSS TAKE-OFF WEIGHT = WE + WTO                    ACCOST  198
C     WHANDL   = LOAD AND HANDLING SYSTEM WEIGHT                              ACCOST  199
C     WHYCAD   = HYDRAULIC POWER CONVERSION & DISTRIBUTION SYSTEM WEIGHT      ACCOST  200
C     WINST    = INSTRUMENT SYSTEM WEIGHT                                     ACCOST  201
C     WLG      = ALIGHTING GEAR SYSTEM WEIGHT                                 ACCOST  202
C     WLGCON   = ALIGHTING GEAR CONTROLS WEIGHT                               ACCOST  203
C     WLGSTR   = ALIGHTING GEAR STRUCTURE WEIGHT                              ACCOST  204
C     WLGTRS   = TIRE WEIGHT                                                  ACCOST  205
C     WLGWHL   = WHEELS AND BRAKE WEIGHT                                      ACCOST  206
C     WNACEL   = ENGINE NACELLES WEIGHT                                       ACCOST  207
C     WPACCO   = PASSENGER ACCOMODATIONS (AND EQUIPMENT) WEIGHT               ACCOST  208
C     WPAYL    = PAYLOAD WEIGHT                                               ACCOST  209
C     WPNCAD   = PNEUMATIC POWER AND DISTRIBUTION SYSTEM WEIGHT               ACCOST  210
C     WPOWER   = AUXILIARY POWER SYSTEM WEIGHT                                ACCOST  211
C     WPPROV   = CREW SIZE RELATED SUBSYSTEM DEVELOPMENT COST FACTOR          ACCOST  212
C     WTREVS   = THRUST REVERSER WEIGHT                                       ACCOST  213
C     WWING    = WING WEIGHT                                                  ACCOST  214
C     XAVD     = AVIONICS DEVELOPMENT FACTOR, NOMINAL VALUE = 0.10            ACCOST  215
C     XF       = FINAL ASSEMBLY-CHECK OUT COST FRACTION, NOMINAL VALUE         ACCOST  216
C     X        = MISCELLANEOUS EQUIPMENT DEVELOPMENT FACTOR, VALUE = 0.       ACCOST  217
C     Y        = AIRFRAME PRODUCTION LEARNING CURVE COST FACTOR                ACCOST  218
C     YA       = AVIONICS PRODUCTION LEARNING CURVE COST FACTOR                ACCOST  219
C     ZETA     = AIRFRAME LEARNING CURVE EXPONENT                             ACCOST  220
C     ZETAA    = AVIONICS LEARNING CURVE EXPONENT                             ACCOST  221
C     ZETAP    = ENGINE   LEARNING CURVE EXPONENT                             ACCOST  222
C     YP       = ENGINE PRODUCTION LEARNING CURVE COST FACTOR                 ACCOST  223
                                                                              ACCOST  224
      REAL LEAPN, LEARNP, IV, MEQ, IT, MACH                                   ACCOST  225
      REAL NVEH, NG, NEV, NV, NCREW, NPL, NVHF, LEARNA                        ACCOST  226
      REAL NOENG,NOYRS,NOCON,NOENGL,NOYRSL,NOCONL                             ACCOST  227
      DIMENSION TRDTEC (5),TTLCMP (11)                                        ACCOST  228
      COMMON /TRDTEC / TRDTEC                                                 ACCOST  229
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      COMMON /TTLCMP / TTLCMP                                          ACCOST  230
      COMMON /MAXP / MAXP                                              ACCOST  231
      COMMON /TOTAL/ ITOTAL                                            ACCOST  232
                                                                       ACCOST  233
      COMMON / CJSTOT / AD, ADDF, AGEO, AGEP, AO, AOFEE, C(37,5),      ACCOST  234
     1                  CD, CF, DDEL, DS, FAC, FTS, FTO, FV, GTS, GTV,  ACCOST  235
     2                  IT, MEQ, NDATA, NFV, NG, NV, NVEH(5), OS, OT,   ACCOST  236
     3                  OV, PDTJ, RDFEE, SE, ST, SUBSYS, TOD, TOP, NVHF,ACCOST  237
     4                  TPDTE, TRS, TST                                 ACCOST  238
                                                                       ACCOST  239
      COMMON / CJMOUT / AP, CAFUCA, CAVUCA, CPUCA, FEE, FVCT, FVUC,    ACCOST  240
     X                  FVUCA, I, ICUN, IPROD, IQ(33), MACH, RATE,      ACCOST  241
     2                  SC, TMC, WA, WGROSS                             ACCOST  242
                                                                       ACCOST  243
      COMMON / CSHFLD / CAVION, AMFG, PROPU, XFASSY, ENSPAD, LEARN,    ACCOST  244
     1                  LEARNA, LEARNP                                  ACCOST  245
                                                                       ACCOST  246
      DATA  IQ/1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 20, 30, 40, 50, 60, 70,  ACCOST  247
     1        90, 99, 100, 200, 300, 400, 500, 600, 700, 800, 900,     ACCOST  248
     2        1000, 1200, 1400, 1600, 1800, 2000/                      ACCOST  249
C                                                                      ACCOST  250
C     INITIALIZE PARAMETER DEFAULT VALUES                              ACCOST  251
C                                                                      ACCOST  252
                                                                       ACCOST  253
      DATA AFSPAD / 3,13 /, CFHNDL /1.0/, PN / 1.0/                    ACCOST  254
      DATA NVEH/5*1.0/                                                 ACCOST  255
      DATA ADI, AGEOI, AGEPI, FTOI, PDTJI/5*0.10/                      ACCOST  256
      DATA CFACS, CFAERO, CFANTC, CFAVON, CFBODY, CFELCO, CFEMP, CFENAC, ACCOST  257
     1     CFENG, CFFUSY, CFHYCO, CFINST, CFLG,                        ACCOST  258
     2     CFNAC, CFPACC, CFPNCO, CFPOW, CFTREV, CFWING, CTJI/20*1.0/   ACCOST  259
      DATA FACI /0.0/, FEE /0.10/, FVSPAR /0.20/, GTSPAR /0.10/        ACCOST  260
      DATA CONFIG /1.0/,              EN /4.0/, ENSPAD /0.4/, ENSPAR/0.4/ ACCOST  261
      DATA ICONFG /6/, IDATA /1/, IOPS/0/, IPOWER /2/, IPROD /1/       ACCOST  262
      DATA LEARN, LEARNA, LEARNP, MACH, NCREW, NDATA, NFV,             ACCOST  263
     1     NG, NOCON, NOCON1, NOENG, NOENG1, NOYRS, NOYRS1, NV,        ACCOST  264
     2     RATE, RE, RT, SUBSYT,        TOOLC, WACS, WLG, WPAYL,      ACCOST  265
     3     XAVD, XFASSY, XNEW/ 2*30.0,90.0,  0.40, 1.0, 5, 1.0, 1.0,   ACCOST  266
     4     2*0.0,  150.0, 500.0,  0.75, 1.0,  1.0, 1.0, 17.0, 15.0,    ACCOST  267
     5          0.0, 1.0, 400.0, 0.35, 0.20/                          ACCOST  268
      DATA WAERO, WANTIC, WAVION, WBODY, WELCAD, WEMP,                 ACCOST  269
     1     WENACC, WENGS, WFUSYS, WFUTOT, WGROSS, WHANDL, WHYCAD,      ACCOST  270
     2     WINST, WLGCON, WLGSTR, WLGTRS, WLGWHL, WNACEL, WPACCO,      ACCOST  271
     3     WPNCAD, WPOWER, WTREVS, WWING / 24*0.0 /, IWLG /0/          ACCOST  272
                                                                       ACCOST  273
      NAMELIST /INPUT1/ EN, MACH, PN, T, WACS, WAERO, WANTIC, WAVION,  ACCOST  274
     1                  WBODY, WELCAD, WEMP, WENACC,                    ACCOST  275
     2                  WENGS, WFUSYS, WFUTOT, WGROSS, WHANDL,          ACCOST  276
     3                  WHYCAD, WINST, WLG, WLGCON, WLGSTR, WLGTRS,     ACCOST  277
     4                  WLGWHL, WNACEL, WPACCO, WPNCAD, WPOWER, WTREVS, ACCOST  278
     5                  WWING, WPAYL, IWLG                              ACCOST  279
                                                                       ACCOST  280
      NAMELIST /INPUT2/ ADI, AGEOI, AGEPI, CFACS, CFAERO, CFANTC,      ACCOST  281
     1                  CFAVON, CFBODY, CFELCO, CFEMP, CFENAC, CFENG,   ACCOST  282
     2                  CFFUSY, CFHNDL, CFHYCO, CFINST, CFLG, CFNAC,    ACCOST  283
     3                  CFPACC, CFPNCO, CFPOW, CFTREV, CFWING, CONFIG,  ACCOST  284
     4                  CTJI, AFSPAD,    PAD, ENSPAR, FACI, FEE, FTOI,  ACCOST  285
     5                  FVSPAR, GTSPAR, ICONFG, IDATA, IPOWER, IPROD,   ACCOST  286
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     6                  IOPS, LEARN, LEARNA, LEARNP, NCREW, NDATA, NEV,    ACCOST  287
     7                  NG, NOCON, NOCON1, NOENG, NOENG1, NOYRS, NOYRS1,   ACCOST  288
     8                  NV, NVEH, POTJT, RATE, RE, RT, SUBSYT,             ACCOST  289
     9                  TOOLC, XAVO, XFASSY, XNEW                          ACCOST  290
  293 C                                                                     ACCOST  291
      C     READ AND WRITE INPUT PARAMETERS TO BE OVERRIDEN                 ACCOST  292
      C                                                                     ACCOST  293
                                                                            ACCOST  294
      READ (4,INPUT1)                                                       ACCOST  295
  295 READ (4,INPUT2)                                                       ACCOST  296
      RATE = MAXP                                                           ACCOST  297
      WRITE (6,INPUT1)                                                      ACCOST  298
      WRITE (6,INPUT2)                                                      ACCOST  299
      IF (IWLG .GE. 1)                                                      ACCOST  300
  300 *WLG     = WLGSTR + WLGCON + WLGWHL + WLGTRS                          ACCOST  301
                                                                            ACCOST  302
      WRITE (6,21) (NVEH(J),J=1,5),NDATA, ICONFG, IDATA, IPOWER, IPROD      ACCOST  303
   21 FORMAT (1HO, 4X, 6HNVEH =, 5F15.1/ 4X, 7HNDATA =, I3, 4X,             ACCOST  304
     1 8HICONFG =, I3, 4X, 7HIDATA =, I3, 8HIPOWER =, I3, 4X,               ACCOST  305
  305 2 7HIPROD =, I3)                                                      ACCOST  306
      WRITE (6,22)  ADI, NG, CONFIG, LEARN,  NOCON, NOCON1,                 ACCOST  307
     1              FACI, NV, ENSPAR,LEARNP, NOENG, NOENG1,                ACCOST  308
     2              FEF, RE, ENSPAR,LEARNA,  NOYRS, NOYRS1,                ACCOST  309
     3              MACH,RT, FTOI,   NEV,  XNEW, XAVO,                     ACCOST  310
  313 4              RATE,    TOOLC, CFACS,  XFASSY                        ACCOST  311
   22 FORMAT (/ 5X, *ADI  =*, F8.3,5X, *NG =*, F8.3, 6X,                    ACCOST  312
     1                                *CONFIG =*, F8.3, 6X, *LEARN =*,      ACCOST  313
     1F8.3, 6X, *NOCON =*, F8.3, 6X, *NOCON1 =*, F8.3/ 5X, *FACT =*,        ACCOST  314
     2F8.3, 6X, *NV =*, F8.3, 6X,*ENSPAR =*,F8.3,6X,    *LEARNP=*, F8.3,    ACCOST  315
  315 36X, *NOENG =*, F8.3, 6X, *NOENG1 =*, F8.3/                           ACCOST  316
     3                                5X, *FEF  =*, F8.3, 6X, *RF =         ACCOST  317
     4*, F8.3, 6X, *ENSPAR =*, F8.3, 6X,*LEARNA=*,F8.3,6X,    *NOYRS =*,    ACCOST  318
     5F8.3, 6X, *NOYRS1 =*, F8.3/5X, *MACH =*, F8.3, 6X,*RT =*, F8.3, 6X    ACCOST  319
     5,*FTOI   =*, F8.3, 6X, *NEV   =*, F8.3, 6X,*XNEW  =*, F8.3,          ACCOST  320
  320 *6X, *XAVO   =*, F8.3/                                                ACCOST  321
     7                  5X, *RATE =*, F8.3, 24X, *TOOLC  =*, F8.3, 6X,     ACCOST  322
     8*CFACS =*, F8.3, 5X, *XFASSY =*, F8.3 /)                              ACCOST  323
      WRITE (6,25) AGEOI, EVSPAR, POTJ, SUBSYS, IOPS, PN,                   ACCOST  324
     1             AGEPI, GTSPAR, POTJI, SUBSYT,NCREW                     ACCOST  325
  325 25 FORMAT (5X, *AGEOI =*, F8.3,6X, *EVSPAR =*, F8.3, 6X, *POT.  =*,   ACCOST  326
     1F8.3,6X,*SUBSYS =*,F8.3, 6X,*IOPS =*, I4, 6X, *PN    =*, F8.3/       ACCOST  327
     2 5X,      *AGEPI =*, F8.3, 6X, *GTSPAR =*, F8.3, 6X, *POTJT =*,      ACCOST  328
     3F8.3, 6X, *SUBSYT =*, F8.3, 26X,                                      ACCOST  329
     4*NCREW =*, F8.3/)                                                     ACCOST  330
      WRITE (6,23) CFAERO, CFANTC, CFAVON, CFBODY, CFELCO,                  ACCOST  331
     1CFENG, CFEMP, CFENAC, CFHYCO, CFFUSY, CFINST, CFLG,                   ACCOST  332
     2CFNAC, CFPNCO, CFROW, CFWHOL, CFTREV, CFWING, CFXACC, CFACS           ACCOST  333
   23 FORMAT (13X,                          8HCFAERO =, F7.3, 5X,          ACCOST  334
     1 8HCFANTC =, F7.3, 5X, 8HCFAVON =, F7.3, 5X, 8HCFBODY =, F7.3, 5X,    ACCOST  335
  335 2*HCFELCO =, F7.3/ 13X, 8HCFENG  =, F7.3, 5X, 8HCFEMP  =, F7.3, 5X,   ACCOST  336
     3                  8HCFENAC =, F7.3, 5X,  8HCFHYCO =, F7.3, 5X,       ACCOST  337
     4 8HCFFUSY =, F7.3/ 13X, 8HCFINST =, F7.3, 5X,                         ACCOST  338
     5 8HCFLG   =, F7.3, 5X,                          8HCFNAC  =, F7.3,     ACCOST  339
     65X, 8HCFPNCO =, F7.3, 5X, 8HCFROW  =, F7.3/                           ACCOST  340
  340 713X, 8HCFWHOL =,F7.3, 5X, 8HCFTREV =, F7.3, 5X, 8HCFWING =,          ACCOST  341
     8F7.3, 5X, 8HCFXACC =, F7.3, 5X, 8HCFACS  =, F7.3)                     ACCOST  342
                                                                            ACCOST  343
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                      T       = .
                      ICUM    = 1
                      J       = 0
                C  MANUFACTURING COST BREAKDOWN
                      TPEREN=T
                      TOVERW = TPEREN * EN    / WGROSS
                      WRITE(5,500) TOVERW,EN
                  500 FORMAT(*CTOVERW=*,E12.5,5X,*EN = *, E12.5)
                C   LEARNING CURVE EXPONENT
                      ZETA=1.0+(ALOG(.01*LEARN)/ALOG(2.))
                C
                      IF (LEARNA .EQ. 0.) ZETAA = ZETA
                      IF (LEARNA .EQ. 0.) GO TO 9
                      ZETAA = 1.) + (ALOG(.01*LEARNA)/ALOG(2.0))
                    9 ZETAP=1.0+(ALOG(.01*LEARNP)/ALOG(2.))
                C
                C     FIRST OF TWO MAJOR PROGRAM LOOPS.  ONE CYCLE FOR EACH
                C     POSITION ON LEARNING CURVE.
                C
                      DO 999 N=1,NDATA
                C
                      DO 3332 J=1,37
                 3332 C(J,N)=0.
                C
                      Z = NVEH(N)**ZETA
                      ZA = NVEH(N)**ZETAA
                      ZP = NVEH(N)**ZETAP
                      WPPROV = NCREW * 500. - 500.
                C
                C        AIRPLANE STRUCTURE
                C
                C             1. WING GROUP
                      CWING = 36000. * WWING**.451 * Z * CFWING
                C             2. TAIL GROUP
                      CEMP = 10230. * WEMP**.451 * Z * CFEMP
                C             3. BODY GROUP
                      CBODY=5610.*WBODY**.451*Z*CFBODY
                C             4. ALIGHTING GEAR GROUP STRUCTURE
                      CLG  = 10430. * WLG**.541 * Z * CFLG
                C             5. NACELLE GROUP
                      CNACEL=5610.*WNACEL**.451*Z*CFNAC
                C             6. PROPULSION GROUP
                C                   ENGINES
                      CTJ  =2770.*T**.6*ZP*CFENG
                      IF (CTJI .NE. 1.) CTJ = CTJI
                      CENGS = CTJ * EN
                C                   THRUST REVERSER
                      CTREVS   = 2860.0 * WTREVS**0.766 * ZP * CFTREV
                C                   ENGINE ACCESSORIES
                      CENACC   = 159.0 * WENACC * ZP * CFENAC
                C                   FUEL SYSTEM
                      CFUSYS   = 31.9 * WFUSYS * ZP * CFFUSY
                C                   PROPULSION GROUP TOTAL
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      C         7. SURFACE CONTROLS GROUP                                    ACCOST  402
            CAERO=4.*WACRO**.7*CFAERO                                        ACCOST  403
                                                                             ACCOST  404
      C     AIRPLANE SYSTEMS                                                 ACCOST  405
                                                                             ACCOST  406
      C         8. HYDRAULIC GROUP                                           ACCOST  407
            CHYCAD=197?.*WHYCAD**.765*Z*CFHYCD                               ACCOST  408
      C         9. ELECTRICAL GROUP                                          ACCOST  409
            CELCAD = 1973. * WELCAD**0.785 * Z * CFELCD                      ACCOST  410
      C         10. PNEUMATIC GROUP                                          ACCOST  411
            CPNCAD  = 200.0 * WPNCAD * Z * CFPNCD                            ACCOST  412
      C         11. AIR CONDITIONING GROUP                                   ACCOST  413
            CACS = 6432.0 * WACS**0.5C65 * Z * CFACS                         ACCOST  414
      C         12. ANTI-ICING GROUP                                         ACCOST  415
            CANTIC  = 230.0 * WANTIC * Z * CFANTC                            ACCOST  416
      C         13. AUXILIARY POWER GROUP                                    ACCOST  417
            CPOWER  = 243.0 * WPOWER * Z * CFPOW                             ACCOST  418
      C         14. FURNISHINGS AND EQUIPMENT GROUP                          ACCOST  419
            CPACCO  = 115.0 * WPACCO ** Z * CFPACC                           ACCOST  420
      C         15. INSTRUMENTS                                              ACCOST  421
      C             EQUIPMENT                                                ACCOST  422
            CINSTE  = 1930.( * (WINST/2.0) * ZA * CFINST                     ACCOST  423
      C             INSTALLATION                                             ACCOST  424
            CINSTI  = 154.0 * (WINST/2.0) * ZA * CFINST                      ACCOST  425
      C             INSTRUMENT GROUP TOTAL                                   ACCOST  426
            CINST   = CINSTE + CINSTI                                        ACCOST  427
      C         16. AVIONICS GROUP                                           ACCOST  428
      C             EQUIPMENT                                                ACCOST  429
            CAVONE  = 1930.( * (WAVION/2.0) * ZA * CFAVON                    ACCOST  430
      C             INSTALLATION                                             ACCOST  431
            CAVONI  = 154.0 * (WAVION/2.0) * ZA * CFAVON                     ACCOST  432
      C             AVIONICS GROUP TOTAL                                     ACCOST  433
            CAVONT  = CAVONE  +  CAVONI                                      ACCOST  434
      C         17. LOAD AND HANDLING GROUP                                  ACCOST  435
            CHANDL  = (WHANDL / WBODY) * CBODY * CFHNDL                      ACCOST  436
                                                                             ACCOST  437
                                                                             ACCOST  438
      C     AIRPLANE ASSEMBLY                                                ACCOST  439
                                                                             ACCOST  440
      C     AIRFRAME                                                         ACCOST  441
            AMFG = CWING + CEMP + CBODY + CLG + CAERO + CNACEL + CPOWER +    ACCOST  442
           1       CACS + CHYCAD + CPACCO + CELCAD + CPNCAD + CANTIC + CHANDL ACCOST  443
      C     AVIONICS                                                         ACCOST  444
            CAVION  = CINST  +  CAVONT                                       ACCOST  445
      C     TOTAL ASSEMBLY COST                                              ACCOST  446
            CSTRUC = AMFG + CAVION + PROFI                                   ACCOST  447
      C     AIRPLANE CHECKOUT                                                ACCOST  448
            CFASSY=.2*CSTRUC                                                 ACCOST  449
      C     TOTAL AIRLINE MODEL COST                                         ACCOST  450
            CV = CSTRUC + CFASSY                                             ACCOST  451
      C                                                                      ACCOST  452
            C(2,M)=CBODY                                                     ACCOST  453
            C(4,M) = CLG                                                     ACCOST  454
            C(5,M)=CENGS                                                     ACCOST  455
            C( 6,M) = CAVONI                                                 ACCOST  456
            C(7,M)=CTRLVS                                                    ACCOST  457
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                C(8,N1)=CNACEL                                          ACCOST  458
                C(09,N1) = CPNCAD                                       ACCOST  459
                C(10,N1) = AMFG                                         ACCOST  460
      450       C(11,N1) = CAVION                                       ACCOST  461
                C(12,N1) = PROPU                                        ACCOST  462
                C(13,N1) = CV                                           ACCOST  463
                C(14,N1)=CFUSYS                                         ACCOST  464
                C(15,N1) = CANTIC                                       ACCOST  465
      465       C(16,N1) = CHANDL                                       ACCOST  466
                C(19,N1)=CAERO                                          ACCOST  467
                C(20,N1) = CENACC                                       ACCOST  468
                C(21,N1)=CPOWER                                         ACCOST  469
                C(22,N1) = CAVONT                                       ACCOST  470
      470       C(23,N1)=CINSTE                                         ACCOST  471
                C(24,N1)=CINST                                          ACCOST  472
                C(25,N1) = CHYCAD                                       ACCOST  473
                C(26,N1) = CELCAD                                       ACCOST  474
                C(27,N1) = CINSTI                                       ACCOST  475
      475       C(28,N1) = CACS                                         ACCOST  476
                C(29,N1)= CPACCO                                        ACCOST  477
                C(30,N1)=CAVONE                                         ACCOST  478
                C(31,N1) = CSTRUC                                       ACCOST  479
                C(32,N1)=CSTRUC+CFASSY                                  ACCOST  480
      480       C(33,N1) = CFASSY                                       ACCOST  481
                C(34,N1) = CWING                                        ACCOST  482
                C(35,N1) = CEMP                                         ACCOST  483
                C(37,N1)=CFASSY                                         ACCOST  484
          C                                                             ACCOST  485
      485   C   ALL COSTS BEYOND THIS POINT ARE IN MILLIONS OF DOLLARS   ACCOST  486
            C                                                           ACCOST  487
            C                                                           ACCOST  488
            C                                                           ACCOST  489
            C                                                           ACCOST  490
      490   C                                                           ACCOST  491
            C     END OF FIRST MAJOR LOOP.  SET INITIAL VALUES FOR SECOND MAJOR ACCOST  492
            C     LOOP                                                  ACCOST  493
            C                                                           ACCOST  494
                                                                        ACCOST  495
      495       AMFG = C(10,1)                                          ACCOST  496
                CAVION = C(11,1)                                        ACCOST  497
                PROPU = C(12,1)                                         ACCOST  498
                VMAX = 660.0 * MACH                                     ACCOST  499
                WE = WGROSS - WPAYL - WFUTOT                            ACCOST  500
      500       NVHF = NV + NFV                                         ACCOST  501
                WRL     = NCREW * NVHF * 2.0                            ACCOST  502
                WAVIOT  = WAVION + WINST                                ACCOST  503
                WA = WE - WENGS - WELCAD - WAVIOT - WACS - WPOWER       ACCOST  504
                                                                        ACCOST  505
      505   C   AIRFRAME DESIGN AND DEVELOPMENT ENGINEERING(NDDE)       ACCOST  506
            C     CONCEPT FORMULATION(CF)                               ACCOST  507
                  CF=35.0*NOENG*NOYRS*NDCON*1.E-06                      ACCOST  508
            C     CONTRACT DEFINITION(CD)                               ACCOST  509
                  CD=250.0*NOENG1*NOYRS1*NDCON1*1.E-06                  ACCOST  510
      510   C                                                           ACCOST  511
            C     DESIGN AND DEVELOPMENT ENGINEERING LABOR(DDEL)        ACCOST  512
            C                                                           ACCOST  513
            C  ICONFG =          6 FOR SUPERSONIC PRODUCTION A/C.       ACCOST  514
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C  7 FOR SUBSONIC PROTOTYPE A/C, 9 FOR SUPERSONIC PRODUCTION A/C          ACCOST  515
515 C                                                                     ACCOST  516
      GO TO (205,206,205,205,205,205,207,209),ICONFG                      ACCOST  517
C                                                                         ACCOST  518
  205 DDEL=207.*WA**.931*RE*1.E-6*CONFIG                                  ACCOST  519
      GO TO 213                                                           ACCOST  520
520   207 DDEL=RE*3145.*WA**.5825*1.E-6*CONFIG                            ACCOST  521
      GO TO 203                                                           ACCOST  522
  209 DDEL=RE*344.*WA**.931*1.E-6*CONFIG                                  ACCOST  523
  213 ADDE=CE+CO*DDEL                                                     ACCOST  524
C                                                                         ACCOST  525
525 C   SUBSYSTEM DEVELOPMENT                                            ACCOST  526
      SUBSYS = 3.,35 * (WACS + WINST*3.5 + WPOWER + WELCAD + WAERO        ACCOST  527
     1 + WHYCAD + WPNCAD + WENACC + WFUSYS + WPPROV) * XNEW               ACCOST  528
C                                                                         ACCOST  529
       IF (SUBSYI .NE. 0.0) SUBSYS=SUBSYI                                 ACCOST  530
530 C                                                                     ACCOST  531
C   AVIONICS DEVELOPMENT(AD)                                              ACCOST  532
      AD =    (5.3 * (WAVION*(.75)**.439 + 2.19 * (0.25*WAVION)**0.439    ACCOST  533
     1          + 3.55 * (0.56*WINST)**0.439) * FAVD                      ACCOST  534
      IF(ADI.NE..1) AD=ADI                                                ACCOST  535
535 C                                                                     ACCOST  536
C   PROPULSION DEVELOPMENT-     TURBOJET OR TURBOFAN  (POTJ),             ACCOST  537
C                                                                         ACCOST  538
C     SECOND MAJOR PROGRAM LOOP,  CYCLE ONCE FOR ACTUAL TOTAL OF          ACCOST  539
C     AIRCRAFT TO BE PRODUCED AND THEN 33 CYCLES FOR ARRAY OF             ACCOST  540
540 C     PRESET NUMBERS OF AIRCRAFT TO BE PRODUCED                       ACCOST  541
C                                                                         ACCOST  542
110   CONTINUE                                                            ACCOST  543
  1C), POTJ=29.5*(T/1000.)**.55*MACH**.62*( NVHF   *FN*(1.+FNSPAR       ACCOST  544
     **ENSPAD))**).1                                                      ACCOST  545
545     IF (ICUM .GE. 1) GO TO 122                                        ACCOST  546
      WRITE (6,501) T, MACH, NV, NFV, FN, FNSPAR, FNSPAD, AFSPAD          ACCOST  547
  501 FORMAT(*DT=*,F8.1, 5X,*MACH=*,F8.3, 3X,*NV=*,F8.3, 5X,*NFV=*,F8.3,  ACCOST  548
     1 5X, *FN=*, F8.3/  * FNSPAR=*, F8.3, 5X, *FNSPAD=*, F8.3, 5X,       ACCOST  549
     2 *AFSPAD=*, F8.3)                                                   ACCOST  550
550     IF(POTJI.NE..1) POTJ=POTJI                                        ACCOST  551
      WRITE (6,502) POTJ                                                  ACCOST  552
  502 FORMAT (* POTJ = *, E12.5)                                          ACCOST  553
C                                                                         ACCOST  554
C     FLIGHT TEST VEHICLES(FV)                                            ACCOST  555
555     CAFFV = AMFG * NFV**ZETA                                          ACCOST  556
      CAVFV =CAVION * NFV**ZETAA                                          ACCOST  557
      CPFV = PROPU * NFV**ZETAP                                           ACCOST  558
      FV = (CAFFV + CAVFV + CPFV) * (1.0 + YFASSY)                        ACCOST  559
C                                                                         ACCOST  560
560 C     GROUND TEST VEHICLES (GTV)                                      ACCOST  561
     $ GTV=   AMFG * NG                                                   ACCOST  562
C                                                                         ACCOST  563
C     TOOLING AND SPECIAL EQUIPMENT(TSE)                                  ACCOST  564
      GO TO (30,31,31,31,31,32,30,32), ICONFG                             ACCOST  565
565    30 TSE=PT*6.19*WA**1.062*TOOLC*1.E-6                               ACCOST  566
      GO TO 34                                                            ACCOST  567
    31 TSE = 45.0 * PT * WA**1.062 * TOOLC * 1.E-6                        ACCOST  568
      GO TO 33                                                            ACCOST  569
    32                                                  TSE=PT*.0267*     ACCOST  570
570     * WA**.99*VMAX**1.21*RATE**.4*NFV**.14*TOOLC*1.E-6                ACCOST  571
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                33  IF((IPROD.EQ.1)
                   *TST=RT*6.19*WA**1.062*TOOLC*1.E-6                                ACCOST  572
                                                                                     ACCOST  573
                C                                                                    ACCOST  574
                C                                                                    ACCOST  575
      575       C   AIRCRAFT TYPE FLIGHT TEST PROGRAM                                ACCOST  576
                C     FLIGHT TEST OPERATIONS(FTO)                                    ACCOST  577
                34 FTO=.30*NFV**1.1*       VMAX**.9*1.E-6 * WGROSS**.8              ACCOST  578
                   IF(FTOI .NE..1) FTO=FTOI                                          ACCOST  579
                C                                                                    ACCOST  580
      580       C     AGE(AGEP)                                                      ACCOST  581
                      AGEP=.15*FV+.05*ADDE                                           ACCOST  582
                      IF (AGEPI .NE. 0.1) AGEP = AGEPI                               ACCOST  583
                C                                                                    ACCOST  584
                C     TECHNICAL DATA(TDP)                                            ACCOST  585
      585             TDP=.02*FV                                                     ACCOST  586
                C                                                                    ACCOST  587
                C     GROUND TEST SPARES(GTS)                                        ACCOST  588
                      GTS = GTV * GTSPAR                                             ACCOST  589
                C                                                                    ACCOST  590
      590       C     FLIGHT TEST SPARES(FS)                                         ACCOST  591
                      FTS= FV * FVSPAR                                               ACCOST  592
                C                                                                    ACCOST  593
                C   INITIAL INVESTMENT(IV)                                          ACCOST  594
                C                                                                    ACCOST  595
      595       C     OPERATIONAL VEHICLE(OV)                                        ACCOST  596
                120 CONTINUE                                                         ACCOST  597
                                                                                     ACCOST  598
                125 CAFO    = NVHF**ZETA * AMFG                                      ACCOST  599
                    CAVO    = CAVION * NVHF**ZETAA                                   ACCOST  600
      600           CPO     = PROPU * NVHF**ZETAP                                    ACCOST  601
                130 OV      = (CAVO + CAFO + CPO) * (1.0 + XFASSY)                   ACCOST  602
                C                                                                    ACCOST  603
                C     AGE                                                            ACCOST  604
                      AGEO    = 0.15 * OV                                            ACCOST  605
      605             IF (AGEOI .NE. 0.1) AGEO = AGEOI                               ACCOST  606
                C                                                                    ACCOST  607
                C     SPARES(OS)                                                     ACCOST  608
                      OSA     = AFSPAO * (CAFO + CAVO)                               ACCOST  609
                      OSP = PROPU * ((NVHF * (1.0+ENSPAO))**ZETAP - NVHF**ZETAP)     ACCOST  610
      610             OS = OSA + OSP                                                 ACCOST  611
                      IF (IOPS .EQ. 1) OS = 0.                                       ACCOST  612
                C                                                                    ACCOST  613
                C     FACILITIES(FAC)  INPUT                                         ACCOST  614
                      FAC = FACI                                                     ACCOST  615
      615       C                                                                    ACCOST  616
                C     SUSTAINING ENGINEERING(SE)                                     ACCOST  617
                                                                                     ACCOST  618
                      SE      = ADDE * (NVHF**.2( -1.0)                              ACCOST  619
                      IF(IOPS.EQ.1) SE=.10*OV                                        ACCOST  620
      620       C                                                                    ACCOST  621
                C     SUSTAINING TOOLING(ST)                                         ACCOST  622
                      ST      = TST * (( NVHF ) ** 0.14 - 1.0 )                      ACCOST  623
                      GO TO 176                                                      ACCOST  624
                C                                                                    ACCOST  625
      625       C     TECHNICAL DATA(TDD)                                            ACCOST  626
                176 TDD     = 0.02 * OV                                            ACCOST  627
                C                                                                    ACCOST  628
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C     MISCELLANEOUS EQUIPMENT(MEQ)                                      ACCOST  629
      MEQ = 5CC. * NPL* 4. * 10.**(-06)                                 ACCOST  630
      IF(ITOPS.EQ..) MEQ=0.                                             ACCOST  631
C                                                                       ACCOST  632
C   TRAINING EQUIPMENT (OT)                                             ACCOST  633
      OT      = 1.442E-1 *  DV * NVHF**(-0.4525)                        ACCOST  634
      IF (ITOPS.EQ.1) OT=0.                                             ACCOST  635
C     INITIAL TRAINING(IT)                                              ACCOST  636
      IT=NPL*.05                                                        ACCOST  637
      IF (ITOPS.EQ.1) IT=0.                                             ACCOST  638
C                                                                       ACCOST  639
C     INITIAL TRANSPORTATION(TRI)                                       ACCOST  640
      TRI=.035*(DV+OS+MEQ+ OT+AGEQ)                                     ACCOST  641
C                                                                       ACCOST  642
C                                                                       ACCOST  643
      IV      = DV + OS + FAC + ST + SE + TOO + MEQ + OT + IT + TRI+AGEQ ACCOST  644
C                                                                       ACCOST  645
C                                                                       ACCOST  646
C        BASIC RESEARCH, DEVELOPMENT, AND ENGINEERING COSTS             ACCOST  647
      RDTE = CF + CD + DDEL + SUBSYS + AD + PDTJ + GTV + GTS + FTS+ TST ACCOST  648
     ** FTD + AGEP + TDP                                                ACCOST  649
C              FEE                                                      ACCOST  650
      RDFEE=RDTE*FEE                                                    ACCOST  651
C        TOTAL RESEARCH, DEVELOPMENT, TEST, AND EVALUATION COSTS        ACCOST  652
      TRDTE=RDTE+RDFEE                                                  ACCOST  653
      IF (ICUM .GT. 1) GO TO 190                                        ACCOST  654
C                                                                       ACCOST  655
C     CONTRACTOR FEE                                                    ACCOST  656
      AOFEE=IV*FEE                                                      ACCOST  657
C                                                                       ACCOST  658
C     TOTAL PRODUCTION COSTS                                            ACCOST  659
      AQ=IV+AOFEE                                                       ACCOST  660
      OS = GTV + GTS + FTS + TST + FTD + AGEP + TDP                     ACCOST  661
      IF (ICUM .EQ. 1) GO TO 196                                        ACCOST  662
  193 CAFUCA  = AMFG * Q**(ZETA-1.0)                                    ACCOST  663
      CAVUCA  = CAVION * Q**(ZETAA-1.0)                                 ACCOST  664
      CPUCA   = PROPU * Q**(ZETAP-1.0)                                  ACCOST  665
      FVUCA   = (CAFUCA + CAVUCA + CPUCA) * (1.+XFASSY) * (1.0+FEE)     ACCOST  666
      CAFCT   = AMFG * Y                                                ACCOST  667
      CAVCT   = CAVION * YA                                             ACCOST  668
      CPCT    = PROPU * ZP                                              ACCOST  669
      FVCT    = (CAFCT + CAVCT + CPCT) * (1.. + XFASSY) * (1.0 + FEE)   ACCOST  670
      IF (ICUM .EQ. 1) GO TO 195                                        ACCOST  671
      CAFCTI  = AMFG     * (Q-1.)**ZETA                                 ACCOST  672
      CAVCTI  = CAVION     * (Q-1.)**ZETAA                             ACCOST  673
      CPCTI   = PROPU     * (Q-..)**ZETAP                               ACCOST  674
      FVCTI   = (CAFCTI + CAVCTI + CPCTI) * (1.0 + XFASSY) * (1.0+FEE)  ACCOST  675
      FVUC    = FVCT - FVCTI                                            ACCOST  676
  195 IF (ICUM .EQ. 1) FVUC = FVCT                                      ACCOST  677
      SC      = ( IV - DV ) * ( 1.0 + FEE )                             ACCOST  678
      TMC     = FVCT +TRDTE + SC                                        ACCOST  679
      AP      = TMC / Q                                                 ACCOST  680
  196 CALL COSTPP                                                       ACCOST  681
      I = I + 1                                                         ACCOST  682
      Q       = IQ(I)                                                   ACCOST  683
      NVHF    = 0                                                       ACCOST  684
      IF (NVHF .GT. NFV) NV = 0 - NFV                                   ACCOST  685
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```
      NPL      = NCREW * Q * 2.
      Z        = Q**ZETA
      ZA       = Q**ZETAA
      ZP       = Q**ZETAP
      ICUM     = ICUM + 1
  695 IF (ICUM.NE.1)  GO TO 200
      TTLCMP (1)    = C(13,1)
      TTLCMP (2)    = OS
      TTLCMP (3)    = FAC
      TTLCMP (4)    = SE
  695 TTLCMP (5)    = ST
      TTLCMP (6)    = AGED
      TTLCMP (7)    = TPQ
      TTLCMP (8)    = MEQ
      TTLCMP (9)    = OT
  700 TTLCMP (10)   = IT
      TTLCMP (11)   = TRI
      TRDTEC(1)=ADDE
      TRDTEC(2)=SUBSYS
      TRDTEC(3)=AD
  705 TRDTEC(4)=POTJ
      TRDTEC(5)=OS
  200 CONTINUE
      IF (ICUM .GT. 331)  GO TO 300
      GO TO 110
  710 C
      C     END OF SECOND MAJOR PROGRAM LOOP
      C
  300 CONTINUE
      RETURN
  715 END
```

```
      SUBROUTINE COSTPR                                                 COSTPR     2
C                                                                       COSTPR     3
C     THIS SUBROUTINE PRINTS COST FACTORS DEVELOPED BY                  COSTPR     4
C     SUBROUTINE ACCOST                                                 COSTPR     5
C                                                                       COSTPR     6
                                                                        COSTPR     7
                                                                        COSTPR     8
      DIMENSION PR(2)                                                   COSTPR     9
      COMMON / CUMOUT / AP, CAFUCA, CAVUCA, CPUCA, FEE, FVCT, FVUC,     COSTPR    10
     X                  FVUCA, I, ICUM, IPROD, IO(33), MACH, RATE,     COSTPR    11
     2                  SC, TMC, WA, WGROSS                            COSTPR    12
                                                                        COSTPR    13
      COMMON / COSTOT / AD, ADDE, AGED, AGEP, AQ, AQFEE, C(37,5),       COSTPR    14
     1                  CD, CF, DDEL, DS, FAC, FTS, FTD, FV, GTS, GTV, COSTPR    15
     2                  IT, MEQ, NDATA, NEV, NG, NV, NVEH(5), OS, OT,  COSTPR    16
     3                  OV, PDTJ, PDFEE, SE, ST, SUBSYS, TDD, TDP, NVHF, COSTPR   17
     4                  TRDTS, TRI, TST                                COSTPR    18
                                                                        COSTPR    19
      DIMENSION TITLE(8)                                                COSTPR    20
      REAL NVEH, NEV, NG, NV, NVHF, IT, MEQ                             COSTPR    21
                                                                        COSTPR    22
      DATA PR/1HPRODUCTION , 1HPROTOTYPE  /                             COSTPR    23
                                                                        COSTPR    24
      FEEI = FEE*100.                                                   COSTPR    25
      PRI  = PR(1)                                                      COSTPR    26
      IF (IPROD .EQ. 2) PRI = PR(2)                                     COSTPR    27
      IF (ICUM .GT. 0) GO TO 700                                        COSTPR    28
C                                                                       COSTPR    29
C     WRITE BREAKDOWN OF CUMULATIVE MANUFACTURING COSTS ONLY ON FIRST   COSTPR    30
C     CYCLE OF ACCOST                                                   COSTPR    31
C                                                                       COSTPR    32
                                                                        COSTPR    33
                                                                        COSTPR    34
      READ (4,29) (TITLE(I),I=1,8,1)                                    COSTPR    35
   29 FORMAT(8A10)                                                      COSTPR    36
      WRITE (6,30) (TITLE(I),I=1,8)                                     COSTPR    37
   30 FORMAT (1H1, 26X, 8A10//)                                         COSTPR    38
      WRITE(6,35)                                                       COSTPR    39
      WRITE(6,888)(NVEH(N),N=1,NDATA)                                   COSTPR    40
      WRITE (6,801) (C(34,N),N=1,NDATA)                                 COSTPR    41
      WRITE (6,802) (C(35,N),N=1,NDATA)                                 COSTPR    42
      WRITE(6,800) (C(2,N),N=1,NDATA)                                   COSTPR    43
      WRITE(6,2100) (C(4,N),N=1,NDATA)                                  COSTPR    44
      WRITE(6,3100) (C(6,N),N=1,NDATA)                                  COSTPR    45
      WRITE(6,2800) (C(12,N),N=1,NDATA)                                 COSTPR    46
      WRITE(6,2900) (C(3,N),N=1,NDATA)                                  COSTPR    47
      WRITE(6,3100) (C(7,N),N=1,NDATA)                                  COSTPR    48
      WRITE(6,3600) (C(14,N),N=1,NDATA)                                 COSTPR    49
      WRITE(6,2970) (C(23,N),N=1,NDATA)                                 COSTPR    50
      WRITE(6,4200) (C(19,N),N=1,NDATA)                                 COSTPR    51
      WRITE(6,5950) (C(25,N),N=1,NDATA)                                 COSTPR    52
      WRITE(6,5430) (C(26,N),N=1,NDATA)                                 COSTPR    53
      WRITE(6,3330) (C(9,N),N=1,NDATA)                                  COSTPR    54
      WRITE(6,4500) (C(23,N),N=1,NDATA)                                 COSTPR    55
      WRITE(6,6100) (C(15,N),N=1,NDATA)                                 COSTPR    56
      WRITE(6,4900) (C(21,N),N=1,NDATA)                                 COSTPR    57
      WRITE(6,6500) (C(29,N),N=1,NDATA)                                 COSTPR    58
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      WRITE(6,5800) (C(24,N),N=1,NDATA)                                 COSTPR     59
      WRITE(6,5700) (C(23,N),N=1,NDATA)                                 COSTPR     60
   50 WRITE(6,5900) (C(27,N),N=1,NDATA)                                 COSTPR     61
      WRITE(6,7100) (C(22,N),N=1,NDATA)                                 COSTPR     62
      WRITE(6,7100) (C(30,N),N=1,NDATA)                                 COSTPR     63
      WRITE(6,6300) (C(26,N),N=1,NDATA)                                 COSTPR     64
      WRITE(6,6200) (C(25,N),N=1,NDATA)                                 COSTPR     65
   55 156 WRITE (6,7200) (C(37,N),N=1,NDATA)                            COSTPR     66
      WRITE(6,7200) (C(32,N),N=1,NDATA)                                 COSTPR     67
    35 FORMAT(1HO, 32X,                                                 COSTPR     68
     1 44HBREAKDOWN OF CUMULATIVE MANUFACTURING COST,      , 3X,        COSTPR     69
     2 22HMILLIONS OF DOLLARS          )                               COSTPR     70
   70 800 FORMAT(1HO,52HBODY STRUCTURE                                  COSTPR     71
     1 5F14.4)                                                          COSTPR     72
      801 FORMAT(1HO,52HWING                                            COSTPR     73
     1 5F14.4)                                                          COSTPR     74
      802 FORMAT(1HO,52HEMPENNAGE                                       COSTPR     75
   75 1 5F14.4)                                                         COSTPR     76
      809 FORMAT(1HO, 52HNUMBER OF VEHICLES                             COSTPR     77
     1 5F14.0)                                                          COSTPR     78
     2100 FORMAT(1HO,52HLANDING GEAR                                    COSTPR     79
     1 5F14.4)                                                          COSTPR     80
   85 2800 FORMAT(1HO,52HPROPULSION SYSTEM                              COSTPR     81
     1 13H  (, F11.4, 1H), 4(2H (, F11.4, 1H))                          COSTPR     82
     2876 FORMAT(1H ,52H   ENGINE ACCESSORIES                           COSTPR     83
     1 5F14.4)                                                          COSTPR     84
     2900 FORMAT(1H ,52H    ENGINES                                     COSTPR     85
   90 1 5F14.4)                                                         COSTPR     86
     3000 FORMAT(1H ,52H    THRUST REVERSER                             COSTPR     87
     1 5F14.4)                                                          COSTPR     88
     3100 FORMAT(1HO,52HNACELLES, PODS, PYLONS, SUPPORTS                COSTPR     89
     1 5F14.4)                                                          COSTPR     90
   95 3300 FORMAT(1HO,52HPNEUMATIC                                      COSTPR     91
     1 5F14.4)                                                          COSTPR     92
     3600 FORMAT(1H ,52H    FUEL SYSTEM                                 COSTPR     93
     1 5F14.4)                                                          COSTPR     94
     4200 FORMAT(1HO,52HAERODYNAMIC CONTROLS (SURFACE CONTROLS)         COSTPR     95
  100 1 5F14.4)                                                         COSTPR     96
     4900 FORMAT(1HO,52HAUXILIARY POWER SOURCE                          COSTPR     97
     1 5F14.4)                                                          COSTPR     98
     5400 FORMAT(1HO,52HELECTRICAL POWER CONVERSION AND DISTRIBUTION    COSTPR     99
     1 5F14.4)                                                          COSTPR    100
  105 5950 FORMAT (1HO, 52HHYDRAULIC                                    COSTPR    101
     1 ,2X,5F14.4)                                                      COSTPR    102
     5700 FORMAT(1H ,52H    EQUIPMENT                                   COSTPR    103
     1 5F14.4)                                                          COSTPR    104
     5800 FORMAT(1HO,52HINSTRUMENTATION                                 COSTPR    105
     1 13H  (, F11.4, 1H), 4(2H (, F11.4, 1H))                          COSTPR    106
     5900 FORMAT(1H ,52H    INSTALLATION                                COSTPR    107
     1 5F14.4)                                                          COSTPR    108
     6000 FORMAT(1HO,52HAIR CONDITIONING                                COSTPR    109
     1 5F14.4)                                                          COSTPR    110
  115 6100 FORMAT(1HO,52HANTI-ICING                                     COSTPR    111
     1 5F14.4)                                                          COSTPR    112
     6200 FORMAT(1HO,52HLOAD AND HANDLING                               COSTPR    113
     1 5F14.4)                                                          COSTPR    114
     6300 FORMAT(1H ,52H    INSTALLATION                                COSTPR    115
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                     15F14.4)                                                  COSTPR  116
                 66  FORMAT(1H ,52HPASSENGER ACCOMMODATIONS                    COSTPR  117
                     15F14.4)                                                  COSTPR  118
                 71  FORMAT(1H0,52HAVIONICS                                    COSTPR  119
                     13H  (, F11.4, 1H), 4(24 (, F1..4, 1H)))                  COSTPR  120
     125         71C3 FORMAT(1H ,52H    EQUIPMENT                              COSTPR  121
                     15F14.4)                                                  COSTPR  122
                 72G1 FORMAT(1H0,52HVEHICLE TOTAL                              COSTPR  123
                     15F14.4)                                                  COSTPR  124
                 72G3 FORMAT(1H0,52HFINAL ASSEMBLY AND CHECKOUT                COSTPR  125
     129             * 5F14.4)                                                 COSTPR  126
                   C                                                           COSTPR  127
                      1  WRITE (6,192)TRDTE,ADDE,DE,CD,DDEL                    COSTPR  128
                 192 FORMAT(1H1,53X,25HCOST(MILLIONS OF DOLLARS)//             COSTPR  129
                     141H RESEARCH,DEVELOPMENT,TEST,AND EVALUATION,77X,F12.2//  COSTPR  130
     130             21H ,10X,43HAIRFRAME DESIGN AND ENGINEERING DEVELOPMENT,37X,F12.2//  COSTPR  131
                     31H ,20X,19HCONCEPT FORMULATION,31X,F12.2/                 COSTPR  132
                     41H ,20X,19HCONTRACT DEFINITION,31X,F12.2/                 COSTPR  133
                     5 1H ,20X,20HAIRFRAME ENGINEERING, 32X,F12.2 )             COSTPR  134
                      WRITE(6,193) SUBSYS                                       COSTPR  135
     135             193 FORMAT(                                                COSTPR  136
                     * 1H ,10X,35HSUBSYSTEMS DEVELOPMENT              , 45X, F12.2)  COSTPR  137
                      WRITE(6,194) AD, POTJ, DS                                 COSTPR  138
                     194 FORMAT(                                                COSTPR  139
                     61H ,10X,20HAVIONICS DEVELOPMENT,60X, F12.2/               COSTPR  140
     140             71H ,10X,22HPROPULSION DEVELOPMENT,58X, F12.2/             COSTPR  141
                     81H ,10X,19HDEVELOPMENT SUPPORT, 61X, F12.2)               COSTPR  142
                      WRITE(6,200) NG, GTV                                      COSTPR  143
                     200 FORMAT(                                                COSTPR  144
                     11H ,20X,22HGROUND TEST VEHICLES (,F4.1, 1H), 23X,F12.2 )  COSTPR  145
     145                                                                        COSTPR  146
                      WRITE (6,301) GTS, FTS,TST, FTO, AGEP, TDP, RDFEE         COSTPR  147
                      WRITE (6,440) C(13,1), C(10,1), C(11,1), C(12,1)          COSTPR  148
                      WRITE (6,435) C(37,1)                                     COSTPR  149
                      WRITE (6,445) AD, NVHF, OV                                COSTPR  150
     150                                                                        COSTPR  151
                     301 FORMAT(                                                COSTPR  152
                     21H ,20X,19HGROUND TEST SPARES,32X,F12.2/                  COSTPR  153
                     41H ,20X,18HFLIGHT TEST SPARES, 32X, F12.2/                COSTPR  154
                     51H ,20X,34HTOOLING AND SPECIAL TEST EQUIPMENT,16X,F12.2/  COSTPR  155
     155             71H ,20X,22HFLIGHT TEST OPERATIONS,  28X,F12.2/            COSTPR  156
                     11H ,20X,50HGROUND SUPPORT EQUIPMENT                       COSTPR  157
                     1,F12.2/                                                   COSTPR  158
                     21H ,20X,14HTECHNICAL DATA,36X,F12.2/                      COSTPR  159
                     *1H , 10X, 3HFEE, 77X, F12.2///)                          COSTPR  160
     160             445 FORMAT( 1H ,                                           COSTPR  161
                     3 20HAIRCRAFT PRODUCTION, 98X, F12.2/                      COSTPR  162
                     41H ,10X,22HOPERATIONAL VEHICLES (,F6.1, 1H), 51X, F12.2)  COSTPR  163
                     435 FORMAT (                                               COSTPR  164
                     *1H , 30X, 30HFINAL ASSEMBLY AND CHECKOUT   , 14(, F12.2, 1H)///)  COSTPR  165
     165             440 FORMAT (1H ,                                           COSTPR  166
                     *    13X,27H(MANUFACTURING--FIRST UNIT),23X,14(,F12.2,1H)//  COSTPR  167
                     *1H ,30X,14HAIRFRAME      ,16X,1H(,F12.2,14) /             COSTPR  168
                     71H ,30X,20HAVIONICS PROCUREMENT,10X,14(,F12.2,1H)/        COSTPR  169
                     91H ,30X 22HPROPULSION PROCUREMENT,8X,14(,F12.2,,4H))      COSTPR  170
     170                                                                        COSTPR  171
                      WRITE(6,450)                                              COSTPR  172
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     3QS ,FAC ,          SE  ,ST, AGED, TOT ,MSQ , OT, IT  ,TRI ,                COSTPR  173
     * AQFEE                                                                     COSTPR  174
  4Q, FORMAT(                                                                    COSTPR  175
175  51H ,1QX,6HSPARES,74X,F12.2/                                                COSTPR  176
     62H ,1QX,1QHFACILITIES,7QX,F12.2/                                           COSTPR  177
     91H ,1QX,22HSUSTAINING ENGINEERING 58X,F12.2/                               COSTPR  178
     71H ,1QX,13HSUSTAINING TOOLING, 62X, F12.2/                                 COSTPR  179
     11H ,1QX,3QHGROUND SUPPORT EQUIPMENT        ,5QX, F12.2/                    COSTPR  18Q
185  2QH ,1QX,14HTECHNICAL DATA,66X,F12.2/                                       COSTPR  181
     31H ,1QX,23HMISCELLANEOUS EQUIPMENT,57X,F12.2/                              COSTPR  182
     *1H , 1QX,18HTRAINING EQUIPMENT, 62X,F12.2/                                 COSTPR  183
     51H ,1QX,15HINITIAL TRAINING,64X,F12.2/                                     COSTPR  184
     61H ,1QX,22HINITIAL TRANSPORTATION,59X,F12.2/                               COSTPR  185
195  *1H , 1QX, 3HFEE, 77X, F12.2/)                                              COSTPR  186
                                                                                 COSTPR  187
      TOTAL=TRDTE+AQ                                                             COSTPR  188
      AVJAC = TOTAL/NVHF                                                         COSTPR  189
      WRITE (6,415) TOTAL, NVHF, AVJAC                                           COSTPR  19Q
193  415 FORMAT(1HQ, 1QHTOTAL COST, 1Q7X, F12.2//                                COSTPR  191
     141HQTOTAL NUMBER OF FLIGHT VEHICLES PRODUCED, 77X, F12.2//                 COSTPR  192
     2274QAVERAGE UNIT AIRPLANE COST , 91X, F12.2)                               COSTPR  193
                                                                                 COSTPR  194
      WRITE (5,416)                                                              COSTPR  195
195  416 FORMAT(1H1)                                                             COSTPR  196
      RETURN                                                                     COSTPR  197
  7QQ IF (ICUM .GT. 1) GO TO 735                                                 COSTPR  198
C                                                                                COSTPR  199
C     WRITE HEADINGS ONLY FOR SECOND CALL FROM ACCOST                            COSTPR  2QQ
220 C                                                                            COSTPR  2Q1
      WRITE (6,71Q)                                                              COSTPR  2Q2
      WRITE (6,72Q) W, MACH, WGROSS, NV,  RATE, NFV, PPI, FEEI                   COSTPR  2Q3
      WRITE (6,73Q)                                                              COSTPR  2Q4
                                                                                 COSTPR  2Q5
205  71Q FORMAT (1H , 46X, *AIRPLANE COST VERSUS QUANTITY *//)                   COSTPR  2Q6
     72Q FORMAT (1H , 15X, *AMPR WEIGHT (LBS)*, F1Q.Q, 8X,  *MACH NO.*,         COSTPR  2Q7
     1 F7.2, 8X, *TAKE-OFF GROSS WT. (LBS)*, F1Q.Q// 5X, *NO. AIRCRAFT*,        COSTPR  2Q8
     2F8.Q, 4X, *PRODUCTION RATE AC/MO*, F5.2, 4X, *TEST AC*, F5.Q, 4X,         COSTPR  2Q9
     3*PROGRAM TYPE*, 2X, A1Q, 4X, *PERCENT PROFIT*, F8.1///)                    COSTPR  21Q
210  73Q FORMAT (1H , T21, *AVERAGE MANUFACTURING COSTS*,                        COSTPR  211
     1                              T75, *R D T & E*, T9Q, *SUSTAINING*,        COSTPR  212
     2        T1Q1, *AVERAGE*/                                                   COSTPR  213
     3        T2, *QUANTITY*, T13, *AIRFRAME*, T24, *PROPULSION*,                COSTPR  214
     4        T37, *AVIONICS*, T48, *UNIT COST*, T62, *CUMULATIVE*, T77,         COSTPR  215
215  5        *COSTS*, T9Q, *COSTS*, T1Q3, *COST*//)                             COSTPR  216
C                                                                                COSTPR  217
C     WRITE COST VERSUS QUANTITY DATA FOR ALL CALLS AFTER THE                    COSTPR  218
C     FIRST (ACCOST)                                                             COSTPR  219
C                                                                                COSTPR  22Q
220  735 WRITE (6,74Q) IQ(I), CAFUQA, CPUCA, CAVUCA, FVUCA, FVCT, TRDTE,         COSTPR  221
     1              SC, AP                                                      COSTPR  222
     740 FORMAT (1H , T2, T6, T11, F12.4, T22, F1Q.4, T33, F13.4,                COSTPR  223
     1T47, F8.2, T61, F13.2, T74, F1Q.2, T87, F1Q.2, T98, F1Q.2)                 COSTPR  224
                                                                                 COSTPR  225
225  5Q3 *RETURN                                                                 COSTPR  226
      END                                                                        COSTPR  227
```

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      1                 SUBROUTINE UNIT04                                     UNIT04     2
                      C                                                       UNIT04     3
                      C     THIS SUBROUTINE COPIES SOME OF THE CARD INPUT TO DISK UNITS      UNIT04     4
                      C     FUTURE USE                                        UNIT04     5
      5               C                                                       UNIT04     6
                            DIMENSION CARD(8)                                 UNIT04     7
                     10     CONTINUE                                          UNIT04     8
                            READ (5,1) CARD                                   UNIT04     9
                            IF (EOF(5)) 99,20                                 UNIT04    10
     10             20     CONTINUE                                          UNIT04    11
                      C                                                       UNIT04    12
                      C     TITLE INFORMATION IS WRITTEN ON UNIT 4 FOR USE IN SUBROUTINE     UNIT04    13
                      C     COSTPR                                            UNIT04    14
                      C                                                       UNIT04    15
     15                     WRITE (4,1) CARD                                  UNIT04    16
                     1      FORMAT(8A10)                                      UNIT04    17
                            GO TO 10                                          UNIT04    18
                     99     CONTINUE                                          UNIT04    19
                     30     CONTINUE                                          UNIT04    20
     20                     READ (5,1) CARD                                   UNIT04    21
                            IF (EOF(5)) 199,40                                UNIT04    22
                     40     CONTINUE                                          UNIT04    23
                      C                                                       UNIT04    24
                      C     PRICE INFORMATION IS WRITTEN ON UNIT 8 FOR USE IN SUBROUTINE     UNIT04    25
     25               C     IMPLANT                                           UNIT04    26
                      C                                                       UNIT04    27
                            WRITE (8,1) CARD                                  UNIT04    28
                            GO TO 30                                          UNIT04    29
                    199     CONTINUE                                          UNIT04    30
     30                     REWIND 8                                          UNIT04    31
                            REWIND 4                                          UNIT04    32
                            RETURN                                            UNIT04    33
                            END                                               UNIT04    34
```

Appendix E

LISTING OF PROGRAM SOURCE CODE FOR THE AIR CARRIER MODULE

```
      PROGRAM OPLIFE     76/76   OPT=1                    FTN 4.64+463        04/26/79  09.41.54       PAGE     1

    1                 *ROGRAM OPLIFE (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT)                    OPLIFE      2
                  C     PROGRAM OCFROI (INPUT, OUTPUT, TAPE5=INPUT, TAPE6=OUTPUT)               OPLIFE      3
                  C OCF/ROI ECONOMIC MODEL                                                      OPLIFE      4
                  C                                                                             OPLIFE      5
    5             C     MAIN CONTROL FOR AIR CARRIER MODULE                                     OPLIFE      6
                  C                                                                             OPLIFE      7
                        DIMENSION NAME (122)                                                    OPLIFE      8
                        LEVEL 2,                                                                OPLIFE      9
                       X          AREV,     CF,       CSAREV,   CSCF,     CSDCF,    CSDEPR,  OPLIFE     10
   10                  1CSEBIT,   CSEBT,    CSINTI,   CSINTX,   CSNTRN,   CSOPCT,   CSPRIN,  OPLIFE     11
                       2CSYNTR,   DCF,      DEPR,     DEPREC,   EBIAT,    EBT,      ECLIFE,  OPLIFE     12
                       3I,        INCTAX,   INTINV,   IYEAR,    NAC,      NTEARN,   OPCOST,  OPLIFE     13
                       4PRIN,     PV,       R,        SALVAG,   SAREV,    SDEPR,    SEBIAT,  OPLIFE     14
                       5SEBT,     SINCTX,   SINTIN,   SNTERN,   SOPCST,   SPRIN,    SSALVG,  OPLIFE     15
   15                  6SSTDEP,   STDEP,    SYNTRS,   YNTRST,                               OPLIFE     16
                       7COST,     PRICE,    RES,      RRATE,    TXRATE,                       OPLIFE     17
                       8BVALUE                                                                OPLIFE     18
                        DIMENSION AREV(25,100),CF(25),COST(25,100),                           OPLIFE     19
                       1DCF(25),DEPR(25,100),EBIAT(25,100),EBT(25,100),ECLIFE(100),           OPLIFE     20
   20                  2INCTAX(25,100),INTINV(25,100),NTEARN(25,100),OPCOST(25,100),          OPLIFE     21
                       3PRIN(25,100),PV(25),RES(100),RRATE(100),SALVAG(25,100),               OPLIFE     22
                       4STDEP(25,100),YNTRST(25,100),                                         OPLIFE     23
                       5SAREV(25),SSALVG(25),SINTIN(25),SPRIN(25),SOPCST(25),SDEPR(25),       OPLIFE     24
                       6SSTDEP(25),SEBIAT(25),SYNTRS(25),SEBT(25),SINCTX(25),SNTERN(25),      OPLIFE     25
   25                  7DEPREC(25),PRICE(25,100),CSDCF(25),                                   OPLIFE     26
                       8SEXP(25),SINCOM(25),CG(25,100),BVALUE(25,100),SCG(25),                OPLIFE     27
                       9CGTX(25,100),SCGTX(25)                                                OPLIFE     28
                        COMMON/IN/AREV,     CF,       CSAREV,   CSCF,     CSDCF,    CSDEPR,  OPLIFE     29
                       1CSEBIT,   CSEBT,    CSINTI,   CSINTX,   CSNTRN,   CSOPCT,   CSPRIN,  OPLIFE     30
   30                  2CSYNTR,   DCF,      DEPR,     DEPREC,   EBIAT,    EBT,      ECLIFE,  OPLIFE     31
                       3I,        INCTAX,   INTINV,   IYEAR,    NAC,      NTEARN,   OPCOST,  OPLIFE     32
                       4PRIN,     PV,       R,        SALVAG,   SAREV,    SDEPR,    SEBIAT,  OPLIFE     33
                       5SEBT,     SINCTX,   SINTIN,   SNTERN,   SOPCST,   SPRIN,    SSALVG,  OPLIFE     34
                       6SSTDEP,   STDEP,    SYNTRS,   YNTRST,                               OPLIFE     35
   35                  7COST,     PRICE,    RES,      RRATE,    TXRATE,                       OPLIFE     36
                       8BVALUE                                                                OPLIFE     37
                        REAL INTINV,INCTAX,NTEARN                                             OPLIFE     38
                  C                                                                           OPLIFE     39
                  C     SET INITIAL AIRCRAFT PRICE AND CALL INPUTS                            OPLIFE     40
   40             C                                                                           OPLIFE     41
                        PRICE(1,1)=5000000.                                                   OPLIFE     42
                        CALL INPUTS(NAME)                                                     OPLIFE     43
                        DO 31 M=1,NAC                                                         OPLIFE     44
                        WRITE (6,32) (INTINV(I,M),I=1,IYEAR)                                  OPLIFE     45
   45            32   FORMAT (* INTINV= *,10E12.4)                                           OPLIFE     46
                 31   CONTINUE                                                               OPLIFE     47
                  C                                                                           OPLIFE     48
                  C     MAIN LOOP POINT - CYCLE MAIN PROGRAM FOR SUCCESSIVE AIRCRAFT          OPLIFE     49
                  C     PRICES                                                              OPLIFE     50
   50             C                                                                           OPLIFE     51
                  C     WE HAVE ASSUMED THE RATIOS 2.6 AND 1.5 USED IN THE NEXT TWO LINES     OPLIFE     52
                     39 INTINV(1,1)=PRICE(1,1)/2.6                                            OPLIFE     53
                        COST(1,1)=1.5*INTINV(1,1)                                             OPLIFE     54
                  C                                                                           OPLIFE     55
   55             C     CALL REPAY, DEPSUB AND NETSUB FOR EACH YEAR UNDER STUDY.              OPLIFE     56
                  C     THEN CALL REST OF SUBROUTINES FOR THIS CYCLE                          OPLIFE     57
                  C                                                                           OPLIFE     58
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```
                DO 2 I=1,IYEAR                                          OPLIFE     59
                CALL REPAY                                              OPLIFE     60
60              CALL DEPSUB                                             OPLIFE     61
                CALL NETSUB                                             OPLIFE     62
              2 CONTINUE                                                OPLIFE     63
                CALL SUM                                                OPLIFE     64
                CALL CFSUB                                              OPLIFE     65
65              CALL TAX                                                OPLIFE     66
                CALL CFSUB                                              OPLIFE     67
                CALL DCFSUB                                             OPLIFE     68
                CALL OUTPUT                                             OPLIFE     69
          C                                                             OPLIFE     70
70        C     INCREMENT AIRCRAFT PRICE AND RECYCLE UNTIL PRICE LIMIT IS REACHED OPLIFE     71
          C                                                             OPLIFE     72
                PRICE(1,1)=PRICE(1,1)+2500000.                          OPLIFE     73
                IF(PRICE(1,1).GT.30000000.) GO TO 29                    OPLIFE     74
                GO TO 39                                                OPLIFE     75
75           29 STOP                                                    OPLIFE     76
                END                                                     OPLIFE     77
```

```
      SUBROUTINE INPUTS(NAME)                                                  INPUTS     2
C                                                                              INPUTS     3
C     THIS SUBROUTINE CAUSES THE INITIALIZATION OF BASIC PARAMETERS AND        INPUTS     4
C     THE DIRECT AND INDIRECT OPERATING COST VALUES                            INPUTS     5
C                                                                              INPUTS     6
      DIMENSION                                                                INPUTS     7
     2HINFL(25),DOC1(100),IOC1(100),DOC(25,100),IOC(25,100)                    INPUTS     8
      REAL INTINV,INCTAX,NTEARN                                                INPUTS     9
      DIMENSION NAME(122)                                                      INPUTS    10
      LEVEL 2,                                                                 INPUTS    11
     X    AREV,CF,CSAREV,CSCF,CSDCF,CSDEPR,CSEBIT,CSEBT,CSINTI,CSINTX,         INPUTS    12
     1CSNTRN,CSOPCT,CSPRIN,CSYNTR,DCF,DEPR,DEPREC,EBIAT,EBT,ECLIFE,            INPUTS    13
     2I,INCTAX,INTINV,IYEAR,NAC,NTEARN,OPCOST,PRIN,PV,R,SALVAG,SAREV,          INPUTS    14
     3SDEPR,SEBIAT,SEBT,SINCTX,SINTIN,SNTERM,SOPCST,SPRIN,SSALVG,              INPUTS    15
     4SSTDEP,STDEP,SYNTRS,YNTRST,COST,PRICE,RES,RRATE,TXRATE,BVALUE            INPUTS    16
      DIMENSION AREV(25,100),CF(25),COST(25,100),DCF(25),DEPR(25,100),         INPUTS    17
     1EBIAT(25,100),EBT(25,100),ECLIFE(100),INCTAX(25,100),                    INPUTS    18
     2INTINV(25,100),NTEARN(25,100),OPCOST(25,100),PRIN(25,100),               INPUTS    19
     3PV(25),RES(100),RRATE(100),SALVAG(25,100), STDEP(25,100),                INPUTS    20.
     4YNTRST(25,100),SAREV(25),SSALVG(25),SINTIN(25),SPRIN(25),                INPUTS    21
     5SOPCST(25),SDEPR(25),SSTDEP(25),SEBIAT(25),SYNTRS(25),SEBT(25),          INPUTS    22
     6SINCTX(25),SNTERM(25),DEPREC(25),PRICE(25,100),CSDCF(25),                INPUTS    23
     7SEXP(25),SINCOM(25),CG(25,100),BVALUE(25,100),SCG(25),                   INPUTS    24
     8CGTX(25,100),SCGTX(25)                                                   INPUTS    25
      COMMON/IN/AREV,CF,CSAREV,CSCF,CSDCF,CSDEPR,CSEBIT,CSEBT,CSINTI,          INPUTS    26
     1CSINTX,CSNTRN,CSOPCT,CSPRIN,CSYNTR,DCF,DEPR,DEPREC,EBIAT,EBT,            INPUTS    27
     2ECLIFE,I,INCTAX,INTINV,IYEAR,NAC,NTEARN,OPCOST,PRIN,PV,R,                INPUTS    28
     3SALVAG,SAREV,SDEPR,SEBIAT,SEBT,SINCTX,SINTIN,SNTERM,SOPCST,SPRIN,        INPUTS    29
     4SSALVG,SSTDEP,STDEP,SYNTRS,YNTRST,COST,PRICE,RES,RRATE,TXRATE,           INPUTS    30
     5BVALUE                                                                   INPUTS    31
      LEVEL 2, DOC,IOC                                                         INPUTS    32
      COMMON/DOC/DOC                                                           INPUTS    33
      COMMON/IOC/IOC                                                           INPUTS    34
C                                                                              INPUTS    35
C     INITIALIZE BASIC AIR CARRIER MODULE PARAMETERS                           INPUTS    36
C                                                                              INPUTS    37
      IYEAR=15                                                                 INPUTS    38
      NAC=1                                                                    INPUTS    39
       TXRATE=0.48                                                             INPUTS    40
C     WE HAVE ASSUMED THE RATIOS 2.6 AND 1.5 USED IN THE NEXT 2 LINES          INPUTS    41
      INTINV(1,1)=PRICE(1,1)/2.5                                               INPUTS    42
      COST(1,1)=1.5*INTINV(1,1)                                                INPUTS    43
      DO 20 I=1,IYEAR                                                          INPUTS    44
       HINFL(I)=1.0                                                            INPUTS    45
      AREV(I,1)=7500000.                                                       INPUTS    46
   20 CONTINUE                                                                 INPUTS    47
      DO 11 M=1,NAC                                                            INPUTS    48
      DO 10 I=2,IYEAR                                                          INPUTS    49
       COST(I,M)= 0.                                                           INPUTS    50
       INTINV(I, M )=0                                                         INPUTS    51
C     PRICE OF AIRCRAFT INCREASED BY HINFL FOR SUBSEQUENT YEARS                INPUTS    52
       PRICE(I, M )=PRICE(I-1,M)*(HINFL(I)                                     INPUTS    53
   10 CONTINUE                                                                 INPUTS    54
   11 CONTINUE                                                                 INPUTS    55
      DO 31 M=1,NAC                                                            INPUTS    56
      WRITE (6,32) (INTINV(I,M),I=1,IYEAR)                                     INPUTS    57
   32 FORMAT (* INTINV= *,10E12.4)                                             INPUTS    58
```

```
              31   CONTINUE                                                  INPUTS     59
                   DO 30 M=1,NAC                                             INPUTS     60
     60       C    ECONOMIC LIFE OF EACH AIRCRAFT ASSUMED TO BE 15 YEARS     INPUTS     61
                    ECLIFE(M)=15.                                            INPUTS     62
                    RES(M)=0.15                                              INPUTS     63
                    KRATE(M)=0.1                                             INPUTS     64
              30    CONTINUE                                                  INPUTS     65
     65       C                                                              INPUTS     66
              C    CALL SUBROUTINES TO INPUT AND CALCULATE DIRECT AND INDIRECT INPUTS     67
              C    OPERATING EXPENSES                                        INPUTS     68
              C                                                              INPUTS     69
                   CALL            DIRECT(DOC1,NAC)                          INPUTS     70
     70            CALL            INDIR(IOC1,NAC)                           INPUTS     71
              C                                                              INPUTS     72
              C    APPLY INFLATION FACTOR TO DIRECT AND INDIRECT COSTS, THEN SUM INPUTS     73
              C    THEM INTO OPCOST AND PRINT THE SUM                        INPUTS     74
              C                                                              INPUTS     75
     75            DO 50 M=1,NAC                                             INPUTS     76
                   DOC(1,M)=DOC1(M)                                          INPUTS     77
                   IOC(1,M)=IOC1(M)                                          INPUTS     78
                   DO 40 I=2,IYEAR                                           INPUTS     79
                    DOC(I,M)=DOC(I-1,M)*HINFL(I)                             INPUTS     80
     80             IOC(I,M)=IOC(I-1,M)*HINFL(I)                            INPUTS     81
              40   CONTINUE                                                  INPUTS     82
              50   CONTINUE                                                  INPUTS     83
                   DO 60 M=1,NAC                                             INPUTS     84
                   DO 70 I=1,IYEAR                                           INPUTS     85
     85             OPCOST(I,M)=DOC(I,M)+IOC(I,M)                           INPUTS     86
              70   CONTINUE                                                  INPUTS     87
              60   CONTINUE                                                  INPUTS     88
                    WRITE(6,91)                                              INPUTS     89
              91    FORMAT (*1O,* OPCOST(6)  *)                              INPUTS     90
     90             DO 80 M=1,NAC                                           INPUTS     91
                    WRITE(6,51) (OPCOST(I,M),I=1,IYEAR)                      INPUTS     92
            51 FORMAT(1H ,10F12.0)                                           INPUTS     93
              80    CONTINUE                                                 INPUTS     94
                   RETURN                                                    INPUTS     95
     95            END                                                       INPUTS     96
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      SUBROUTINE DIRECT (DOC1,MAC)                                      DIRECT      2
      DIMENSION DOC1(100)                                               DIRECT      3
C   THIS IS THE DOC PROGRAM FOR AMES STUDY  (1976)                      DIRECT      4
C                                                                       DIRECT      5
C     INPUT , SIC DIRECT COST PARAMETERS, THEN CALCULATE BASIC DIRECT   DIRECT      6
C     OPERATING COSTS PER AIRCRAFT                                      DIRECT      7
C                                                                       DIRECT      8
      DIMENSION BA(12),BT(12),BF(12),FLTT(12),SL(12),CRT(12),CFC(12),   DIRECT      9
     1CFO(12),CI(12),CFDP(12),CLA(12),CMA(12),CLE(12),CME(12),CMB(12),  DIRECT     10
     2CM(12),CO(12),CAM(12),CFM(12),CBM(12),CASM(12)                    DIRECT     11
      DIMENSION XNAME(20)                                               DIRECT     12
      NAMELIST/NSTAGE/U,   RL,NSL,SL,FCK,ADOC,COFL,COIL                 DIRECT     13
      NAMELIST/NPLANE/M,RCSL,RCM,CLS,CRS,DESS,GNT,ANT,WGR,F1,D1,F2,D2,  DIRECT     14
     1VA,VE,WEM,WEN,T,NRCREW,NRENGN,NRSEAT,NPLANE,      NUSTAG          DIRECT     15
C                                                                       DIRECT     16
C     PARAMETER INITIALIZATION                                          DIRECT     17
C                                                                       DIRECT     18
       M=MAC                                                            DIRECT     19
      NPLANE=1                                                          DIRECT     20.
C                                                                       DIRECT     21
C     MAIN PROGRAM CYCLE POINT FOR EACH AIRCRAFT - READ AND WRITE       DIRECT     22
C     INPUT LISTS                                                       DIRECT     23
C                                                                       DIRECT     24
  909    K=0                                                            DIRECT     25
      READ(5,NSTAGE)                                                    DIRECT     26
      WRITE(6,NSTAGE)                                                   DIRECT     27
    1 NUSTAG=0                                                          DIRECT     28
      WRITE(6,512)                                                      DIRECT     29
  512 FORMAT(*1*)                                                       DIRECT     30
      READ(5,510) XNAME                                                 DIRECT     31
  510 FORMAT(20A4)                                                      DIRECT     32
      WRITE(6,511) XNAME                                                DIRECT     33
  511 FORMAT(5X,20A4)                                                   DIRECT     34
      READ(5,NPLANE)                                                    DIRECT     35
      WRITE(6,NPLANE)                                                   DIRECT     36
      IF(NUSTAG.EQ.0) GO TO 2                                           DIRECT     37
      READ(5,NSTAGE)                                                    DIRECT     38
      WRITE(6,NSTAGE)                                                   DIRECT     39
C   DERIVATION OF THE ELEMENTS OF THE COST EQUATIONS                    DIRECT     40
C   COEFFICIENTS IN THE FLIGHT CREW COSTS                               DIRECT     41
    2   IF (NRCREW.GT.2.0) FCK=ADOC*(NRCREW-2.0)*FCK                    DIRECT     42
C   VT-AIRCRAFT TOTAL COST, VA-AIRFRAME COST, VE-UNIT ENGINE COST       DIRECT     43
      VT=VA+VE*NRENGN                                                   DIRECT     44
C   COEFFICIENTS IN THE MAINTENANCE LABOR COST EQUATIONS                DIRECT     45
C   WA-AIRFRAME WT, WEM-AIRCRAFT EMPTY WT, WEN-UNIT ENGINE WT           DIRECT     46
      WA=WEM-WEN*NRENGN                                                 DIRECT     47
      FCAL=(WA*(5.0E-5)+6.0-630.0/(120.0+WA*1.0E-3))                    DIRECT     48
      FHAL=0.5*FCAL                                                     DIRECT     49
      FCEL=(0.3+T*3.0E-5)*NRENGN*0.5                                    DIRECT     50
      FHEL=(0.6+T*2.7E-5)*NRENGN*0.5                                    DIRECT     51
C   COEFFICIENTS IN MAINTENANCE MATERIAL COST EQUATIONS                 DIRECT     52
      FCAM=WA*6.2E-6*0.5                                                DIRECT     53
      FHAM=WA*3.08E-6*0.5                                               DIRECT     54
      FCEM=VE*NRENGN*2.0E-5                                             DIRECT     55
      FHEM=VE*NRENGN*2.5E-5                                             DIRECT     56
C   BLOCK SPEED COMPUTATION                                             DIRECT     57
C     CLIMB TIME-CLT  TO ALTITUDE-H                                     DIRECT     58
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      C     RATE OF CLIMB-SEA LEVEL=RCSL, RATE OF CLIMB-H=RCH                 DIRECT     59
            CLT=2*H/((RCSL+RCH)*60.0)                                         DIRECT     60
 60   C     DESCENT TIME - DEST                                               DIRECT     61
      C     ASSUME THAT DESCENT TIME EQUALS CLIMB TIME                        DIRECT     62
            DEST=CLT                                                          DIRECT     63
      C                                                                       DIRECT     64
      C     CYCLE POINT FOR EACH STAGE UNDER STUDY (SOME STAGE LENGTH         DIRECT     65
 65   C     DEPENDENT CALCULATIONS)                                           DIRECT     66
      C                                                                       DIRECT     67
            DO 10 I=1,NSL                                                     DIRECT     68
      C     CRUISE TIME - CRT(I)                                              DIRECT     69
            CRT(I)=((SL(I)+0.015*SL(I))-(CLS*CLT+DESS*DEST))/CRS              DIRECT     70
 70         IF(SL(I).GT.1400.) CRT(I)=((SL(I)+0.02*SL(I)+20.0)-               DIRECT     71
           1(CLS*CLT+DESS*DEST))/CRS                                          DIRECT     72
      C     GROUND MANEUVER TIME                                              DIRECT     73
      C     AIR MANEUVER TIME                                                 DIRECT     74
      C     BLOCK TIME - BT(I)                                                DIRECT     75
 75         BT(I)=GMT+CLT+DEST+CRT(I)+AMT                                     DIRECT     76
      C   BLOCK SPEED - BS(I)                                                 DIRECT     77
            BS(I)=SL(I)/BT(I)                                                 DIRECT     78
      C   BLOCK FUEL COMPUTATION                                              DIRECT     79
      C     F1,D1,F2,AND D2 ARE DATA POINTS ON THE RANGE-PAYLOAD DIAGRAMS     DIRECT     80
 80   C     F1,D1 IS THE MAX. PAYLOAD POINT AND F2,D2 IS THE MAX. FUEL POINT  DIRECT     81
      C   BLOCK FUEL - BF(I)                                                  DIRECT     82
            BF(I)=WGR*0.01+((F1-F2)/(D2-D1))*SL(I)+0.033*((F1-F2)/(D2-D1))*CRS DIRECT     83
            BF(1)=11200.                                                      DIRECT     84
            BF(2)=19800.                                                      DIRECT     85
 85         BF(3)=28000.                                                      DIRECT     86
            BF(4)=34300.                                                      DIRECT     87
      C   FLIGHT TIME COMPUTATION                                            DIRECT     88
      C   FLIGHT TIME - FLTT(I)                                               DIRECT     89
            FLTT(I)=BT(I)-GMT                                                 DIRECT     90
 90   C   CALCULATION OF THE OPERATING COSTS                                   DIRECT     91
      C     FLYING OPERATIONS COSTS                                           DIRECT     92
      C       FLIGHT CREW COSTS                                               DIRECT     93
            CFC(I)=(WGR*5.0E-5+FCK)/BS(I)                                     DIRECT     94
      C       FUEL AND OIL COSTS                                              DIRECT     95
 95         CFO(I)=1.02*( COFL*BF(I)+NRENG*0.135* COIL*BT(I))/SL(I)           DIRECT     96
      C       INSURANCE COSTS                                                 DIRECT     97
            CI(I)=.001*VT/(U*BS(I))                                           DIRECT     98
      C     TOTAL FLYING OPERATIONS COSTS                                     DIRECT     99
            CFOP(I)=CFC(I)+CFO(I)+CI(I)                                       DIRECT    100
100   C     DIRECT MAINTENANCE - FLIGHT EQUIPMENT COSTS                       DIRECT    101
      C       LABOR - AIRFRAME                                                DIRECT    102
            CLA(I)=RL*(FMAL*FLTT(I)+FCAL)/SL(I)                               DIRECT    103
      C       MATERIAL - AIRFRAME                                             DIRECT    104
            CMA(I)=(FMAM*FLTT(I)+FCAM)/SL(I)                                  DIRECT    105
105   C       LABOR - ENGINE                                                  DIRECT    106
            CLE(I)=RL*(FMEL*FLTT(I)+FCEL)/SL(I)                               DIRECT    107
      C       MATERIAL - ENGINE                                               DIRECT    108
            CME(I)=(FMEM*FLTT(I)+FCEM)/SL(I)                                  DIRECT    109
      C       MAINTENANCE BURDEN                                              DIRECT    110
110         CMB(I)=1.8*(CLA(I)+CLE(I))                                        DIRECT    111
      C     TOTAL DIRECT MAINTENANCE COSTS                                    DIRECT    112
            CM(I)=CLA(I)+CMA(I)+CLE(I)+CME(I)+CMB(I)                          DIRECT    113
      C     DEPRECIATION - FLIGHT EQUIPMENT                                   DIRECT    114
            CD(I)= 0.                                                         DIRECT    115
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      C   COST PER AIRCRAFT MILE                                          DIRECT  116
          CAM(I)=CFOP(I)+CM(I)+CD(I)                                      DIRECT  117
      C   COST PER FLIGHT HOUR                                            DIRECT  118
          CFH(I)=CAM(I)*BS(I)*BT(I)/FLTT(I)                               DIRECT  119
      C   COST PER BLOCK HOUR                                            DIRECT  120
          CBH(I)=CAM(I)*BS(I)                                             DIRECT  121
      C   DIRECT OPERATING COST PER AVAILABLE SEAT MILE                   DIRECT  122
          CASM(I)=CAM(I)/NRSEAT                                           DIRECT  123
       10 CONTINUE                                                        DIRECT  124
          WRITE (6,404)                                                   DIRECT  125
      404  FORMAT (*0-*,*$ PER AIRCRAFT MILE *)                           DIRECT  126
      C                                                                   DIRECT  127
      C     LOOP POINT TO WRITE DIRECT OPERATING COSTS PER BLOCK HOUR AFTER DIRECT  128
      C     COSTS PER AIRCRAFT MILE ARE WRITTEN                           DIRECT  129
      C                                                                   DIRECT  130
      505  WRITE (6,511) XNAME                                            DIRECT  131
           WRITE (6,97)  M                                                DIRECT  132
           WRITE (6,91) (SL(I),I=1,NSL)                                   DIRECT  133
           WRITE (6,92) (BS(I),I=1,NSL)                                   DIRECT  134
           WRITE (6,93) (BT(I),I=1,NSL)                                   DIRECT  135
           WRITE (6,94) (FLTT(I),I=1,NSL)                                 DIRECT  136
           WRITE (6,95) (CRT(I),I=1,NSL)                                  DIRECT  137
           WRITE (6,96) (BF(I),I=1,NSL)                                   DIRECT  138
           WRITE (6,100) U,   RL                                          DIRECT  139
           WRITE (6,101) (CFC(I),I=1,NSL)                                 DIRECT  140
           WRITE (6,102) (CFO(I),I=1,NSL)                                 DIRECT  141
           WRITE (6,103) (CI(I),I=1,NSL)                                  DIRECT  142
           WRITE (6,104) (CFOP(I),I=1,NSL)                                DIRECT  143
           WRITE (6,105) (CLA(I),I=1,NSL)                                 DIRECT  144
           WRITE (6,106) (CMA(I),I=1,NSL)                                 DIRECT  145
           WRITE (6,107) (CLE(I),I=1,NSL)                                 DIRECT  146
           WRITE (6,108) (CME(I),I=1,NSL)                                 DIRECT  147
           WRITE (6,109) (CMB(I),I=1,NSL)                                 DIRECT  148
           WRITE (6,110) (CM(I),I=1,NSL)                                  DIRECT  149
      C                                                                   DIRECT  150
      C     SKIP REST OF WRITE STATEMENTS WHEN WRITING COSTS PER BLOCK HOUR DIRECT  151
      C                                                                   DIRECT  152
            IF(K-1)212,214,214                                            DIRECT  153
       212  WRITE (6,112) (CAM(I),I=1,NSL)                                 DIRECT  154
           WRITE (6,113) (CFH(I),I=1,NSL)                                 DIRECT  155
           WRITE (6,114) (CBH(I),I=1,NSL)                                 DIRECT  156
           WRITE (6,115) (CASM(I),I=1,NSL)                                DIRECT  157
         91 FORMAT(*0-*,*STAGE LENGTH (MILES)        *,10F8.0)            DIRECT  158
         92 FORMAT(*0-*,*BLOCK SPEED (MPH)           *,10F8.0)            DIRECT  159
         93 FORMAT(* BLOCK TIME (HOURS)          *,10F8.3)                DIRECT  160
         94 FORMAT(* FLIGHT TIME (HOURS)         *,10F8.3)                DIRECT  161
         95 FORMAT(* CRUISE TIME (HOURS)         *,10F8.3)                DIRECT  162
         96 FORMAT(* BLOCK FUEL (POUNDS)         *,10F8.0)                DIRECT  163
         97 FORMAT(*0-*,*CRUISE ALTITUDE (FEET)      *,10F8.0)           DIRECT  164
        100 FORMAT(*0*,*D.O.C.I FACTORS (INPUT) - ANN UTILIZATION(HR)=*,  DIRECT  165
           1F6.0,*  LABOR RATE($/HR)=*,F5.2)                              DIRECT  166
        101 FORMAT(*0*,* DIRECT OPERATING COSTS*/*0*,* FLYING OPERATIONS COSTS DIRECT  167
           1*/* FLIGHT CREW                 *,10F8.3)                     DIRECT  168
        102 FORMAT(* FUEL AND OIL              *,10F8.3)                  DIRECT  169
        103 FORMAT(* HULL INSURANCE            *,10F8.3)                  DIRECT  170
        104 FORMAT(* TOTAL FLIGHT OPS          *,10F8.3)                  DIRECT  171
        105 FORMAT(*0*,* DIRECT MAINTENANCE COSTS*/* LABOR AIRFRAME       DIRECT  172
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     1  *,10F8.3)                                                          DIRECT   173
   106 FORMAT(* MATERIAL AIRFRAME          *,10F8.3)                       DIRECT   174
   107 FORMAT(* LABOR ENGINES              *,10F8.3)                       DIRECT   175
175 108 FORMAT(* MATERIAL ENGINES           *,10F8.3)                       DIRECT   176
   109 FORMAT(* MAINT. BURDEN              *,10F8.3)                       DIRECT   177
   110 FORMAT(* TOTAL MAINTENANCE          *,10F8.3)                       DIRECT   178
   112 FORMAT(*0*,* TOTAL DIRECT OPERATING COST*/*0*,                      DIRECT   179
     1*$/AIRCRAFT MILE          *,10F8.3)                                  DIRECT   180
180 113 FORMAT(* $/FLIGHT HOUR              *,10F8.0)                       DIRECT   181
   114 FORMAT(* $/BLOCK HOUR               *,10F8.1)                       DIRECT   182
   115 FORMAT(* $/AVAIL. SEAT MILE         *,10F8.3)                       DIRECT   183
C    COST PER CRUISE MILE FOR THE AIRCRAFT                                DIRECT   184
     CACM=(CAM(2)*SL(2)-CAM(1)*SL(1))/(SL(2)-SL(1))                       DIRECT   185
185 C    COST PER TAKEOFF FOR THE AIRCRAFT                                DIRECT   186
     CTO=(CAM(1)-CACM)*SL(1)                                              DIRECT   187
C    COST PER CRUISE MILE PER SEAT                                        DIRECT   188
     CSCM=CACM/NRSEAT                                                     DIRECT   189
C    COST PER TAKEOFF PER SEAT                                            DIRECT   190
190    CSTO=CTO/NRSEAT                                                    DIRECT   191
     WRITE (6,116) CTO,CACM                                               DIRECT   192
     WRITE (6,117) CSTO,CSCM                                              DIRECT   193
 116 FORMAT (*0*,* COST PER AIRCRAFT TRIP = $*,F7.2,* PLUS $*,F6.2,       DIRECT   194
     1*/MILE*)                                                            DIRECT   195
195  117 FORMAT (*0*,* COST PER SEAT TRIP = $*,F5.2,* PLUS $*,F6.4,*/MILE*) DIRECT   196
C    CALCULATION OF THE OPERATING COSTS PER BLOCK HOUR                    DIRECT   197
       K=1                                                                DIRECT   198
C                                                                         DIRECT   199
C      SECOND CYCLE FOR STAGE LENGTH DEPENDENT CALCULATIONS               DIRECT   200
200 C                                                                     DIRECT   201
C      FLYING OPERATIONS COSTS                                            DIRECT   202
C        FLIGHT CREW COSTS                                                DIRECT   203
         DO  500 I=1,NSL                                                  DIRECT   204
       CFC(I)=(WGR*5.0E-5*FCK)                                            DIRECT   205
205 C      FUEL AND OIL COSTS                                             DIRECT   206
       CFO(I)=(1.02*( COFL*BF(I)+NRENGN*0.135* COIL*BT(I))/SL(I))*BS(I)   DIRECT   207
C      INSURANCE COSTS                                                    DIRECT   208
       CI(I)=.001*VT/ U                                                   DIRECT   209
C      TOTAL FLYING OPERATIONS COSTS                                      DIRECT   210
210    CFOP(I)=CFC(I)+CFO(I)+CI(I)                                        DIRECT   211
C      DIRECT MAINTENANCE - FLIGHT EQUIPMENT COSTS                        DIRECT   212
C        LABOR - AIRFRAME                                                 DIRECT   213
       CLA(I)=(RL*(FHAL*FLTT(I)+FCAL)/SL(I))*BS(I)                        DIRECT   214
C        MATERIAL - AIRFRAME                                              DIRECT   215
215    CMA(I)=((FHAM*FLTT(I)+FCAM)/SL(I))*BS(I)                           DIRECT   216
C        LABOR - ENGINE                                                   DIRECT   217
       CLE(I)=(RL*(FHEL*FLTT(I)+FCEL)/SL(I) )*BS(I)                       DIRECT   218
C        MATERIAL - ENGINE                                                DIRECT   219
       CME(I)=((FHEM*FLTT(I)+FCEM)/SL(I) )*BS(I)                          DIRECT   220
220 C        MAINTENANCE BURDEN                                           DIRECT   221
       CMB(I)=1.8*(CLA(I)+CLE(I))                                         DIRECT   222
C      TOTAL DIRECT MAIN ENANCE COSTS                                     DIRECT   223
       CM(I)=CLA(I)+CMA(I)+CLE(I)+CME(I)+CMB(I)                           DIRECT   224
C      FIRST STAGE LENGTH SHOULD BE FROM RED BOOK                         DIRECT   225
225    DOC1(NPLANE)=(CM(1)+CFOP(1))*U                                     DIRECT   226
 500     CONTINUE                                                         DIRECT   227
       WRITE (6,303)                                                      DIRECT   228
 303   FORMAT (*-*,*$ PER BLOCK HOUR *)                                   DIRECT   229
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                C                                                                DIRECT   230
230             C     TRANSFER TO WRITE COSTS PER BLOCK HOUR                     DIRECT   231
                C                                                                DIRECT   232
                      GO TO 505                                                  DIRECT   233
                214   MPLANE=MPLANE+1                                            DIRECT   234
                213   IF(MPLANE.GT.M)   GO TO 20                                 DIRECT   235
235             C                                                                DIRECT   236
                C     TRANSFER UNTIL ALL AIRCRAFT HAVE BEEN PROCESSED            DIRECT   237
                C                                                                DIRECT   238
                      GO TO 909                                                  DIRECT   239
                 20   RETURN                                                     DIRECT   240
240                   END                                                        DIRECT   241
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      SUBROUTINE INDIR(IOC1,NAC)                                        INDIR      2
      DIMENSION IOC1(100)                                               INDIR      3
C   THIS IS THE IOC PROGRAM FOR AMES STUDY  (1976)                      INDIR      4
C                                                                       INDIR      5
C     INPUT BASIC INDIRECT COST PARAMETERS, THEN CALCULATE BASIC        INDIR      6
C     INDIRECT OPERATING COSTS PER AIRCRAFT                             INDIR      7
C                                                                       INDIR      8
      DIMENSION DIS(17),TB(17),SB(17),CF(17),DPT(17),SL(17),C6(17),     INDIR      9
     1 C7(17),C8(17),C9(17),C10(17),C11(17),C12(17),C13(17),C14(17),    INDIR     10
     2 C15(17), C16(17),C17(17),C18(17),C19(17),C20(17),C21(17),        INDIR     11
     3C22(17),C23(17),TTS(17),TRS(17),C24(17),C25(17),C26(17),          INDIR     12
     4C27(17),TAP(17),C28(17),C29(17),C30(17),C31(17),C32(17),          INDIR     13
     5C33(17),C34(17),C35(17),C1(17),C2(17),C4(17),C36(17),FLTT(17),    INDIR     14
     6CAM(17),CFH(17),CBH(17),CAS9(17),FLF(17),CLF(17),CRT(17)          INDIR     15
      DIMENSION XNAME(20),TAS(17)                                       INDIR     16
      NAMELIST/MPLANE/M,RCSL,RCH,CLS,CRS,DESS,GMT,AMT,NRSEAT            INDIR     17
      NAMELIST/MSTAGE/MSL,FLF,CLF,DIS,CF,DPT,U                          INDIR     18
      NAMELIST/STEWS/AI5,FSTEW,CSTEW                                    INDIR     19
      NAMELIST/FOOD/AI6,FS,CS,FOODR                                     INDIR     20.
      NAMELIST/PAXFLT/AI7                                               INDIR     21
      NAMELIST/ACSERV/ AI8,AI9,AI10                                     INDIR     22
      NAMELIST/TRAFF/AI11,AI12,AI12A,BAG,RTM,RTP                        INDIR     23
      NAMELIST/RES/AI13,AI14,AI15,EXP                                   INDIR     24
      NAMELIST/ADV/ AI15,AI17                                           INDIR     25
      NAMELIST/MAINT/AI18,AI19,AI20,AI2                                 INDIR     26
      NAMELIST/GENADM/AI21,AI1,AI2,AI4                                  INDIR     27
C                                                                       INDIR     28
C     PROGRAM INITIALIZATION                                            INDIR     29
C                                                                       INDIR     30
       M=NAC                                                            INDIR     31
      MPLANE=1                                                          INDIR     32
C                                                                       INDIR     33
C     MAIN PROGRAM CYCLE POINT FOR EACH AIRCRAFT - READ AND WRITE       INDIR     34
C     INPUT LISTS                                                       INDIR     35
C                                                                       INDIR     36
 1    NUSTAG=0                                                          INDIR     37
      WRITE(6,512)                                                      INDIR     38
 512  FORMAT(*1*)                                                       INDIR     39
      READ(5,510) XNAME                                                 INDIR     40
 510  FORMAT(20A4)                                                      INDIR     41
      WRITE(6,511) XNAME                                                INDIR     42
 511  FORMAT(5X,20A4)                                                   INDIR     43
      READ(5,MPLANE)                                                    INDIR     44
      WRITE(6,MPLANE)                                                   INDIR     45
      READ(5,MSTAGE)                                                    INDIR     46
      WRITE(6,MSTAGE)                                                   INDIR     47
      READ(5,STEWS)                                                     INDIR     48
      WRITE(6,STEWS)                                                    INDIR     49
      READ(5,FOOD)                                                      INDIR     50
      WRITE(6,FOOD)                                                     INDIR     51
      READ(5,PAXFLT)                                                    INDIR     52
      WRITE(6,PAXFLT)                                                   INDIR     53
      READ(5,ACSERV)                                                    INDIR     54
      WRITE(6,ACSERV)                                                   INDIR     55
      READ(5,TRAFF)                                                     INDIR     56
      WRITE(6,TRAFF)                                                    INDIR     57
      READ(5,RES)                                                       INDIR     58
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                WRITE(6,RES)                                                    INDIR     59
                READ(5,ADV)                                                     INDIR     60
 60             WRITE(6,ADV)                                                    INDIR     61
                READ(5,MAINT)                                                   INDIR     62
                WRITE(6,MAINT)                                                  INDIR     63
                READ(5,GENADM)                                                  INDIR     64
                WRITE(6,GENADM)                                                 INDIR     65
 65         C   BLOCK TIME  COMPUTATION  TB(I)                                  INDIR     66
            C     CLIMB TIME-CLT  TO ALTITUDE-H                                 INDIR     67
            C     RATE OF CLIMB-SEA LEVEL-RCSL, RATE OF CLIMB-H-RCH             INDIR     68
                  CLT=2*H/((RCSL+RCH)*60.0)                                     INDIR     69
            C     DESCENT TIME - DEST                                           INDIR     70
 70         C     ASSUME THAT DESCENT TIME EQUALS CLIMB TIME                    INDIR     71
                  DEST=CLT                                                      INDIR     72
            C                                                                   INDIR     73
            C     CYCLE POINT FOR EACH STAGE UNDER STUDY (SOME STAGE LENGTH     INDIR     74
            C     DEPENDENT CALCULATIONS)                                       INDIR     75
 75         C                                                                   INDIR     76
                  DO 10 I=1,NSL                                                 INDIR     77
                   SL(I)=DIS(I)                                                 INDIR     78
            C     CRUISE TIME - CRT(I)                                          INDIR     79
                  CRT(I)=((SL(I)+0.015*SL(I))-(CLS*CLT+DESS*DEST))/CRS          INDIR     80
 80               IF(SL(I).GT.1400.) CRT(I)=((SL(I)+0.02*SL(I)+20.01-           INDIR     81
                 1(CLS*CLT+DESS*DEST))/CRS                                      INDIR     82
            C     GROUND MANEUVER TIME                                          INDIR     83
                  GMT=0.16                                                      INDIR     84
            C     AIR MANEUVER TIME                                             INDIR     85
 85               AMT=0.16                                                      INDIR     86
            C     BLOCK TIME - TB(I)                                            INDIR     87
                  TB(I)=GMT+CLT+DEST+CRT(I)+AMT                                 INDIR     88
            C   BLOCK SPEED - SB(I)                                            INDIR     89
                  SB(I)=SL(I)/TB(I)                                             INDIR     90
 90         C   FLIGHT TIME COMPUTATION                                         INDIR     91
            C   FLIGHT TIME - FLTT(I)                                          INDIR     92
                  FLTT(I)=TB(I)-GMT                                             INDIR     93
            C   DERIVATION OF THE ELEMENTS OF THE IOC  EQUATION                 INDIR     94
            C     STEWARDESS EXPENSE FIRST CLASS                                INDIR     95
 95               C6(I)= AI5*FSTEW*TB(I)                                        INDIR     96
            C     STEWARDESS EXPENSE COACH                                      INDIR     97
                   C7(I)= AI5*CSTEW*TB(I)                                       INDIR     98
            C     TOTAL STEWARDESS EXPENSE                                      INDIR     99
                   C8(I)= C6(I)+C7(I)                                           INDIR    100
100         C     FOOD EXPENSE FIRST CLASS                                      INDIR    101
                   C9(I)=AI6*FS*FLF(I)*FDOOR*TB(I)                              INDIR    102
            C     FOOD EXPENSE COACH                                            INDIR    103
                   C10(I)=AI6*CS*CLF(I)*TB(I)                                   INDIR    104
            C     TOTAL FOOD EXPENSE                                            INDIR    105
105                C11(I)= C9(I)+C10(I)                                         INDIR    106
            C     OTHER PASSENGER IN FLT EXPENSE FIRST CLASS                    INDIR    107
                   C12(I)= AI7*FS*FLF(I)*DIS(I)*CF(I)                           INDIR    108
            C     OTHER PASSENGER IN FLT EXPENSE COACH                          INDIR    109
                   C13(I)=AI7*CS*CLF(I)*DIS(I)*CF(I)                            INDIR    110
110         C     TOTAL OTHER PASSENGER IN FLT EXPENSE                          INDIR    111
                   C14(I)=C12(I)+C13(I)                                         INDIR    112
            C     AIRCRAFT SERVICING EXPENSE , LINE SERVICING                   INDIR    113
                   C15(I)=AI8*DPT(I)                                            INDIR    114
            C     AIRCRAFT SERVICING EXPENSE , CONTROL                          INDIR    115
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      C16(I)=AI9*TB(I)                                                  INDIR  116
C     AIRCRAFT SERVICING EXPENSE, LANDING FEES                          INDIR  117
      C17(I)= AI10*DPT(I)                                               INDIR  118
C     TOTAL AIRCRAFT SERVICING-TAS                                      INDIR  119
      TAS(I)=C15(I)+C16(I)+C17(I)                                       INDIR  120
C     TRAFFIC SERVICING EXPENSE PASSENGER FIRST CLASS                   INDIR  121
      C18(I)=AI11*FS*FLF(I)                                             INDIR  122
C     TRAFFIC SERVICING EXPENSE PASSENGER COACH                         INDIR  123
      C19(I)=AI11*CS*CLF(I)                                             INDIR  124
C     TRAFFIC SERVICING EXPENSE BAGGAGE FIRST CLASS                     INDIR  125
      C20(I)=AI12*(BAG/2000)*FS*FLF(I)                                  INDIR  126
C     TRAFFIC SERVICING EXPENSE BAGGAGE COACH                           INDIR  127
      C21(I)=AI12*(BAG/2000)*CS*CLF(I)                                  INDIR  128
C     TRAFFIC SERVICING EXPENSE PAX + BAGGAGE                           INDIR  129
      C22(I)=C18(I)+C19(I)+C20(I)+C21(I)                                INDIR  130
C     TRAFFIC SERVICING EXPENSE CARGO                                   INDIR  131
      C23(I)=AI12A*(RTH+RTP)                                            INDIR  132
C     TOTAL TRAFFIC SERVICING-TTS                                       INDIR  133
      TTS(I)=C22(I)+C23(I)                                              INDIR  134
C     RESERVATION AND SALES EXPENSE FIRST CLASS                         INDIR  135
      C24(I)=AI13*FS*FLF(I)+AI14*FS*FLF(I)*DIS(I)*CF(I)                 INDIR  136
C     RESERVATION AND SALES EXPENSE COACH                               INDIR  137
      C25(I)=AI13*CS*CLF(I)+AI14*CS*CLF(I)*DIS(I)*CF(I)                 INDIR  138
C     RESERVATION AND SALES EXPENSE PAX TOTAL                           INDIR  139
      C26(I)=C24(I)+C25(I)                                              INDIR  140
C     EXPRESS TONS ENPLANED                                             INDIR  141
      RTE=RTP*EXP                                                       INDIR  142
C     FREIGHT TONS ENPLANED                                             INDIR  143
      RTF=RTP-RTE                                                       INDIR  144
C     RESERVATION AND SALES EXPENSE , PROPERTY                          INDIR  145
      C27(I)=(RTF+RTE)*AI15*DIS(I)*CF(I)                                INDIR  146
C     RESERVATION AND SALES EXPENSE , TOTAL-TRS                         INDIR  147
      TRS(I)=C26(I)+C27(I)                                              INDIR  148
C     ADVERTISING & PUBLICITY EXPENSE FIRST CLASS                       INDIR  149
      C28(I)=AI16*FS*FLF(I)*DIS(I)*CF(I)                                INDIR  150
C     ADVERTISING & PUBLICITY EXPENSE COACH                             INDIR  151
      C29(I)=AI16*CS*CLF(I)*DIS(I)*CF(I)                                INDIR  152
C     ADVERTISING & PUBLICITY EXPENSE PAX TOTAL                         INDIR  153
      C30(I)=C28(I)+C29(I)                                              INDIR  154
C     ADVERTISING & PUBLICITY EXPENSE PROPERTY                          INDIR  155
      C31(I)=(RTF+RTE)*AI17*DIS(I)*CF(I)                                INDIR  156
C     ADVERTISING & PUBLICITY EXPENSE TOTAL- TAP(I)                     INDIR  157
      TAP(I)=C30(I)+C31(I)                                              INDIR  158
C     MAINTENANCE EXPENSE GROUND PROPERY & EQUIPMENT                    INDIR  159
      C32(I)=AI18*DPT(I)                                                INDIR  160
C     DEPR. GENERAL GRD. PROP. & EQUIP. AND AMORT. EXCL. DIRECTLY ASSD. INDIR  161
      C33(I)=AI19*DPT(I)                                                INDIR  162
C     DEPR. MAINTENANCE EQUIP.                                          INDIR  163
      C2(I)=AI2*TB(I)                                                   INDIR  164
      C34(I)=AI20*(C2(I)+C32(I))                                        INDIR  165
C     GENERAL AND ADMINISTRATIVE EXPENSE                                INDIR  166
      C1(I)=AI1*TB(I)                                                   INDIR  167
      C4(I)=AI4*TB(I)                                                   INDIR  168
      C35(I)=AI21*(C1(I)+C2(I)+C4(I)+C8(I)+C11(I)+C14(I)+C15(I)+        INDIR  169
     1C16(I)+C17(I)+C22(I)+C23(I)+C25(I)+C27(I)+C30(I)+C31(I)+C32(I))   INDIR  170
C     TOTAL INDIRECT EXPENSE                                            INDIR  171
      C36(I)=C8(I)+C11(I)+C14(I)+C15(I)+C16(I)+C17(I)+C22(I)+C23(I)+    INDIR  172
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                1 C26(I)+C27(I)+C30(I)+C31(I)+C32(I)+C33(I)+C34(I)+C35(I)                INDIR  173
      C          FIRST STAGE LENGTH SHOULD BE FROM RED BOOK                              INDIR  174
                 IOC1(MPLANE)=C36(1)+U/TB(1)                                             INDIR  175
175   C          INDIRECT COST PER AIRCRAFT MILE                                         INDIR  176
                  CAM(I)=C36(I)/SL(I)                                                    INDIR  177
      C          INDIRECT COST PER FLIGHT HOUR                                           INDIR  178
                  CFH(I)=C36(I)/FLTT(I)                                                  INDIR  179
      C          INDIRECT COST PER BLOCK HOUR                                            INDIR  180
160               CBH(I)=C36(I)/TB(I)                                                    INDIR  181
      C          INDIRECT COST PER AVAILABLE SEAT MILE                                   INDIR  182
                  CASM(I)=CAM(I)/NRSEAT                                                  INDIR  183
               10 CONTINUE                                                               INDIR  184
      C                                                                                  INDIR  185
185   C          WRITE OUTPUT TABLE OF INDIRECT OPERATING COSTS PER BLOCK HOUR           INDIR  186
      C          FOR EACH STAGE FOR EACH AIRCRAFT                                        INDIR  187
      C                                                                                  INDIR  188
                 WRITE(6,512)                                                            INDIR  189
                 WRITE(6,511) XNAME                                                      INDIR  190
190              WRITE (6,91) (SL(I),I=1,NSL)                                            INDIR  191
                 WRITE (6,92) (SB(I),I=1,NSL)                                            INDIR  192
                 WRITE (6,93) (TB(I),I=1,NSL)                                            INDIR  193
                 WRITE (6,94) (FLTT(I),I=1,NSL)                                          INDIR  194
                 WRITE (6,95) (DPT(I),I=1,NSL)                                           INDIR  195
195              WRITE (6,96) (CF(I),I=1,NSL)                                            INDIR  196
                 WRITE (6,97) (CLF(I),I=1,NSL)                                           INDIR  197
                 WRITE (6,100)(FLF(I),I=1,NSL)                                           INDIR  198
                 WRITE (6,101) (C1 (I),I=1,NSL)                                          INDIR  199
                 WRITE (6,102) (C2 (I),I=1,NSL)                                          INDIR  200
200              WRITE (6,104) (C4  (I),I=1,NSL)                                         INDIR  201
                 WRITE (6,106) (C8 (I),I=1,NSL)                                          INDIR  202
                 WRITE (6,107) (C11(I),I=1,NSL)                                          INDIR  203
                 WRITE (6,108) (C14(I),I=1,NSL)                                          INDIR  204
                 WRITE (6,109) (C15(I),I=1,NSL)                                          INDIR  205
205              WRITE (6,110) (C16(I),I=1,NSL)                                          INDIR  206
                 WRITE (6,111) (C17(I),I=1,NSL)                                          INDIR  207
                 WRITE (6,211) (TAS(I),I=1,NSL)                                          INDIR  208
                 WRITE (6,112) (C22(I),I=1,NSL)                                          INDIR  209
                 WRITE (6,113) (C23(I),I=1,NSL)                                          INDIR  210
210              WRITE (6,212) (TTS(I),I=1,NSL)                                          INDIR  211
                 WRITE (6,114) (C26(I),I=1,NSL)                                          INDIR  212
                 WRITE (6,115) (C27 (I),I=1,NSL)                                         INDIR  213
                 WRITE (6,216) (TRS (I),I=1,NSL)                                         INDIR  214
                 WRITE (6,116) (C30 (I),I=1,NSL)                                         INDIR  215
215              WRITE (6,117) (C31 (I),I=1,NSL)                                         INDIR  216
                 WRITE (6,217) (TAP (I),I=1,NSL)                                         INDIR  217
                 WRITE (6,118) (C32 (I),I=1,NSL)                                         INDIR  218
                 WRITE (6,119) (C33 (I),I=1,NSL)                                         INDIR  219
                 WRITE (6,120) (C34 (I),I=1,NSL)                                         INDIR  220
220              WRITE (6,121) (C35 (I),I=1,NSL)                                         INDIR  221
                 WRITE (6,122) (C36 (I),I=1,NSL)                                         INDIR  222
                 WRITE (6,123) (CAM (I),I=1,NSL)                                         INDIR  223
                 WRITE (6,124) (CFH (I),I=1,NSL)                                         INDIR  224
                 WRITE (6,125) (CBH (I),I=1,NSL)                                         INDIR  225
225              WRITE (6,126) (CASM(I),I=1,NSL)                                         INDIR  226
              91 FORMAT(0-    PASSENGER TRIP DISTANCE(MILES)          *,10F8.0)          INDIR  227
              92 FORMAT(0-   BLOCK SPEED (MPH)                       *,10F8.0)          INDIR  228
              93 FORMAT(0 BLOCK TIME (HOURS)                         *,10F8.3)          INDIR  229
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                94 FORMAT(* FLIGHT TIME (HOURS)                                  *,10F8.3)      INDIR      230
230             95 FORMAT(* DEP/PAX TRIP (FLIGHT BASIS)                          *,10F8.3)      INDIR      231
                96 FORMAT(* PASSENGER TRIP CIRCUITRY FACTOR                      *,10F8.3)      INDIR      232
                97 FORMAT(* COACH LOAD FACTOR                                    *,10F8.3)      INDIR      233
               100 FORMAT(* FIRST CLASS LOAD FACTOR                              *,10F8.3)      INDIR      234
               101 FORMAT(* FLYING OPERATIONS(LESS RENTALS) EXP     C1   *,10F8.3)      INDIR      235
235            102 FORMAT(* MAINTENANCE EXPENSE FLY EQUIPMENT       C2   *,10F8.3)      INDIR      236
               104 FORMAT(* RENTALS FLT EQUIP                       C4   *,10F8.3)      INDIR      237
               106 FORMAT(*0*,*PASSENGER IN FLY EXPENSE*/                               INDIR      238
                 1       * STEWS                                   C8   *,10F8.3)      INDIR      239
               107 FORMAT(* FOOD                                    C11  *,10F8.3)      INDIR      240
240            108 FORMAT(* OTHER                                   C14  *,10F8.3)      INDIR      241
               109 FORMAT(*0*,*AIRCRAFT SERVICING EXP */                                INDIR      242
                 1       * LINE SERVICE                            C15  *,10F8.3)      INDIR      243
               110 FORMAT(* CONTROL                                 C16  *,10F8.3)      INDIR      244
               111 FORMAT(* LANDING FEES                            C17  *,10F8.3)      INDIR      245
245            211 FORMAT(* TOTAL AIRCRAFT SERVICING                TAS  *,10F8.3)      INDIR      246
               112 FORMAT(*0*,*TRAFFIC SERVICING EXP */                                 INDIR      247
                 1       * PAX & BAGGAGE                           C22  *,10F8.3)      INDIR      248
               113 FORMAT(* CARGO                                   C23  *,10F8.3)      INDIR      249
               212 FORMAT(* TOTAL TRAFFIC SERVICING                 TTS  *,10F8.3)      INDIR      250
250            114 FORMAT(*0*,*RESERVATION & SALES   */                                 INDIR      251
                 1       * PAX                                     C26  *,10F8.3)      INDIR      252
               115 FORMAT(* PROPERTY                                C27  *,10F8.3)      INDIR      253
               216 FORMAT(* TOTAL RESERVATION & SALES               TRS  *,10F8.3)      INDIR      254
               116 FORMAT(*0*,*ADVERTISING & PUBLICITY */                               INDIR      255
255              1       * PAX                                     C30  *,10F8.3)      INDIR      256
               117 FORMAT(* PROPERTY                                C31  *,10F8.3)      INDIR      257
               217 FORMAT(* TOTAL ADVERTISING & PUBLICITY           TAP  *,10F8.3)      INDIR      258
               118 FORMAT(* MAINTENANCE EXP- GRD PROP & EQUIP       C32  *,10F8.3)      INDIR      259
               119 FORMAT(* DEPR-GENERAL GRD PROP & EQUIP & AMORT   C33  *,10F8.3)      INDIR      260
260            120 FORMAT(* DEPR-MAINTENANCE EQUIP                  C34  *,10F8.3)      INDIR      261
               121 FORMAT(* GENERAL & ADM EXPENSE                   C35  *,10F8.3)      INDIR      262
               122 FORMAT(* TOTAL INDIRECT OPERATING EXPENSE        C36  *,10F8.3)      INDIR      263
               123 FORMAT(* INDIRECT COST PER AIRCRAFT MILE                *,10F8.3)      INDIR      264
               124 FORMAT(* INDIRECT COST PER FLIGHT HOUR                  *,10F8.0)      INDIR      265
265            125 FORMAT(* INDIRECT COST PER BLOCK HOUR                   *,10F8.3)      INDIR      266
               126 FORMAT(* INDIRECT COST PER AV. SEAT MILES               *,10F8.3)      INDIR      267
C                COST PER CRUISE MILE FOR THE AIRCRAFT                                   INDIR      268
                   CACM=(CAM(2)*SL(2)-CAM(1)*SL(1))/(SL(2)-SL(1))                        INDIR      269
C                COST PER TAKEOFF FOR THE AIRCRAFT                                       INDIR      270
270                CTO=(CAM(1)-CACM)*SL(1)                                               INDIR      271
C                COST PER CRUISE MILE PER SEAT                                           INDIR      272
                   CSCM=CACM/NRSEAT                                                      INDIR      273
C                COST PER TAKEOFF PER SEAT                                               INDIR      274
                   CSTO=CTO/NRSEAT                                                       INDIR      275
275                WRITE (6,316) CTO,CACM                                                INDIR      276
                   WRITE (6,317) CSTO,CSCM                                               INDIR      277
                316 FORMAT (*0*,* COST PER AIRCRAFT TRIP = $*,F7.2,* PLUS $*,F6.2,       INDIR      278
                  1*/MILE*)                                                            INDIR      279
                317 FORMAT (*0*,* COST PER SEAT TRIP = $*,F5.2,* PLUS $*,F6.4,*/MILE*) INDIR      280
280             214  NPLANE=NPLANE+1                                                    INDIR      281
                     IF(NPLANE.GT.A)   GO TO 20                                        INDIR      282
C                                                                                      INDIR      283
C                CYCLE UNTIL ALL AIRCRAFT HAVE BEEN PROCESSED                          INDIR      284
C                                                                                      INDIR      285
285                  GO TO 1                                                           INDIR      286
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      20    RETURN
            END
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INDIR   287
INDIR   288
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      SUBROUTINE REPAY                                                  REPAY    2
C                                                                       REPAY    3
C     CALCULATE REPAYMENT SCHEDULE FOR EACH AIRCRAFT                    REPAY    4
C                                                                       REPAY    5
      DIMENSION AREV(25,100),CF(25),COST(25,100),                       REPAY    6
     1DCF(25),DEPR(25,100),EBIAT(25,100),EBT(25,100),ECLIFE(100),       REPAY    7
     2INCTAX(25,100),INTINV(25,100),NTEARN(25,100),OPCOST(25,100),      REPAY    8
     3PRIN(25,100),PV(25),RES(100),RRATE(100),SALVAG(25,100),           REPAY    9
     4STDEP(25,100),YNTRST(25,100),                                     REPAY   10
     5SAREV(25),SSALVG(25),SINTIN(25),SPRIN(25),SOPCST(25),SDEPR(25),   REPAY   11
     6SSTDEP(25),SEBIAT(25),SYNTRS(25),SEBT(25),SINCTX(25),SNTERM(25),  REPAY   12
     7DEPREC(25),PRICE(25,100),CSDCF(25),                               REPAY   13
     8SEXP(25),SINCOM(25),CG(25,100),BVALUE(25,100),SCG(25),            REPAY   14
     9CGTX(25,100),SCGTX(25),YRPPAY(25,100)                             REPAY   15
      LEVEL 2,                                                          REPAY   16
     X          AREV,     CF,       CSAREV,   CSCF,     CSDCF,   CSDEPR,REPAY   17
     1CSEBIT,   CSEBT,    CSINTI,   CSINTX,   CSNTRM,   CSOPCT,  CSPRIN,REPAY   18
     2CSYNTR,   DCF,      DEPR,     DEPREC,   EBIAT,    EBT,     ECLIFE,REPAY   19
     3I,        INCTAX,   INTINV,   IYEAR,    NAC,      NTEARN,  OPCOST,REPAY   20
     4PRIN,     PV,       R,        SALVAG,   SAREV,    SDEPR,   SEBIAT,REPAY   21
     5SEBT,     SINCTX,   SINTIN,   SNTERM,   SOPCST,   SPRIN,   SSALVG,REPAY   22
     6SSTDEP,   STDEP,    SYNTRS,   YNTRST,                          REPAY   23
     7COST,     PRICE,    RES,      RRATE,    TXRATE,                 REPAY   24
     8BVALUE                                                          REPAY   25
      LEVEL 2, YRPPAY                                                 REPAY   26
      COMMON/IN/AREV,     CF,       CSAREV,   CSCF,     CSDCF,   CSDEPR,REPAY   27
     1CSEBIT,   CSEBT,    CSINTI,   CSINTX,   CSNTRM,   CSOPCT,  CSPRIN,REPAY   28
     2CSYNTR,   DCF,      DEPR,     DEPREC,   EBIAT,    EBT,     ECLIFE,REPAY   29
     3I,        INCTAX,   INTINV,   IYEAR,    NAC,      NTEARN,  OPCOST,REPAY   30
     4PRIN,     PV,       R,        SALVAG,   SAREV,    SDEPR,   SEBIAT,REPAY   31
     5SEBT,     SINCTX,   SINTIN,   SNTERM,   SOPCST,   SPRIN,   SSALVG,REPAY   32
     6SSTDEP,   STDEP,    SYNTRS,   YNTRST,                          REPAY   33
     7COST,     PRICE,    RES,      RRATE,    TXRATE,                 REPAY   34
     8BVALUE                                                          REPAY   35
      COMMON/YRPPAY/YRPPAY                                            REPAY   36
      REAL INTINV,INCTAX,NTEARN                                       REPAY   37
C                                                                     REPAY   38
C     MAIN LOOP POINT FOR EACH AIRCRAFT - SKIP PROCESSING WITHIN LOOP REPAY   39
C     EXCEPT FOR FIRST YEAR CRAFT IS PURCHASED                        REPAY   40
C                                                                     REPAY   41
      DO 90 J=1,NAC                                                   REPAY   42
      IF (COST(I,J) .LE.0.0) GO TO 90                                 REPAY   43
      PBCOST=COST(I,J)                                                REPAY   44
C                                                                     REPAY   45
C     CALCULATE TOTAL ANNUAL PAYMENTS (PRINCIPAL PLUS INTEREST)       REPAY   46
C                                                                     REPAY   47
      YRPPAY(I,J)=(PBCOST*RRATE(J))*((1+RRATE(J))**ECLIFE(J))/        REPAY   48
     1(((1+RRATE(J))**ECLIFE(J))-1)                                   REPAY   49
      NLIFE=ECLIFE(J)                                                 REPAY   50
      NN=1+NLIFE-1                                                    REPAY   51
      DO 90 N=1,NN                                                    REPAY   52
C                                                                     REPAY   53
C     CALCULATE INTEREST AND PRINCIPAL PAYMENT SCHEDULE               REPAY   54
C                                                                     REPAY   55
      YNTRST(N,J) = PBCOST*RRATE(J)                                   REPAY   56
      PRIN(N,J) = YRPPAY(I,J) - YNTRST(N,J)                           REPAY   57
      PBCOST=PBCOST-PRIN(N,J)                                         REPAY   58
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                  50 CONTINUE                                                   REPAY      59
                C                                                               REPAY      60
                C     END OF MAIN PROGRAM LOOP                                  REPAY      61
                C                                                               REPAY      62
                  90 CONTINUE                                                   REPAY      63
                     RETURN                                                     REPAY      64
                     END                                                        REPAY      65
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      SUBROUTINE DEPSUB                                                 DEPSUB     2
C                                                                       DEPSUB     3
C     CALCULATE DEPRECIATION SCHEDULE FOR EACH AIRCRAFT - DOUBLE        DEPSUB     4
C     DECLINING BALANCE METHOD FOR FIRST HALF OF ECONOMIC LIFE AND      DEPSUB     5
C     STRAIGHT LINE METHOD FOR BALANCE OF ECONOMIC LIFE                 DEPSUB     6
C                                                                       DEPSUB     7
      DIMENSION AREV(25,100),CF(25),COST(25,100),                       DEPSUB     8
     1DCF(25),DEPR(25,100),EBIAT(25,100),EBT(25,100),ECLIFE(100),       DEPSUB     9
     2INCTAX(25,100),INTINV(25,100),NTEARN(25,100),OPCOST(25,100),      DEPSUB    10
     3PRIN(25,100),PV(25),RES(100),RRATE(100),SALVAG(25,100),           DEPSUB    11
     4STDEP(25,100),YNTRST(25,100),                                     DEPSUB    12
     5SAREV(25),SSALVG(25),SINTIN(25),SPRIN(25),SOPCST(25),SDEPR(25),   DEPSUB    13
     6SSTDEP(25),SEBIAT(25),SYNTRS(25),SEBT(25),SINCTX(25),SNTERN(25),  DEPSUB    14
     7DEPREC(25),PRICE(25,100),CSDCF(25),                               DEPSUB    15
     8SEXP(25),SINCOM(25),CG(25,100),BVALUE(25,100),SCG(25),            DEPSUB    16
     9CGTX(25,100),SCGTX(25)                                            DEPSUB    17
      LEVEL 2,                                                          DEPSUB    18
      X          AREV,     CF,       CSAREV,   CSCF,     CSDCF,   CSDEPR, DEPSUB    19
     1CSEBIT,    CSEBT,    CSINTI,   CSINTX,   CSNTRN,   CSOPCT,  CSPRIN, DEPSUB    20
     2CSYNTR,    DCF,      DEPR,     DEPREC,   EBIAT,    EBT,     ECLIFE, DEPSUB    21
     3I,         INCTAX,   INTINV,   IYEAR,    NAC,      NTEARN,  OPCOST, DEPSUB    22
     4PRIN,      PV,       R,        SALVAG,   SAREV,    SDEPR,   SEBIAT, DEPSUB    23
     5SEBT,      SINCTX,   SINTIN,   SNTERN,   SOPCST,   SPRIN,   SSALVG, DEPSUB    24
     6SSTDEP,    STDEP,    SYNTRS,   YNTRST,                              DEPSUB    25
     7COST,      PRICE,    RES,      RRATE,    TXRATE,                    DEPSUB    26
     8BVALUE                                                            DEPSUB    27
      COMMON/IN/AREV,     CF,       CSAREV,   CSCF,     CSDCF,   CSDEPR, DEPSUB    28
     1CSEBIT,    CSEBT,    CSINTI,   CSINTX,   CSNTRN,   CSOPCT,  CSPRIN, DEPSUB    29
     2CSYNTR,    DCF,      DEPR,     DEPREC,   EBIAT,    EBT,     ECLIFE, DEPSUB    30
     3I,         INCTAX,   INTINV,   IYEAR,    NAC,      NTEARN,  OPCOST, DEPSUB    31
     4PRIN,      PV,       R,        SALVAG,   SAREV,    SDEPR,   SEBIAT, DEPSUB    32
     5SEBT,      SINCTX,   SINTIN,   SNTERN,   SOPCST,   SPRIN,   SSALVG, DEPSUB    33
     6SSTDEP,    STDEP,    SYNTRS,   YNTRST,                              DEPSUB    34
     7COST,      PRICE,    RES,      RRATE,    TXRATE,                    DEPSUB    35
     8BVALUE                                                            DEPSUB    36
      REAL INTINV,INCTAX,NTEARN                                         DEPSUB    37
C                                                                       DEPSUB    38
C     MAIN LOOP POINT FOR EACH AIRCRAFT - DO DOUBLE DECLINING BALANCE   DEPSUB    39
C     METHOD COMPUTATIONS FIRST                                         DEPSUB    40
C                                                                       DEPSUB    41
      DO 92 J=1,NAC                                                     DEPSUB    42
      RATE = 2. * (1.-RES(J))/ECLIFE(J)                                 DEPSUB    43
      IECLIF=ECLIFE(J)/2.                                               DEPSUB    44
      BVALUE(1,J) = PRICE(I,J)                                          DEPSUB    45
      IF(PRICE(I,J) .LE.0.0) GO TO 92                                   DEPSUB    46
      MM=ECLIFE(J)                                                      DEPSUB    47
      DO 20 K=1,MM                                                      DEPSUB    48
      II=K                                                              DEPSUB    49
      DEPR(II,J)=BVALUE(II,J)*RATE                                      DEPSUB    50
      BVALUE(II+1,J)=BVALUE(II,J)-DEPR(II,J)                            DEPSUB    51
      LL=IECLIF+1                                                       DEPSUB    52
      DO 30 M=LL,MM                                                     DEPSUB    53
      DEPR(M,J)=0.0                                                     DEPSUB    54
   30 CONTINUE                                                          DEPSUB    55
   20 CONTINUE                                                          DEPSUB    56
C                                                                       DEPSUB    57
C     PERFORM STRAIGHT LINE METHOD CALCULATIONS                         DEPSUB    58
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      C                                                                 DEPSUB     59
            STLIFE=ECLIFE(J)-IECLIF                                     DEPSUB     60
60          C     ASSUME SALVAGE VALUE SAME AS FOR NLIFE                DEPSUB     61
            M=ECLIFE(J)-1                                               DEPSUB     62
            DO 75 L=1,M                                                 DEPSUB     63
            SALVAG(L,J)=0.0                                             DEPSUB     64
           75 CONTINUE                                                  DEPSUB     65
65          NLIFE=ECLIFE(J)                                             DEPSUB     66
            SALVAG(NLIFE,J)=PRICE(1,J)*RES(J)                           DEPSUB     67
            II=IECLIF+1                                                 DEPSUB     68
            DO 55 N=II,NLIFE                                            DEPSUB     69
            STDEP(N,J)=(BVALUE(II,J)-SALVAG(NLIFE,J))/STLIFE            DEPSUB     70
70          M=N+1                                                       DEPSUB     71
            BVALUE(M,J)=BVALUE(N,J)-STDEP(N,J)                          DEPSUB     72
           55 CONTINUE                                                  DEPSUB     73
      C     ASSUME STRAIGHT LINE DEPRECIATION IS ZERO UPTO II YEARS     DEPSUB     74
            DO 65 N=1,IECLIF                                            DEPSUB     75
75          STDEP(N,J)=0.                                               DEPSUB     76
           65 CONTINUE                                                  DEPSUB     77
      C                                                                 DEPSUB     78
      C     END OF MAIN PROGRAM LOOP                                    DEPSUB     79
      C                                                                 DEPSUB     80
80         92 CONTINUE                                                  DEPSUB     81
            RETURN                                                      DEPSUB     82
            END                                                         DEPSUB     83
```

```
      SUBROUTINE NETSUB                                                 NETSUB     2
C                                                                       NETSUB     3
C     COMPUTE EARNINGS AND TAXES                                        NETSUB     4
C                                                                       NETSUB     5
      DIMENSION AREV(25,100),CF(25),COST(25,100),                       NETSUB     6
     1DCF(25),DEPR(25,100),EBIAT(25,100),EBT(25,100),ECLIFE(100),       NETSUB     7
     2INCTAX(25,100),INTINV(25,100),NTEARN(25,100),OPCOST(25,100),      NETSUB     8
     3PRIN(25,100),PV(25),RES(100),RRATE(100),SALVAG(25,100),           NETSUB     9
     4STDEP(25,100),YNTRST(25,100),                                     NETSUB    10
     5SAREV(25),SSALVG(25),SINTIN(25),SPRIN(25),SOPCST(25),SDEPR(25),   NETSUB    11
     6SSTDEP(25),SEBIAT(25),SYNTRS(25),SEBT(25),SINCTX(25),SNTERN(25),  NETSUB    12
     7DEPREC(25),PRICE(25,100),CSDCF(25),                               NETSUB    13
     8SEXP(25),SINCOM(25),CG(25,100),BVALUE(25,100),SCG(25),            NETSUB    14
     9CGTX(25,100),SCGTX(25)                                            NETSUB    15
      LEVEL 2,                                                          NETSUB    16
     X          AREV,     CF,       CSAREV,   CSCF,     CSDCF,   CSDEPR, NETSUB    17
     1CSEBIT,   CSEBT,    CSINTI,   CSINTX,   CSNTRN,   CSOPCT,  CSPRIN, NETSUB    18
     2CSYNTR,   DCF,      DEPR,     DEPREC,   EBIAT,    EBT,     ECLIFE, NETSUB    19
     3I,        INCTAX,   INTINV,   IYEAR,    NAC,      NTEARN,  OPCOST, NETSUB    20
     4PRIN,     PV,       R,        SALVAG,   SAREV,    SDEPR,   SEBIAT, NETSUB    21
     5SEBT,     SINCTX,   SINTIN,   SNTERN,   SOPCST,   SPRIN,   SSALVG, NETSUB    22
     6SSTDEP,   STDEP,    SYNTRS,   YNTRST,                             NETSUB    23
     7COST,     PRICE,    RES,      RRATE,    TXRATE,                   NETSUB    24
     8BVALUE                                                            NETSUB    25
      COMMON/IN/AREV,     CF,       CSAREV,   CSCF,     CSDCF,   CSDEPR, NETSUB    26
     1CSEBIT,   CSEBT,    CSINTI,   CSINTX,   CSNTRN,   CSOPCT,  CSPRIN, NETSUB    27
     2CSYNTR,   DCF,      DEPR,     DEPREC,   EBIAT,    EBT,     ECLIFE, NETSUB    28
     3I,        INCTAX,   INTINV,   IYEAR,    NAC,      NTEARN,  OPCOST, NETSUB    29
     4PRIN,     PV,       R,        SALVAG,   SAREV,    SDEPR,   SEBIAT, NETSUB    30
     5SEBT,     SINCTX,   SINTIN,   SNTERN,   SOPCST,   SPRIN,   SSALVG, NETSUB    31
     6SSTDEP,   STDEP,    SYNTRS,   YNTRST,                             NETSUB    32
     7COST,     PRICE,    RES,      RRATE,    TXRATE,                   NETSUB    33
     8BVALUE                                                            NETSUB    34
      REAL INTINV,INCTAX,NTEARN                                         NETSUB    35
C                                                                       NETSUB    36
C     MAIN PROGRAM LOOP POINT FOR EACH AIRCRAFT - WRITE DEPRECIATION AND NETSUB    37
C     EARNINGS WHEN CALCULATED                                          NETSUB    38
C                                                                       NETSUB    39
      DO 94 J=1,NAC                                                     NETSUB    40
      WRITE (6,53) DEPR(I,J)                                            NETSUB    41
   53 FORMAT (* DEPR= *,10E12.4)                                        NETSUB    42
      WRITE (6,61) STDEP(I,J)                                           NETSUB    43
   61 FORMAT (* STDEP= *,10E12.4)                                       NETSUB    44
      EBIAT(I,J)=AREV(I,J)-OPCOST(I,J)-DEPR(I,J)-STDEP(I,J)             NETSUB    45
      EBT(I,J)=EBIAT(I,J)-YNTRST(I,J)                                   NETSUB    46
      WRITE (6,20) EBIAT(I,J)                                           NETSUB    47
   20 FORMAT (* EBIAT= *,10E12.4)                                       NETSUB    48
      WRITE (6,30) EBT(I,J)                                             NETSUB    49
   30 FORMAT (* EBT = *,10E12.4)                                        NETSUB    50
      INCTAX(I,J)=(EBT(I,J))*(TXRATE)                                   NETSUB    51
      NTEARN(I,J)=EBT(I,J)-INCTAX(I,J)                                  NETSUB    52
C                                                                       NETSUB    53
C     END OF MAIN PROGRAM LOOP                                          NETSUB    54
C                                                                       NETSUB    55
   94 CONTINUE                                                          NETSUB    56
      RETURN                                                            NETSUB    57
      END                                                               NETSUB    58
```

```
      SUBROUTINE SUM                                                    SUM
C                                                                       SUM
C     CALCULATE YEARLY AND CUMULATIVE SUMS FOR ALL REVENUE, PAYMENTS    SUM
C     AND EARNINGS                                                      SUM
C                                                                       SUM
      DIMENSION AREV(25,100),CF(25),COST(25,100),                       SUM
     1DCF(25),DEPR(25,100),EBIAT(25,100),EBT(25,100),ECLIFE(100),       SUM
     2INCTAX(25,100),INTINV(25,100),NTEARN(25,100),OPCOST(25,100),      SUM
     3PRIN(25,100),PV(25),RES(100),RRATE(100),SALVAG(25,100),           SUM
     4STDEP(25,100),YNTRST(25,100),                                     SUM
     5SAREV(25),SSALVG(25),SINTIN(25),SPRIN(25),SOPCST(25),SDEPR(25),   SUM
     6SSTDEP(25),SEBIAT(25),SYNTRS(25),SEBT(25),SINCTX(25),SNTERN(25),  SUM
     7DEPREC(25),PRICE(25,100),CSDCF(25),                               SUM
     8SEXP(25),SINCOM(25),CG(25,100),BVALUE(25,100),SCG(25),            SUM
     9CGTX(25,100),SCGTX(25)                                            SUM
      LEVEL 2,                                                          SUM
     X          AREV,     CF,       CSAREV,   CSCF,     CSDCF,   CSDEPR,SUM
     1CSEBIT,   CSEBT,    CSINTI,   CSINTX,   CSNTRN,   CSOPCT,  CSPRIN,SUM
     2CSYNTR,   DCF,      DEPR,     DEPREC,   EBIAT,    EBT,     ECLIFE,SUM
     3I,        INCTAX,   INTINV,   IYEAR,    NAC,      NTEARN,  OPCOST,SUM
     4PRIN,     PV,       R,        SALVAG,   SAREV,    SDEPR,   SEBIAT,SUM
     5SEBT,     SINCTX,   SINTIN,   SNTERN,   SOPCST,   SPRIN,   SSALVG,SUM
     6SSTDEP,   STDEP,    SYNTRS,   YNTRST,                          SUM
     7COST,     PRICE,    RES,      RRATE,    TXRATE,                 SUM
     8BVALUE                                                          SUM
      COMMON/IN/AREV,     CF,       CSAREV,   CSCF,     CSDCF,   CSDEPR,SUM
     1CSEBIT,   CSEBT,    CSINTI,   CSINTX,   CSNTRN,   CSOPCT,  CSPRIN,SUM
     2CSYNTR,   DCF,      DEPR,     DEPREC,   EBIAT,    EBT,     ECLIFE,SUM
     3I,        INCTAX,   INTINV,   IYEAR,    NAC,      NTEARN,  OPCOST,SUM
     4PRIN,     PV,       R,        SALVAG,   SAREV,    SDEPR,   SEBIAT,SUM
     5SEBT,     SINCTX,   SINTIN,   SNTERN,   SOPCST,   SPRIN,   SSALVG,SUM
     6SSTDEP,   STDEP,    SYNTRS,   YNTRST,                          SUM
     7COST,     PRICE,    RES,      RRATE,    TXRATE,                 SUM
     8BVALUE                                                          SUM
      REAL INTINV,INCTAX,NTEARN                                         SUM
C                                                                       SUM
C     PROGRAM STRUCTURE IS SMALL LOOPS TO CALCULATE THE REQUIRED SUMS   SUM
C                                                                       SUM
      DO 31 M=1,NAC                                                     SUM
      WRITE (6,33) (INTINV(I,M),I=1,IYEAR)                              SUM
   33 FORMAT (* INTINV= *,10E12.4)                                      SUM
   31 CONTINUE                                                          SUM
C                                                                       SUM
C     ANNUAL REVENUE                                                    SUM
C                                                                       SUM
      DO 10 M=1,IYEAR                                                   SUM
      SAREV(M)=0.0                                                      SUM
      DO 10 J=1,NAC                                                     SUM
      SAREV(M)=AREV(M,J)+SAREV(M)                                       SUM
   10 CONTINUE                                                          SUM
      CSAREV=0.0                                                        SUM
      DO 12 M=1,IYEAR                                                   SUM
      CSAREV=SAREV(M)+CSAREV                                            SUM
   12 CONTINUE                                                          SUM
C                                                                       SUM
C     SALVAGE VALUE                                                     SUM
C                                                                       SUM
```

```
                      DO 20 N=1,IYEAR                                    SUM        59
                      SSALVG(N)=0.0                                      SUM        60
   60                 DO 20 J=1,NAC                                      SUM        61
                      SSALVG(N)=SALVAG(N,J)+SSALVG(N)                    SUM        62
                   20 CONTINUE                                           SUM        63
                C                                                        SUM        64
                C     INITIAL INVESTMENT                                 SUM        65
   65           C                                                        SUM        66
                      DO 30 N=1,IYEAR                                    SUM        67
                      SINTIN(N)=0.0                                      SUM        68
                      DO 30 J=1,NAC                                      SUM        69
                      SINTIN(N)=INTINV(N,J)+SINTIN(N)                    SUM        70
   70                 WRITE (6,21) (SINTIN(N),N=1,IYEAR)                 SUM        71
                   30 CONTINUE                                           SUM        72
                    21 FORMAT(* SINTIN= *,10E12.4)                       SUM        73
                      CSINTI=0.0                                         SUM        74
                      DO 32 N=1,IYEAR                                    SUM        75
   75                 CSINTI=SINTIN(N)+CSINTI                            SUM        76
                   32 CONTINUE                                           SUM        77
                C                                                        SUM        78
                C     PRINCIPAL PAYMENTS                                 SUM        79
                C                                                        SUM        80
   80                 DO 40 N=1,IYEAR                                    SUM        81
                      SPRIN(N)=0.0                                       SUM        82
                      DO 40 J=1,NAC                                      SUM        83
                      SPRIN(N)=PRIN(N,J)+SPRIN(N)                        SUM        84
                   40 CONTINUE                                           SUM        85
   85                 CSPRIN=0.0                                         SUM        86
                      DO 42 N=1,IYEAR                                    SUM        87
                      CSPRIN=SPRIN(N)+CSPRIN                             SUM        88
                   42 CONTINUE                                           SUM        89
                C                                                        SUM        90
   90           C     OPERATING COSTS                                    SUM        91
                C                                                        SUM        92
                      DO 50 N=1,IYEAR                                    SUM        93
                      SOPCST(N)=0.0                                      SUM        94
                      DO 50 J=1,NAC                                      SUM        95
   95                 SOPCST(N)=OPCOST(N,J)+SOPCST(N)                    SUM        96
                   50 CONTINUE                                           SUM        97
                      CSOPCT=0.0                                         SUM        98
                      DO 52 N=1,IYEAR                                    SUM        99
                      CSOPCT=SOPCST(N)+CSOPCT                            SUM       100
  100                 52 CONTINUE                                        SUM       101
                C                                                        SUM       102
                C     DEPRECIATION                                       SUM       103
                C                                                        SUM       104
                      DO 60 N=1,IYEAR                                    SUM       105
  105                 SDEPR(N)=0.0                                       SUM       106
                      DO 60 J=1,NAC                                      SUM       107
                      WRITE (6,53) DEPR(N,J)                             SUM       108
                    53 FORMAT (* DEPR= *,10E12.4)                        SUM       109
                      SDEPR(N)=DEPR(N,J)+SDEPR(N)                        SUM       110
  110                 60 CONTINUE                                        SUM       111
                      DO 70 N=1,IYEAR                                    SUM       112
                      SSTDEP(N)=0.0                                      SUM       113
                      DO 70 J=1,NAC                                      SUM       114
                      WRITE (6,61) STDEP(N,J)                            SUM       115
```

```
      61   FORMAT (* STDEP= *,10E12.4)                                       SUM       116
           SSTDEP(N)=STDEP(N,J)+SSTDEP(N)                                    SUM       117
        70 CONTINUE                                                          SUM       118
           DO 75 N=1,IYEAR                                                   SUM       119
           DEPREC(N)=SDEPR(N)+SSTDEP(N)                                      SUM       120
           WRITE (6,71) DEPREC(N)                                            SUM       121
      71   FORMAT (* DEPREC= *,10E12.4)                                      SUM       122
        75 CONTINUE                                                          SUM       123
           CSDEPR=0.0                                                        SUM       124
           DO 77 N=1,IYEAR                                                   SUM       125
           CSDEPR=DEPREC(N)+CSDEPR                                           SUM       126
        77 CONTINUE                                                          SUM       127
C                                                                            SUM       128
C     EARNINGS BEFORE INTEREST AND TAXES                                     SUM       129
C                                                                            SUM       130
           DO 80 N=1,IYEAR                                                   SUM       131
           SEBIAT(N)=0.0                                                     SUM       132
           DO 80 J=1,MAC                                                     SUM       133
           SEBIAT(N)=EBIAT(N,J)+SEBIAT(N)                                    SUM       134
        80 CONTINUE                                                          SUM       135
           CSEBIT=0.0                                                        SUM       136
           DO 82 N=1,IYEAR                                                   SUM       137
           CSEBIT=SEBIAT(N)+CSEBIT                                           SUM       138
        82 CONTINUE                                                          SUM       139
C                                                                            SUM       140
C     INTEREST PAYMENTS                                                      SUM       141
C                                                                            SUM       142
           DO 90 N=1,IYEAR                                                   SUM       143
           SYNTRS(N)=0.0                                                     SUM       144
           DO 90 J=1,MAC                                                     SUM       145
           SYNTRS(N)=YNTRST(N,J)+SYNTRS(N)                                   SUM       146
        90 CONTINUE                                                          SUM       147
           CSYNTR=0.0                                                        SUM       148
           DO 92 N=1,IYEAR                                                   SUM       149
           CSYNTR=SYNTRS(N)+CSYNTR                                           SUM       150
        92 CONTINUE                                                          SUM       151
C                                                                            SUM       152
C     EARNINGS BEFORE TAXES                                                  SUM       153
C                                                                            SUM       154
           DO 100 N=1,IYEAR                                                  SUM       155
           SEBT(N)=0.0                                                       SUM       156
           DO 100 J=1,MAC                                                    SUM       157
           SEBT(N)=EBT(N,J)+SEBT(N)                                          SUM       158
       100 CONTINUE                                                          SUM       159
           CSEBT=0.0                                                         SUM       160
           DO 102 N=1,IYEAR                                                  SUM       161
           CSEBT=SEBT(N)+CSEBT                                               SUM       162
       102 CONTINUE                                                          SUM       163
C                                                                            SUM       164
C     INCOME TAX                                                             SUM       165
C                                                                            SUM       166
           DO 110 N=1,IYEAR                                                  SUM       167
           SINCTX(N)=0.0                                                     SUM       168
           DO 110 J=1,MAC                                                    SUM       169
           SINCTX(N)=INCTAX(N,J)+SINCTX(N)                                   SUM       170
       110 CONTINUE                                                          SUM       171
           CSINTX=0.0                                                        SUM       172
```

```
                DO 112 N=1,IYEAR                                        SUM     173
                CSINTX=SINCTX(N)+CSINTX                                 SUM     174
              112 CONTINUE                                              SUM     175
175           C                                                         SUM     176
              C     NET EARNINGS                                        SUM     177
              C                                                         SUM     178
                DO 120 N=1,IYEAR                                        SUM     179
                SNTERN(N)=0.0                                           SUM     180
180             DO 120 J=1,MAC                                          SUM     181
                SNTERN(N)=NTEARN(N,J)+SNTERN(N)                         SUM     182
              120 CONTINUE                                              SUM     183
                CSNTRN=0.0                                              SUM     184
                DO 122 N=1,IYEAR                                        SUM     185
185             CSNTRN=SNTERN(N)+CSNTRN                                 SUM     186
              122 CONTINUE                                              SUM     187
                RETURN                                                  SUM     188
                END                                                     SUM     189
```

```
      SUBROUTINE CFSUB                                                  CFSUB      2
C                                                                       CFSUB      3
C     COMPUTE THE CASHFLOW FOR EACH YEAR UNDER STUDY                    CFSUB      4
C                                                                       CFSUB      5
      DIMENSION AREV(25,100),CF(25),COST(25,100),                       CFSUB      6
     1DCF(25),DEPR(25,100),EBIAT(25,100),EBT(25,100),ECLIFE(100),       CFSUB      7
     2INCTAX(25,100),INTINV(25,100),NTEARN(25,100),OPCOST(25,100),      CFSUB      8
     3PRIN(25,100),PV(25),RES(100),RRATE(100),SALVAG(25,100),           CFSUB      9
     4STDEP(25,100),YNTRST(25,100),                                     CFSUB     10
     5SAREV(26),SSALVG(25),SINTIN(25),SPRIN(25),SOPCST(25),SDEPR(25),   CFSUB     11
     6SSTDEP(25),SEBIAT(25),SYNTRS(25),SEBT(25),SINCTX(25),SNTERM(25),  CFSUB     12
     7DEPREC(25),PRICE(25,100),CSDCF(25),                               CFSUB     13
     8SEXP(25),SINCOM(25),CG(25,100),BVALUE(25,100),SCG(25),            CFSUB     14
     9CGTAX(25,100),SCGTX(25)                                           CFSUB     15
      LEVEL 2,                                                          CFSUB     16
      X          AREV,     CF,       CSAREV,   CSCF,     CSDCF,    CSDEPR,  CFSUB     17
     1CSEBIT,    CSEBT,    CSINTI,   CSINTX,   CSNTRM,   CSOPCT,   CSPRIN,  CFSUB     18
     2CSYNTR,    DCF,      DEPR,     DEPREC,   EBIAT,    EBT,      ECLIFE,  CFSUB     19
     3I,         INCTAX,   INTINV,   IYEAR,    NAC,      NTEARN,   OPCOST,  CFSUB     20
     4PRIN,      PV,       R,        SALVAG,   SAREV,    SDEPR,    SEBIAT,  CFSUB     21
     5SEBT,      SINCTX,   SINTIN,   SNTERM,   SOPCST,   SPRIN,    SSALVG,  CFSUB     22
     6SSTDEP,    STDEP,    SYNTRS,   YNTRST,                                CFSUB     23
     7COST,      PRICE,    RES,      RRATE,    TXRATE,                      CFSUB     24
     8BVALUE                                                            CFSUB     25
      COMMON/IN/AREV,     CF,       CSAREV,   CSCF,     CSDCF,    CSDEPR,  CFSUB     26
     1CSEBIT,    CSEBT,    CSINTI,   CSINTX,   CSNTRM,   CSOPCT,   CSPRIN,  CFSUB     27
     2CSYNTR,    DCF,      DEPR,     DEPREC,   EBIAT,    EBT,      ECLIFE,  CFSUB     28
     3I,         INCTAX,   INTINV,   IYEAR,    NAC,      NTEARN,   OPCOST,  CFSUB     29
     4PRIN,      PV,       R,        SALVAG,   SAREV,    SDEPR,    SEBIAT,  CFSUB     30
     5SEBT,      SINCTX,   SINTIN,   SNTERM,   SOPCST,   SPRIN,    SSALVG,  CFSUB     31
     6SSTDEP,    STDEP,    SYNTRS,   YNTRST,                                CFSUB     32
     7COST,      PRICE,    RES,      RRATE,    TXRATE,                      CFSUB     33
     8BVALUE                                                            CFSUB     34
      REAL INTINV,INCTAX,NTEARN                                         CFSUB     35
C                                                                       CFSUB     36
C     CALCULATE CASHFLOW FOR EACH YEAR                                  CFSUB     37
C                                                                       CFSUB     38
      DO 50 N=1,IYEAR                                                   CFSUB     39
      CF(N)=SAREV(N)+SSALVG(N)-SINTIN(N)-SPRIN(N)-SOPCST(N)             CFSUB     40
     1-SYNTRS(N)-SINCTX(N)                                              CFSUB     41
   50 CONTINUE                                                          CFSUB     42
C                                                                       CFSUB     43
C     WRITE CALCULATED CASHFLOW                                         CFSUB     44
C                                                                       CFSUB     45
      WRITE (6,60) (CF(N),N=1,IYEAR)                                    CFSUB     46
   60 FORMAT(* CASH FLOW= *,10E12.4)                                    CFSUB     47
      CSCF=0.0                                                          CFSUB     48
C                                                                       CFSUB     49
C     COMPUTE CUMULATIVE TOTAL CASHFLOW                                 CFSUB     50
C                                                                       CFSUB     51
      DO 100 N=1,IYEAR                                                  CFSUB     52
      CSCF=CF(N)+CSCF                                                   CFSUB     53
  100 CONTINUE                                                          CFSUB     54
      RETURN                                                            CFSUB     55
      END                                                               CFSUB     56
```

```
      SUBROUTINE DCFSUB                                                 DCFSUB     2
C                                                                       DCFSUB     3
C     CALCULATE INTERNAL RATE OF RETURN ON INVESTMENT FOR INDICATED     DCFSUB     4
C     CASHFLOW                                                          DCFSUB     5
C                                                                       DCFSUB     6
      DIMENSION AREV(25,100),CF(25),COST(25,100),                       DCFSUB     7
     1DCF(25),DEPR(25,100),EBIAT(25,100),EBT(25,100),ECLIFE(100),       DCFSUB     8
     2INCTAX(25,100),INTINV(25,100),NTEARN(25,100),OPCOST(25,100),      DCFSUB     9
     3PRIN(25,100),PV(25),RES(100),RRATE(100),SALVAG(25,100),           DCFSUB    10
     4STDEP(25,100),YNTRST(25,100),                                     DCFSUB    11
     5SAREV(25),SSALVG(25),SINTIN(25),SPRIN(25),SOPCST(25),SDEPR(25),   DCFSUB    12
     6SSTDEP(25),SEBIAT(25),SYNTRS(25),SEBT(25),SINCTX(25),SNTERN(25),  DCFSUB    13
     7DEPREC(25),PRICE(25,100),CSDCF(25),                               DCFSUB    14
     8SEXP(25),SINCOM(25),CG(25,100),BVALUE(25,100),SCG(25),            DCFSUB    15
     9CGTX(25,100),SCGTX(25)                                            DCFSUB    16
      LEVEL 2,                                                          DCFSUB    17
     X          AREV,     CF,       CSAREV,   CSCF,     CSDCF,   CSDEPR,DCFSUB    18
     1CSEBIT,   CSEBT,    CSINTI,   CSINTX,   CSNTRN,   CSOPCT,  CSPRIN,DCFSUB    19
     2CSYNTR,   DCF,      DEPR,     DEPREC,   EBIAT,    EBT,     ECLIFE,DCFSUB    20
     3I,        INCTAX,   INTINV,   IYEAR,    NAC,      NTEARN,  OPCOST,DCFSUB    21
     4PRIN,     PV,       R,        SALVAG,   SAREV,    SDEPR,   SEBIAT,DCFSUB    22
     5SEBT,     SINCTX,   SINTIN,   SNTERN,   SOPCST,   SPRIN,   SSALVG,DCFSUB    23
     6SSTDEP,   STDEP,    SYNTRS,   YNTRST,                           DCFSUB    24
     7COST,     PRICE,    RES,      RRATE,    TXRATE,                 DCFSUB    25
     8BVALUE                                                          DCFSUB    26
      COMMON/IN/AREV,     CF,       CSAREV,   CSCF,     CSDCF,   CSDEPR,DCFSUB    27
     1CSEBIT,   CSEBT,    CSINTI,   CSINTX,   CSNTRN,   CSOPCT,  CSPRIN,DCFSUB    28
     2CSYNTR,   DCF,      DEPR,     DEPREC,   EBIAT,    EBT,     ECLIFE,DCFSUB    29
     3I,        INCTAX,   INTINV,   IYEAR,    NAC,      NTEARN,  OPCOST,DCFSUB    30
     4PRIN,     PV,       R,        SALVAG,   SAREV,    SDEPR,   SEBIAT,DCFSUB    31
     5SEBT,     SINCTX,   SINTIN,   SNTERN,   SOPCST,   SPRIN,   SSALVG,DCFSUB    32
     6SSTDEP,   STDEP,    SYNTRS,   YNTRST,                           DCFSUB    33
     7COST,     PRICE,    RES,      RRATE,    TXRATE,                 DCFSUB    34
     8BVALUE                                                          DCFSUB    35
      REAL INTINV, INCTAX, NTEARN                                       DCFSUB    36
C                                                                       DCFSUB    37
C     INITIALIZE LOOP AND TEST PARAMETERS                               DCFSUB    38
C                                                                       DCFSUB    39
      REAL K,KK,KKK                                                     DCFSUB    40
      KK=0.                                                             DCFSUB    41
      KKK=0.                                                            DCFSUB    42
      RR=0.                                                             DCFSUB    43
      RRR=0.                                                            DCFSUB    44
      ICNT=0                                                            DCFSUB    45
C                                                                       DCFSUB    46
C     SET STARTING VALUE FOR R                                          DCFSUB    47
C                                                                       DCFSUB    48
      IF (CSCF.LT.0.0) GO TO 50                                         DCFSUB    49
      R=0.01                                                            DCFSUB    50
      GO TO 40                                                          DCFSUB    51
   50 R=-0.01                                                           DCFSUB    52
C                                                                       DCFSUB    53
C     MAIN ITERATION CYCLE POINT - CALCULATE DISCOUNTED CASHFLOW SUM    DCFSUB    54
C                                                                       DCFSUB    55
   40 DO 48 N=1,IYEAR                                                   DCFSUB    56
   48 PV(N)=(1.+R)**(-N)                                                DCFSUB    57
      SUM=CF(1)                                                         DCFSUB    58
```

```
                DCF(1)=CF(1)                                                    DCFSUB     59
                DO 500 N=2,IYEAR                                                DCFSUB     60
60              DCF(N)=CF(N)*PV(N-1)                                            DCFSUB     61
                SUM=SUM+DCF(N)                                                  DCFSUB     62
 500          CONTINUE                                                         DCFSUB     63
  70          K=ABS(SUM)-9000.                                                 DCFSUB     64
C                                                                               DCFSUB     65
65          C     IF CURRENT AND SECOND TO LAST SUMS ARE THE SAME, VALUES NEEDED DCFSUB     66
C           C     HAVE BEEN FOUND                                              DCFSUB     67
C           C                                                                  DCFSUB     68
                IF(KKK.EQ.K) GO TO 10                                           DCFSUB     69
                KKK=KK                                                          DCFSUB     70
70              RRR=RR                                                          DCFSUB     71
                KK=K                                                            DCFSUB     72
                RR=R                                                            DCFSUB     73
                ICNT=ICNT+1                                                     DCFSUB     74
C                                                                               DCFSUB     75
75          C     WRITE VALUES OF R AND K EVERY TENTH ITERATION CYCLE          DCFSUB     76
C           C                                                                  DCFSUB     77
                IF(MOD(ICNT,10).NE.0) GO TO 75                                  DCFSUB     78
                WRITE(6,101) R,K                                                DCFSUB     79
  75          CONTINUE                                                         DCFSUB     80
80          C                                                                   DCFSUB     81
C           C     VALUES NEEDED HAVE BEEN FOUND IF K IS NEAR ZERO OR NEGATIVE  DCFSUB     82
C           C                                                                  DCFSUB     83
                IF(K.LE.1.E-32) GO TO 20                                        DCFSUB     84
C                                                                               DCFSUB     85
85          C     INCREMENT R FOR NEXT ITERATION CYCLE                         DCFSUB     86
C           C                                                                  DCFSUB     87
                IF (SUM) 60,20,30                                               DCFSUB     88
C           C     ASSUME DELTA R                                               DCFSUB     89
 60             R=R-0.001                                                       DCFSUB     90
90              GO TO 80                                                        DCFSUB     91
 30             R=R+0.001                                                       DCFSUB     92
C                                                                               DCFSUB     93
C           C     TRANSFER TO PERFORM NEXT ITERATION CYCLE                     DCFSUB     94
C           C                                                                  DCFSUB     95
95           80   GO TO 40                                                     DCFSUB     96
C                                                                               DCFSUB     97
C           C     SELECT PROPER VALUE FOR R WHEN DONE                          DCFSUB     98
C           C                                                                  DCFSUB     99
  10          CONTINUE                                                        DCFSUB    100
100             IF(KKK-KK) 120,130,130                                          DCFSUB    101
  120           R=RRR                                                         DCFSUB    102
                GO TO 20                                                        DCFSUB    103
  130           R=RR                                                          DCFSUB    104
C                                                                               DCFSUB    105
105         C     CALCULATE DISCOUNTED CASHFLOW SUM AND WRITE FINAL VALUES FOR DCFSUB    106
C           C     R AND K                                                      DCFSUB    107
C           C                                                                  DCFSUB    108
 20             CSDCF(1)=CF(1)                                                  DCFSUB    109
                DO 100 N=2,IYEAR                                                DCFSUB    110
110             CSDCF(N)=DCF(N)+CSDCF(N-1)                                      DCFSUB    111
  100           CONTINUE                                                        DCFSUB    112
                WRITE(6,101) R,K                                                DCFSUB    113
  101           FORMAT(2F20.7)                                                  DCFSUB    114
                RETURN                                                          DCFSUB    115
```

```
115                 END
```

DCFSUB 116

```
      SUBROUTINE OUTPUT                                                 OUTPUT     2
C                                                                       OUTPUT     3
C     PRINT FINAL OUTPUT TABLES SUMMARIZING AIR CARRIER MODULE          OUTPUT     4
C     OPERATIONS                                                        OUTPUT     5
C                                                                       OUTPUT     6
      DIMENSION AREV(25,100),CF(25),COST(25,100),                       OUTPUT     7
     1DCF(25),DEPR(25,100),EBIAT(25,100),EBT(25,100),ECLIFE(100),       OUTPUT     8
     2INCTAX(25,100),INTINV(25,100),NTEARN(25,100),OPCOST(25,100),      OUTPUT     9
     3PRIN(25,100),PV(25),RES(100),RRATE(100),SALVAG(25,100),           OUTPUT    10
     4STDEP(25,100),YNTRST(25,100),                                     OUTPUT    11
     5SAREV(25),SSALVG(25),SINTIN(25),SPRIN(25),SOPCST(25),SDEPR(25),   OUTPUT    12
     6SSTDEP(25),SEBIAT(25),SYNTRS(25),SEBT(25),SINCTX(25),SNTERN(25),  OUTPUT    13
     7DEPREC(25),PRICE(25,100),CSDCF(25),                               OUTPUT    14
     8SEXP(25),SINCOM(25),CG(25,100),BVALUE(25,100),SCG(25),            OUTPUT    15
     9CGTX(25,100),SCGTX(25)                                            OUTPUT    16
      LEVEL 2,                                                          OUTPUT    17
      X         AREV,     CF,       CSAREV,   CSCF,     CSDCF,  CSDEPR, OUTPUT    18
     1CSEBIT,   CSEBT,    CSINTI,   CSINTX,   CSNTRN,   CSOPCT, CSPRIN, OUTPUT    19
     2CSYNTR,   DCF,      DEPR,     DEPREC,   EBIAT,    EBT,    ECLIFE, OUTPUT    20
     3I,        INCTAX,   INTINV,   IYEAR,    NAC,      NTEARN, OPCOST, OUTPUT    21
     4PRIN,     PV,       R,        SALVAG,   SAREV,    SDEPR,  SEBIAT, OUTPUT    22
     5SEBT,     SINCTX,   SINTIN,   SNTERN,   SOPCST,   SPRIN,  SSALVG, OUTPUT    23
     6SSTDEP,   STDEP,    SYNTRS,   YNTRST,                             OUTPUT    24
     7COST,     PRICE,    RES,      RRATE,    TXRATE,                   OUTPUT    25
     8BVALUE                                                            OUTPUT    26
      COMMON/IN/AREV,     CF,       CSAREV,   CSCF,     CSDCF,  CSDEPR, OUTPUT    27
     1CSEBIT,   CSEBT,    CSINTI,   CSINTX,   CSNTRN,   CSOPCT, CSPRIN, OUTPUT    28
     2CSYNTR,   DCF,      DEPR,     DEPREC,   EBIAT,    EBT,    ECLIFE, OUTPUT    29
     3I,        INCTAX,   INTINV,   IYEAR,    NAC,      NTEARN, OPCOST, OUTPUT    30
     4PRIN,     PV,       R,        SALVAG,   SAREV,    SDEPR,  SEBIAT, OUTPUT    31
     5SEBT,     SINCTX,   SINTIN,   SNTERN,   SOPCST,   SPRIN,  SSALVG, OUTPUT    32
     6SSTDEP,   STDEP,    SYNTRS,   YNTRST,                             OUTPUT    33
     7COST,     PRICE,    RES,      RRATE,    TXRATE,                   OUTPUT    34
     8BVALUE                                                            OUTPUT    35
      REAL INTINV, INCTAX, NTEARN                                       OUTPUT    36
C                                                                       OUTPUT    37
C     WRITE FIRST OUTPUT PAGE                                           OUTPUT    38
C                                                                       OUTPUT    39
      WRITE (6,100)                                                     OUTPUT    40
  100 FORMAT(1H1,*YEAR*,9X,*ANNUAL*,16X,*INVESTMENT*,15X,*OPERATING*,   OUTPUT    41
     15X,*DEPRECIATION*,2X,*EARNING BEFORE*,6X,*INTEREST*)              OUTPUT    42
      WRITE (6,101)                                                     OUTPUT    43
  101 FORMAT(1H ,13X,*REVENUE*,10X,*INITIAL*,4X,*PRINCIPAL PAY*,9X,     OUTPUT    44
     1*COST*,21X,*INTEREST AND TAX*)                                    OUTPUT    45
      WRITE (6,102)                                                     OUTPUT    46
  102 FORMAT(1H ,15X,*($)*,14X,*($)*,11X,*($)*,14X,*($)*,12X,*($)*,14X, OUTPUT    47
     1*($)*,13X,*($)*)                                                  OUTPUT    48
      DO 20 N=1,IYEAR                                                   OUTPUT    49
      WRITE (6,300) N,SAREV(N),SINTIN(N),SPRIN(N),SOPCST(N),            OUTPUT    50
     1DEPREC(N),SEBIAT(N),SYNTRS(N)                                     OUTPUT    51
  300 FORMAT(1HO,I4,6X,F13.2,4X,F12.2,3X,F12.2,4X,F12.2,4X,F12.2,4X,    OUTPUT    52
     1F12.2,4X,F12.2)                                                   OUTPUT    53
   20 CONTINUE                                                          OUTPUT    54
      WRITE (6,104)                                                     OUTPUT    55
  104 FORMAT(1H0,10X,13(1H-),4X,12(1H-),3X,12(1H-),4X,12(1H-),4X,       OUTPUT    56
     112(1H-),4X,12(1H-),4X,12(1H-))                                    OUTPUT    57
      WRITE (6,105) CSAREV,CSINTI,CSPRIN,CSOPCT,CSDEPR,CSEBIT,CSYNTR   OUTPUT    58
```

```
      105 FORMAT(1HO,*TOTALS*,4X,F13.2,3X,F13.2,2X,F13.2,3X,F13.2,3X,F13.2,     OUTPUT     59
     13X,F13.2,3X,F13.2)                                                       OUTPUT     60
60          C                                                                  OUTPUT     61
            C     WRITE SECOND OUTPUT PAGE                                     OUTPUT     62
            C                                                                  OUTPUT     63
            WRITE (6,200)                                                      OUTPUT     64
      200 FORMAT(1H1, *YEAR*,8X,*EARNINGS*,10X,*INCOME*,11X,*NET*,11X,         OUTPUT     65
65   1*NET CASH*,5X,*DISCOUNT*,6X,*DISCOUNTED*,16X,*NPV*)                      OUTPUT     66
            WRITE (6,201)                                                      OUTPUT     67
      201 FORMAT(1H ,11X,*BEFORE TAX*,11X,*TAX*,10X,*EARNINGS*,10X,*FLOW*,     OUTPUT     68
     18X,*FACTOR*,8X,*CASH FLOW*)                                              OUTPUT     69
            WRITE (6,202) R                                                    OUTPUT     70
70    202 FORMAT(1H ,14X,*($)*,15X,*($)*,12X,*($)*,13X,*($)*,7X,               OUTPUT     71
     1*ROI=*,F6.3,9X,*($)*,20X,*($)*)                                          OUTPUT     72
            N=1                                                                OUTPUT     73
            WRITE(6,399) N,SEBT(N),SINCTX(N),SNTERN(N),CF(N),DCF(N),CSDCF(N)   OUTPUT     74
      399 FORMAT(1HO,I4,F18.2,3F16.2,3X,9H   1.0000,F17.2,F22.2)               OUTPUT     75
75          DO 30 N=2,IYEAR                                                    OUTPUT     76
            NN=N-1                                                             OUTPUT     77
            WRITE(6,400) N,SEBT(N),SINCTX(N),SNTERN(N),CF(N),PV(NN),DCF(N),    OUTPUT     78
     1CSDCF(N)                                                                 OUTPUT     79
      400 FORMAT(1HO,I4,6X,E12.2,3F16.2,F12.4,F17.2,F22.2)                     OUTPUT     80
80     30 CONTINUE                                                            OUTPUT     81
            WRITE (6,204)                                                      OUTPUT     82
      204 FORMAT(1HO,10X,12(1H-),4X,12(1H-),4X,12(1H-),4X,12(1H-),17X,         OUTPUT     83
     112(1H-))                                                                 OUTPUT     84
            WRITE (6,205) CSEBT,CSINTX,CSNTRN,CSCF,CSDCF(IYEAR)                OUTPUT     85
85    205 FORMAT(1HO,*TOTALS*,3X,E13.2,F16.2,3X,E13.2,F16.2,12X,F17.2)         OUTPUT     86
            RETURN                                                             OUTPUT     87
            END                                                                OUTPUT     88
```

```
      SUBROUTINE TAX                                                    TAX       2
C                                                                       TAX       3
C     CALCULATE EFFECTS OF LOSS CARRIED BACKWARDS AND FORWARDS.         TAX       4
C     ALSO CAPITAL GAINS TREATMENT                                      TAX       5
C                                                                       TAX       6
      DIMENSION AREV(25,100),CF(25),COST(25,100),                       TAX       7
     1DCF(25),DEPR(25,100),EBIAT(25,100),EBT(25,100),ECLIFE(100),       TAX       8
     2INCTAX(25,100),INTINV(25,100),NTEARN(25,100),OPCOST(25,100),      TAX       9
     3PRIN(25,100),PV(25),RES(100),RRATE(100),SALVAG(25,100),           TAX      10
     4STDEP(25,100),YNTRST(25,100),                                     TAX      11
     5SAREV(25),SSALVG(25),SINTIN(25),SPRIN(25),SOPCST(25),SDEPR(25),   TAX      12
     6SSTDEP(25),SEBIAT(25),SYNTRS(25),SEBT(25),SINCTX(25),SNTERN(25),  TAX      13
     7DEPREC(25),PRICE(25,100),CSDCF(25),                               TAX      14
     8SEXP(25),SINCOM(25),CG(25,100),BVALUE(25,100),SCG(25),            TAX      15
     9CGTX(25,100),SCGTX(25)                                            TAX      16
      LEVEL 2,                                                          TAX      17
     X          AREV,     CF,       CSAREV,   CSCF,     CSDCF,  CSDEPR, TAX      18
     1CSEBIT,   CSEBT,    CSINTI,   CSINTX,   CSNTRN,   CSOPCT, CSPRIN, TAX      19
     2CSYNTR,   DCF,      DEPR,     DEPREC,   EBIAT,    EBT,    ECLIFE, TAX      20
     3I,        INCTAX,   INTINV,   IYEAR,    NAC,      NTEARN, OPCOST, TAX      21
     4PRIN,     PV,       R,        SALVAG,   SAREV,    SDEPR,  SEBIAT, TAX      22
     5SEBT,     SINCTX,   SINTIN,   SNTERN,   SOPCST,   SPRIN,  SSALVG, TAX      23
     6SSTDEP,   STDEP,    SYNTRS,   YNTRST,                            TAX      24
     7COST,     PRICE,    RES,      RRATE,    TXRATE,                  TAX      25
     8BVALUE                                                            TAX      26
      LEVEL 2,CG,CGTX                                                   TAX      27
      COMMON/IN/AREV,     CF,       CSAREV,   CSCF,     CSDCF,  CSDEPR, TAX      28
     1CSEBIT,   CSEBT,    CSINTI,   CSINTX,   CSNTRN,   CSOPCT, CSPRIN, TAX      29
     2CSYNTR,   DCF,      DEPR,     DEPREC,   EBIAT,    EBT,    ECLIFE, TAX      30
     3I,        INCTAX,   INTINV,   IYEAR,    NAC,      NTEARN, OPCOST, TAX      31
     4PRIN,     PV,       R,        SALVAG,   SAREV,    SDEPR,  SEBIAT, TAX      32
     5SEBT,     SINCTX,   SINTIN,   SNTERN,   SOPCST,   SPRIN,  SSALVG, TAX      33
     6SSTDEP,   STDEP,    SYNTRS,   YNTRST,                            TAX      34
     7COST,     PRICE,    RES,      RRATE,    TXRATE,                  TAX      35
     8BVALUE                                                            TAX      36
      COMMON/CG/CG                                                      TAX      37
      COMMON/CGTX/CGTX                                                  TAX      38
      REAL INTINV,INCTAX,NTEARN                                         TAX      39
C     EVALUATING LOSSES AND CARRYING THEM FORWARD AND BACKWARDS,        TAX      40
C     DETERMINING CAPITAL GAINS TAX AND READJUSTING NET EARNINGS,       TAX      41
C     AND INCOME TAX APPROPRIATELY                                      TAX      42
C                                                                       TAX      43
C     PARAMETER INITIALIZATION                                          TAX      44
C                                                                       TAX      45
      DO 20 N=1,IYEAR                                                   TAX      46
      SEXP(N)= SOPCST(N)+DEPREC(N)+SYNTRS(N)                            TAX      47
C     SINCOM SAME AS SEBT                                               TAX      48
      SINCOM(N)=SAREV(N)-SEXP(N)                                        TAX      49
   20 CONTINUE                                                          TAX      50
C                                                                       TAX      51
C     START OF LOOP TO CALCULATE LOSS CARRIED BACKWARDS AND FORWARD.    TAX      52
C     ROUTINE STOPS IF A YEAR WITH NET POSITIVE INCOME IS FOUND FOR     TAX      53
C     EACH AIRCRAFT                                                     TAX      54
C                                                                       TAX      55
      DO 400 N=1,IYEAR                                                  TAX      56
      IF(SINCOM(N).GT.0.0) GO TO 300                                    TAX      57
      ALOSS=SINCOM(N)                                                   TAX      58
```

```
      C     WE CAN CARRY THE LOSS BACK 3 YEARS & FORWARD 5 YEARS AND MODIFY    TAX        59
      C     SEBT                                                               TAX        60
   60         IF(N.LT.2) GO TO 200                                            TAX        61
              IF(N.EQ.2) GO TO 25                                             TAX        62
              IF(N.EQ.3) GO TO 35                                             TAX        63
              IF(N.GE.4) GO TO 45                                             TAX        64
      C                                                                       TAX        65
   65 C     SPECIAL CARRY BACK CASE - YEAR=2                                   TAX        66
      C                                                                       TAX        67
    25        K=N-1                                                          TAX        68
              IF (SINCOM(K).LE.0.0) GO TO 14                                  TAX        69
              SINCOM(K)=SINCOM(K)+ALOSS                                       TAX        70
   70         ALOSS=SINCOM(K)                                                 TAX        71
    14        IF(ALOSS.GE.0.0)GO TO 300                                       TAX        72
              IF(ALOSS.LT.0.0) GO TO 200                                      TAX        73
      C                                                                       TAX        74
      C     SPECIAL CARRY BACK CASE - YEAR=3                                  TAX        75
   75 C                                                                       TAX        76
    35        M=N-2                                                          TAX        77
              L=N-1                                                          TAX        78
              DO 50 K=M,L                                                    TAX        79
              IF (SINCOM(K).LE.0.0) GO TO 1000                               TAX        80
   80         SINCOM(K)=SINCOM(K)+ALOSS                                       TAX        81
              ALOSS=SINCOM(K)                                                TAX        82
    1000      IF(ALOSS.GE.0.0)GO TO 300                                      TAX        83
    50        CONTINUE                                                       TAX        84
              IF(ALOSS.LT.0.0) GO TO 200                                     TAX        85
   85 C                                                                       TAX        86
      C     GENERAL CARRY BACKWARD CASE                                       TAX        87
      C                                                                       TAX        88
    45        M=N-3                                                          TAX        89
              L=N-1                                                          TAX        90
   90         DO 60 K=M,L                                                    TAX        91
              IF (SINCOM(K).LE.0.0) GO TO 2000                               TAX        92
              SINCOM(K)=SINCOM(K)+ALOSS                                      TAX        93
              ALOSS=SINCOM(K)                                                TAX        94
    2000      IF(ALOSS.GE.0.0)GO TO 300                                      TAX        95
   95         60   CONTINUE                                                  TAX        96
              IF(ALOSS.LT.0.0) GO TO 200                                     TAX        97
      C                                                                       TAX        98
      C     LOSS CARRY FORWARD PORTION                                        TAX        99
      C                                                                       TAX       100
  100          200  M=N+1                                                    TAX       101
               IF(M-15)16,17,17                                              TAX       102
    16         L=N+5                                                         TAX       103
               IF(L-15)18,19,19                                              TAX       104
    17         M=IYEAR                                                       TAX       105
  105          19   L=IYEAR                                                  TAX       106
    18         DO 70 K=M,L                                                   TAX       107
               IF(SINCOM(K).LE.0.0) GO TO 70                                 TAX       108
               SINCOM(K)=SINCOM(K)+ALOSS                                     TAX       109
               ALOSS=SINCOM(K)                                               TAX       110
  110          IF(SINCOM(K).LT.0.0) SINCOM(K)=0.0                            TAX       111
    70         CONTINUE                                                      TAX       112
    400        CONTINUE                                                      TAX       113
      C                                                                       TAX       114
      C     LOSS TREATMENT COMPLETED - UPDATE EARNINGS AND TAXES              TAX       115
```

```
      C                                                                 TAX     116
       300  DO 80 N=1,IYEAR                                            TAX     117
            SEBT(N)=SINCOM(N)                                           TAX     118
            SINCTX(N)=0.0                                               TAX     119
       80   CONTINUE                                                    TAX     120
            DO 90 N=1,IYEAR                                             TAX     121
            SNTERN(N)=SEBT(N)                                           TAX     122
            IF(SEBT(N).LT.0.0) GO TO 90                                 TAX     123
            SNTERN(N)=SEBT(N)-SEBT(N)*TXRATE                            TAX     124
            SINCTX(N)=SINCTX(N)+SEBT(N)*TXRATE                          TAX     125
       90   CONTINUE                                                    TAX     126
            DO 99 L=2,IYEAR                                             TAX     127
            M=L-1                                                       TAX     128
            DEPREC(L)=DEPREC(L)+DEPREC(M)                               TAX     129
       99   CONTINUE                                                    TAX     130
      C                                                                 TAX     131
      C     CALCULATE CAPITAL GAINS TREATMENT                           TAX     132
      C                                                                 TAX     133
      C     LONG TERM CAPITAL GAINS TAX                                 TAX     134
            DO 11 J=1,NAC                                               TAX     135
            M=ECLIFE(J)-1                                               TAX     136
            DO 75 L=1,M                                                 TAX     137
      C     ASSUME SALVAGE VALUE  ZERO                                  TAX     138
            SALVAG(L,J)=0.0                                             TAX     139
       75   CONTINUE                                                    TAX     140
            M=ECLIFE(J)                                                 TAX     141
            SALVAG(L,J) =PRICE(1,J)*RES(J)                              TAX     142
            DO 11 N=1,IYEAR                                             TAX     143
            SSALVG(N)=0.0                                               TAX     144
            SSALVG(N)=SALVAG(N,J)+SSALVG(N)                             TAX     145
       11   CONTINUE                                                    TAX     146
      C     CAPITAL GAINS=CG                                            TAX     147
       77   DO 111 L=1,IYEAR                                           TAX     148
            DO 111 J=1,NAC                                              TAX     149
            CG(L,J)=0.0                                                 TAX     150
            CG(IYEAR,J)=PRICE(1,J)*RES(J)                               TAX     151
            CGTX(L,J)=0.0                                               TAX     152
            IF(CG(L,J).LE.0.0) GO TO 333                                TAX     153
            IF(CG(L,J).GE.25000.0) GO TO 66                             TAX     154
            IF(CG(L,J).LT.25000.0) GO TO 44                             TAX     155
       66   CGTAX=0.30                                                  TAX     156
            GO TO 3                                                     TAX     157
       44   CGTAX=0.22                                                  TAX     158
            GO TO 3                                                     TAX     159
       333  CGTAX=0.0                                                   TAX     160
        3   CGTX(L,J)=CGTAX*CG(L,J)                                     TAX     161
            CG(L,J)=CG(L,J)-CGTX(L,J)                                   TAX     162
       111  CONTINUE                                                    TAX     163
      C                                                                 TAX     164
      C     UPDATE CUMULATIVE SUMS                                      TAX     165
      C                                                                 TAX     166
            DO 88 N=1,IYEAR                                             TAX     167
            SCG(N)=0.0                                                  TAX     168
            SCGTX(N)=0.0                                                TAX     169
            DO 88 J=1,NAC                                               TAX     170
            WRITE(6,8) CG(N,J)                                          TAX     171
        8   FORMAT(* CG = *,  E12.4)                                    TAX     172
```

```
                    SCG(N)=CG(N,J)+SCG(N)                                   TAX       173
                    SCGTX(N)=CGTX(N,J)+SCGTX(N)                             TAX       174
                 88 CONTINUE                                                TAX       175
175              55 DO 99 N=1,IYEAR                                         TAX       176
                    SNTERM(N)=SNTERM(N)+SCG(N)                              TAX       177
                    SINCTX(N)=SINCTX(N)+SCGTX(N)                            TAX       178
                 99 CONTINUE                                                TAX       179
                    CSEBT=0.0                                               TAX       180
180                 DO 102 N=1,IYEAR                                        TAX       181
                    CSEBT=SEBT(N)+CSEBT                                     TAX       182
                 102 CONTINUE                                               TAX       183
                    CSNTRM=0.0                                              TAX       184
                    DO 122 N=1,IYEAR                                        TAX       185
185                 CSNTRM=SNTERM(N)+CSNTRM                                 TAX       186
                 122 CONTINUE                                               TAX       187
                    CSINTX=0.0                                              TAX       188
                    DO 112 N=1,IYEAR                                        TAX       189
                    CSINTX=SINCTX(N)+CSINTX                                 TAX       190
190                 112 CONTINUE                                            TAX       191
                    RETURN                                                  TAX       192
                    END                                                     TAX       193
```

Appendix F

COSMIC SOFTWARE SUBMITTAL INFORMATION

Appendix F

COSMIC SOFTWARE SUBMITTAL INFORMATION

Abstract

The Analysis of the Benefits and Costs of Aeronautical Research and Technology (ABC-ART) models have been developed by NASA for use in analyzing the economic feasibility of applying advanced aeronautical technology to future civil aircraft. The methodology is composed of three major modules: Fleet Accounting Module, Airframe Manufacturer Module, and Air Carrier Module.

The Fleet Accounting Module is used to estimate the number of new aircraft required as a function of time to meet demand. This estimation is based primarily upon the expected retirement age of existing aircraft and the expected change in revenue passenger miles demanded. Fuel consumption estimates are also generated by this module. The Airframe Manufacturer Module is used to analyze the feasibility of manufacturing the new aircraft demanded. The module includes logic for production scheduling and estimating manufacturing costs. For a series of aircraft selling prices, a cash flow analysis is performed and a rate of return on investment is calculated. The Air Carrier Module provides a tool for analyzing the financial feasibility of an airline purchasing and operating the new aircraft. This module includes a methodology for computing the air carrier direct and indirect operating costs, performing a cash flow analysis, and estimating the internal rate of return on investment for a set of aircraft purchase prices.

The ABC-ART models are exercised in two distinct job steps. The Fleet Accounting Module and Airframe Manufacturer Module are run in one job step. The Air Carrier Module is run in a second job step. The modules are

designed for batch processing. Hardware requirements include a card reader, a printer, and disk storage. In addition, plotter output is generated by the Fleet Accounting Module. The software is currently programmed for a ZETA 230 plotter. The models have been run of a CDC 7600 with the SCOPE 2.1.3 operating system. CPU time is very modest for either job step. However, core requirements are substantial. The first job step requires 132K octal words, the second requires 154K octal words small core memory plus 144K octal words of large core memory.

Method of Solution

The methodology embedded in the ABC-ART models is described in detail in Volume I of this report (NASA CR-152278). The methodology for the Fleet Accounting, Airframe Manufacturer, and Air Carrier Modules are described in Sections II, III, and IV, respectively.

Computer Configuration Required

The ABC-ART models have been run on the NASA AMES CDC 7600, with the SCOPE 2.1.3 operating system. The only required input device is a card reader. Required output devices include a printer, a plotter, and disk storage. The job step which exercises the Fleet Accounting and Airframe Manufacturer Modules requires a printer, a plotter (software is provided for the ZETA 230 plotter), and four output disk files, two for storage of data generated for the plotter and two for temporary storage of input data. The job step that exercises the Air Carrier Module requires only a printer and a card reader.

Memory Required

On the CDC 7600 there are two types of memory, small core memory (SCM) and large core memory (LCM)*. The Fleet Accounting and Airframe Manufacturer Modules require 132K octal words of SCM and no LCM. The Air Carrier Module requires 154K octal words of SCM and 144K words of LCM to run. Variables were placed in LCM using the LEVEL 2 conversion for the CDC 7600.

Source Language

The ABC-ART models are programmed in CDC FORTRAN extended 4 language. The reference manual for this language is CDC Publication Number 84000009. The ZETA 230 plotter software is written in the same language, except for a single COMPASS routine (less than 1% of the code). COMPASS can be compiled using the CDC FORTRAN compiler.

User Instructions

Instructions for use of ABC-ART models are provided in Volume I, Section V of this report where a sample run of the models is described.

Implementation Instructions

The software package is being submitted in the five data sets. Each data set consists of a single tape file except for the fifth data set, which is composed of four tape files. These files are described below:

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*On the NASA Ames computer system, 160K octal words of SCM and 1,200K octal works of LCM are available.

Data Sets	Tape File	Contents
1	1	FORTRAN source code for the Fleet Accounting and Airframe Manufacturer Modules (see Appendices C and D).
2	2	FORTRAN and COMPASS source code for the ZETA 230 plotter software.
3	3	FORTRAN source code for the Air Carrier Module (see Appendix E).
4	4	Data input for the sample run of the Air Carrier Module (see Volume I, Table 41).
5	5,6,7,8	Data input for sample run of the Fleet Accounting and Airframe Manufacturer Modules (see Volume I, Table 40).

The tape containing these files is an unlabeled, 9-track tape in the EBCDIC character set with a density of 1600 BPI. The logical records are in card image format, 80 characters in length with no blocking. The tape was written on a CDC 7600 computer in SCOPE stranger format (i.e., F=S). No job control language is included in any of the files.

Program Timing

The CPU time required to run the ABC-ART models is quite modest. It will vary with the problem analyzed, the main factor being the number of new aircraft types. The sample run of the ABC-ART models, described in Volume I, Section V, took 22 and 4 CPU seconds for the Fleet Accounting and Airframe Manufacturer modules and Air Carrier Module, respectively. This time includes 5 and 3 CPU seconds, respectively, for compilation.

Accuracy of Results

The ABC-ART system does not contain mathematical or statistical routines that are very sensitive to word size. Single precision calculations on the CDC 7600 use a 60-bit word which provides a high degree of accuracy in computed results.

Sample Input and Output

Volume I of this report provides sample input and resulting output. In Section V, the sample problem is described, including a listing of the card input. Excerpts from the resulting printed and plotted output for the Fleet Accounting, Airframe Manufacturer and Air Carrier Modules are provided in Sections II, III, and IV, respectively.

Flowcharts

Flowcharts of the logic of each of the routines in the ABC-ART models have been provided in Volume I of this report. Flowcharts for the Fleet Accounting, Airframe Manufacturer, and Air Carrier Modules are provided in Sections II, III, and IV, respectively.

Program Listing

Listings of the FORTRAN code for the ABC-ART models are provided in Volume II of this report. Program listings for the Fleet Accounting, Airframe Manufacturer, and Air Carrier Modules are provided in Appendices C, D, and E, respectively.