OUTSIDE USERS PAYLOAD MODEL

July, 1985

(NASA-CR-176011) OUTSIDE USERS PAYLOAD MODEL (Battelle Columbus Labs., Ohio.) 181 p HC A09/MF A01 CSCL 22A

N85-29986

Unclas G3/16 15637

to

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

from

BATTELLE'S COLUMBUS LABORATORIES

under

Contract Number NASw-3595

188

1985 OUTSIDE USERS PAYLOAD MODEL

Report to

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

by

BATTELLE'S COLUMBUS LABORATORIES

under

Contract Number NASw-3595

JULY 1985

FOREWORD

This document was prepared as part of Battelle-Columbus' activity on NASA Contract NASw-3595. The technical monitor for this portion of the contract was Mr. D. N. Turner of NASA Headquarters (Mail Code MCP; telephone 202/453-2400).

Principal Battelle contributors to this effort were:

Robert J. Conlon	614/424-5066	(FTS 976-5066)
John B. Day	614/424-5133	(FTS 976-5133)
Norman H. Fischer	614/424-5087	(FTS 976-5087)
Diana B. Neale	614/424-5077	(FTS 976-5077).

Additional support was provided by Connie Prouty.

It would not have been possible to prepare this report without the cooperation of many persons in both industry and government, and these contributions are gratefully acknowledged.

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued)

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

This 1985 Outside Users Payload Model is a continuation of such documents which have been prepared for NASA over a number of years. It replaces and supersedes the July 1984 edition. The time period covered by this model is 1985 through 2000.

The following sections contain:

- A definition of the scope of the model
- A discussion of the methodology used
- An overview of total demand
- A summary of the estimated market segmentation by launch vehicle
- A summary of the estimated market segmentation by user type
- Details of the STS market forecast
- A summary of transponder trends
- A model overview by mission category
- Detailed mission models
- Bibliography
- List of acronyms.

The model follows closely the format of the 1984 edition.

SCOPE

All known non-NASA, non-DOD reimbursable* payloads forecast to be flown by non-Soviet-bloc countries** are included in this model with the exception of Spacelab payloads and Small Self-Contained Payloads. Certain DOD-sponsored or co-sponsored payloads are included if they are reimbursable launches.

---

*Those payloads (i.e., JEA, SSIP, Cooperative) for which NASA provides free transportation in exchange for other considerations are not included.

**Payloads of the People's Republic of China are included in the model.

METHODOLOGY

A brief overview of the approach used in preparing the model is presented in this section.

Key Assumptions

Four major assumptions underlie all the work reported in this model. Additional specific assumptions for certain market areas are identified later in the report.

Assumption 1: There will be no revolutionary technical, economic, or social developments which will drastically alter current plans. While both "High" and "Low" planned projections are made (see following), the model does not attempt to encompass the full range of possible futures. Thus, major wars, drastic swings in the world economy, and totally unforeseen technological breakthroughs are not included. (Evolutionary technological improvements in both space-based and terrestrial technologies are considered in the development of the High and Low models.)

Assumption 2: Both Shuttle and Ariane are technologically successful and price competitive. Neither launch system has been trouble-free, and an extended period of down time for either could significantly impact overall launch schedules. As of the time of preparation of this document (Spring 1985), the STS launch price for FY 90 and beyond had not been established. Major disparities between STS and Ariane prices could lead to some customer shifts between the two vehicles. It appears very unlikely that total demand for launch of commercial communications satellites will be affected significantly by moderate changes in price.

Assumption 3: The impact of U.S. commercial expendable launch vehicles is not considered in this model. At the time this document was prepared, there were no known commitments to use these vehicles. The entry of such vehicles into the marketplace will likely have a negligible effect on total launch demand, but may affect the market shares of STS and Ariane. Although both the Soviet Union and mainland China have offered expendable launch vehicles commercially to Western and third-world countries, there have been no takers to date; it is too early to determine the effect of these offers.

Assumption 4: In the time frame of this model (1985-2000), the major impacts of Space Station are likely to be in the MPS area and should be reasonably bounded by the High and Low models. The planned initial operational capability date for Space Station is now around 1992. There is little interest in this activity in the communications satellite industry, and interest likely will not pick up until there is an operational capability with a demonstrated economic advantage. It appears that any economic advantage would come in the form of reduced requirements for launch services. Uncertainty in the MPS field is so great that a very wide range of possible demand is forecast. This range is believed adequate to cover a variety of operational scenarios. There may, however, be significant differences in the ways in which payloads are flown and MPS is accomplished when the Space Station becomes operational.

Nature of the Forecasts

The Outside Users Payload Model is created from the bottom up in the sense that data on discrete payloads are used to construct an overall demand model. The projections are based largely on information about specific transportation requirements of specific users of space transportation (e.g., INTELSAT) rather than on analysis of derived space transportation demand created by a given end-market demand (e.g., international telecommunications).

In general, the model is based only on demand and is not assumed to be capacity limited. However, in the near term, user plans may be based on projected available capacity and may to some extent be capacity limited.

Because both user plans and NASA needs are defined in terms of discrete payloads rather than average rates, this model also is expressed in terms of discrete payloads. In the near term, the data on the payloads themselves should be reasonably accurate. Near-term launch forecasts are the best available, but there has been a considerable history of slippage in all launch schedules.* Substantially more latitude should be given to the longer term forecasts. These might best be interpreted as indications of probable activity levels in appropriate time frames. At a minimum, it should not be inferred that the level of precision expressed in some of the tables is an indication of the accuracy of the forecasts.

While the models draw heavily on specific user plans for data, some adjustments have been made. These adjustments reflect the authors' judgments on such matters as the likelihood of achieving a stated schedule, the impact of total market demands on the viability of all the announced candidates to provide a given service, etc. In addition, adjustments in long-range demand are included in the form of follow-on and "market forecast" payloads. The follow-ons consist of payloads which may be used to replace and/or expand an existing service. Market forecasts are hypothetical payloads inserted in recognition of the fact that there will be additional long-term demand which has not yet been identified.

---

*Typically, the number of actual launches achieved in a given year represents about 70 percent of the launches scheduled at the beginning of that year.

"High" and "Low" Model Concepts

As in previous editions of this document, both "High" and "Low" models are presented. These two models are not intended to represent absolute bounds on any program or mission category, but it is believed that there is a reasonable likelihood that total activity will, on the average, fall within the indicated bounds. (Historically, the actual number of near-term launches has been much closer to the Low model forecasts than to those of the High one.) The two models thus define a range of potential demand which might be considered in making planning decisions.

Inherent in the High model are more optimistic assumptions of sustained growth in established demand and the early success of planned new activities; e.g., direct broadcasting and materials processing. In general, data included in this model are based on the authors' assessment of announced plans, with additional market forecast payloads included in later years. Few program delays are assumed, as is a lower level of market penetration by competing terrestrial technologies.

A reduction of the level of activity is assumed in the Low model. This could result from a variety of causes. Among them are slower growth in total demand; budgetary problems in government programs or financing problems in the private sector; technological improvements which allow demand to be met with smaller payloads or payloads with longer life; capture of a part of the total demand by a competing terrestrial technology; and unanticipated schedule slips.

No attempt is made to force the number of payloads in the Low model for any given year in a category to be lower than the number of payloads in the High model for the same year and same category. This results in an occasional anomaly where there may be more payloads in a given year in the Low model than in the High. One example of this can be found in Table 3 in the "Foreign Reg. Comm." line for the year 1993 which shows 7 launches in the High model; 8 in the Low. Hypothesized slips in launch schedules in the Low model is the explanation for this particular entry. The intent of the labels "High" and "Low" is to identify tendencies in the aggregate over the period covered by the OUPM; this is amply reflected by the total launches displayed at the end of the "Foreign Reg. Comm." row: High = 141, Low = 86.

Data Sources

A variety of data sources was used in preparation of the model. The opinions of spacecraft manufacturers and other aerospace firms, space system operators, NASA Shuttle mission planners, NOAA, and NASA launch vehicle planners were obtained. These contacts were made both by phone and in visits to the various organizations.

Additionally, data were obtained from the available literature (e.g., Aviation Week and Space Technology, Satellite Week, and Interspace). Other models and projections of future traffic and related areas (e.g., on-orbit transponder requirements) were reviewed for additional data and insights into future space activity. Projected launch schedules for the Shuttle, Atlas/Centaur, Delta, and Ariane were used as guidelines for the early years of the model. A list of data sources is provided in Appendix B.

With the wide variety of data inputs and the continually changing plans of the various organizations involved, there are, as would be expected, a number of conflicts. Where possible, these conflicts are resolved via direct contact with the user organization. In other cases, judgment is used to resolve the conflicts. Since the data inputs reflect plans and intentions of the organizations, some judgments are made as to the validity of the schedules and the potential for schedule slips.

Estimation of Equivalent Shuttle Flights

Because the primary objective of this document is to provide information to Shuttle planners, an attempt is made to characterize all payloads in terms of equivalent Shuttle flights. The payloads included in the OUPM vary widely in size, weight, shape, destination, and are scheduled to be launched on a number of different launch vehicles, so the conversion is not necessarily a straightforward one.

For Shuttle payloads, the equivalent portion of a Shuttle flight is based on the estimated load factor as defined in existing reimbursement policies. Where both the length and weight of the payload are known, both length and weight load factors are computed and the larger is used. Computation of the weight load factor is based on advertised Shuttle capability to the intended orbit (e.g., 65,000 lbs to 28.5°/160 nm, 32,000 lbs to 90°/160 nm). For payloads not yet well defined, estimated Shuttle payload weight is used as the basis for computing load factor on the assumption that these payloads likely will be Shuttle-optimized such that length and weight load factors are essentially identical.

The construction of the Shuttle equivalent load factors for payloads designed exclusively for flight on other launch vehicles is based on determining the weight of a Shuttle cargo which could place the same spacecraft weight in geosynchronous transfer orbit as the launch vehicle in question. For each vehicle, the maximum capability of the launcher is used as opposed to the weight of a specific payload. In translating payload capability of a specific expendable launch vehicle to an equivalent Shuttle load factor, an equivalent Shuttle cargo weight is determined by assuming a PKM with a I_{sp} of 285 seconds, an expended mass fraction of 0.91 (typical of a solid motor), and a cradle factor of 0.2. An additional correction is made to account for differences in launch site. A minimum equivalent load factor of 0.05 is assumed since this is the minimum STS charge factor. The resulting load factors based on these assumptions are shown in Table 1.

TABLE 1. EQUIVALENT SHUTTLE LOAD FACTORS FOR VARIOUS EXPENDABLE LAUNCH VEHICLES[a]

Launch Vehicle	Payload to Geosynchronous Transfer, lbs	Equivalent Shuttle Load Factor
Delta 3914	2070	0.11
Delta 3924	2470	0.13
Delta 3910/PAM	2450	0.13
Delta 3920/PAM	2840	0.14
Atlas-F	--	0.25[b]
Atlas-G Centaur	5200	0.27
Scout	--	0.05[c]
M-3S	--	0.05[c]
N-II	1500	0.08
H-Ia	2370	0.12
H-II	7800	0.50
Ariane 1	3750	0.22
Ariane 2	4630	0.27
Ariane 3	5500	0.32
Ariane 4	4200-9250	0.24-0.53
SLV-3	--	0.05[c]
ASLV	--	0.05[c]
PSLV	--	0.10
CZ-3	3800	0.19
C-1	--	0.10
Conestoga	--	0.05[c]
	<u>Dual Launch</u>	
Ariane 1	1720	0.10
Ariane 2	2200	0.13
Ariane 3	2640	0.15
Ariane 4	4280[d]	0.24

(a) See text for assumptions.
(b) Based on equivalent capability to LEO.
(c) Set to minimum Shuttle load factor used for reimbursement purposes.
(d) Obtained by subtracting the weight of the long SPELDA Dual Launch System (800 lb) from the Ariane 4 maximum payload weight and dividing by 2.

Shuttle load factors for dual-compatible payloads are based on the load factor of the payload as configured for Shuttle flights.

Once the equivalent Shuttle load factor is computed for each payload, this is converted into equivalent Shuttle flights in the same way that the Shuttle charge factor is computed from the load factor. If the payload's load factor is 0.75 or less, the Shuttle flight equivalent is computed by dividing the load factor by 0.75. If the load factor is greater than 0.75, the Shuttle flight equivalent is set to 1.0.

The method of computing equivalent Shuttle flights has a significant impact on the apparent demand. For example, implicit in this approach is the assumption that the Shuttle is capable of carrying almost five PAM-D class payloads. While it might be argued that this is an overstatement of Shuttle capability, the approach is consistent with current shared-flight reimbursement practices. To the extent that this approach overstates capacity, the mission models understate demand in terms of equivalent Shuttle flights.

OVERVIEW OF TOTAL DEMAND

This section presents a brief overview of total demand. Specific details and rationale are contained in later sections.

Comparison of 1984 and 1985 Models

Table 2 provides a summary comparison of the 1984 and 1985 models. It shows significant decreases in the number of payloads in both High and Low models.

The number of payloads in the High model has decreased by almost 12 percent, but the number of equivalent STS flights in the same model has decreased by less than 1.5 percent. The payload count is lower primarily because of reductions in the numbers of communications satellites being projected for the 16-year period of the OUPM. Reasons for these major reductions are presented in the sections containing discussions of these three mission categories. The number of equivalent STS flights is not similarly impacted because of the addition of about 19 STS flights in the materials processing category. More than half of these are attributable to adding CY 2000 to the model and dropping CY 1984 (there were no MPS payloads in 1984; there are enough predicted for 2000 to require nearly 10 STS flights). The rest have been added at various points in the detailed MPS model and are discussed later in this report.

The reduction in number of payloads in the Low model is also about 12 percent; however, the reduction in equivalent STS flights is 9.6 percent in this case. Again, major decreases in the number of communications satellites are responsible for virtually the entire loss of payload count in the Low model. In this model, however, the MPS category is not nearly so dominant as in the High model; thus, there is a much more significant loss of equivalent STS launches.

TABLE 2. COMPARISON OF 1984 AND 1985 MODELS

Mission Categories	High Model: Number of Payloads '84	High Model: Number of Payloads '85	High Model: Equivalent STS Flights(1) '84	High Model: Equivalent STS Flights(1) '85	Low Model: Number of Payloads '84	Low Model: Number of Payloads '85	Low Model: Equivalent STS Flights(1) '84	Low Model: Equivalent STS Flights(1) '85
International Communications	74	59	32	25	50	36	19	14
U.S. Domestic Communications	163	111	45	38	97	69	26	21
Foreign Regional Communications	170	141	49	42	98	86	27	25
U.S. Geostationary Earth Observations	8	9	2	2	6	7	1	1
Foreign Geostationary Earth Observations	30	26	6	6	19	17	4	4
U.S. Low Earth Orbit Observations	42	25	9	6	14	15	4	4
Foreign Low Earth Orbit Observations	68	62	13	13	39	36	7	7
Navigation Aids	37	41	2	4	10	8	1	1
Foreign Planetary	10	10	3	3	7	6	2	2
Scientific/Technical Development	60	66	8	8	42	45	6	6
Materials Test/ Processing	149	166	56	75	46	52	7	7
Multiservice Spacecraft Vehicles	12	11	3	2	9	8	2	2
TOTALS(2)	823	727	227	224	437	385	104	94

(1) Based on assumed 75 percent (of advertised capacity) Shuttle load factor on shared flights, rounded to nearest flight.

(2) Equivalent flight totals are rounded totals, not totals of rounded values.

In most of the other mission categories, few dramatic changes have occurred. A brief category-by-category summary follows; details are provided in a later section.

International Communications

Significant decreases in both numbers of payloads and equivalent STS flights are shown in both High and Low models. These decreases are due primarily to two factors; a decrease in experienced and forecast growth for international communications and a major increase in announced fiber-optics communications capacity for both the Atlantic and Pacific Ocean regions. This capacity could take most, if not all, of any increased demand for international traffic in these regions.

U.S. Domestic Communications

Both High and Low models show drastic reductions of payloads when compared to the 1984 OUPM. These reductions are attributed to a variety of reasons: (1) delays in beginning new projects are due to difficulty in finding financing and delays in regulatory procedures; (2) there is no apparent great demand for new satellite communications capacity in the near future; (3) advances in fiber-optics technology and announced domestic fiber-optic communications capacity portend a low-growth future for satellites if the promise of fiber optics is fulfilled; (4) the direct-broadcast satellite segment of the market is apparently having difficulty defining a market, obtaining financing, and coping with pioneering an entirely new area of television delivery.

Both models also show decreases in equivalent STS flights, but the decreases are not so large, percentagewise, as the decreases in numbers of payloads. Although number of payloads declined about 30 percent in both models, the equivalent load factors declined only about 18 percent. This potentially indicates a modest trend to larger satellites.

Foreign/Regional Communications

As in International and U.S. Domestic Communications, there have been substantial reductions of payloads and equivalent STS launches in both the High and Low models. These changes are due to a number of reasons, the most substantial of which are: (1) reduction of projected Chinese satellites based on a clearer perception of their plans, (2) reduction of "market model" satellites, based on the likelihood of fewer of these unidentified entities being needed, and (3) projected capture of a portion of this communications market by alternative means of transmission.

U.S. Geostationary Earth Observation

The only changes from last year's model is the addition of one GOES satellite launch in each of the High and Low models in accordance with NOAA's current plans. Because of satellite size, these additions make no significant impact on the number of equivalent STS flights.

Foreign Geostationary Earth Observation

Changes in this category are minor and are the result of perceived small changes in the ESA and Japanese programs.

U.S. Low Earth Observation

The Low model shows negligible change from last year. The High model has been revised downward rather drastically to reflect the belief that commercial LEO projects, aside from the commercialized LANDSAT, are not likely to occur in the quantity included in last year's OUPM, if at all.

Foreign Low Earth Observation

The small decreases in payload numbers seen in this year's High and Low models are mainly due to reducing the numbers of satellite launches contained in the "market forecast" areas. Since these were relatively small payloads, their deletions had no discernible effect on the numbers of equivalent STS flights projected for this category.

Navigation Aids

The only changes in this category are the addition of a proposed geopositioning system in the High model, and the dropping of 1984 data and adding of CY 2000 data.

Foreign Planetary

There are no changes of significance in this category.

Scientific/Technical Development

There are minimal changes in this category. The payload changes that were made were occasioned by obtaining better definition of the ESA, Indian, and Japanese S/TD programs for the near and, particularly, medium term. These changes are not significant in changing the number of projected equivalent STS flights in either the High or Low model.

Materials Processing

In the Low model, several additional small payloads were added in the area of pharmaceutical research; these made no impact on the number of equivalent STS flights. In the High model, however, there have been large increases in both numbers of payloads and numbers of equivalent STS flights when compared to the 1984 OUPM. There is one major reason for these differences: in 1984, there were no materials processing payloads included in the model; CY 2000, added in the 1985 OUPM, contains two mature space production programs, each of which accounts for a number of very large payloads, as well as a variety of other programs with MPS payloads of varying size. Because MPS is still a very speculative program in terms of both viability and schedule, very large differences are shown between the High and Low models.

Multiservice Spacecraft

The model remains largely unchanged, save for addition of CY 2000 data and deletion of 1984 data.

Annual Demand

Cumulative total demand, in equivalent Shuttle flights, is portrayed in Figure 1. Table 3 presents a breakdown of forecast total payload demand by year for each mission category. This same demand is displayed in equivalent Shuttle flights in Table 4.

Near-term demand is almost the same in both High and Low models because virtually all launches in the first few years are essentially firm. (It is worth noting, however, that past major slips in both Shuttle and Ariane programs have resulted in the launch rate of previous Low models not being achieved. As in past models, this model assumes that no further such slips occur.) Divergence of the models with time is traceable to differences in rates of growth in virtually every payload category. Major contributors to the divergence are communications satellites and payloads dedicated to materials processing activity.

It is also noted in Tables 3 and 4 that communications satellite demand is somewhat cyclical, with a relatively high number of launches in a given period followed by a similar bulge about 10 years later as replacement satellites are launched. Some reasons for these cycles are discussed in a later section.

Table 5 presents total payload demand by type of user for readers desiring this information.

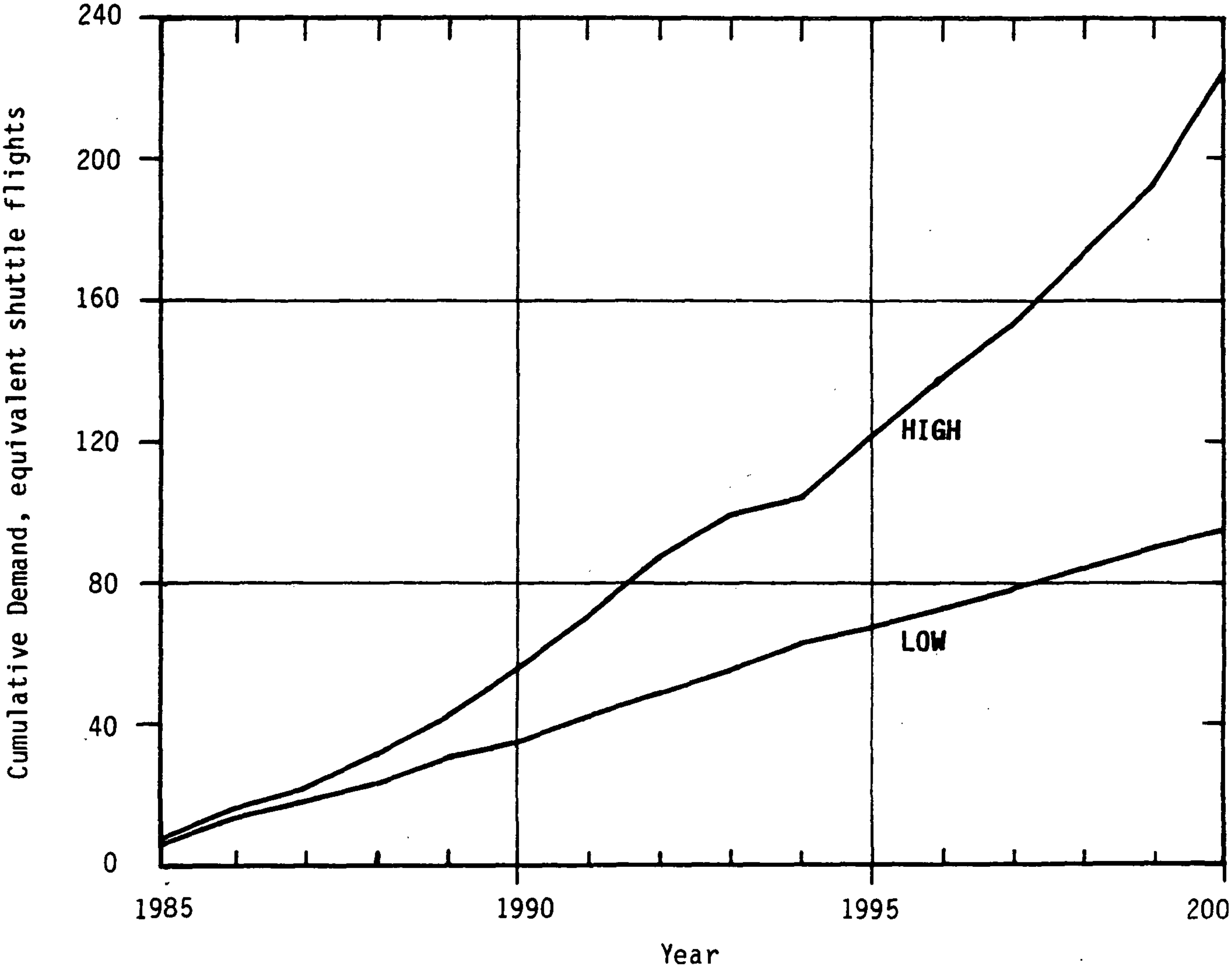


FIGURE 1. CUMULATIVE TOTAL DEMAND, EQUIVALENT SHUTTLE FLIGHTS [1]

[1] Based on assumed 75% (of advertised capacity) Shuttle load factor on shared flights.

TABLE 3. PAYLOAD DEMAND BY MISSION CATEGORY (1)

CATEGORY		LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL
INTERNATIONAL COMM	H	3	4	1	3	5	7	7	3	3	2	2	2	1	4	6	6	59
	L	3	2	2	1	4	4	3	3	3	1	0	0	1	1	4	4	36
U.S. DOMESTIC COMM	H	9	8	4	4	9	7	9	12	6	6	6	4	2	6	10	9	111
	L	9	7	4	3	2	4	3	6	4	4	5	4	7	2	3	2	69
FOREIGN REG COMM	H	10	10	6	8	9	9	12	10	7	8	12	10	10	8	5	7	141
	L	8	8	5	6	5	4	6	6	8	7	7	4	1	4	3	4	86
U.S. GEO OBS	H	0	2	0	0	1	1	0	1	0	1	1	0	0	0	1	1	9
	L	0	2	0	0	0	1	0	0	1	1	0	0	1	0	0	1	7
FOREIGN GEO OBS	H	0	1	1	1	1	2	1	2	0	3	3	1	4	2	2	2	26
	L	0	1	2	1	1	0	1	1	0	3	2	2	0	2	1	0	17
U.S. LEO OBS	H	1	1	1	2	1	1	2	2	2	1	2	2	1	2	3	1	25
	L	1	0	1	1	1	1	2	0	1	2	0	2	1	0	2	0	15
FOREIGN LEO OBS	H	1	4	1	4	2	3	5	6	1	3	7	7	3	6	3	6	62
	L	0	3	1	1	1	3	3	3	4	2	2	2	5	3	1	2	36
NAVIGATION AIDS	H	2	2	4	0	1	5	6	6	6	6	0	1	2	0	0	0	41
	L	0	0	0	2	0	2	0	2	0	2	0	0	0	0	0	0	8
FOREIGN PLANETARY	H	2	0	0	0	1	2	0	0	1	1	1	0	0	1	1	0	10
	L	1	1	0	0	0	0	1	0	0	0	1	0	1	1	0	0	6
SCI/TECHNICAL DEV	H	4	3	3	7	5	3	5	4	6	4	3	4	4	4	4	3	66
	L	1	4	0	2	6	2	3	3	3	4	3	2	2	3	3	4	45
MATERIALS PROCESS	H	0	1	1	2	7	4	9	10	10	15	15	14	20	17	20	21	166
	L	0	0	3	3	7	4	2	2	6	2	4	3	4	2	7	3	52
MULTISERVICE	H	0	1	0	1	1	1	0	2	1	0	1	0	1	0	1	1	11
	L	0	1	0	0	2	0	1	0	1	0	0	2	0	0	1	0	8
TOTAL	H	32	37	22	32	43	45	56	58	43	50	53	45	48	50	56	57	727
	L	23	29	18	20	29	25	25	26	31	28	24	21	23	18	25	20	385

(1) Includes all payloads in this model.

TABLE 4. EQUIVALENT SHUTTLE DEMAND BY MISSION CATEGORY (1,2)

	MODEL	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL
INTERNATIONAL COMM	H	1.08	1.80	.72	1.73	1.84	2.29	2.39	1.52	1.52	1.01	.71	1.23	.61	1.72	2.11	2.61	24.89
	L	1.08	.72	1.08	.72	1.93	1.03	1.48	1.23	1.27	.47	.00	.00	.47	.47	1.43	1.03	14.39
U.S. DOMESTIC COMM	H	2.60	2.03	1.20	1.36	2.75	2.07	3.17	4.68	2.44	2.11	2.65	1.97	.52	2.11	3.16	3.23	38.04
	L	2.60	1.79	1.28	.88	.56	.96	1.45	1.80	1.07	1.19	1.49	1.40	2.55	.65	.89	.56	21.12
FOREIGN REG COMM	H	2.08	2.65	2.20	2.68	2.53	2.96	3.60	2.45	2.24	2.48	3.15	3.19	2.89	2.48	1.49	2.48	41.56
	L	1.65	2.32	1.31	1.76	1.36	1.27	1.55	1.87	2.29	1.99	1.89	1.28	.31	1.75	1.15	1.55	25.28
U.S. GEO OBS	H	.00	.40	.00	.00	.20	.20	.00	.20	.00	.20	.20	.00	.00	.00	.28	.28	1.96
	L	.00	.40	.00	.00	.00	.20	.00	.00	.20	.20	.00	.00	.20	.00	.00	.20	1.40
FOREIGN GEO OBS	H	.00	.20	.20	.20	.16	.47	.20	.36	.00	.56	.71	.20	.89	.40	.49	.51	5.55
	L	.00	.20	.36	.20	.20	.00	.31	.16	.00	.69	.40	.51	.00	.40	.16	.00	3.59
U.S. LEO OBS	H	.33	.33	.33	.64	.33	.23	.53	.40	.53	.17	.53	.40	.31	.40	.71	.17	6.36
	L	.33	.00	.33	.33	.31	.33	.52	.00	.19	.49	.00	.37	.19	.00	.49	.00	3.89
FOREIGN LEO OBS	H	.24	.56	.20	.75	.39	.77	.99	1.21	.17	.63	1.72	1.47	.67	1.39	.51	1.43	13.08
	L	.00	.51	.16	.13	.20	.63	.47	.49	.88	.47	.29	.33	.92	.59	.29	.35	6.71
NAVIGATION AIDS	H	.13	.13	.27	.00	.20	.60	.40	.40	.40	.40	.00	.20	.40	.00	.00	.00	3.53
	L	.00	.00	.00	.13	.00	.13	.00	.13	.00	.13	.00	.00	.00	.00	.00	.00	.53
FOREIGN PLANETARY	H	.43	.00	.00	.00	.07	.49	.00	.00	.16	.33	.16	.00	.00	.71	.33	.00	2.68
	L	.36	.07	.00	.00	.00	.00	.16	.00	.00	.00	.33	.00	.16	.71	.00	.00	1.79
SCI/TECHNICAL DEV	H	.47	.20	.29	1.19	.53	.29	.67	.73	.76	.33	.40	.49	.47	.56	.40	.33	8.12
	L	.07	.47	.00	.23	.99	.33	.33	.27	.36	.80	.40	.20	.13	.49	.27	.67	6.00
MATERIALS PROCESS	H	.00	.13	.13	.45	1.96	2.13	3.12	3.83	4.40	6.41	7.20	7.00	9.61	9.07	10.13	9.92	75.51
	L	.00	.00	.59	.40	.93	.53	.27	.27	.99	.27	.53	.40	.53	.27	1.12	.40	7.49
MULTISERVICE	H	.00	.20	.00	.31	.13	.31	.00	.44	.31	.00	.13	.00	.13	.00	.13	.31	2.40
	L	.00	.20	.00	.00	.44	.00	.31	.00	.13	.00	.00	.44	.00	.00	.13	.00	1.65
TOTAL		7.36	8.64	5.55	9.31	11.09	12.81	15.07	16.23	12.93	14.64	17.56	16.15	16.51	18.83	19.75	21.27	223.68
		6.09	6.67	5.11	4.79	6.92	5.41	6.84	6.21	7.37	6.69	5.35	4.93	5.45	5.32	5.93	4.75	93.84

(1) Includes all payloads in this model.

(2) Based on assumed 75 percent (of advertised capacity) Shuttle load factor on shared flights

TABLE 5. PAYLOAD DEMAND BY SPONSOR TYPE (1)

OPERATION TYPE			LAUNCH SCHEDULE															
			85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL
A	INTERNATIONAL	H	3	4	1	3	5	7	7	3	3	2	2	2	1	4	6	6	59
		L	3	2	2	1	4	3	3	3	2	1	0	0	1	1	4	3	33
B	U.S. COMMERCIAL	H	8	9	4	5	16	12	15	20	16	17	19	18	20	21	29	25	254
		L	8	7	3	6	9	7	5	7	7	5	8	6	10	2	7	3	100
C	OTHER U.S. GOV	H	2	4	2	1	2	2	2	3	1	2	3	1	0	1	2	2	30
		L	2	3	2	1	0	2	1	0	2	2	0	1	2	0	1	1	20
D	FOR. GOVERNMENTS	H	7	12	9	18	15	15	17	16	12	15	17	18	19	17	12	17	236
		L	2	13	6	9	11	7	12	9	9	11	11	10	7	12	9	9	147
E	PROB FOR. GOV	H	10	5	0	0	1	6	13	14	9	13	8	3	5	6	3	5	101
		L	8	3	4	0	1	2	3	4	6	6	4	3	2	3	3	2	54
F	PROB FOR. COMMER	H	0	0	0	1	3	2	0	0	0	0	1	2	1	0	1	1	12
		L	0	0	0	0	0	2	0	1	1	0	0	0	0	0	0	2	6
G	FOR. INDUSTRIAL	H	0	0	0	0	1	0	0	1	0	0	1	0	1	0	1	0	5
		L	0	0	0	0	1	0	0	0	1	0	0	1	0	0	1	0	4
J	JOINT PROG/NASA	H	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
		L	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
M	DOD/MILITARY	H	2	3	6	2	0	1	2	1	2	1	2	1	1	1	2	1	28
		L	0	1	1	3	1	2	1	2	3	3	1	0	1	0	0	0	19
	TOTAL	H	32	37	22	32	43	45	56	58	43	50	53	45	48	50	56	57	727
		L	23	29	18	20	29	25	25	26	31	28	24	21	23	18	25	20	385

(1) Includes all payloads in this model.

THIS PAGE LEFT BLANK DELIBERATELY

MARKET SEGMENTATION BY LAUNCH VEHICLE

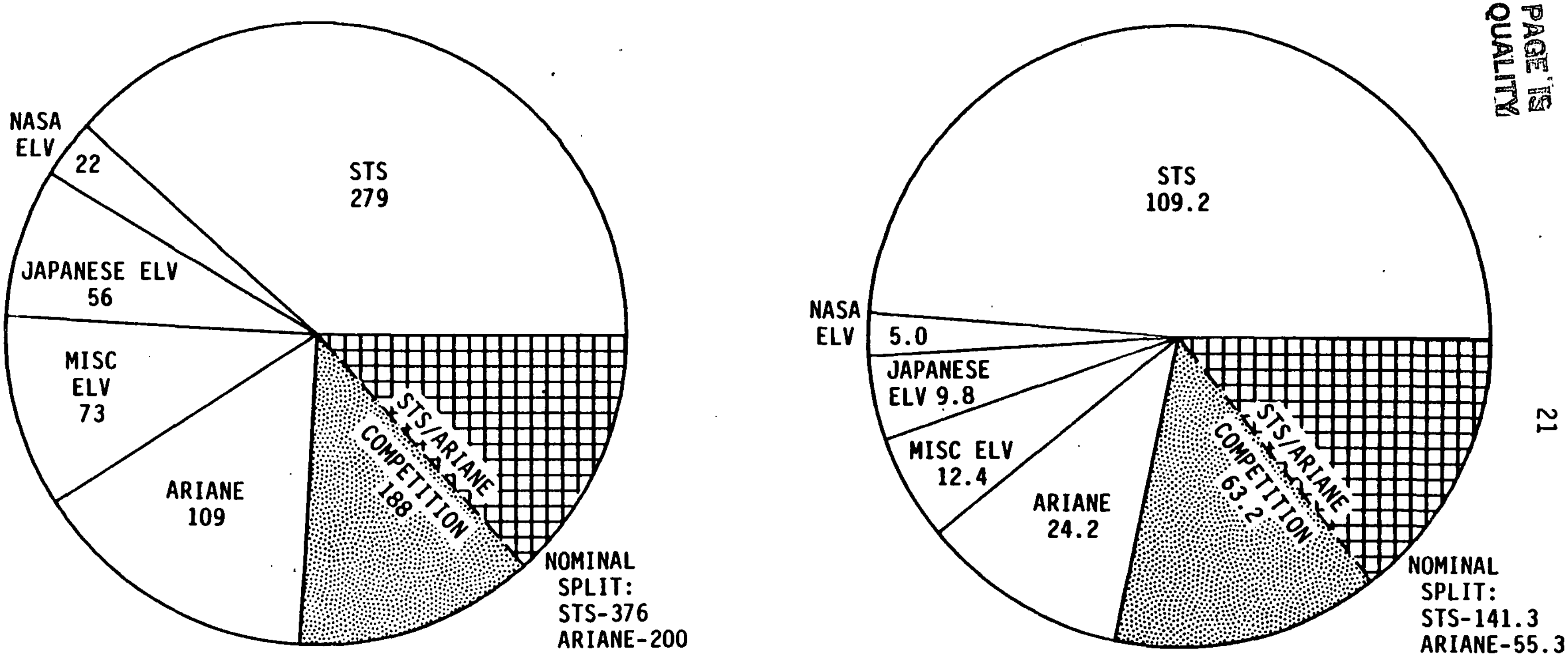
A number of figures and tables in this section present an overview of potential market segmentation. Special emphasis is placed on the Shuttle/Ariane market split. The approach used in assigning market segments is discussed.

Figures 2 and 3 show a breakdown of the total market assigned to each category of launch vehicle. The shaded area on each figure represents those payloads for which Ariane/Shuttle competition is assumed to exist.

Table 6 contains summary data which were used in the preparation of Figures 2 and 3. (Detailed data are contained in Appendix A.) Ariane and/or STS payloads were divided into five categories, and a probable market share was assigned to each category as indicated in the "STS %" column. For example, it was assumed that 100 percent of the payloads in the "STS" class would fly on Shuttle, while only 25 percent of those in the "Ariane/STS" class would do so. These assignments formed the basis for what might be termed "expected value" forecasts. That is, if a single payload were classed as "STS/Ariane", 3/4 of that payload would be assigned to STS and 1/4 to Ariane. While this obviously does not represent physical reality, it does provide a reasonable basis for forecasting aggregate market splits.

Assignments of STS and Ariane payloads were made according to the following general guidelines.

- Payloads already under contract to fly only on a given vehicle were assigned to that vehicle.
- Payloads requiring the unique services of Shuttle were assigned to Shuttle, as were those of U.S. government agencies and those flown as part of a joint program with NASA.
- Payloads of ESA and ESA member state governments were assigned to Ariane unless unique Shuttle capabilities were required for the launch.



727 PAYLOADS

223.8 EQUIVALENT SHUTTLE FLIGHTS[1]

FIGURE 2. HIGH MODEL MARKET SHARE BY LAUNCH VEHICLE[1]

[1] Assumes 75% (of advertised capacity) load factor on shared Shuttle Flights.

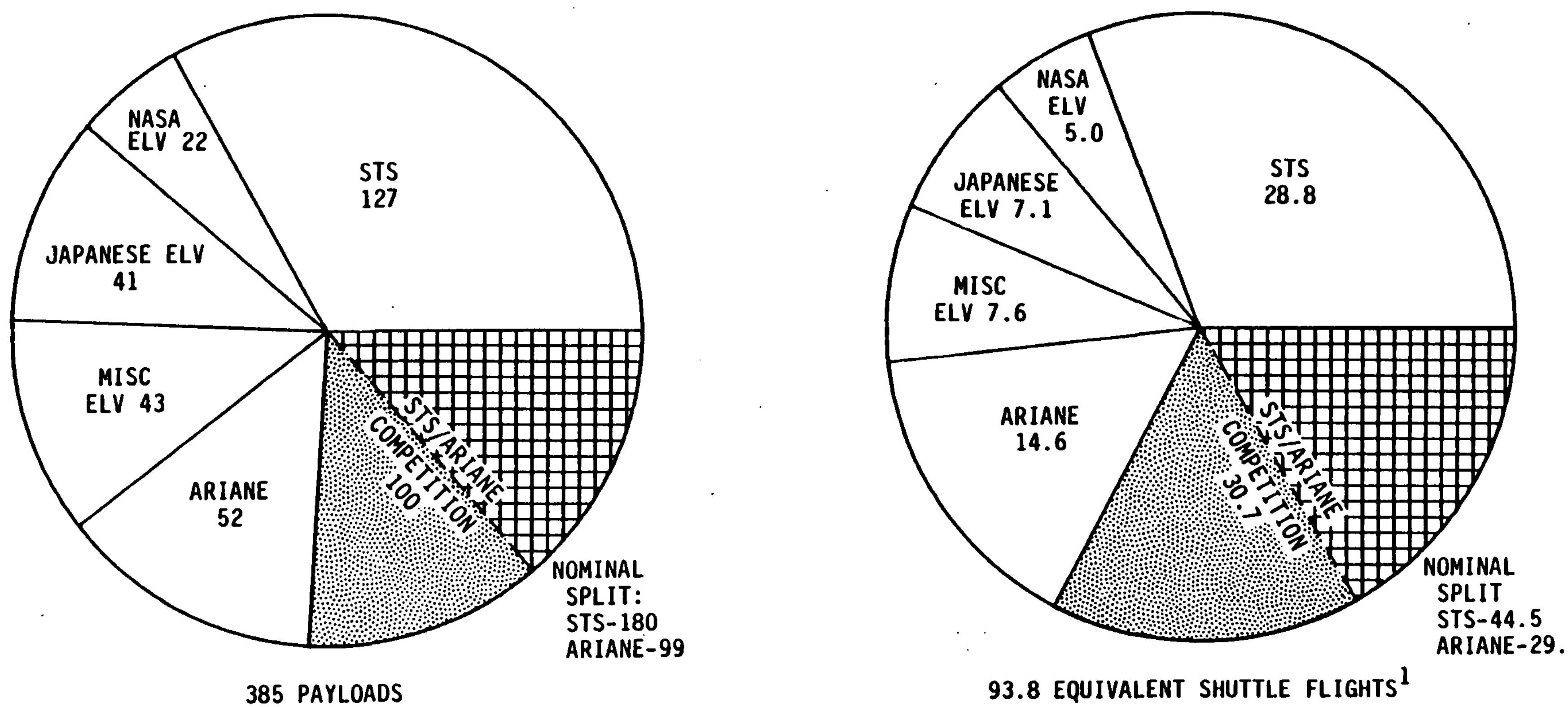


FIGURE 3. LOW MODEL MARKET SHARE BY LAUNCH VEHICLE

[1] Assumes 75% (of advertised capacity) Shuttle load factor on shared flights.

TABLE 6. SUMMARY OF LAUNCH VEHICLE ASSIGNMENTS(1)

Launch Vehicle(s)	STS %(4)	Payloads: High Model	Payloads: Low Model	Equivalent Shuttles(2,3): High Model	Equivalent Shuttles(2,3): Low Model
STS	100	279	127	109.2	28.8
STS/Ariane	75	62	34	20.2	9.1
STS or Ariane	50	74	41	25.1	13.9
Ariane/STS	25	52	25	17.9	7.7
AR-3		6	4	1.9	1.2
AR-4		13	5	6.2	2.2
ARI		33	16	9.8	4.3
Ariane	0	109	52	24.2	14.6
AR-2		7	6	2.4	1.9
AR-3		32	15	8.5	4.2
AR-4		10	8	4.3	3.3
ARI		60	23	9.0	5.2
NASA ELV	0	22	22	5.0	5.0
3914		2	2	0.4	0.4
3920P		1	1	0.2	0.2
A/C		6	6	2.2	2.2
AT-F		5	5	1.7	1.7
Scout		8	8	0.5	0.5
Japanese ELV	0	56	41	9.8	7.1
H-IA		18	19	3.0	3.2
H-II		13	5	4.5	2.3
M-3S		17	11	1.1	0.7
N-II		2	2	0.2	0.3
N/H		6	4	1.0	0.6
Miscellaneous ELV	0	73	43	12.4	7.6
ASLV		10	6	0.7	0.4
Conestoga		6	-	1.0	-
CZ-3		12	10	3.7	3.1
PSLV		10	7	1.3	0.9
Unknown (mostly Chinese)		34	19	5.5	3.0
C-1		1	1	0.2	0.2
TOTAL		727	385	223.8	93.8

(1) See text for assumptions.

(2) Based on assumed 75 percent (of advertised capacity) Shuttle load factor on shared flights.

(3) Subtotals and totals are rounded sums, not sums of rounded values.

(4) Indicates fraction of demand in a given category expected to go to STS.

- A mix of launch vehicles was used for INTELSAT payloads, reflecting that agency's tendency to utilize both launchers.
- Most U.S. domestic communications satellites were assigned to Shuttle, but a portion were considered to be Shuttle/Ariane, reflecting recent trends in competition.
- European foreign regional communications satellites were assigned primarily to Ariane, and similar satellites for other areas of the world were assigned a mixture of "STS/Ariane", "STS or Ariane", and "Ariane/STS".
- All MPS payloads were assigned to Shuttle. However,it is recognized that toward the end of the century, some MPS activity may take place on ESA's Hermes and Columbus Space Station module and be launched by Ariane 5. Since there is a good deal of uncertainty about the scheduling of these programs, their potential impact is not considered in this issue of the OUPM.
- Most Chinese, Japanese, and Indian payloads were assumed to be launched by launch vehicles of their respective nations.

One special word of caution should be stated. The market segmentation activity is better viewed in the aggregate than at the individual payload level. In some cases, the assignment of payload "X" to market segment "Y" was based on achieving a reasonable market balance rather than on specific knowledge of that payload.

Tables 7 and 8 and Figure 4 provide a further breakdown of Shuttle/Ariane competition. The first columns in Tables 7 and 8 indicate the number of payloads (or equivalent Shuttles) which were assigned to Shuttle, Ariane, or some combination of both (all other launch vehicles are excluded). "Assigned" payloads are those which were classed as "STS" or "Ariane" only. The "potentially competitive" category includes all payloads for which some STS-Ariane mix was indicated ("STS/Ariane", "STS or Ariane", "Ariane/STS"). Nominal values for each vehicle were computed by the expected-value procedure discussed earlier. All these

TABLE 7. ARIANE/STS COMPETITION--PAYLOADS

Mission Categories	Model	Payloads Included(1)	STS Assigned(2)	Potentially Competitive(3)	Ariane Assigned(2)	STS Nominal(4)	Ariane Nominal(4)
International Communications	H	56	2	50	4	28.8	27.2
	L	33	2	27	4	17.0	16.0
U.S. Domestic Communications	H	107	61	42	4	90.0	17.0
	L	65	40	21	4	55.0	10.0
Foreign Regional Communications	H	123	15	76	32	47.0	76.0
	L	70	13	39	18	29.0	40.5
U.S. Geostationary Earth Observations	H	7	7	0	0	7.0	0.0
	L	5	5	0	0	5.0	0.0
Foreign Geostationary Earth Observations	H	14	0	4	10	1.0	13.0
	L	9	0	3	6	0.8	8.3
U.S. Low Earth Orbit Observations	H	14	14	0	0	14.0	0.0
	L	10	10	0	0	10.0	0.0
Foreign Low Earth Orbit Observations	H	30	2	5	23	4.5	25.5
	L	16	0	4	12	2.0	14.0
Navigation Aids	H	33	6	0	27	6.0	27.0
	L	0	0	0	0	0.0	0.0
Foreign Planetary	H	2	0	0	2	0.0	2.0
	L	2	0	0	2	0.0	2.0
Scientific/Technical Development	H	13	0	6	7	1.5	11.5
	L	9	0	3	6	0.7	8.2
Materials Test/ Processing	H	166	166	0	0	166.0	0.0
	L	52	52	0	0	52.0	0.0
Multiservice Spacecraft/ Vehicles	H	11	6	5	0	9.7	1.3
	L	8	5	3	0	7.2	0.8
TOTALS	H	576	279	188	109	375.5	200.0
	L	279	127	100	52	179.2	99.8

(1) Does not include payloads assigned to ELVs other than Ariane.

(2) "Assigned" payloads assumed to have high probability of being captured by indicated vehicle for technical, political, economic, or other reason.

(3) Contains all payloads included but not assigned. Includes only a portion of the payloads which are capable of being flown on either vehicle.

(4) Based on allocating demand by proportion indicated in Table 6.

TABLE 8. ARIANE/STS COMPETITION--EQUIVALENT SHUTTLE FLIGHTS(1)

Mission Categories	Model	Equivalent Flights Included(2)	STS Assigned(3)	Potentially Competitive(4)	Ariane Assigned(3)	STS Nominal(5)	Ariane Nominal(5)
International Communications	H L	23.8 13.3	1.4 1.4	20.6 10.1	1.8 1.8	12.5 6.7	11.3 6.6
U.S. Domestic Communications	H L	36.8 19.9	20.2 12.6	15.6 6.3	1.0 1.0	30.9 17.3	5.9 2.6
Foreign Regional Communications	H L	36.3 20.4	3.8 3.2	22.6 11.6	9.9 5.6	12.6 7.8	23.7 12.6
U.S. Geostationary Earth Observations	H L	1.6 1.0	1.6 1.0	0.0 0.0	0.0 0.0	1.6 1.0	0.0 0.0
Foreign Geostationary Earth Observations	H L	2.8 1.8	0.0 0.0	0.8 0.6	2.0 1.2	0.2 0.2	2.6 1.6
U.S. Low Earth Orbit Observations	H L	3.7 2.2	3.7 2.2	0.0 0.0	0.0 0.0	3.7 2.2	0.0 0.0
Foreign Low Earth Orbit Observations	H L	7.3 3.7	0.9 0.0	0.8 0.7	5.6 3.0	1.3 0.4	6.0 3.3
Navigation Aids	H L	3.0 0.0	1.2 0.0	0.0 0.0	1.8 0.0	1.2 0.0	1.8 0.0
Foreign Planetary	H L	1.1 1.1	0.0 0.0	0.0 0.0	1.1 1.1	0.0 0.0	1.1 1.1
Scientific/Technical Development	H L	2.3 1.6	0.0 0.0	1.2 0.6	1.1 1.0	0.3 0.1	2.0 1.5
Materials/Test Processing	H L	75.5 7.5	75.5 7.5	0.0 0.0	0.0 0.0	75.5 7.5	0.0 0.0
Multiservice Spacecraft/ Vehicles	H L	2.4 1.6	0.9 0.7	1.5 0.9	0.0 0.0	2.0 1.4	0.4 0.2
TOTALS	H L	196.6 74.1	109.2 28.6	63.1 30.8	24.3 14.7	141.8 44.6	54.8 29.5

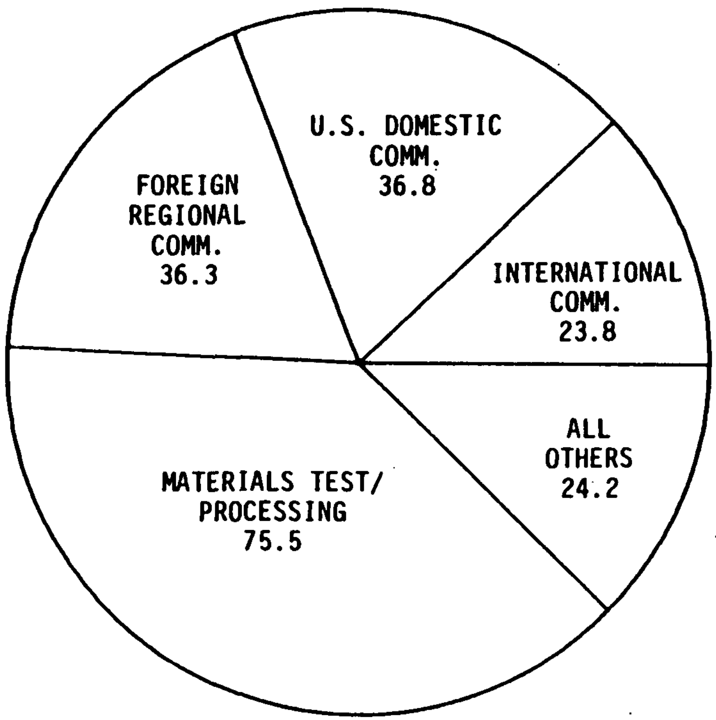
(1) Based on assumed 75 percent (of advertised capacity) average Shuttle load factor on shared flights.

(2) Does not include payloads assigned to ELVs other than Ariane.

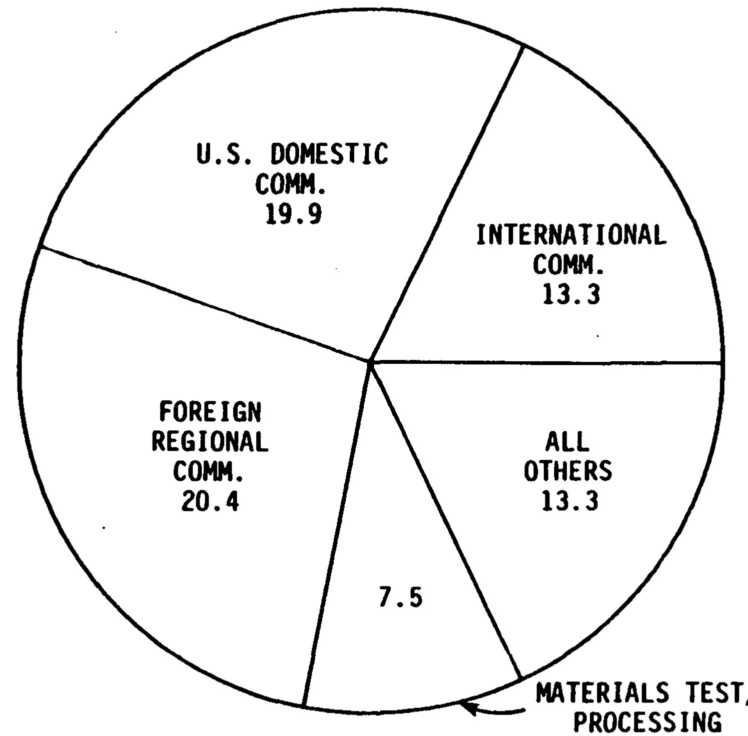
(3) "Assigned" payloads assumed to have high probability of being captured by indicated vehicle for technical, political, economic, or other reasons.

(4) Contains all payloads included but not assigned. Includes only a portion of the payloads which are capable of being flown on either vehicle.

(5) Based on allocating demand by proportions indicated in Table 6 in OUPM.



HIGH MODEL
196.6 EQUIVALENT SHUTTLES[1]



LOW MODEL
74.1 EQUIVALENT SHUTTLES[1]

FIGURE 4. SOURCES OF ARIANE AND/OR STS DEMAND -- EQUIVALENT SHUTTLES[1]

[1] Assumes 75% (of advertised capacity) load factor on shared Shuttle flights.

values should be interpreted rather liberally. There is no guarantee that Ariane will capture all payloads assigned to it, nor is there any certainty that the predicted STS nominal share will be that actually achieved. Rather, these data should be interpreted as general indicators of likely market trends. Figure 4 shows the market sources, by mission category, of all payloads likely to be flown on either the Shuttle or Ariane.

Certain information contained in Tables 7 and 8 deserves highlighting--virtually the entire competition between STS and Ariane for payload launches will concentrate on communications satellites. Table 7 shows that 168 of 188 potentially competitive payloads contained in the High model are accounted for in the three categories of communications satellites; in the Low model, 87 of 100. This is 89 percent and 87 percent of the market, respectively. On an equivalent Shuttle flight basis (see Table 8), the percentages are 93 percent for the High model and 91 percent for the Low model. So even though the projected number of communications satellites was reduced substantially from last year's model, they still compose the overwhelming majority of the future payload launches expected to be the subject of competition between STS and Ariane.

THIS PAGE LEFT BLANK DELIBERATELY

SHUTTLE MARKET DETAILS

Because this document is prepared primarily for Shuttle planning purposes, some additional details on Shuttle demand are included here.

Tables 9 and 10 show estimated Shuttle demand. Optimistic, nominal, and pessimistic forecasts are included in both the High and Low models. The optimistic forecast is based on STS capturing all the flights assigned to it, plus all those identified as being STS-Ariane competitive. Expected-value results are indicated in the nominal case. Pessimistic values assume that Shuttle will capture none of the competitive market.* The optimistic and pessimistic cases thus represent extreme conditions not likely to occur. They at least provide a rough indication of the market swings which could occur in a competitive environment.

Tables 11 and 12 indicate the nominal STS demand by year and mission category; Table 11 by payload, and Table 12 by equivalent Shuttle flights. Nominal demand is based on the expected value approach. As before, these tables should be viewed more as general indicators of demand rather than as precise forecasts, especially in the later years of the program.

*The ability of Ariane to handle all the inferred demand is not considered here.

TABLE 9. STS DEMAND BY YEARS, PAYLOADS(1)

Estimate	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	Total(2)
High Model																	
Optimistic(3)	12.0	9.0	6.0	13.0	31.0	32.0	37.0	38.0	29.0	31.0	37.0	31.0	36.0	36.0	46.0	43.0	467.0
Nominal(4)	12.0	9.0	5.8	10.0	23.0	22.8	27.0	29.0	23.2	25.0	31.0	23.5	30.0	28.2	39.5	36.5	375.5
Pessimistic(5)	12.0	9.0	5.0	6.0	14.0	13.0	16.0	18.0	17.0	19.0	26.0	17.0	26.0	21.0	31.0	29.0	279.0
Low Model																	
Optimistic(3)	10.0	7.0	9.0	9.0	17.0	16.0	16.0	16.0	22.0	18.0	16.0	14.0	16.0	8.0	18.0	15.0	227.0
Nominal(4)	10.0	7.0	8.8	8.2	13.5	12.2	10.5	10.5	17.3	13.5	12.5	11.2	13.5	5.3	15.0	10.2	179.2
Pessimistic(5)	10.0	7.0	8.0	7.0	9.0	7.0	4.0	5.0	12.0	9.0	9.0	9.0	10.0	4.0	11.0	6.0	127.0

(1) Expected-value calculations (see Table 8), rounded to nearest payload.

(2) Rounded correct total, not sum of rounded figures.

(3) Assumes Shuttle gets all payloads in both "Shuttle" and "Competitive" categories (see Table 8).

(4) Assumes Shuttle gets nominal share of "Competitive" payloads (see Table 8).

(5) Assumes Shuttle gets only "Shuttle" payloads, no "Competitive" ones (see Table 8).

TABLE 10. STS DEMAND BY YEARS, EQUIVALENT SHUTTLE FLIGHTS(1)

Estimate	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	Total(2)
High Model																	
Optimistic(3)	3.0	2.6	2.0	4.3	9.0	10.7	12.0	13.0	11.3	11.5	14.1	13.2	14.3	15.5	17.9	18.0	172.4
Nominal(4)	3.0	2.6	1.9	3.2	6.5	7.4	8.9	9.9	9.0	9.6	12.5	10.5	12.2	12.8	15.9	15.5	141.4
Pessimistic(5)	3.0	2.6	1.7	1.7	3.6	4.5	5.6	6.4	6.5	7.8	10.8	7.7	11.0	10.3	13.2	12.8	109.2
Low Model																	
Optimistic(3)	2.6	1.7	2.7	2.5	3.9	3.7	5.2	4.9	5.4	4.5	3.8	3.6	4.4	2.3	4.4	3.8	59.4
Nominal(4)	2.6	1.7	2.6	2.3	2.8	2.6	3.3	3.1	3.8	3.3	2.9	2.7	3.6	1.4	3.4	2.3	44.5
Pessimistic(5)	2.6	1.7	2.4	1.9	1.4	1.1	1.2	1.4	2.3	2.1	2.0	2.0	2.5	0.9	2.1	1.1	28.6

(1) Based on assumed 75 percent (of advertised capacity) Shuttle load factor on shared flights.
(2) Rounded correct total, not sum of rounded figures.
(3) Assumes Shuttle gets all payloads in both "Shuttle" and "Competitive" categories.
(4) Assumes Shuttle gets nominal share of "Competitive" payloads.
(5) Assumes Shuttle gets only "Shuttle" payloads, no "Competitive" ones.

TABLE 11. NOMINAL STS DEMAND BY MISSION CATEGORY--PAYLOADS

	MODEL	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL
INTERNATIONAL COMM	H	.00	1.00	1.00	1.00	2.75	3.50	3.75	1.25	1.75	1.00	1.50	1.00	.50	2.25	3.50	3.00	28.75
	L	.00	.00	1.00	1.00	1.75	2.50	1.50	1.50	1.50	.50	.00	.00	.50	.50	2.25	2.50	17.00
U.S. DOMESTIC COMM	H	6.00	4.00	2.75	3.50	7.75	6.25	8.00	9.25	4.75	4.75	5.75	3.00	2.00	5.25	8.75	8.25	90.00
	L	6.00	3.00	2.75	2.75	1.50	3.50	2.50	4.75	3.25	3.75	4.75	3.75	6.25	2.00	2.50	2.00	55.00
FOREIGN REG COMM	H	6.00	2.00	1.00	1.75	2.25	2.75	4.00	4.50	3.25	3.00	3.50	2.25	3.25	2.50	2.50	2.50	47.00
	L	4.00	3.00	2.00	1.50	.25	1.25	2.00	2.25	3.50	3.50	3.50	.75	.25	.50	.25	1.00	29.50
U.S. GEO OBS	H	.00	.00	.00	.00	1.00	1.00	.00	1.00	.00	1.00	1.00	.00	.00	.00	1.00	1.00	7.00
	L	.00	.00	.00	.00	.00	1.00	.00	.00	1.00	1.00	.00	.00	1.00	.00	.00	1.00	5.00
FOREIGN GEO OBS	H	.00	.00	.00	.00	.00	.00	.00	.25	.00	.25	.00	.25	.00	.25	.00	.00	1.00
	L	.00	.00	.00	.00	.25	.00	.00	.00	.00	.25	.00	.00	.00	.25	.00	.00	.75
U.S. LEO OBS	H	.00	.00	.00	1.00	.00	1.00	2.00	1.00	2.00	.00	2.00	1.00	1.00	1.00	2.00	.00	14.00
	L	.00	.00	.00	.00	1.00	.00	1.00	.00	1.00	2.00	.00	2.00	1.00	.00	2.00	.00	10.00
FOREIGN LEO OBS	H	.00	.00	.00	.00	.00	1.50	.00	.00	.50	.00	1.00	1.00	.00	.00	.50	.00	4.50
	L	.00	.00	.00	.00	.00	.00	.50	.00	.00	.50	.00	.00	.50	.00	.00	.50	2.00
NAVIGATION AIDS	H	.00	.00	.00	.00	1.00	2.00	.00	.00	.00	.00	.00	1.00	2.00	.00	.00	.00	6.00
	L	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
FOREIGN PLANETARY	H	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
	L	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
SCI/TECHNICAL DEV	H	.00	.00	.00	.00	.25	.00	.25	.00	.25	.00	.25	.00	.25	.00	.25	.00	1.50
	L	.00	.00	.00	.00	.00	.00	.25	.00	.00	.00	.25	.00	.00	.00	.00	.25	.75
MATERIALS PROCESS	H	.00	1.00	1.00	2.00	7.00	4.00	9.00	10.00	10.00	15.00	15.00	14.00	20.00	17.00	20.00	21.00	166.00
	L	.00	.00	3.00	3.00	7.00	4.00	2.00	2.00	6.00	2.00	4.00	3.00	4.00	2.00	7.00	3.00	52.00
MULTISERVICE	H	.00	1.00	.00	.75	1.00	.75	.00	1.75	.75	.00	1.00	.00	1.00	.00	1.00	.75	9.75
	L	.00	1.00	.00	.00	1.75	.00	.75	.00	1.00	.00	.00	1.75	.00	.00	1.00	.00	7.25
TOTAL	H	12.00	9.00	5.75	10.00	23.00	22.75	27.00	29.00	23.25	25.00	31.00	23.50	30.00	28.25	39.50	36.50	375.50
	L	10.00	7.00	8.75	8.25	13.50	12.25	10.50	10.50	17.25	13.50	12.50	11.25	13.50	5.25	15.00	10.25	179.25

TABLE 12. NOMINAL STS DEMAND BY MISSION CATEGORY--EQUIVALENT SHUTTLE FLIGHTS (1)

	MODEL	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL
INTERNATIONAL COMM	H	.00	.72	.72	.51	.97	.99	1.23	.63	.89	.51	.53	.61	.31	.91	1.15	1.31	11.99
	L	.00	.00	.72	.72	.66	.61	.74	.61	.63	.23	.00	.00	.23	.23	.76	.61	6.77
U.S. DOMESTIC COMM	H	1.76	1.00	.77	1.18	2.35	1.81	2.87	3.55	1.81	1.74	2.47	1.51	.52	1.82	2.78	2.99	30.94
	L	1.76	.76	.85	.79	.42	.82	1.27	1.51	.86	1.10	1.42	1.33	2.30	.65	.75	.56	17.15
FOREIGN REG COMM	H	1.27	.49	.29	.51	.64	.90	1.06	1.01	.98	.72	.88	.70	.91	.72	.74	.81	12.64
	L	.84	.72	.49	.39	.08	.41	.52	.69	.88	.86	.88	.24	.08	.19	.08	.43	7.79
U.S. GEO OBS	H	.00	.00	.00	.00	.20	.20	.00	.20	.00	.20	.20	.00	.00	.00	.28	.28	1.56
	L	.00	.00	.00	.00	.00	.20	.00	.00	.20	.20	.00	.00	.20	.00	.00	.20	1.00
FOREIGN GEO OBS	H	.00	.00	.00	.00	.00	.00	.00	.05	.00	.05	.00	.05	.00	.05	.00	.00	.20
	L	.00	.00	.00	.00	.05	.00	.00	.00	.00	.05	.00	.00	.00	.05	.00	.00	.15
U.S. LEO OBS	H	.00	.00	.00	.31	.00	.23	.53	.23	.53	.00	.53	.23	.31	.23	.53	.00	3.65
	L	.00	.00	.00	.00	.31	.00	.19	.00	.19	.49	.00	.37	.19	.00	.49	.00	2.23
FOREIGN LEO OBS	H	.00	.00	.00	.00	.00	.55	.00	.00	.09	.00	.47	.15	.00	.00	.09	.00	1.35
	L	.00	.00	.00	.00	.00	.00	.09	.00	.00	.09	.00	.00	.09	.00	.00	.09	.35
NAVIGATION AIDS	H	.00	.00	.00	.00	.20	.40	.00	.00	.00	.00	.00	.20	.40	.00	.00	.00	1.20
	L	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
FOREIGN PLANETARY	H	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
	L	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
SCI/TECHNICAL DEV	H	.00	.00	.00	.00	.05	.00	.05	.00	.05	.00	.05	.00	.05	.00	.05	.00	.30
	L	.00	.00	.00	.00	.00	.00	.05	.00	.00	.00	.05	.00	.00	.00	.00	.05	.15
MATERIALS PROCESS	H	.00	.13	.13	.45	1.96	2.13	3.12	3.83	4.40	6.41	7.20	7.00	9.61	9.07	10.13	9.92	75.51
	L	.00	.00	.59	.40	.93	.53	.27	.27	.99	.27	.53	.40	.53	.27	1.12	.40	7.49
MULTISERVICE	H	.00	.20	.00	.23	.13	.23	.00	.36	.23	.00	.13	.00	.13	.00	.13	.23	2.02
	L	.00	.20	.00	.00	.36	.00	.23	.00	.13	.00	.00	.36	.00	.00	.13	.00	1.42
TOTAL	H	3.03	2.55	1.92	3.18	6.50	7.45	8.86	9.86	8.98	9.63	12.47	10.46	12.24	12.80	15.89	15.53	141.36
	L	2.60	1.68	2.65	2.30	2.81	2.57	3.35	3.08	3.89	3.29	2.88	2.71	3.62	1.40	3.34	2.34	44.50

(1) Based on assumed 75 percent (of advertised capacity) Shuttle load factor on shared flights.

TRANSPONDER TRENDS

Estimates are presented here of the theoretical number of operating on-orbit transponders for each year of the time period covered by this model. These estimates provide a basis for comparison with forecasts of communications demand done by others. A convenient measure of communications capabilities in space is the equivalent 36-MHz transponder. While it is sometimes difficult to equate a given communications requirement to 36-MHz transponders, estimates have been made for all the communications satellites in the model. Data on transponders have been grouped by bands: C, K_u, and K_a.* It is in these bands that almost all of the standard communications traffic (civilian telephony and data transmission, TV and radio distribution) will occur during the period covered by this model. In determining the number of transponders on orbit over the time period of the model, the first step was to tabulate data on satellites already in operation. These satellites were assigned expected remaining lifetimes. Then, for satellites in the model, the following assumptions were made: (1) the satellites are launched on schedule (if a satellite launch has failed, the transponders on that satellite are not counted), (2) they operate as expected (i.e., no failures) and (3) they last for their predicted design lifetimes, no longer/no shorter. From these data, the number of active transponders on orbit is calculated.

Data on five different portions of the model are presented. These are U.S. domestic, WARC Region 2 (primarily the Americas), international communications (i.e., INTELSAT), foreign/regional, and total world demand. These data are shown for both the High and Low models in Figures 5 through 9. In each figure, a breakdown by transponder

---

*C-band is 6/4 GHz, K_u is 14/11 GHz, and K_a is 30/20 GHz. This model does not present data on transponders in other frequency bands for other communications purposes such as 8/7 GHz for military communications and 1.6/1.5 GHz for maritime.

ORIGINAL PAGE IS
OF POOR QUALITY

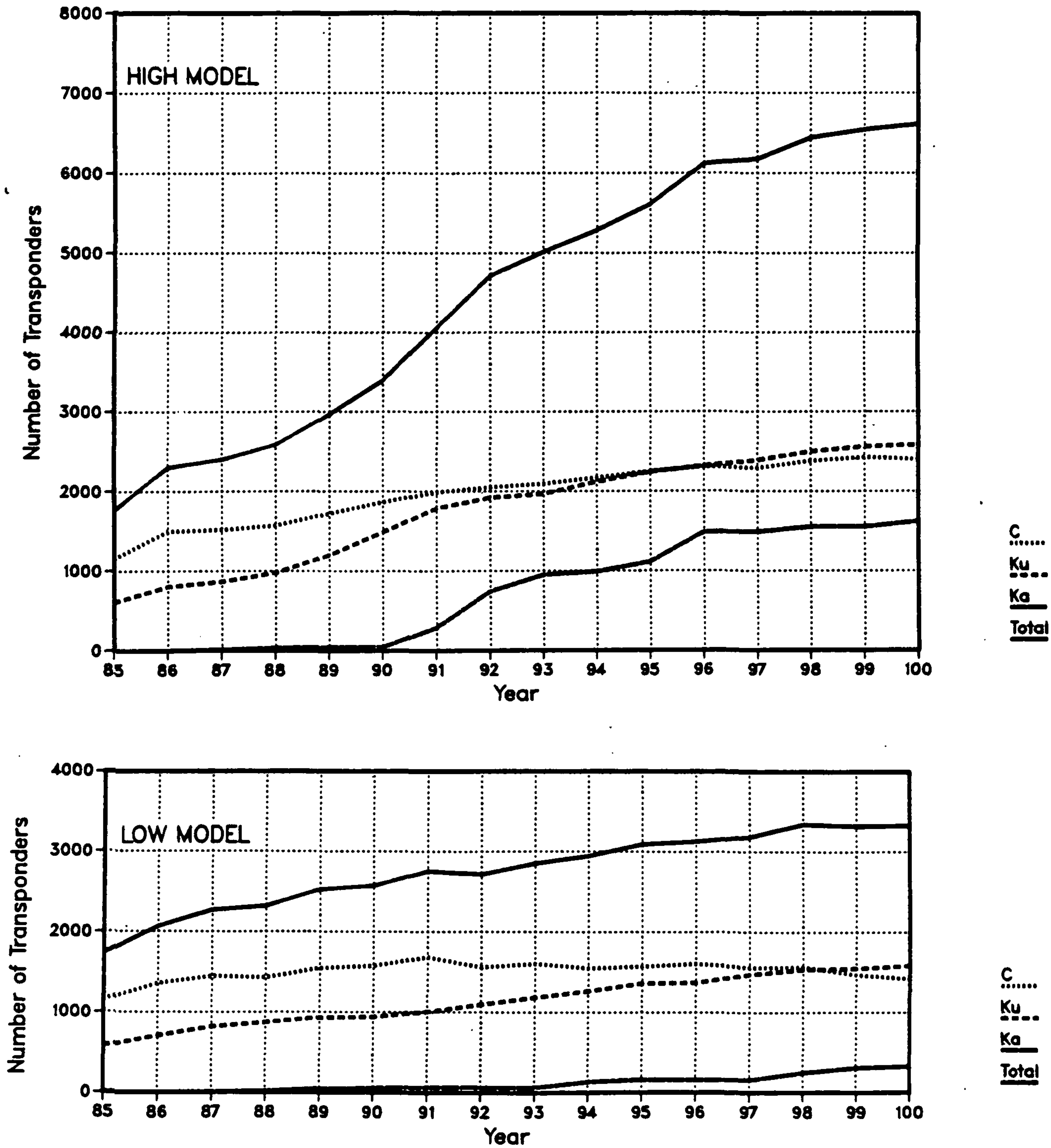
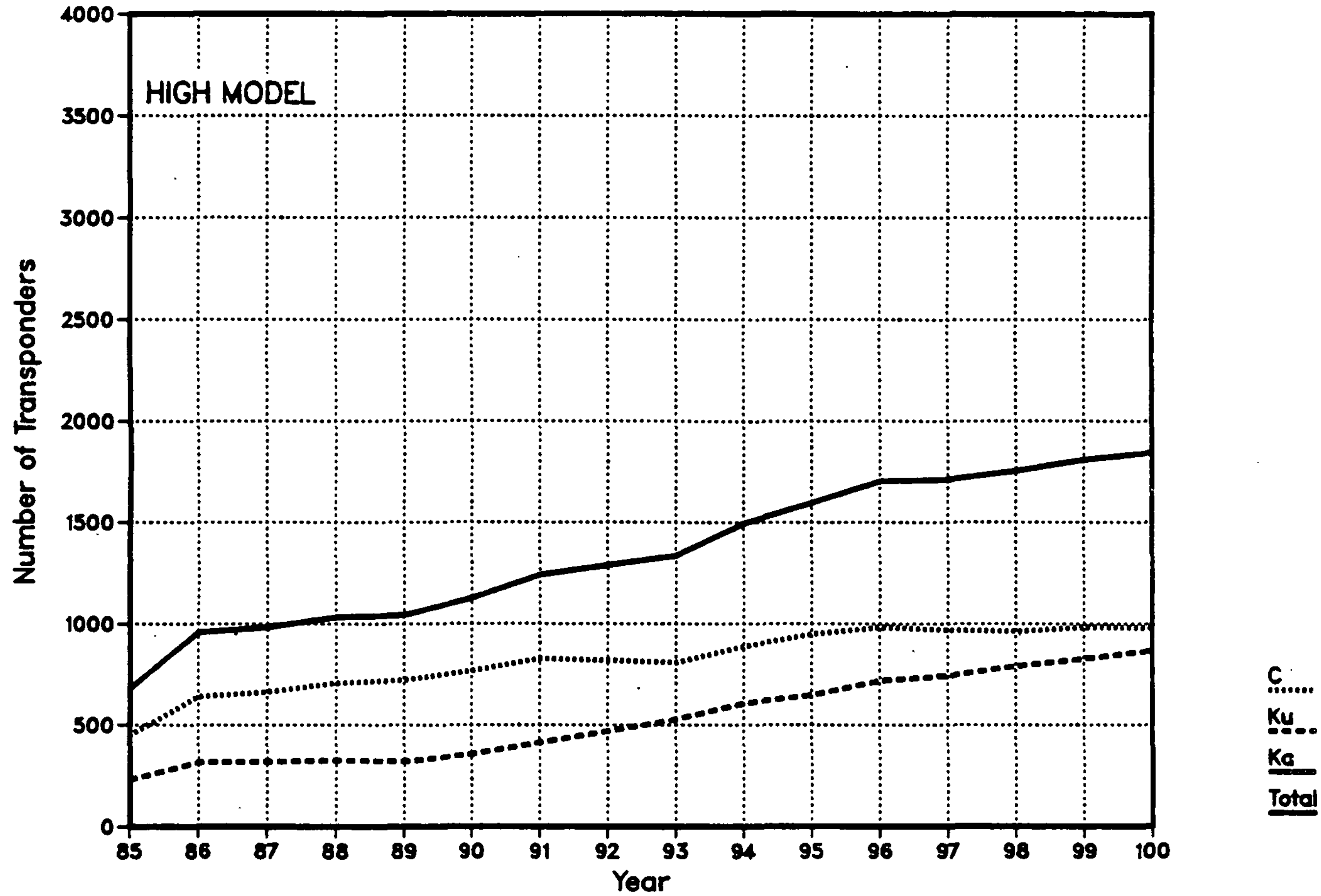


FIGURE 5. THEORETICAL TOTAL WORLD TRANSPONDERS ON ORBIT[1,2]

[1]Includes only payloads contained in this model.

[2]Assumes all launches succeed, all transponders operate for full design life.



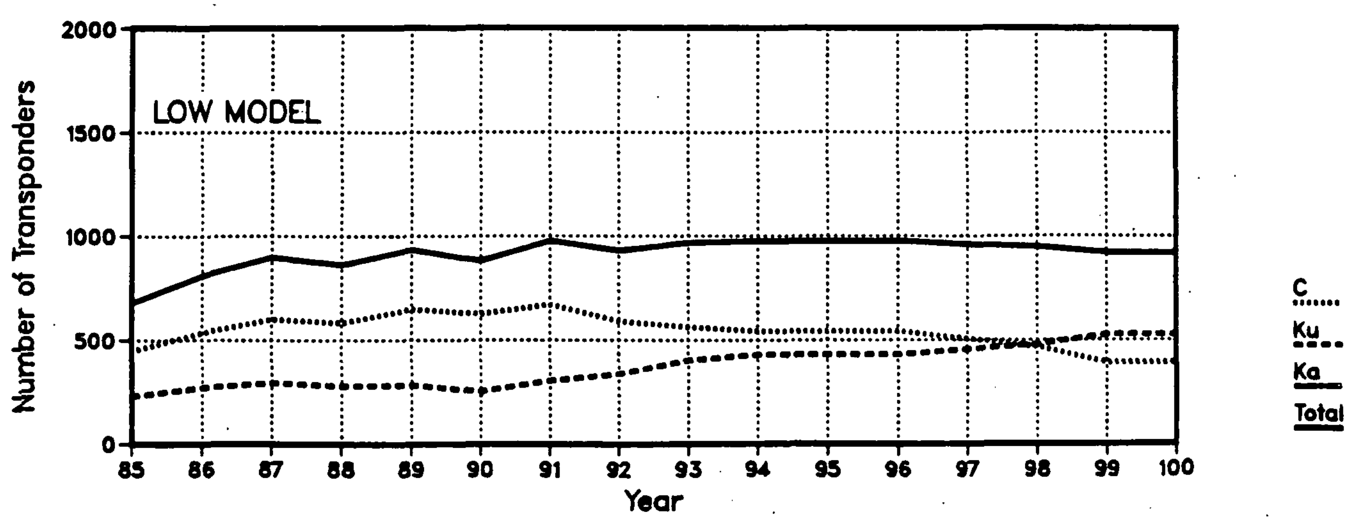
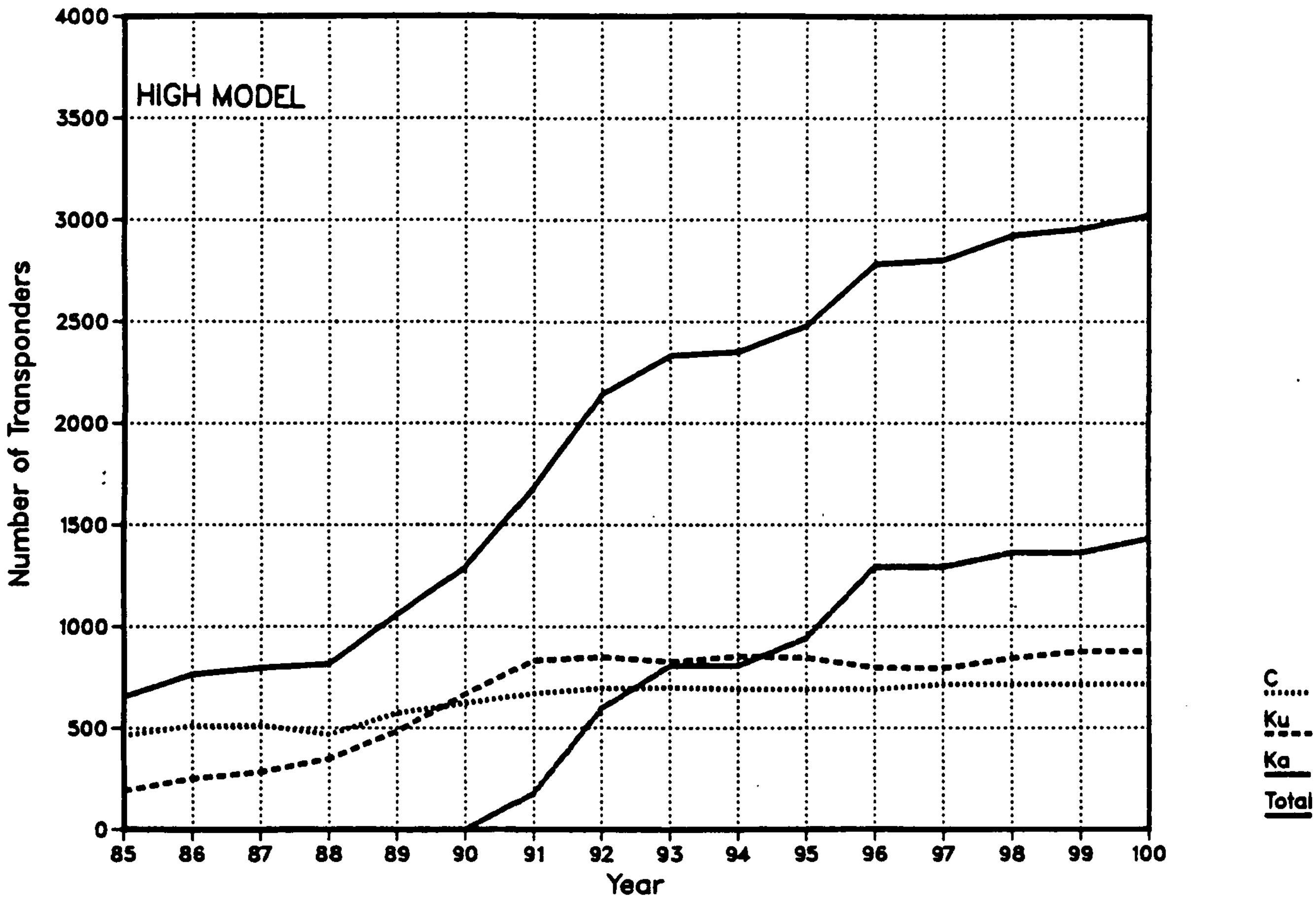


FIGURE 6. THEORETICAL INTERNATIONAL TRANSPONDERS ON ORBIT[1,2]

[1]Includes only payloads contained in this model

[2]Assumes all launches succeed, all transponders operate for full design life.



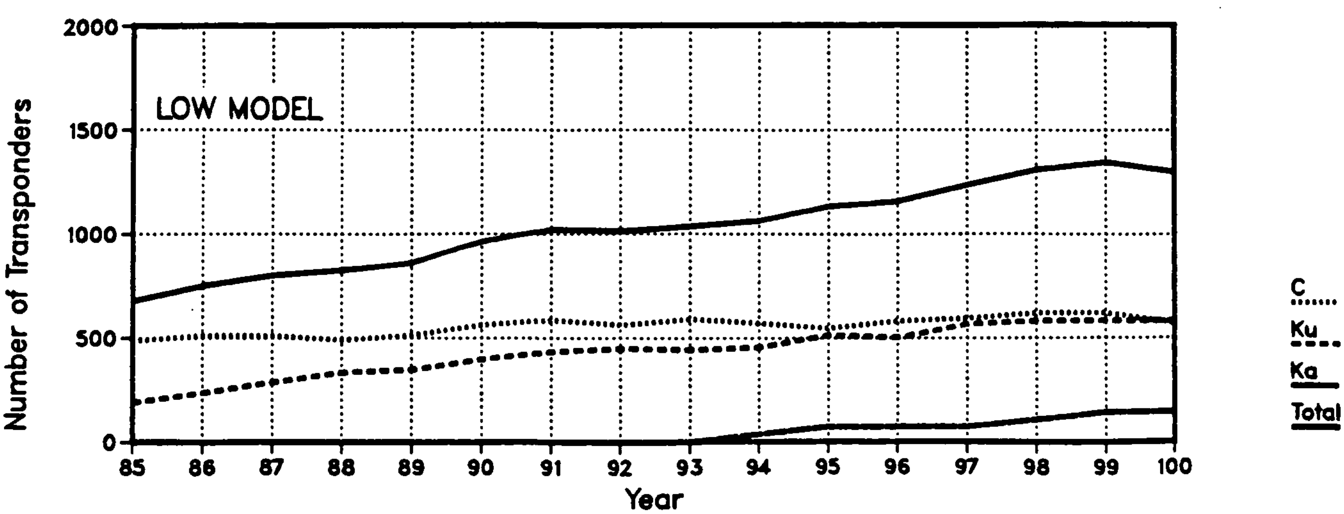
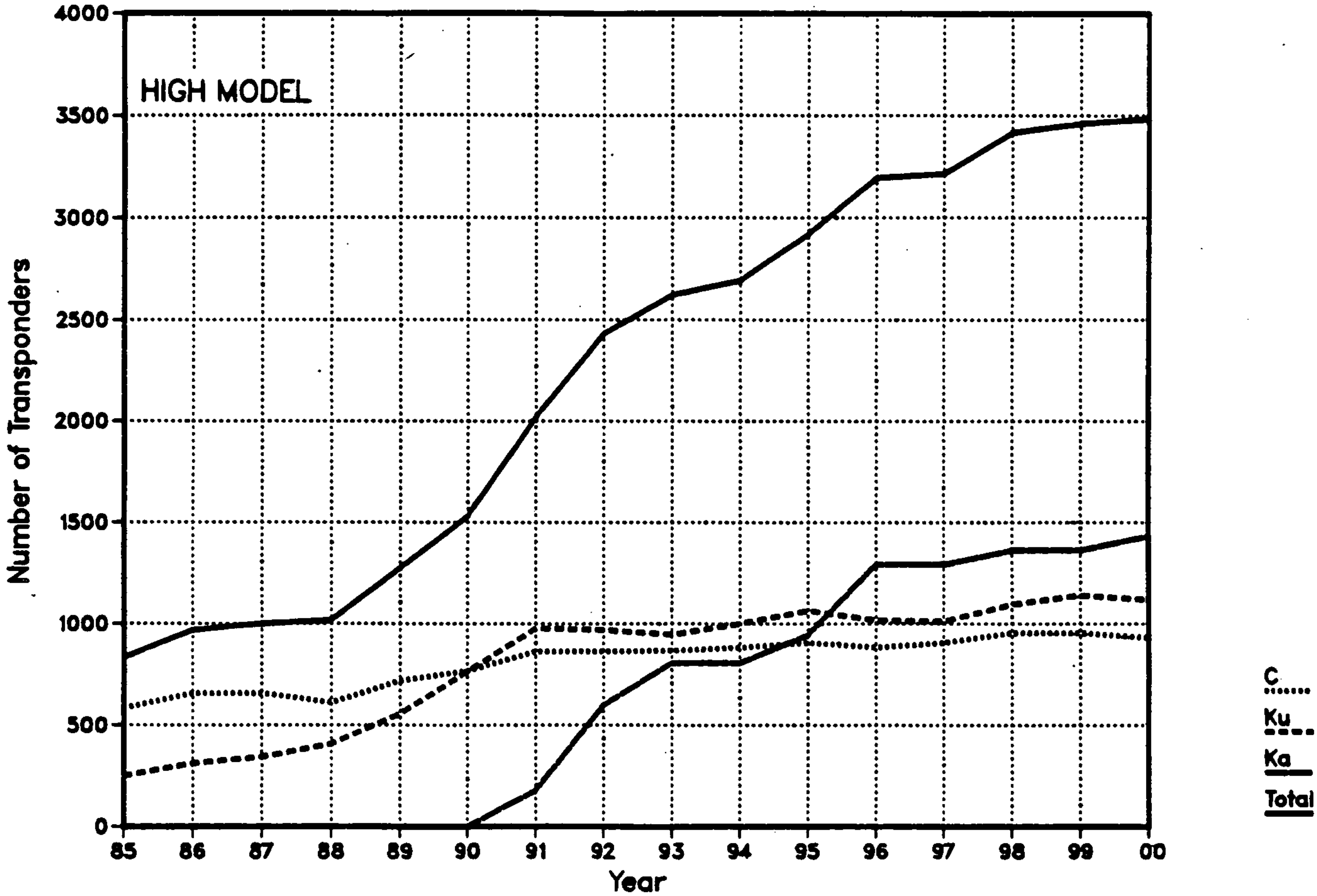


FIGURE 7. THEORETICAL U.S. DOMESTIC TRANSPONDERS ON ORBIT[1,2]

[1]Includes only payloads contained in this model.

[2]Assumes all launches succeed, all transponders operate for full design life.



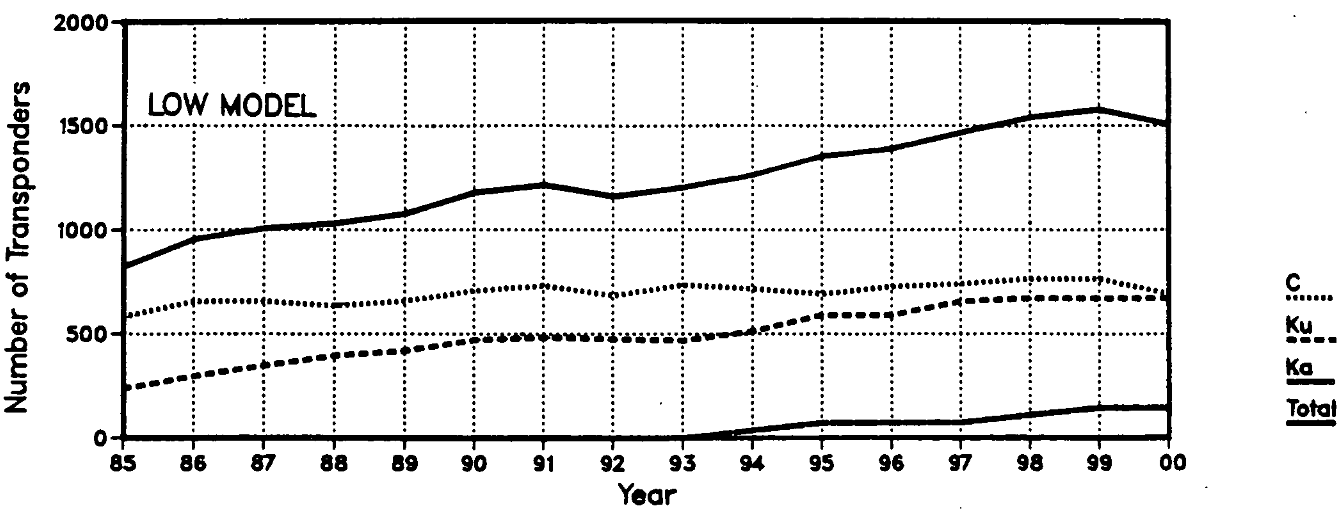


FIGURE 8. THEORETICAL REGION 2 TRANSPONDERS ON ORBIT[1,2]

[1]Includes only payloads contained in this model.

[2]Assumes all launches succeed, all transponders operate for full design life.

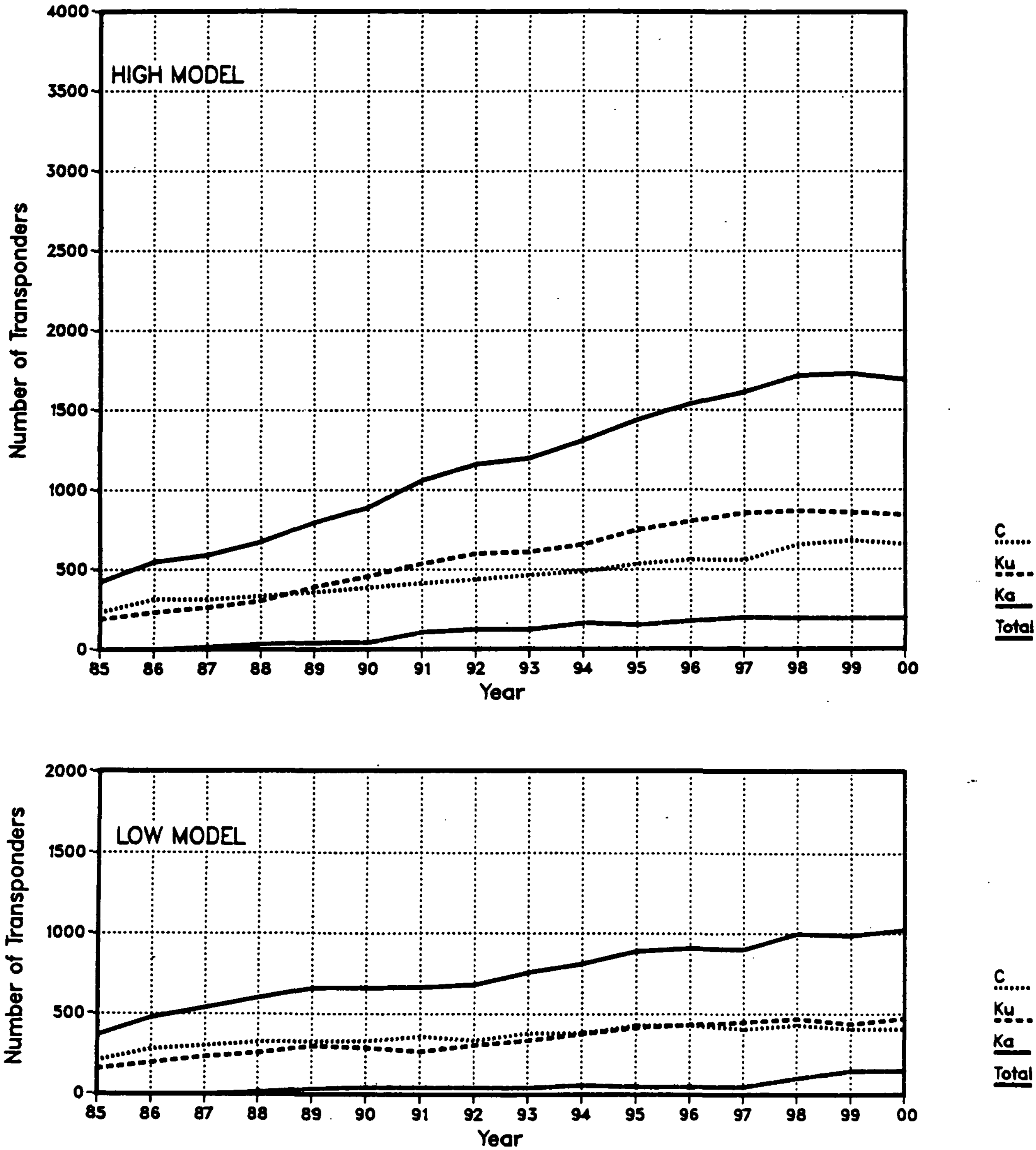


FIGURE 9. THEORETICAL FOREIGN/REGIONAL TRANSPONDERS ON ORBIT[1,2]

[1]Includes only payloads contained in this model.

[2]Assumes all launches succeed, all transponders operate for full design life.

type is presented. These data provide insight into what communications growth is represented by the two models. They have not been used for feedback to the model to approximate any preconceived growth curves. The rationale for this is that estimation of transponder demand curves based upon raw communications needs is beyond the scope of this effort and accepting any one projection over others is not justified. There is a natural tendency to compare these data with other forecasts, but that is appropriately left to the reader.

Figure 5, Theoretical Total World Transponders on Orbit, indicates that this year's projection is consistently lower than the one contained in the 1984 OUPM. For 1985 and 1986, the projections are quite close to last year's, reflecting the fact that plans already underway will likely not be revised in the near term. The growth rate in 1987-89 is considerably smaller than that shown in last year's model; this is primarily due to low growth rates experienced by INTELSAT and U.S. domestic carriers and reflected in their launch plans for this period. By 1989, the 1985 High model projections are about 30 percent lower than shown in the 1984 model. From 1990 to 1997, the transponder growth parallels that shown last year, but is moved about two years to the right. In 1997 the shortfall has narrowed to about 15 percent. During the last three years of the period, the 1985 OUPM High model projects little more than replacement, resulting in an increasing gap in projected number of transponders between the 1984 and 1985 models. The Low model shows a steadily increasing divergence between the 1985 and 1984 projections, with the 1985 model showing approximately one-third fewer transponders in 1997 than does the 1984 model. After about 1995, the Low 1985 model shows replacement only. The High model shows a growth rate of about 10 percent during the overall period covered by the model, while the Low model shows about 5 percent growth in numbers of transponders. Factors contributing to the lower numbers contained in this year's OUPM include (1) in the near term, a slackening of current and projected growth rate of international communications services,

(2) about a two-year delay in an anticipated large increase in U.S. domestic space communications capacity, and (3) the rapid emergence of fiber optics as a formidable competitor on all high-traffic routes in the medium and long term.

International transponders, shown in Figure 6, exhibit significantly different behavior from that presented in the 1984 model. The 1985 Low model shows international transponders reaching a total of nearly 1000 by 1987, then maintaining supply at about this quantity for the rest of the century. This contrasts with last year's Low model, which reached about 1750 transponders in 1997 before leveling off. This Low model projection is a result of massive amounts of fiber-optic communications capacity (discussed elsewhere) that have been announced for introduction to service in the 1988-90 time frame. In the High model, it is assumed that the fiber-optic networks come on line more gradually and that the space-segment providers of communications are able to compete more vigorously either by exploiting niche-market opportunities or by more competitive pricing strategies. The High-model figures presented in Figure 6 show a growth rate of about 5 percent in the 1986-2000 period; this growth still results in a turn-of-the-century shortfall of about a thousand transponders compared to projections of the 1984 OUPM. Another factor that may have to be considered in future models (but was not, in this model) is the possibility of the Soviet Intersputnik satellite system diverting a significant portion of third-world traffic from entities considered in the OUPM.

Figure 7, Theoretical U.S. Domestic Transponders on Orbit, shows a High model picture that is not changed much from the 1984 High model. The major change is about a two-year delay, in the mid-term, in adding a large increase in capacity. Whereas the 1984 OUPM showed this growth taking place between 1988 and 1991, the 1985 model shows it happening in the 1989-93 period. From 1993 to the end of the century, the 1984 and 1985 High models show virtually identical growth, resulting in about 3600 domestic transponders being the projection for the year 2000. The two-year lag in capacity in the late 1980s and early 1990s can be attributed to delays by the FCC in considering the large number of applications to provide both new and continuing services that were filed before November 1983. As of the date of this publication, there has been no FCC action on these applications, but such action is expected in Summer, 1985. A contributing factor to the lag is an apparent lack of demand for additional satellite capacity in the near term. The Low model transponder curve in Figure 7 shows a much slower growth picture for U.S. domestic transponders. It shows an average growth of only about 30 transponders per year for the 10-year period, 1987-96. It also projects a total number of domestic transponders by the turn of the century that is only about 40 percent of the number projected by the High model. The Low model assumes that none of the new applicants follow through on their plans to launch satellites and that fiber optics takes the lion's share of growth in point-to-point communications within the U.S. market. Any growth in provision of U.S. domestic communications satellite services is assumed to be in point-to-multipoint traffic.

The depiction of Region 2 transponders, given in Figure 8, is about the same as in Figure 7 since U.S. domestic communications make up 80-90 percent of the Region 2 total. This is true despite the addition of domestic systems for Mexico and Brazil, and the addition of a potential network for Agentina in the High model. Telesat Canada has reduced its projected launches for the remainder of the century, so U.S. domestic transponders still dominate the numbers for Region 2.

Figure 9 shows foreign and regional transponder projections for the first time in an OUPM. The High model shows a relatively high growth (about 9 percent annually) between 1985 and 1998, with a leveling off after 1998 at about 1700 transponders. The Low model shows a more modest growth rate of about 5 percent with a transponder count of about 1000 by the year 2000.

MODEL OVERVIEW BY MISSION CATEGORY

The payload model is divided into twelve mission categories. In this section, a discussion of each category presents rationale for levels of activity, schedules, differences between High and Low models, as well as changes from the 1984 model.

International Communications

Major changes from the 1984 OUPM are apparent in this category. The 1984 High model included a total of 74 international communications satellites; the 1985 High model, 59. The 1984 Low model showed 50 satellites; the 1985 Low model, 36. Most of the changes in these totals are due to reductions in projections for INTELSAT in the period covered by this OUPM. Several factors contribute to reduced projections for INTELSAT: (1) proliferation of proposed international fiber-optic communications networks, (2) lower current and projected growth of communications traffic in portions of the INTELSAT network, and (3) increased likelihood of competition from other projected satellite networks.

Last year's OUPM mentioned the TAT-8 fiber-optic link for the North Atlantic. Since then a TAT-9 cable has been proposed and two additional entities have filed for permission to build fiber networks on the same route; these are Tel-Optik, Ltd. and Submarine Light Cable Co. (SLC), both with desired initial operating dates of 1989. The FCC has recently approved both of these companies' applications for cable landing rights. An industry analyst has said that, if all these plans are effected, there will be six times more capacity available for the North Atlantic route than current projections indicate will be needed by 1995. In the Pacific basin, Japan is planning to lay a fiber-optic cable between Hawaii and Japan to be operating by 1988, and AT&T and 21 other communications companies are planning a fiber-optic cable between the U.S., Hawaii, and the western Pacific to be operational in 1989.

Other fiber-optic-cable systems for the Pacific region are being discussed.

INTELSAT can also expect competition from other organizations that have applied for authorization to supply satellite-based communications capacity between Europe and North America, North America and South America, and North America and Asia. It appears that the FCC is close to granting approval to one or all of the applications by Orion Satellite Corporation, Cygnus Satellite Corporation, International Satellite, Inc., and RCA Americom for service across the North Atlantic. Other intercontinental systems are not so far along in the process, but approval of the domestic North Atlantic competitors will probably provide impetus for entities desiring to supply satellite communications in other regions.

The third development impacting this year's projections is the fact that INTELSAT traffic growth is slowing down. From 1965 to 1980, international satellite communications grew at greater than a 15 percent annual rate, compounded. In 1984, use of INTELSAT circuits in the Atlantic Ocean Region (where a large majority of its capacity is located) grew by only 7 percent. Growth in other regions also did not match earlier projections.

The result of the preceding factors has resulted in a slower growth scenario for INTELSAT in both High and Low models than was presented last year. The remaining satellites of the INTELSAT V (and V-A) series are already committed and will be launched by 1987 in both models.

The 1984 Low model projected only five large INTELSAT VIs. This year, both models show only five I-VIs, the ones that have already been contracted for. These would be launched between 1986-90 in the High model, and 1987-91 in the Low.

An INTELSAT VII series is projected for both models, with fewer transponders than the I-VIs and weighing about 20 percent more than the I-Vs. In the Low model, ten of these I-VIIs would be launched between 1991-2000. These launches would reflect a gradual loss of capacity for INTELSAT during the latter half of this decade. In the High model, the I-VII series would consist of twelve satellites with these being launched 1990-95; an I-VIII series of eight satellites with 20 percent more capacity than the I-VIIs would be launched 1996-2000. In the high scenario, the I-VIIs and I-VIIIs would present about a 6 percent annual market growth for INTELSAT.

In the High model, it is projected that one of the international competitors can find a niche market in the Atlantic region and would launch a three-satellite system in 1989-90 with slight growth and replacement by the end of the century. The Low model shows the same system, but with no growth.

A satellite communications system for the Pacific basin is shown, and is largely unchanged from last year's projection. It consists of a two-satellite system in the High model, starting with 1989 and 1991 launches with replacement and growth by the end of the century. In the Low model, the first satellite is launched in 1990; the second, in 1993; no growth is projected, only replacement. A two-satellite, inter-Americas system (PANAMSAT) is projected for 1991 in the High model; in the Low model, this system does not get past the planning stage.

One more international system exists: INMARSAT. There has been no change made from last year's model with the exception of replacement satellites needed in CY 2000. Earlier this year, a team led by British Aerospace Dynamics Group (BADG) was awarded a contract by INMARSAT for three satellites with options for six more. The High model assumes that these options are exercised and that the satellites are launched 1988-91; replacements are shown starting in 1998. In the Low model, a four-satellite system is projected with launches in 1989-92 and replacements starting in 1999.

U.S. Domestic Communications

Total numbers of U.S. Domestic communications satellites in both the High and Low models of the 1985 OUPM show a dramatic decrease. The High model goes from 163 to 111; the Low, from 97 to 69.

These changes are a reflection of several developments of the past year. Since the FCC has not yet acted on the majority of the applications received in November 1983, a number of potential launches have been postponed from the 1987-88 period to later years. In some cases, this has meant that follow-on launches have slipped out of the OUPM horizon. Because of STC abandoning the DBS area and the difficulty of other groups in lining up firm financing, the number of projected DBS satellites has been dropped from 16 to 8 in the High model and from 8 to none in the Low. The number of "market projection" satellites has been reduced from 15 to 8 in the High model and from 7 to 4 in the Low, reflecting the belief that a good bit of new applications needs will be met by capacity that is included elsewhere in the model. Finally, rapid strides are being made in fiber-optics technology along with a speed-up in establishment of fiber-optics links, resulting in a general lowering of growth rate in domestic satellite communications after the early 1990s.

Several established U.S. commercial satellite systems for domestic communications are currently in existence: they are WESTAR, SATCOM, TELSTAR, SBS, and Hughes Galaxy. In 1984, the first two GTE Spacenet satellites were launched, as well as two Syncom satellites that are leased by the U.S. Navy. In 1985 the GSTAR and Amersat systems will be initiated with launch of their first satellites. Follow-on and replacement satellites for these systems are projected for the period covered by this OUPM.

In addition to these systems that are already established or in the process of becoming operational, there are a number of potential systems that have applied to the FCC for authorization to build, launch, and operate domestic satellite communications systems. These applications are for three different types of service: (1) fixed satellite service (FSS), (2) broadcast satellite service (BSS), and (3) mobile satellite service (MSS).

The fixed satellite service refers to satellites operating in C, K_u and, eventually, K_a bands and providing telephone transmission, data transmission, and distribution of network radio and television programming to subsidiaries and individual stations. All U.S. domestic communications satellites currently in orbit operate in FSS. Over the past several years, a number of potential new suppliers of communications services in the FSS category have filed applications with the FCC. Table 13 presents a list of these entities, shows their status with the FCC, and lists the number of satellites included in this issue of the OUPM for the period 1985-2000. The systems included in the High model are viewed as having a reasonable chance of coming into existence, based upon a high-growth scenario with fiber-optic competition encountering unforeseen difficulties. In the Low model, a more conservative view of growth in user demand and development of new markets was taken, as well as adopting the view of major growth by fiber-optic competitors, starting in the late 1980s. While a number of these applicants had expressed a desire to commence operations in 1987, the lack of positive action by the FCC to date makes it highly unlikely that any of these applicants could have satellites in orbit prior to 1989.

Examining Table 13 shows that the only actions the FCC has taken on these applications have been negative ones; disapproval of the Rainbow, ABCI, and USSSI applications. In addition, in May 1985, the FCC proposed that any applicant to launch a new system or add satellites to an existing system meet two criteria:

(1) Unequivocally demonstrate that it can carry the financial burden of buying, launching, and operating the system for one year.

(2) Provide proof of customer commitments for 80 percent of the capacity of the proposed system.

TABLE 13. POTENTIAL NEW DOMESTIC SYSTEMS IN THE 1989-1992 PERIOD

System or User	FCC Action	Number of Satellites[1] High Model	Low Model
Advanced Business Comm., Inc.	Disapproved	0	0
Alascom (Aurora)	Pending	2	0
Cablesat General	Pending	0	0
Columbia Communications	Pending	0	0
Digital Telesat	Pending	0	0
Equatorial Communications	Pending	2	0
Federal Express	Pending	4	0
Ford Aerospace Satellite Services	Pending	4	3
Martin Marietta	Pending	3	0
National Exchange	Pending	2	0
Rainbow	Disapproved	0	0
U.S. Satellite Systems, Inc.	Disapproved	0	0

(1) Includes follow-ons through 2000.

If this proposed rulemaking is adopted by the FCC, it will become much more difficult for applicants to receive an operating license. Spot checks carried out by the FCC over a period of at least three years show 40-43 percent of U.S. domestic transponders are not in use at the times of the checks.

There have been significant developments in the BSS area in the past year. The company that was seen to be the front runner in direct-broadcast satellites (DBS), Satellite Television Corporation (STC), withdrew from this endeavor and is left with two nearly finished spacecraft and two STS launch slots that are largely paid for. There are a number of companies that have announced they are going to establish U.S. domestic DBS systems. These companies are listed in Table 14 along with their status with the FCC. In addition, both CBS and Western Union applied for authority to build DBS systems, but withdrew their applications before FCC action. STC is shown with two launches in the High model since they have stated they will proceed with the launches (at least the first one) while they try to sell the satellites.

TABLE 14. POTENTIAL U.S. DBS SYSTEMS

System	FCC Action	Number of Satellites(1) High Model	Number of Satellites(1) Low Model
Dominion Video	Approved	4	0
Satellite Television Corp.	Approved	2	0
Advanced Communications	Conditional Approval		0
Antares Satellite Corp.	Filed		0
DBS Corp.	Conditional Approval		0
Hughes Communications Galaxy	Conditional Approval		0
National Christian Network	Conditional Approval	2	0
National Exchange	Conditional Approval		0
RCA	Filed		0
Satellite Development Trust	Conditional Approval		0
Satellite Syndicated Systems	Conditional Approval		0
USSB	Conditional Approval		0

(1) Includes follow-ons through 2000.

In addition to the STC satellites, which may or may not become part of an operational DBS system, the high model shows two U.S. commercial DBS systems consisting of two satellites each. One system is shown coming into being in 1989-90; the other, in 1991-92. The Low model is based on a scenario that assumes either (1) no demand for the DBS medium with the concomitant result of no DBS satellite launches or (2) a relatively minor market (primarily in outlying areas) that is served by medium power transponders on FSS satellites.

In the area of mobile satellite services (MSS), the FCC accepted applications from twelve companies in April 1985. These twelve are listed in Table 15. Three of these applicants also filed requests to offer RDS (radiodetermination satellite) services on the same satellite as they would use to provide the MSS services.

TABLE 15. U.S. MOBILE SATELLITE SYSTEM APPLICANTS

Global Land Mobile Satellite
Globesat Express
Hughes Communications Mobile Satellite
McCaw Space Technologies
MCCA American Satellite Service
Mobile Satellite Corp.
Mobile Satellite Services, Inc.
North American Mobile Satellite
Omninet
Satellite Mobile Telephone
Skylink
Wismer & Becket/Transit Communications

It is expected that only a single applicant will be approved originally to provide a two-satellite system to cover the U.S. and to operate in conjunction with a Canadian MSAT system. The High model shows such a two-satellite system with a first launch in 1989, while the Low model projects a single-satellite system with a 1990 launch. Both High and Low models show replacement launches after 10 years.

Foreign/Regional Communications

The category of Foreign/Regional Communications includes satellites launched by single countries (private or government sponsored) and also satellites sponsored by organizations established to provide services to a regional group of countries (e.g., Eutelsat). Certain satellites with broader international services (e.g. INMARSAT) or sponsored by an organization whose charter is to sell international services (e.g., Cyprus) have been included in the International category. The discussion of Foreign/Regional Communications satellites is grouped into three areas: Europe, Asia/Africa/Pacific, and Latin America plus Canada. A list of the new systems being proposed for each of these regions is given in Table 16. The number of foreign and regional satellites to be launched in the period covered by this OUPM have not changed so dramatically as those for the international and U.S. domestic sectors. Nevertheless, the total number of payload launches has fallen from 170 to 141 in the High model and, from 98 to 86 in the Low. The major contributors to these reductions were clarification of China's future plans and provision of fewer satellites to currently unknown entities. More detailed discussion of changes is provided in the following paragraphs dealing with the separate areas mentioned above.

TABLE 16. POTENTIAL NEW FOREIGN/REGIONAL SYSTEMS IN THE 1980s AND EARLY 1990s

System or User	Number of Satellites(1) High Model	Number of Satellites(1) Low Model
European		
Italsat (Italy)	3	2
Olympus (England)	2	2
TELE-X (Scandinavia)	1	1
NORDCOM (Scandinavia)	4	2
TDF (France)	4	2
TV-SAT (Germany)	4	3
GDL/SES (Luxembourg)	4	-
DFS/KOPERNIKUS (Germany)	4	2
UK DBS	4	-
Sarit (Italy)	3	-
DRS (ESA)	3	-
Yugoslavia	-	-
Romania	-	-
F-Sat (France)	-	-
Videosat (France)	-	-
Luxsat (Luxembourg)	-	-
Helvesat (Switzerland	-	-
Mailstar (Sweden)	-	-
European Business System (Sweden)	-	-

TABLE 16. POTENTIAL NEW FOREIGN/REGIONAL SYSTEMS IN THE 1980s AND EARLY 1990s (Continued)

System or User	Number of Satellites(1) High Model	Low Model
Latin America/Canada		
Morelos	5	4
SBTS	5	4
Argentina (Nahuel)	3	-
Cuba	-	-
Satcol	-	-
Carib-sat	-	-
Andes-Sat	-	-
Asia/Africa/Pacific		
AMS (Israel)	1	-
Arabsat	5	4
Aussat	7	6
INS (Japan)	-	3
JSC (Japan)	4	-
China DBS	5	2
STW (China)	9	6
AFSAT	1	-
PAKSAT (Pakistan)	2	-
KOREASAT	1	-
Egypt	-	-
Nigeria	-	-
Arab DBS	-	-
Thaisat (Thailand)	-	-

(1) Includes follow-ons through CY 2000.

In WARC Region 2, the U.S. and Canada will be joined this year by Mexico and Brazil in having domestic communications satellites on orbit; Brazil with two SBTS satellites scheduled for launch on Ariane, one this year and one next year, and Mexico with two Morelos satellites to be Shuttle-launched in 1985 (in the Low model, one of these is shown slipping to a 1986 launch). Both Mexico and Brazil are shown with follow-on launches in the mid-1990s in both High and Low models. The High model shows Argentina establishing a two-satellite domestic network in 1990-91, while the Low model assumes Argentina will continue to procure needed satellite communications services from Intelsat or from one of its potential competitors. None of the other proposed national or regional systems shown in Table 16 is included in either the High or Low models.

Predicted and current demand for satellite communications in Canada has decreased drastically from earlier projections with the following consequences:

(1) The High model for 1985 projects 5 Telesat-Canada launches as opposed to 10 contained in the 1984 High model.

(2) The equivalent figures for the Low model are 7 and 4.

(3) Telesat's Anik C-3, launched in April of this year is planned to remain inactive in on-orbit storage for about 3 years before it is expected to be needed (it was launched because it was more economical to be stored on orbit than to be stored on the ground and launched during a period of considerably higher costs for launch services).

Although there appears to be a good chance that Canada will proceed with a mobile communications satellite (MSAT) to be coordinated with the U.S. commercial Mobilsat program, there are indications that the launch of such a satellite would be underwritten partially or totally by NASA. This eventuality would class the launch of a possible Canadian MSAT as a NASA launch and, thus, not qualified for inclusion in this model.

In 1985 several countries/organizations will join the list of Asian and African countries that have already orbited test and operational systems. Joining Indonesia, Japan, and China will be Australia and the Arab Satellite Communications Organization. Table 16 lists not only Arabsat and Aussat, but also a number of other systems being proposed, studied, or planned by Asian/African countries, groups of countries, and commercial organizations. Arabsat and Aussat each has two launches scheduled in 1985; it is interesting that there is apparently enough demand for the services to be provided by the Aussat network that a third satellite in that series is already scheduled for launch in 1986. In the High model, both Aussat and Arabsat are shown with replacement satellites including growth; the Low model indicates replacement, only.

Among previously established entities in Asia, only Indonesia's projected launches look much the same as last year. A Palapa launch (B-3) is scheduled for 1986; three replacements are scheduled for the early 1990s in the High model, with only two in the Low model. This model predicts that an operational STW system for China will not be established so rapidly as predicted in the 1984 OUPM, with several launches being removed from both High and Low models. During the past year, China's near-term plans for DBS have become clearer with its issuing an RFP for procurement of a two-satellite system, and reserving launch space on both Ariane and STS. As a result, the numbers of DBS satellites predicted for Mainland China during the remainder of the century have been reduced by about half in both High and Low models. Japan is shown with follow-ons to both their BS and CS series of satellites. In addition, the High model shows one of the recently formed Japanese-U.S. commercial joint ventures launching a two-satellite network in the late 1980s, and replacing it in the late 1990s. In the Low model, a totally domestic Japanese system is shown in the early 1990s. While fiber-optic communication is not likely to affect the growth of communications satellite systems in Indonesia and China in the near future due to the widespread geographic dispersion of population in both of these countries, it could have a severe impact in Japan due to (1) the compact nature of the Japanese nation and (2) the fact that Japan is a world leader in fiber-optic devices and systems.

Among smaller Asian countries, Pakistan and Korea are shown, in the High model, initiating domestic satellite communications networks in the 1990s. An African-Mediterranean area satellite (AMS) proposed by an Israeli consortium is also shown being launched in the early 1990s in the High model only. Although Thailand has been expressing possible interest in buying and launching one of the recovered and refurbished HS-376 satellites, it could be considered to be included in the "market model" projections for other entities that could launch systems in the future.

The situation with respect to European area communications satellites is largely unchanged from that presented in last year's OUPM. The 1984 OUPM showed 57 satellites in the High model and 35 in the Low. The 1985 version lists 59 in the High and 31 in the Low. Since the totals are so close, only the relatively significant changes are discussed.

ESA has proposed a data relay system (DRS) consisting of three satellites to be used in relaying information from the ESA Space Station module, Columbus, to Earth. This system would be launched in the mid-1990s in the High model, but is not contained in the Low. Italy is studying a three-satellite combined DBS-FSS system, called Sarit, to be orbited over a 7-year period starting in 1989. This system also is contained in the High model but not in the Low.

A series of follow-on satellites to the British military Skynet IV system was proposed during the past year. This raised the number of launches shown in the High model from four to eight, and in the Low from four to six. Because Great Britain appears to be having both commercial and political problems in establishing a DBS program, the Unisat and Eiresat programs shown last year have been collapsed into a single "UK DBS" system with High model launches reduced from 6 to 4. Neither the 1984 or 1985 Low model envisions a DBS system dedicated to the United Kingdom.

The nine-satellite ECS system of EUTELSAT shown in the 1984 High model is reduced to six satellites in this year's issue, whereas the Low model remains at six. An Olympus II satellite is now scheduled in both High and Low models; last year, only the first Olympus was shown in both models.

The remainder of the satellite systems shown in the 1985 OUPM in this category remain largely as shown in the 1984 version, with a few launches being slipped a year or two, and an occasional satellite being added or dropped. There has been a name change: the German "Postsat" of last year is now "DFS-Kopernikus".

As a matter of policy, the French amateur radio satellite "Arsene" was dropped from the OUPM. These satellites are usually quite small compared to most payloads contained in this model. In addition, they have little commercial significance, since they are usually launched at a minimal charge (or gratis). By including this type of satellite in an overall count of payloads launched, an artificially high sum is arrived at. There will be no more of them included in the OUPM.

One idea, recently broached by EUTELSAT, but not included in this year's OUPM, is that of a Pan-European DBS system that would be analagous to the ECS system in the FSS band. Since this proposed plan is so new it has had no reported reaction yet, it was not factored into this year's OUPM.

As is seen from Table 16, there are two newly proposed systems (both Swedish) for which no satellites have been included in either High or Low model. One is the low-Earth-orbit Mailstar message-relay system, and the other is a proposed business data-transfer system.

U.S. Geostationary Earth Orbit (GEO) Observations

GOES (Geostationary Operational Environment Satellite) is a system operated by NOAA which provides data to weather stations throughout the entire U.S. The system undergoes periodic improvements by installation of additional sensors and/or new improved sensors on the next series of satellites. The design life of the GOES spacecraft is 7 years. In the High model, replacements are launched every 5 to 6 years to keep three active satellites on orbit with an in-orbit spare, if possible. In the Low model, fewer launches are forecast under the assumption that the replacement time is 7 to 8 years due to satellites exceeding their design life. There are no significant changes from the 1984 OUPM.

Foreign Geostationary Earth Orbit (GEO) Observations

To the present time only Europe and Japan have built and launched satellites for observing the Earth from geosynchronous orbit. Both Europe and Japan launched their first such satellites for meteorological purposes in 1977. The Japanese GMS-1 (Geostatic Meteorological Satellite) launch was followed up with replacement launches in 1981 and 1984. Future replacement launches are expected in 1989, 1994, and 1999 in the High model. The Low model projects that a 7-year lifetime will be achieved for these follow-on satellites, resulting in a need for only two additional launches by the end of the century. An experimental satellite to test instruments for a more advanced version of the GMS for the early 2000s is forecast for launch in the late 1990s in both High and Low models. Japan is also expected to launch a satellite to geosynchronous orbit to be used for geological and other resource observations about 1990 in both models with a follow-on in about 7 years in the High model, and an experimental satellite toward the end of the century in the High Model. Japan is also projected to launch two additional geostationary Earth observations satelites in both models in the 1990s; marine observation is a possible use for these satellites.

The European EUMETSAT program is planning to launch a prototype of a Meteosat Operational Program satellite in 1986, with launches of a three-satellite network projected for 1987, 1988, and 1991. Replacements are forecast for seven years after the original satellites are launched. The Low model projects a two-satellite system launched in 1987 and 1988 with follow-ons eight years later. It is expected that ESA will begin a geostationary Earth observations program in the mid-1990s, and three satellites are projected in the High model, only one in the Low.

It is expected that China will become the third foreign entity to launch geostationary Earth observations satellites. The High model projects a single satellite in 1990, with replacements at 5-year intervals; the Low model delays initial launch to 1991, again with a 5-year replacement schedule.

Five additional foreign geostationary Earth observation satellites are included in the High model, and three in the Low model, in anticipation of other national entities initiating their own domestic or regional systems.

The Low model scenario assumes that improvements in reliability and lifetime will reduce the follow-on launch rate. In addition, part of the reduction in activity is attributed to budgetary constraints which impact the initial R&D activities and force a stretchout of replacements for the operational meteorological satellite systems.

U.S. Low Earth Orbit (LEO) Observations

Payloads in this category generally operate in the altitude range of 210 to 600 nmi and are usually sun-synchronous. The service life of these satellites is generally short compared to communications satellites. The short service life results from economic trade-offs of the following parameters: (1) fuel required to maintain desired orbit, (2) service lives of special instruments, (3) reliability of system components, (4) total power requirements, and (5) obsolescence due to significant improvement in sensors, on-board data processing, and new techniques for reducing processed-data costs. A planned STS operation which may change the design requirements of LEO payloads is the retrieval of LEO payloads for resupply. It is believed to be premature to factor the impact of these planned operations into either the High or Low models.

Satellites in this category traditionally have been supported by NASA. They provide valuable data for a large portion of the population. The TIROS-N series of weather satellites has been transferred to NOAA, and NASA's LANDSAT system is in transition to a commercial operation. The High model shows the launch of the first commercial LANDSAT occurring in 1988 with a two-satellite system being established by 1991. Four replacement launches are also shown in the 1990s at intervals that could provide some backup capability in case of premature satellite failure. The Low model shows a first commercial LANDSAT launch in 1989 with replacement launches occurring at five-year intervals.

The High model includes a postulated low-cost, short-life series of LEO satellites customized for geological investigations for individual corporate users. This satellite series is not included in the Low model.

Foreign Low Earth Orbit (LEO) Observations

To date, the U.S. LANDSAT program has been the only operational LEO Earth observations program. This monopoly will be broken when the French SPOT-1 satellite is launched toward the end of 1985. A number of other countries and ESA are also planning to launch LEO satellites during the remainder of the century for a variety of purposes.

The SPOT program is poised to take advantage of a two-year gap in LANDSAT operations that could occur as a result of the prolonged process of selecting a commercial operator to assume the U.S. Earth observations program. A commercial marketing organization, SPOT-Image, was formed in 1982 to market imagery and other products to be obtained and enhanced from the SPOT satellites. The High model predicts five launches of SPOTs, while the Low model projects four. ESA proposes a series of ERS (Earth Resources Satellite) spacecraft whose primary missions will be observations of ice cover, oceans, and weather. The High model shows four of these starting in 1989; the Low model, three, beginning in 1990. Other European LEO satellites such as an Advanced

Land-1 for a 1995 launch are included in a generic "Operational LEO" category that contains two launches in the last half of the 1990s in both High and Low models. The oft-discussed Franco-German military reconnaissance satellite, SAMRO, is projected to have seven launches in the High model, while it is absent from the Low model.

Japan is planning a series of Maritime Observation Satellites (MOS) with seven launches shown in the High model and five in the Low, starting in 1986. Both models show a Japanese experimental geodetic payload being launched in 1986. In the 1990s, Japan has plans for a series of Earth remote sensing (J-ERS) satellites that would be slanted toward LANDSAT-type rather than ocean-sensing applications. The High model shows five of these satellites; the Low model, only three. In all of these Japanese LEO satellites, the first of the series is an experimental, proof-of-concept satellite, with operational ones being built and launched only after successful demonstration of the originals.

A series of Indian remote sensing (IRS) satellites is shown with a planned first launch on a Soviet ELV in 1986; five follow-on launches, to be carried out with the Indian-developed PSLV starting in 1988, are shown in the High model. The Low model projects only three follow-on IRS launches by the end of the century. Two series of South American and Chinese LEO Earth-observation satellites are also anticipated with the first Chinese launch occurring in 1986. The first South American launch, possibly by Brazil (which has plans to develop its own launch vehicle), is not expected until 1990 in the High model and 1991 in the Low.

There are three other LEO satellites shown in the High model, but not in the Low. These are a two-satellite POPSAT (Precise Orbit Prediction Satellite) being studied by ESA for 1992 and 1996 launches, and the on-again, off-again TERS (Tropical Earth Resources Satellite) being put forth as a joint venture of Indonesia and the Netherlands with a projected 1996 launch in the High model. In addition, the High model contains six and the Low model three satellites to account for countries that might decide to get into the LEO business, but have not yet made their interest known.

Navigation Aids

This category shows little change from the numbers that were presented last year. The only change is the addition of a commercial position-determining system in the High model. The only other satellites are those of the NAVSTAR system being studied by ESA, and the U.S. Navy's Transit satellites.

Since the Transit spacecraft have, historically, exceeded their design lifetime of 4 years by large margins, their actual launches have been fewer than scheduled. The U.S. Navy has decided to launch the remainder of the Transits and maintain them in on-orbit storage until needed. To this end, the SOOS (Stacked Oscar On Scout)* Program was initiated to enable two Transits to be launched by a single Scout. The High model shows eight Transits being launched in the 1985-87 period, in accordance with the Navy's planned schedule. The Low model contains the same number of satellites, but assumes the SOOS program is not effected until 1988 and spreads the total program out until 1994. The NAVSAT system currently being studied by ESA is similar to the DOD's NAVSTAR project, but with simpler spacecraft. The High model assumes that ESA adopts the program and deploys 27 spacecraft (including three on-orbit spares) over a 5-year period beginning in 1990. The Low model does not include a NAVSAT system.

The High model also contains a position-locating satellite system being established in 1989-90, with replacement launches seven years later. Four companies have applied to FCC to be considered for launching satellites in the RDSS (Radio Determination Satellite System) spectrum. They are (1) Geostar Corporation; (2) MCCA American Radiodetermination Corp.; (3) McCaw Space Technologies, Inc.; and (4) Omninet Corporation. Geostar has carried out ground tests of its concept and has applied to FCC for permission to place an experimental

*Oscar is the Navy's name for Transit.

payload aboard the GSTAR A-2 satellite to be orbited in 1986. The Low model includes no such satellites under the assumptions that (1) orbital tests prove unsuccessful, (2) there is no market for the service, or (3) the function can be provided with auxiliary payloads included aboard satellites operating in the fixed-satellite service.

Foreign Planetary

This category is little changed from the 1984 model. Foreign planetary missions currently are being planned by two organizations: ESA and Japan. ESA has firm plans for two missions, Giotto (a Halley's comet mission) and International Solar Polar, for the mid-1980s. With their general interest in this area, additional missions could occur in the 1990s, and one is included in both the High and Low models in 1998. The ISPM mission is not included in the model since it is a cooperative mission with NASA providing the STS launch at no charge to ESA. The Japanese also have specific plans for the future and are likely to continue their program into the 1990s. The Japanese are expected to use one of their national launchers for these missions. The High model includes three additional planetary missions before the turn of the century, while the Low model lists only one.

Scientific/Technical Development

There are few differences between the 1984 OUPM and this year's issue in the S/TD category outside of four payloads added in the High model and two in the Low because of the one-year change in the period being covered.

The majority of payloads in this category are sponsored by ESA, Japan, and India. The High model projects that each of these sponsors will have expanding scientific programs in the 1980s and will maintain a high level of activity using automated payloads in addition to Spacelab. Only the automated payloads are included in this model. ESA has a relatively constant budget for science missions (adjusted for inflation), thus the overall ESA activity remains relatively constant throughout the time period.

In the Low model, it is assumed that Spacelab will be the focal point of the ESA activity, with less emphasis on automated payloads. A trend toward cooperative missions may further reduce the number of ESA scientific automated payloads.

In Japan, the Institute of Space and Aeronautical Sciences (ISAS) is responsible for carrying out the space-science program. As the Japanese space-science program expands, it is projected that the payloads will increase in mass and size, and will utilize the capabilities of the N series launch vehicles rather than the smaller Mu vehicles. The number of Japanese scientific satellites and the projected launch schedule were derived from the proposed Japanese 15-year space program plan. The proposed program, which is considered ambitious, was reduced slightly and used for the High model. The Low model reflects a greatly reduced level of activity for the Japanese scientific programs.

India is planning an increasingly active program of scientific space exploration. Since 1979, India has launched three of its Rohini scientific satellites using its own SLV-3 launch vehicle. The High model projects 15 additional Indian S/TD satellite launches during the 16 years covered by the OUPM. The majority of these launches would use the Indian-developed ASLV (ready this year) and PSLV (to be operational about 1988) expendable launch vehicles. The ASLVs would be used to launch stretched versions of the Rohinis (SROSSs); the PSLV, with more capability, is planned to be used for sun-synchronous launches of payloads weighing up to about 1300 pounds. The Low model projects a total of ten Indian S/TD launches, six of them being SROSS-type payloads.

A Chinese S/TD payload program is also postulated, with six launches being contained in the High model and four in the Low.

Emerging scientific and technical development launch programs are projected for both India and China. It is expected that payloads developed under these programs will be launched on domestic Indian and Chinese ELVs.

Materials Test and Processing

The materials processing mission category has the potential of becoming one of the major segments of the overall model. However, there are still a great number of uncertainties regarding the commercial viability of materials processing in space (MPS). Consequently, there is a large difference between the High and Low models.

The availability of Space Station and the cost of doing business both could be big factors in determining the economic feasibility of MPS and how it is performed. Given the uncertainties associated with Space Station today, it was decided that no attempt would be made to differentiate between operations with and without Space Station. LEASECRAFT/EURECA-type operations therefore are assumed through the model, except for a few attached R&D payloads. The High and Low models appear to contain sufficient latitude to deal with a wide variety of other possible outcomes.

The NASA Joint Endeavor Agreement (JEA) program will likely be the beginning of many commercial operations. The initial JEA was established with McDonnell Douglas Astronautics Company and Johnson and Johnson (MDAC/JJ) for their Electrophoresis Operations in Space (EOS) program. The MDAC/JJ EOS program began in 1976 and had its first flight in the Shuttle mid-deck in 1982. Additional JEA flights have been made and others are scheduled in the 1984-1986 time period. These JEA flights, being non-reimbursable, are not shown in the model. The EOS models for 1985 are identical to those of 1984. Flights to date are reported to have verified expected performance, and there are no announced reasons to change the 1984 numbers. In the High model the EOS program is shown as beginning commercial operations in the late 1980s and growing to full-scale operation in the 1990s. In the Low model, however, the EOS program is shown as being tried in the 1980s and not being continued. A number of factors could cause this. They include technical problems, economic viability, and development of a less expensive ground-based system. In both the High and Low models, it is assumed that a mix of shared and dedicated flights will be used in conjunction with the use of factories aboard free-flying space platforms that can rendezvous with the Orbiter to exchange processed product for a resupply of raw materials. Fairchild (with Leasecraft), RCA, and Ball Aerospace are proposing such platforms.

Although there are a large number of other products/processes that have been considered for materials processing in space, only a few have been identified as having a chance at becoming commercial ventures. These are production of Gallium Arsenide chips and Mercury Cadmium Telluride detectors, an isoelectric-focusing-separation technique which would complement EOS, and small-scale research programs in metals/ceramics and protein crystals which would be used to better understand ground processes. In the High model, all these possibilities are included; while in the Low model only one is shown as being commercially successful in competition with evolving terrestrial technologies. Since pharmaceuticals appear to hold promise for producing high value-added products through space processing, a number of pilot-plant size payloads are shown in the Low model. In the High model it has been assumed that sufficiently positive results are obtained in early JEA-supported flights to move immediately to production-size payloads in several cases; thus, no pilot plant payloads are shown on a separate line in the High Model.

One additional generic MPS series involving relatively high transportation demand is included in the High model. This demand could represent the later entry of a competitor in the EOS field or evolution of a major new product through JEA activities by firms such as 3M.

In the foreign area, ESA's EURECA mission is included in both models, as well as some generic materials processing, which could be an outgrowth of German, French, or Japanese programs.

Multiservice Spacecraft/Vehicle

The first operational satellite to operate in a multiservice mode was India's INSAT-1A, launched in 1982. This satellite, operating in geostationary orbit, provided communications services, TV broadcasting, and meterological observations before its premature demise after less than five months of service. INSAT 1-B was launched in August 1983, and is functioning properly. The communications functions of this satellite have been designed to be compatible with Indonesia's second-generation communications satellite PALAPA-B. Thus, for the communications task, INSAT can back up PALAPA and vice versa. West Germany's deployable Shuttle Pallet Satellite (SPAS) is included in this category since it has the capability of accepting a variety of different types of payloads.

In future issues of the OUPM, more payloads may be included under this category. As an example, several of the applicants for authorization to build and launch satellites for mobile communications included requests to provide position determination capability aboard the same satellites or filed separately for RDSS satellites. As this issue becomes clearer, reassignment of such satellites may be made.

APPENDIX A

to

OUTSIDE USERS PAYLOAD MODEL

DETAILED PAYLOAD MODELS

JULY 1985

APPENDIX A
DETAILED PAYLOAD MODELS

INTRODUCTION

Detailed High and Low payload models are found in this appendix. Tables A-1A and A-1B present the High model and Tables A-2A and A-2B present the Low model. In each case, the "A" tables contain schedule, launch, and organizational data; while the "B" tables contain technical details of the payloads themselves. Definitions of the symbols used are given in the "Key to Tables and Table Symbols".

In some cases, a single type of payload may be represented by multiple entries in the tables. Typical examples would include:

- A single series of payloads, some of which are committed to Shuttle and others committed to Ariane
- A series of payloads which transitions from one form of ownership to another during the forecast period.
- A series of related payloads (e.g., MPS) which have a variety of launch weights.

Fairly detailed technical data are provided (in the "B" tables) on near-term payloads and others that are well defined. Estimated values are frequently used for longer-term payloads.

DESIGN LIFE: Design service life of the satellite system is shown in years. These data are needed to estimate replacement schedules.

LAUNCH SCHEDULE: Number in column is the quantity per calendar year, not the month in which a launch is planned.

GROUND SPARE: Ground spares are not counted in any of the totals. The entry is included to provide accountability for the total buy of flightworthy satellites. Launches of on-orbit spares are not differentiated from the launches of active satellites.

PROGRAM STATUS: Program status is provided to assist the user in assessing the level of commitment to the program and the certainty of the launch schedule. Frequently these data are missing due to data unavailability and/or lack of clarity in categorizing the status.

A - Program approved
C - Contracted
D - Design/competition stage
F - Expected follow-on
L - Already launched within the year of the OUPM
M - Market forecast
O - Option
P - Proposed/planned
S - Being studied.

LAUNCHER STATUS:

A - Alternative

C - Captive (no choice)

F - Firm

P - Probable

U - Unknown

If a single launch vehicle is shown and is assigned "F", "C", or "P", it is assumed that the vehicle will get 100 percent of the market. Where two launch vehicles are shown, the nominal market split is assumed to be 75/25 if one vehicle is listed as "P" and the other is listed as "A". Where both are "A", a 50/50 nominal split is assumed. This does not mean that the individual payload's flights will be split as indicated. Rather, it is a rough guess of which way the market for payloads of this type will be split. (In some cases, a single type of payload may be flown on more than one launcher.)

TRAJECTORY: Payloads destined for Geostationary Orbit will not have a specific transfer orbit stated. Sun-synchronous orbits may not have altitude and inclination specified.

Key to Tables A-1B and A-2B

NOTE: The "B" tables contain a number of physical payload parameters: dimensions, weights, etc. These parameters are not always readily available and frequently cannot be estimated with any degree of certainty. A short dash -- or OPEN means data not available. A question mark indicates that data missing from this report should be available from other sources.

SPACECRAFT DESCRIPTION: Describes type of bus or spacecraft to be used.

EQUIVALENT 36-MHz TRANSPONDERS: For communications satellites, an estimated number of equiavalent 36-MHz C, K_u, and K_a band transponders is shown.

SPACECRAFT WEIGHT: Weight, lbs, of the spacecraft at the beginning of its operational life.

CONFIGURATION FOR STS LAUNCH: Appropriate data (below) are indicated for those payloads where STS launch parameters are known.

UPPER STAGE USED: Where perigee stages are used, indicates name or type to be used. A name followed by a question mark is used to indicate approximate stage size, not the actual stage to be used.

LIFTOFF WEIGHT: Weight, lbs, of the complete STS payload. Includes spacecraft, propulsion stages, cradles, etc.

LIFTOFF LENGTH: Length, ft, of the complete STS payload. Includes spacecraft, propulsion stage, cradles, etc.

MOUNTING: Indicates horizontal (H) or vertical (V) mounting in the STS.

STS CHARGE POLICY: STS transportation charge category.

0 - NASA payload - no reimbursement to NASA (may appear in the OUPM for some joint payloads)
1 - Transportation charges per 14 CFR 1214.1
2 - Transportation charges per 14 CFR 1214.2
3 - DOD payload

OUTSIDE USERS PAYLOAD MODEL TABLES

HIGH MODEL

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	INTERNATIONAL COMMUNICATIONS																											
1	INTELSAT V, F-10	D	INTELSAT	A	7	1																1		L	A/C	E	F	GEOSYNCH TRANSFER
2	INTELSAT V-A, F-11, F-12	D	INTELSAT	A	7	2																2		C	A/C	E	F	GEOSYNCH TRANSFER
3	INTELSAT V-A, F-13, F-14, F-15	D	INTELSAT	A	7		3															3		C	AR-2	K	F	GEOSYNCH TRANSFER
4	INTELSAT VI F-1, F-2	D	INTELSAT	A	10		1	1														2		C	STS	E	F	GEOSYNCH TRANSFER
5	INTELSAT VI F-3	D	INTELSAT	A	10				1													1		C	AR-4	K	F	GEOSYNCH TRANSFER
6	INTELSAT VI F-4, F-5	D	INTELSAT	A	10				1	1												2		C	STS AR-4	E K	A A	GEOSYNCH TRANSFER
7	INTELSAT VII	D	INTELSAT	A	10						2	1	2	1	1							7		O	AR-4 STS	K E	P A	GEOSYNCH TRANSFER
8	INTELSAT VII	D	INTELSAT	A	10								1	2	1	1						5		O	STS AR-4	E K	P A	GEOSYNCH TRANSFER
9	INTELSAT VIII	D	INTELSAT	A	10												2	1	2	1	2	8		F	STS AR-4	E K	A A	GEOSYNCH TRANSFER
10	OTHER INT. (ORION, CYGNUS, ISI)	D	OTHER	A	10					1	2					1			1	2		7		P	STS AR-2	E K	P A	GEOSYNCH TRANSFER
11	INMARSAT 1, 2, 3	D	INMARSAT	A	10				1	2												3		C	STS ARI	E K	A A	GEOSYNCH TRANSFER
12	INMARSAT 4, 5, 6, 7, 8, 9	D	INMARSAT	A	10						3	3										6		O	STS ARI	E K	A A	GEOSYNCH TRANSFER
13	INMARSAT F/O	D	INMARSAT	A	10														1	2	3	6		F	STS ARI	E K	A A	GEOSYNCH TRANSFER

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	INTERNATIONAL COMMUNICATIONS													
1	INTELSAT V, F-10	FORD		3-AXIS	40	21	0	2315	NA	NA	NA	-	-	LAUNCHED 3-22-85
2	INTELSAT V-A, F-11, F-12	FORD		3-AXIS	44	21	0	2395	NA	NA	NA	-	-	
3	INTELSAT V-A, F-13, F-14, F-15	FORD		3-AXIS	44	21	0	2395	NA	NA	NA	-	-	
4	INTELSAT VI F-1, F-2	HUGHES		SPIN	62	24	0	4800	INT.	35274	27.9	H	1	
5	INTELSAT VI F-3	HUGHES		SPIN	62	24	0	4800	INT.	NA	NA	-	-	
6	INTELSAT VI F-4, F-5	HUGHES		SPIN	62	24	0	4800	INT.	35274	27.9	H	1	
7	INTELSAT VII	UNK		UNK	40	40	0	3000 (EST)	UNK	25000 (EST)	22.5 (EST)	H	1	
8	INTELSAT VII	UNK		UNK	40	40	0	3000 (EST)	UNK	25000 (EST)	22.5 (EST)	H	1	
9	INTELSAT VIII	UNK		UNK	48	48	0	3500	UNK	30000 (EST)	24.0 (EST)	H	1	
10	OTHER INT. (ORION, CYGNUS, ISI)	UNK		UNK	22	0	0	1300 (EST)	UNK	10000 (EST)	8.5 (EST)	V	1	
11	INMARSAT 1, 2, 3	BADG	EUROSTAR	3-AXIS	0	0	0	1600 (EST)	UNK	14550 (EST)	13.0 (EST)	V	1	
12	INMARSAT 4, 5, 6, 7, 8, 9	BADG	EUROSTAR	3-AXIS	0	0	0	1600 (EST)	UNK	14550 (EST)	13.0 (EST)	V	1	
13	INMARSAT F/O	UNK		UNK	0	0	0	1600 (EST)	UNK	14550 (EST)	13.0 (EST)	V	1	

XBLC-2 (5-85) STD

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	INTERNATIONAL COMMUNICATIONS																											
1	PASS	D	PACIFIC AREA SATELLITE SYSTEM	A	10					1		1										2		P	STS ARI	E K	A A	GEOSYNCH TRANSFER
2	PASS F/O	D	PACIFIC AREA SATELLITE SYSTEM	A	10															1	1	2		F	STS AR-4	E K	A A	GEOSYNCH TRANSFER
3	PANAMSAT	D	PAN AMERICAN SATELLITE	A	10							2										2		P	STS AR-4	E K	P A	GEOSYNCH TRANSFER
4	TOTAL					3	4	1	3	5	7	7	3	3	2	2	2	1	4	6	6	59						
5																												
6																												
7																												
8																												
9																												
10																												
11																												
12																												
13																												

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	INTERNATIONAL COMMUNICATIONS													
1	PASS	UNK		UNK	12	12	0	1900 (EST)	UNK	15000 (EST)	15.0 (EST)	V	1	
2	PASS F/O	UNK		UNK	24	24	0	3000 (EST)	UNK	25000 (EST)	22.5 (EST)	H	1	
3	PANAMSAT	HUGHES?	HS-393 CLASS	SPIN	24	12	0	1900 (EST)	INT	15000 (EST)	15.0 (EST)	V	1	
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	U.S. DOMESTIC COMMUNICATIONS																											
1	WESTAR 6S	D	WESTERN UNION	B	10		1															1		C	STS	E	F	GEOSYNCH TRANSFER
2	WESTAR -8	D	WESTERN UNION	B	10					1												1		P	STS ARI	E K	P A	GEOSYNCH TRANSFER
3	WESTAR F/O 9, 10, 11, 12, 13	D	WESTERN UNION	B	10								2		1		1			1		5		F	STS ARI	E K	A A	GEOSYNCH TRANSFER
4	WESTAR KU A, B	D	WESTERN UNION	B	10							1	1									2		P	STS ARI	E K	P A	GEOSYNCH TRANSFER
5	FORDSAT 1, 2	D	FORD AEROSPACE SATELLITE SERV. CORP.	B	10					1	1											2	1	A	STS ARI	E K	P A	GEOSYNCH TRANSFER
6	FORDSAT F/O	D	FORD AEROSPACE SATELLITE SERV. CORP.	B	10															1	1	2		F	STS	E	P	GEOSYNCH TRANSFER
7	AMERSAT -A, -B	D	AMERICAN SATELLITE COMPANY	B	9	1	1															2	1	C	STS	E	F	GEOSYNCH TRANSFER
8	AMERSAT F/O	D	AMERICAN SATELLITE COMPANY	B	10										1	1		1				3		F	STS	E	P	GEOSYNCH TRANSFER
9	AMERSAT K	D	AMERICAN SATELLITE COMPANY	B	10							1										1		P	STS	E	P	GEOSYNCH TRANSFER
10	MOBILSAT -1, -2	D	MOBILE SAT. CORP., SKYLINK, ETC.	B	10					1	1									1	1	4		P	STS	E	P	GEOSYNCH TRANSFER
11	GSTAR A-1	D	GTE SATELLITE CORP (GSAT)	B	10	1																1		L	AR-3	K	F	GEOSYNCH TRANSFER
12	GSTAR A-2	D	GTE SATELLITE CORP (GSAT)	B	10		1															1		C	AR-3	K	F	GEOSYNCH TRANSFER
13	GSTAR A-3	D	GTE SATELLITE CORP (GSAT)	B	10			1														1	1	C	STS AR-3	E K	P A	GEOSYNCH TRANSFER

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS C	KU	KA	SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH: UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING	STS CHARGE POLICY	NOTES
	U.S. DOMESTIC COMMUNICATIONS													
1	WESTAR 6S	HUGHES	HS-376	SPIN	24	0	0	1450	PAM-D	9962	8.2	V	1	
2	WESTAR -8	UNK		UNK	24	0	0	1450	PAM-D	10032	8.2	V	1	
3	WESTAR F/O 9, 10, 11, 12, 13	UNK		UNK	24	0	0	1450 (EST)	PAM-D	10032	8.2	V	1	
4	WESTAR KU A, B	UNK		UNK	0	16	0	2100 (EST)	PAM-D2	16000	15.0	V	1	
5	FORDSAT 1, 2	FORD		3-AXIS	24	24	0	3100	UNK	17914	16.5	H	1	
6	FORDSAT F/O	FORD		3-AXIS	24	24	0	3100	UNK	17914	16.5	H	1	
7	AMERSAT -A, -B	RCA		3-AXIS	24	12	0	1467	PAM-D	10068	8.2	V	1	
8	AMERSAT F/O	UNK		UNK	24	12	0	1467	PAM-D ?	10068	8.2	V	1	
9	AMERSAT K	UNK		UNK	24	30	36	2200 (EST)	PAM-A ?	16000	15.0	V	1	
10	MOBILSAT -1, -2	UNK	HS-376 CLASS	UNK	0	27	0	1300 (EST)	PAM-D ?	10000 (EST)	8.2 (EST)	V	1	
11	GSTAR A-1	RCA		3-AXIS	0	24	0	1471	NA	NA	NA	-	-	LAUNCHED 5-7-85
12	GSTAR A-2	RCA		3-AXIS	0	24	0	1471	NA	NA	NA	-	-	
13	GSTAR A-3	RCA		3-AXIS	0	24	0	1471	PAM-D2	13430	8.2	V	1	

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	U.S. DOMESTIC COMMUNICATIONS																											
1	GSTAR F/O	D	GTE SATELLITE CORP (GSAT)	B	10											1	2					3		F	STS ARI	E K	P A	GEOSYNCH TRANSFER
2	SPACENET -3	D	GTE SPACENET	B	8	1																1	1	C	AR-3	K	F	GEOSYNCH TRANSFER
3	SPACENET F/O	D	GTE SPACENET	B	10								2	1								3		F	STS ARI	E K	A A	GEOSYNCH TRANSFER
4	SBS -5	D	SATELLITE BUSINESS SYSTEMS	B	10		1															1		C	ARI	K	F	GEOSYNCH TRANSFER
5	SBS -6, -7, -8, -9	D	SATELLITE BUSINESS SYSTEMS	B	10				1	1		1		1								4		C	STS ARI	E K	P A	GEOSYNCH TRANSFER
6	SBS -10, -11	D	SATELLITE BUSINESS SYSTEMS	B	10														1	1		2		F	STS ARI	E K	P A	GEOSYNCH TRANSFER
7	GALAXY -D	D	HUGHES COMMUNICATIONS INC.	B	9		1															1		C	3920P	E	F	GEOSYNCH TRANSFER
8	GALAXY F/O	D	HUGHES COMMUNICATIONS INC.	B	9								2	1		1						4		F	STS	E	P	GEOSYNCH TRANSFER
9	GALAXY K -1, -2	D	HUGHES COMMUNICATIONS INC.	B	10				2													2		P	STS	E	P	GEOSYNCH TRANSFER
10	GALAXY K F/O	D	HUGHES COMMUNICATIONS INC.	B	10														2			2		P	STS	E	P	GEOSYNCH TRANSFER
11	GALAXY KA -1, -2	D	HUGHES COMMUNICATIONS INC.	B	10							1	1									2		P	STS	E	P	GEOSYNCH TRANSFER
12	LEASAT (SYNCOM IV) -3	D	HUGHES COMMUNICATIONS SERVICES, INC.	B	10	1																1		L	STS	E	C	GEOSYNCH TRANSFER
13	LEASAT (SYNCOM IV) -4, -5	D	HUGHES COMMUNICATIONS SERVICES, INC.	B	10	1	1															2		C	STS	E	C	GEOSYNCH TRANSFER

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS C	KU	KA	SPACECRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH: UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING	STS CHARGE POLICY	NOTES
	U.S. DOMESTIC COMMUNICATIONS													
1	GSTAR F/O	UNK		UNK	0	0	139	4500 (EST)	TOS?	35000 (EST)	30.0 (EST)	H	1	
2	SPACENET -3	RCA		3-AXIS	24	12	0	1260	NA	NA	NA	-	-	
3	SPACENET F/O	UNK		UNK	0	0	139	4500 (EST)	TOS?	35000 (EST)	30.0	H	1	
4	SBS -5	HUGHES	HS-376	SPIN	0	24	0	1438	NA	NA	NA	-	-	
5	SBS -6, -7, -8, -9	HUGHES	HS-393	SPIN	0	24	0	2900 (EST)	INTEGRAL	17000 (EST)	15.0 (EST)	H	1	
6	SBS -10, -11	HUGHES?			0	33	0	3500 (EST)	TOS?	20000 (EST)	20.0 (EST)	H	1	
7	GALAXY -D	HUGHES	HS-376	SPIN	24	0	0	1174	NA	NA	NA	-	-	
8	GALAXY F/O	HUGHES	HS-393?	SPIN	48	0	0	2900 (EST)	INTEGRAL	17000 (EST)	15.0 (EST)	H	1	
9	GALAXY K -1, -2	HUGHES	HS-393	SPIN	0	23	0	2900 (EST)	INTEGRAL	17107	14.8	H	1	
10	GALAXY K F/O	HUGHES	HS-393	SPIN	0	32	0	2900 (EST)	INTEGRAL	17000 (EST)	15.0 (EST)	H	1	
11	GALAXY KA -1, -2	HUGHES	HS-393	SPIN	0	0	142	2900	INTEGRAL	17000 (EST)	15.0 (EST)	H	1	
12	LEASAT (SYNCOM IV) -3	HUGHES	SYNCOM IV	SPIN	0	0	0	2900	INTEGRAL	17260	15.8	H	1	LAUNCH FAILED 4-12-85
13	LEASAT (SYNCOM IV) -4, -5	HUGHES	SYNCOM IV	SPIN	0	0	0	2900	INTEGRAL	17260	15.8	H	1	

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	U.S. DOMESTIC COMMUNICATIONS																											
1	TELSTAR 3-D	D	AT&T	B	10	1																1		L	STS	E	F	GEOSYNCH TRANSFER
2	TELSTAR 3 F/O	D	AT&T	B	10									1	1							2		F	STS	E	P	GEOSYNCH TRANSFER
3	TELSTAR K	D	AT&T	B	10					1	1	1								1	1	5		P	STS	E	P	GEOSYNCH TRANSFER
4	SATCOM -I	D	RCA AMERICOM	B	10						1											1		C	STS	E	F	GEOSYNCH TRANSFER
5	SATCOM F/O	D	RCA AMERICOM	B	10					1	1		1							1	2	6		F	STS AR-4	E K	P A	GEOSYNCH TRANSFER
6	SATCOM K1, K2, K3	D	RCA AMERICOM	B	10	2		1														3		C	STS	E	F	GEOSYNCH TRANSFER
7	SATCOM K F/O	D	RCA AMERICOM	B	10											2		1		1		4		F	STS	E	P	GEOSYNCH TRANSFER
8	FLEETSATCOM	D	U.S. NAVY	C	5	1	1	1														3		C	A/C	E	F	GEOSYNCH TRANSFER
9	FLTSATCOM F/O	D	U.S. NAVY	C	10							1	1		1	1					1	5		F	STS	E	C	GEOSYNCH TRANSFER
10	STC -1, -2	D	SATELLITE TELEVISION CORP.	B	7		1	1														2		O	STS	E	P	GEOSYNCH TRANSFER
11	DOMINION DBS	D	DOMINION VIDEO SATELLITE	B	10				1	1												2		P	STS AR-4	E K	P A	GEOSYNCH TRANSFER
12	DOMINION DBS F/O	D	DOMINION VIDEO SATELLITE	B	10														1	1		2		F	STS AR-4	E K	P A	GEOSYNCH TRANSFER
13	OTHER DBS	D	RCA, USSB, DBS, GALAXY, ETC.	B	10									1	1							2		F	STS ARI	E K	A A	GEOSYNCH TRANSFER

TABLE A-18. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	U.S. DOMESTIC COMMUNICATIONS													
1	TELSTAR 3-D	HUGHES	HS-376	SPIN	24	0	0	1436	PAM-D	10100	8.2	V	1	LAUNCHED 6-19-85
2	TELSTAR 3 F/O	UNK		UNK	40	0	0	1700 (EST)	PAM-D2 ?	15000 (EST)	12.0 (EST)	V	1	
3	TELSTAR K	UNK		UNK	0	20	0	2200	PAM-A ?	16000 (EST)	15.0 (EST)	V	1	
4	SATCOM -I	RCA	ADV SATCOM	3-AXIS	24	0	0	1451	PAM-D	10002	9.2	V	1	
5	SATCOM F/O	RCA?	ADV SATCOM	3-AXIS	24	0	0	1450 (EST)	PAM-D2	15000 (EST)	11.5 (EST)	V	1	
6	SATCOM K1, K2, K3	RCA?	RCA SATCOM KU	3-AXIS	0	16	0	1461	PAM-D2	15900	11.5	V	1	
7	SATCOM K F/O	RCA?	RCA SATCOM KU	3-AXIS	0	24	0	2300 (EST)	PAM-A ?	15000 (EST)	12.0 (EST)	V	1	
8	FLEETSATCOM	TRW		3-AXIS	0	0	0	2200 (EST)	NA	NA	NA	-	-	
9	FLTSATCOM F/O	UNK		UNK	0	0	0	4500 (EST)	UNKNOWN	35000 (EST)	30.0 (EST)	H	1	
10	STC -1, -2	RCA		3-AXIS	0	3	0	1430	PAM-D	10200	10.7	V	1	
11	DOMINION DBS	HUGHES	HS-394	HYBRID	0	6	0	3000 (EST)	INTEGRAL	17000 (EST)	15.0 (EST)	H	1	
12	DOMINION DBS F/O	UNK		UNK	0	6	0	3000 (EST)	SCOTS ?	17000 (EST)	15.0 (EST)	H	1	
13	OTHER DBS	HUGHES?	UNK	UNK	0	6	0	3000 (EST)	TOS?	17000 (EST)	15.0 (EST)	H	1	

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE																	GROUND SPARE	PROGRAM STATUS	LAUNCH			TRAJECTORY (NMI) (DEG)
						85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL			VEHICLE	SITE	STATUS	APOGEE PERIGEE INCLINATION
	U.S. DOMESTIC COMMUNICATIONS																											
1	OTHER NEW KU-BAND USES	D	VARIOUS	B	10										1				1			2		M	STS AR-4	E K	P A	GEOSYNCH TRANSFER
2	OTHER NEW KA-BAND USES	D	VARIOUS	B	8									1			1		1		1	4		M	STS	E	P	GEOSYNCH TRANSFER
3	MMSAT	D	MARTIN-MARIETTA	B	10						1	1									1	3		P	STS AR-4	E K	P A	GEOSYNCH TRANSFER
4	FEDSAT	D	FEDERAL EXPRESS	B	10					1	1									1	1	4		P	STS	E	P	GEOSYNCH TRANSFER
5	SPOTNET K	D	NATIONAL EXCHANGE	B	10							1	1									2		P	STS AR-4	E K	P A	GEOSYNCH TRANSFER
6	AURORA -2, -3	D	ALASCOM, INC.	B	10					1										1		2		P	STS	E	P	GEOSYNCH TRANSFER
7	EQUASTAR -1, -2	D	EQUATORIAL COMM., INC.	B	10							1	1									2		P	STS	E	P	GEOSYNCH TRANSFER
8	TOTAL					9	8	4	4	9	7	9	12	6	6	6	4	2	6	10	9	111						
9																												
10																												
11																												
12																												
13																												

XBCL-1-2-84 EC2

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	U.S. DOMESTIC COMMUNICATIONS													
1	OTHER NEW KU-BAND USES	UNK		UNK	0	24	0	2200 (EST)	PAM-A ?	16000 (EST)	15.0 (EST)	H	1	
2	OTHER NEW KA-BAND USES	UNK		UNK	0	0	70	3000 (EST)	TOS?	16000 (EST)	15.0 (EST)	H	1	
3	MMSAT	UNK		UNK	0	64	0	3000 (EST)	TOS ?	16000 (EST)	15.0 (EST)	H	1	
4	FEDSAT	UNK		UNK	0	48	0	2150 (EST)	PAM-A ?	15000 (EST)	15.0 (EST)	V	1	
5	SPOTNET K	UNK		UNK	0	24	0	1400 (EST)	PAM-D ?	10000 (EST)	8.5 (EST)	V	1	
6	AURORA -2, -3	RCA?		3-AXIS	36	0	0	1600 (EST)	PAM-D2	14000 (EST)	12.0 (EST)	V	1	
7	EQUASTAR -1, -2	UNK		UNK	24	0	0	1400 (EST)	PAM-D	10000 (EST)	9.0 (EST)	V	1	
8														
9														
10														
11														
12														
13														

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	FOREIGN REGIONAL COMMUNICATIONS																											
1	TELESAT -I (ANIK C-3)	D	CANADA	E	7	1																1		L	STS	E	F	GEOSYNCH TRANSFER
2	TELESAT -J, -L (ANIK C-4, C-5)	D	CANADA	E	10							1				1						2		F	STS ARI	E K	A A	GEOSYNCH TRANSFER
3	TELESAT -K, -N (ANIK D-3, D-4)	D	CANADA	E	10						1				1							2		F	STS ARI	E K	A A	GEOSYNCH TRANSFER
4	ARABSAT -A	D	ARAB SATELLITE COMMUNICATIONS ORGANIZATION	E	7	1																1		L	AR-3	K	F	GEOSYNCH TRANSFER
5	ARABSAT -B	D	ARAB SATELLITE COMMUNICATIONS ORGANIZATION	E	7	1																1	1	L	STS	E	F	GEOSYNCH TRANSFER
6	ARABSAT F/O	D	ARAB SATELLITE COMMUNICATIONS ORGANIZATION	E	10								2					1				3		F	STS ARI	E K	A A	GEOSYNCH TRANSFER
7	ITALSAT (PRE-OPERATIONAL)	D	ITALY	D	5					1												1		P	AR-4 STS	K E	P A	GEOSYNCH TRANSFER
8	ITALSAT (OPERATIONAL)	D	ITALY	D	5								1					1				2		P	ARI STS	K E	P A	GEOSYNCH TRANSFER
9	SARIT	D	ITALY	D	10					1			1				1					3		P	AR-3	K	P	GEOSYNCH TRANSFER
10	MORELOS -1, -2	D	MEXICO	E	9	2																2		C	STS	E	F	GEOSYNCH TRANSFER
11	MORELOS F/O	D	MEXICO	E	9										2				1			3		F	STS AR-3	E K	P A	GEOSYNCH TRANSFER
12	SBTS -1	D	BRAZIL	E	10	1																1		L	AR-3	K	F	GEOSYNCH TRANSFER
13	SBTS -2	D	BRAZIL	E	10		1															1		C	AR-3	K	F	GEOSYNCH TRANSFER

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	FOREIGN REGIONAL COMMUNICATIONS													
1	TELESAT -I (ANIK C-3)	HUGHES	HS-376	SPIN	0	24	0	1250	PAM-D	9800	8.2	V	1	LAUNCHED 4-12-85
2	TELESAT -J, -L (ANIK C-4, C-5)	UNK		UNK	0	24	0	1350 (EST)	PAM-D	10000 (EST)	8.2 (EST)	V	1	
3	TELESAT -K, -N (ANIK D-3, D-4)	UNK		UNK	24	0	0	1350 (EST)	PAM-D	10000 (EST)	8.2 (EST)	V	1	
4	ARABSAT -A	AERO	SPACEBUS 100	3-AXIS	25	0	0	1296	NA	NA	NA	-	-	LAUNCHED 2-8-85
5	ARABSAT -B	AERO	SPACEBUS 100	3-AXIS	25	0	0	1296	PAM-D	10337	9.8	V	1	LAUNCHED 6-18-85
6	ARABSAT F/O	UNK		UNK	23	12	0	1500 (EST)	PAM-D ?	10500 (EST)	10.5 (EST)	V	1	
7	ITALSAT (PRE-OPERATIONAL)	SELENIA		3-AXIS	0	0	9	1700 (EST)	PAM-D2	14746 (EST)	11.3 (EST)	V	1	
8	ITALSAT (OPERATIONAL)	UNK		3-AXIS	0	0	16	1750 (EST)	PAM-D2	15000 (EST)	11.5 (EST)	V	1	
9	SARIT	SELENIA?	OLYMPUS-2?	3-AXIS	0	22	0	2700 (EST)	NA	NA	NA	-	-	
10	MORELOS -1, -2	HUGHES	HS-376	SPIN	24	12	0	1465	PAM-D	9974	8.2	V	1	-1 LAUNCHED 6-17-85
11	MORELOS F/O	UNK		UNK	24	20	0	1500 (EST)	PAM-D ?	10500 (EST)	8.5 (EST)	V	1	
12	SBTS -1	SPAR	HS-376	SPIN	24	0	0	1450 (EST)	NA	NA	NA	-	-	LAUNCHED 2-8-85
13	SBTS -2	SPAR	HS-376	SPIN	24	0	0	1450 (EST)	NA	NA	NA	-	-	

XBLC-2 (5-85) SFD

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	FOREIGN REGIONAL COMMUNICATIONS																											
1	SBTS F/O	D	BRAZIL	E	10											2			1			3		F	ARI STS	K E	P A	GEOSYNCH TRANSFER
2	AUSSAT -1, -2	D	AUSTRALIA	E	7	2																2		C	STS	E	F	GEOSYNCH TRANSFER
3	AUSSAT -3	D	AUSTRALIA	E	7		1															1		C	AR-3	K	F	GEOSYNCH TRANSFER
4	AUSSAT F/O	D	AUSTRALIA	E	10								2	1				1				4		F	STS ARI	E K	P A	GEOSYNCH TRANSFER
5	PALAPA B-3	D	INDONESIA	E	8		1															1		C	STS	E	F	GEOSYNCH TRANSFER
6	PALAPA F/O	D	INDONESIA	E	10							2	1									3		F	STS ARI	E K	P A	GEOSYNCH TRANSFER
7	ECS -3, -4	D	EUTELSAT	E	7	1	1															2	1	C	AR-3	K	F	GEOSYNCH TRANSFER
8	ECS F/O	D	EUTELSAT	E	10						1	1				1					1	4		F	ARI STS	K E	P A	GEOSYNCH TRANSFER
9	TELECOM 1 -B	D	FRANCE	E	7	1																1		L	AR-3	K	F	GEOSYNCH TRANSFER
10	TELECOM 1 -C	D	FRANCE	E	7		1															1		C	AR-3	K	F	GEOSYNCH TRANSFER
11	TELECOM F/O	D	FRANCE	E	10							1	1	1								3		F	ARI	K	P	GEOSYNCH TRANSFER
12	OLYMPUS (FORMERLY L-SAT)	D	ESA	D	7			1														1	1	C	AR-3	K	F	GEOSYNCH TRANSFER
13	OLYMPUS II	D	ESA	D	10				1													1		F	AR-3	K	F	GEOSYNCH TRANSFER

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	FOREIGN REGIONAL COMMUNICATIONS													
1	SBTS F/O	UNK		UNK	24	12	0	1500 (EST)	PAM-D ?	10200 (EST)	8.5 (EST)	V	1	
2	AUSSAT -1, -2	HUGHES	HS-376	SPIN	0	19	0	1430	PAM-D	10008	8.2	V	1	
3	AUSSAT -3	HUGHES	HS-376	SPIN	0	19	0	1430	NA	NA	NA	-	-	
4	AUSSAT F/O	HUGHES?		UNK	0	26	0	1500 (EST)	PAM-D ?	10200 (EST)	8.5 (EST)	V	1	
5	PALAPA B-3	HUGHES	HS-376	SPIN	24	0	0	1437	PAM-D	9992	8.2	V	1	
6	PALAPA F/O	UNK		UNK	24	12	0	1500 (EST)	PAM-D ?	10200 (EST)	9.0 (EST)	V	1	
7	ECS -3, -4	MESH		3-AXIS	0	12	0	1500	NA	NA	NA	-	-	
8	ECS F/O	UNK		UNK	0	16	0	2000 (EST)	NA	NA	NA	-	-	
9	TELECOM 1 -B	MATRA		3-AXIS	9	6	0	1430	NA	NA	NA	-	-	LAUNCHED 5-7-85
10	TELECOM 1 -C	MATRA		3-AXIS	9	6	0	1430	NA	NA	NA	-	-	
11	TELECOM F/O	UNK		UNK	12	12	0	1500 (EST)	PAM-D ?	10200 (EST)	10.0 (EST)	V	1	
12	OLYMPUS (FORMERLY L-SAT)	BADG		3-AXIS	0	7	2	2640	NA	NA	NA	-	-	
13	OLYMPUS II	UNK		3-AXIS	0	12	6	3000 (EST)	NA	NA	NA	-	-	

XBLC-2 (5-83) SFD

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	FOREIGN REGIONAL COMMUNICATIONS																											
1	TELE-X (PRECURSOR OF NORDCOM)	D	SWEDEN NORWAY	D	5			1														1		C	AR-3	K	F	GEOSYNCH TRANSFER
2	NORDCOM	D	SWEDEN, NORWAY FINLAND(ICELAND DENMARK)	D	7						1	1						1	1			4		P	ARI STS	K E	P A	GEOSYNCH TRANSFER
3	TDF -1, -2	D	FRANCE	D	7		1	1														2		C	AR-4	K	F	GEOSYNCH TRANSFER
4	TDF F/O	D	FRANCE	D	10									1	1							2		F	ARI STS	K E	P A	GEOSYNCH TRANSFER
5	TV-SAT (PRE-OPERATIONAL)	D	W.GERMANY	D	7		1															1		C	AR-2	K	F	GEOSYNCH TRANSFER
6	TV-SAT (OPERATIONAL)	D	W.GERMANY	D	7				1							1					1	3		P	ARI	K	P	GEOSYNCH TRANSFER
7	GDL	D	S.E.S. (LUXEMBOURG)	F	7					1	1											2		P	ARI	K	P	GEOSYNCH TRANSFER
8	GDL F/O	D	S.E.S. (LUXEMBOURG)	F	10												1	1				2		F	ARI	K	P	GEOSYNCH TRANSFER
9	DFS-KOPERNIKUS -1, -2	D	W.GERMANY	D	10			1	1													2		C	AR-4	K	P	GEOSYNCH TRANSFER
10	DFS-KOPERNIKUS F/O	D	W.GERMANY	D	10												1	1				2		F	ARI STS	K E	P A	GEOSYNCH TRANSFER
11	UK DBS	D	UNISAT, BRITSAT, WESTSAT, ETC.	F	7				1	1												2	1	P	ARI STS	K E	P A	GEOSYNCH TRANSFER
12	UK DBS F/O	D	UNISAT, BRITSAT, WESTSAT, ETC.	F	7											1	1					2		F	ARI STS	K E	P A	GEOSYNCH TRANSFER
13	NATO IV	D	NATO	M	7						1	1						1	1			4		P	STS ARI	E K	A A	GEOSYNCH TRANSFER

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS C	KU	KA	SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH: UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING	STS CHARGE POLICY	NOTES
	FOREIGN REGIONAL COMMUNICATIONS													
1	TELE-X (PRECURSOR OF NORDCOM)	EUROSAT		3-AXIS	0	4	0	2860	NA	NA	NA	-	-	
2	NORDCOM	UNK		3-AXIS	0	6	0	3200	TOS ?	22800	20.0 (EST)	H	1	
3	TDF -1, -2	AERO		3-AXIS	0	3	0	2620	NA	NA	NA	-	-	
4	TDF F/O	UNK		3-AXIS	0	5	0	2700 (EST)	NA	NA	NA	-	-	
5	TV-SAT (PRE-OPERATIONAL)	AERO		3-AXIS	0	3	0	2620	NA	NA	NA	-	-	
6	TV-SAT (OPERATIONAL)	UNK		3-AXIS	0	5	0	2700 (EST)	NA	NA	NA	-	-	
7	GDL	UNK		UNK	0	2	0	1800 (EST)	NA	NA	NA	-	-	
8	GDL F/O	UNK		UNK	0	4	0	1800 (EST)	NA	NA	NA	-	-	
9	DFS-KOPERNIKUS -1, -2	MBB		3-AXIS	0	16	1	1800 (EST)	NA	NA	NA	-	-	
10	DFS-KOPERNIKUS F/O	MBB?		3-AXIS	0	12	24	2400 (EST)	NA	NA	NA	-	-	
11	UK DBS	UNK		3-AXIS	0	6	0	1870	PAM-D2 ?	14564	11.8	V	1	
12	UK DBS F/O	UNK		3-AXIS	0	10	0	2000 (EST)	PAM-D2 ?	15000 (EST)	12.0 (EST)	V	1	
13	NATO IV	UNK		UNK	0	0	0	1750 (EST)	PAM-D2 ?	14100 (EST)	8.0 (EST)	V	1	

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	FOREIGN REGIONAL COMMUNICATIONS																											
1	BS 2B	D	JAPAN NASDA	B	5		1															1		C	N-II	T	F	GEOSYNCH TRANSFER
2	BS F/O	D	JAPAN NASDA	D	7					1		1					1	1				4		F	H-IA	T	P	GEOSYNCH TRANSFER
3	CS -3A, 3B	D	JAPAN NASDA	D	7			1	1													2		A	H-IA	T	P	GEOSYNCH TRANSFER
4	CS -4A, -4B	D	JAPAN MINISTRY OF POSTS & TELECOM.	D	10							1			1							2		P	H-II	T	P	GEOSYNCH TRANSFER
5	JCS -1, -2	D	JAPAN COMMUNICATIONS SATELLITE, INC.	F	10					1	1											2		P	ARI STS	K E	A A	GEOSYNCH TRANSFER
6	JCS F/O	D	JAPAN COMMUNICATIONS SATELLITE, INC.	F	10															1	1	2		F	STS ARI	E K	A A	GEOSYNCH TRANSFER
7	STW F/O	D	PEOPLE'S REPUBLIC OF CHINA	D	7		1		1		1			1		1	1		1	1	1	9		P	CZ-3	S	U	GEOSYNCH TRANSFER
8	CHINA DBS	D	PEOPLE'S REPUBLIC OF CHINA	D	7				1	1						1	1				1	5		D	STS ARI	E K	A A	GEOSYNCH TRANSFER
9	SKYNET 4-A, 4-B, 4-C	D	GREAT BRITAIN	M	7		1	1	1													3		C	STS	E	F	GEOSYNCH TRANSFER
10	SKYNET F/O	D	GREAT BRITAIN	M	7									2		1				1	1	5		P	STS	E	P	GEOSYNCH TRANSFER
11	AFSAT	D	UAPT	M	7										1							1	1	S	STS ARI	E K	A A	GEOSYNCH TRANSFER
12	PAKSAT DBS	D	PAKISTAN	D	7							1							1			2		P	ARI STS	K E	P A	GEOSYNCH TRANSFER
13	KOREASAT	D	S.KOREA	D	10												1					1		S	STS ARI	E K	P A	GEOSYNCH TRANSFER

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	FOREIGN REGIONAL COMMUNICATIONS													
1	BS 2B	TOSHIBA		3-AXIS	0	2	0	770	NA	NA	NA	-	-	
2	BS F/O	UNK		3-AXIS	0	4	0	1200 (EST)	NA	NA	NA	-	-	
3	CS -3A, 3B	MELCO		SPIN	0	0	12	1210	NA	NA	NA	-	-	
4	CS -4A, -4B	UNK		UNK	0	0	64	4400 (EST)	NA	NA	NA	-	-	
5	JCS -1, -2	HUGHES	HS-393	SPIN	0	32	0	2900 (EST)	INTEGRAL	17000 (EST)	15.0 (EST)	H	1	
6	JCS F/O	UNK		UNK	0	32	0	2900 (EST)	TOS ?	17000 (EST)	15.0 (EST)	H	1	
7	STW F/O	CHINA		UNK	24	0	0	1900	NA	NA	NA	-	-	
8	CHINA DBS	RCA?		3-AXIS	0	2	0	1500 (EST)	PAM-D2	13500 (EST)	12.0 (EST)	V	1	
9	SKYNET 4-A, 4-B, 4-C	BADG		3-AXIS	0	0	0	1750 (EST)	PAM-D2 ?	14100	8.0	V	1	
10	SKYNET F/O	UNK		UNK	0	0	0	1750 (EST)	PAM-D2 ?	14000 (EST)	8.0 (EST)	V	1	
11	AFSAT	UNK	HS-376 CLASS	UNK	24	0	0	1350 (EST)	PAM-D ?	10200 (EST)	10.8 (EST)	V	1	
12	PAKSAT DBS	UNK		UNK	0	3	0	1800 (EST)	PAM-D2 ?	11200 (EST)	10.8 (EST)	V	1	
13	KOREASAT	UNK		UNK	24	0	0	1800 (EST)	PAM-D2 ?	11000 (EST)	10.8 (EST)	V	1	

ORIGINAL PAGE IS OF POOR QUALITY

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	FOREIGN REGIONAL COMMUNICATIONS																											
1	NAHUEL -1, -2	D	ARGENTINA	D	10						1	1										2		P	STS ARI	E K	A A	GEOSYNCH TRANSFER
2	NAHUEL F/O	D	ARGENTINA	D	10															1		1		P	STS ARI	E K	A A	GEOSYNCH TRANSFER
3	DRS (DATA RELAY SAT.) -1, -2, -3	D	ESA	E	10										1	2						3		S	ARI	K	P	GEOSYNCH TRANSFER
4	AMS	D	ISRAEL	D	10								1									1		P	STS ARI	E K	A A	GEOSYNCH TRANSFER
5	PAM-D CLASS FOREIGN COMM. SATS.	D	VARIOUS	D	7					1			1			1		1		1		5		M	STS AR-3	E K	A A	GEOSYNCH TRANSFER
6	PAM-D2 CLASS FOREIGN COMM. SATS	D	VARIOUS	D	7					1		1			1		1	1	1			6		M	AR-3 STS	K E	P A	GEOSYNCH TRANSFER
7	OLYMPUS CLASS FOREIGN COMM. SATS.	D	VARIOUS	D	7						1			1			1		1		1	5		M	AR-4 STS	K E	P A	GEOSYNCH TRANSFER
8	TOTAL					10	10	6	8	9	9	12	10	7	8	12	10	10	8	5	7	141						
9																												
10																												
11																												
12																												
13																												

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS C	KU	KA	SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH: UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING	STS CHARGE POLICY	NOTES
	FOREIGN REGIONAL COMMUNICATIONS													
1	NAHUEL -1, -2	UNK		UNK	0	24	0	2400 (EST)	TOS?	16000 (EST)	15.0 (EST)	H	1	
2	NAHUEL F/O	UNK		UNK	0	36	0	2700 (EST)	TOS?	16000 (EST)	15.0 (EST)	H	1	
3	DRS (DATA RELAY SAT.) -1, -2, -3	UNK		UNK	0	12	0	1500 (EST)	NA	NA	NA	-	-	
4	AMS	UNK		UNK	0	24	0	1800 (EST)	PAM-D2?	14000 (EST)	11.0 (EST)	V	1	
5	PAM-D CLASS FOREIGN COMM. SATS.	VARIOUS		UNK	24	0	0	1400 (EST)	PAM-D ?	10000 (EST)	10.0 (EST)	V	1	
6	PAM-D2 CLASS FOREIGN COMM. SATS	UNK		UNK	0	24	0	1900 (EST)	PAM-D2 ?	15000 (EST)	12.0 (EST)	V	1	
7	OLYMPUS CLASS FOREIGN COMM. SATS.	UNK		UNK	24	12	0	2650 (EST)	TOS ?	20000 (EST)	18.0 (EST)	H	1	
8														
9														
10														
11														
12														
13														

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	U.S. GEOSTATIONARY EARTH OBSERVATIONS																											
1	GOES -G, -H	D	NOAA	C	7		2															2		C	3914	E	P	GEOSYNCH TRANSFER
2	GOES -I, -J, -K,	D	NOAA	C	7					1	1		1									3		C	STS	E	P	GEOSYNCH TRANSFER
3	GOES -L, -M	D	NOAA	C	7										1	1						2		O	STS	E	P	GEOSYNCH TRANSFER
4	GOES F/O	D	NOAA	C	10															1	1	2		F	STS	E	P	GEOSYNCH TRANSFER
5	TOTAL					0	2	0	0	1	1	0	1	0	1	1	0	0	0	1	1	9						
6																												
7																												
8																												
9																												
10																												
11																												
12																												
13																												

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS C	KU	KA	SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH: UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING	STS CHARGE POLICY	NOTES
	U.S. GEOSTATIONARY EARTH OBSERVATIONS													
1	GOES -G, -H	HUGHES		SPIN	0	0	0	975	NA	NA	NA	-	-	
2	GOES -I, -J, -K,	FORD		UNK	0	0	0	1200 (EST)	PAM-D ?	9500 (EST)	7.5 (EST)	V	1	
3	GOES -L, -M	FORD		UNK	0	0	0	1200 (EST)	PAM-D ?	9500 (EST)	7.5 (EST)	V	1	
4	GOES F/O	UNK		UNK	0	0	0	1500 (EST)	PAM-D2?	13500 (EST)	9.5 (EST)	V	1	
5														
6														
7														
8														
9														
10														
11														
12														
13														

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	FOREIGN GEOSTATIONARY EARTH OBSERVATIONS																											
1	METEOSAT P2/LASSO	D	ESA	D	3		1															1		C	ARI	K	F	GEOSYNCH TRANSFER
2	MOP (METEOSAT OPS. PROGRAM)-1,-2,-3	D	EUMETSAT	D	7			1	1			1										3		C	ARI	K	F	GEOSYNCH TRANSFER
3	MOP F/O	D	EUMETSAT	D	7										1	1			1			3		F	ARI	K	P	GEOSYNCH TRANSFER
4	EXPERIMENTAL EARTH RESOURCES	D	ESA	D	3											1		1			1	3		M	ARI	K	P	GEOSYNCH TRANSFER
5	GMS -4, -5, -6	D	JAPAN NASDA	D	5					1					1					1		3		P	H-IA	T	P	GEOSYNCH TRANSFER
6	GMS-X	D	JAPAN NASDA	D	5													1				1		P	H-IA	T	P	GEOSYNCH TRANSFER
7	OTHER SYNCH. SYSTEM	D	JAPAN NASDA	D	5								1					1				2		M	H-IA	T	P	GEOSYNCH TRANSFER
8	CHINA METSAT	D	PEOPLE'S REPUBLIC OF CHINA	D	5						1					1					1	3		M	CZ-3	S	P	GEOSYNCH TRANSFER
9	OTHER SYNCH SATELLITES	D	VARIOUS FOREIGN GOVERNMENTS	D	0								1		1		1		1			4		M	ARI STS	K E	P A	GEOSYNCH TRANSFER
10	GEOS-1	D	JAPAN NASDA	D	7						1											1		P	H-IA	T	P	GEOSYNCH TRANSFER
11	GEOS-2	D	JAPAN NASDA	D	7													1				1		P	H-II	T	P	GEOSYNCH TRANSFER
12	EOTS-1	D	JAPAN NASDA	D	7															1		1		S	H-II	T	P	GEOSYNCH TRANSFER
13	TOTAL					0	1	1	1	1	2	1	2	0	3	3	1	4	2	2	2	26						

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS C	KU	KA	SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING	STS CHARGE POLICY	NOTES
	FOREIGN GEOSTATIONARY EARTH OBSERVATIONS													
1	METEOSAT P2/LASSO	AERO		SPIN	0	0	0	770	NA	NA	NA	-	-	
2	MOP (METEOSAT OPS. PROGRAM)-1,-2,-3	AERO		SPIN	0	0	0	770	NA	NA	NA	-	-	
3	MOP F/O	UNK		UNK	0	0	0	1200 (EST)	NA	NA	NA	-	-	
4	EXPERIMENTAL EARTH RESOURCES	UNK		UNK	0	0	0	1800 (EST)	NA	NA	NA	-	-	
5	GMS -4, -5, -6	NEC?		UNK	0	0	0	880	NA	NA	NA	-	-	
6	GMS-X	UNK		UNK	0	0	0	1800 (EST)	NA	NA	NA	-	-	
7	OTHER SYNCH. SYSTEM	UNK		UNK	0	0	0	1200 (EST)	NA	NA	NA	-	-	
8	CHINA METSAT	CHINA		UNK	0	0	0	1500 (EST)	NA	NA	NA	-	-	
9	OTHER SYNCH SATELLITES	UNK		UNK	0	0	0	1200 (EST)	PAM-D ?	9800 (EST)	9.8 (EST)	V	1	
10	GEOS-1	UNK		UNK	0	0	0	1210 (EST)	NA	NA	NA	-	-	
11	GEOS-2	UNK		UNK	0	0	0	2200 (EST)	NA	NA	NA	-	-	
12	EOTS-1	UNK		UNK	0	0	0	2200 (EST)	NA	NA	NA	-	-	
13														

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	U.S. LOW EARTH ORBIT OBSERVATIONS																											
1	ADVANCED TIROS-N NOAA-G	D	NOAA	C	2	1																1		C	AT-F	W	F	465 456 98.9
2	ADVANCED TIROS-N NOAA-H, NOAA-I, NOAA-J, NOAA-D	D	NOAA	C	2		1	1	1	1												4		C	AT-F	W	P	465 456 98.9
3	ADV. TIROS -N NOAA -K, -L, -M, -N	D	NOAA	C	3						1	1	1	1								4		F	STS	W	P	465 456 98.9
4	ADV. TIROS F/O	D	NOAA	C	3											1	1		1	1		4		F	STS	W	P	465 SUN-SYNCH
5	COMMERCIAL LANDSAT	D	EOSAT	B	5				1			1		1		1		1		1		6		D	STS	W	P	VARIOUS
6	GEOLOGY SATELLITE	D	UNK	B	2								1		1		1		1	1	1	6		M	CON	-	U	VARIOUS
7	TOTAL					1	1	1	2	1	1	2	2	2	1	2	2	1	2	3	1	25						
8																												
9																												
10																												
11																												
12																												
13																												

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACECRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	U.S. LOW EARTH ORBIT OBSERVATIONS													
1	ADVANCED TIROS-N NOAA-G	RCA		3-AXIS	0	0	0	1600	NA	NA	NA	-	-	
2	ADVANCED TIROS-N NOAA-H, NOAA-I, NOAA-J, NOAA-D	RCA		3-AXIS	0	0	0	1600	NA	NA	NA	-	-	
3	ADV. TIROS -N NOAA -K, -L, -M, -N	UNK		UNK	0	0	0	2400 (EST)	UNK	4000 (EST)	10.0 (EST)	H	2	
4	ADV. TIROS F/O	UNK		UNK	0	0	0	3000 (EST)	UNK	4500 (EST)	10.0 (EST)	H	1	
5	COMMERCIAL LANDSAT	RCA?		3-AXIS	0	0	0	5000 (EST)	UNK	7500 (EST)	10.0 (EST)	H	1	
6	GEOLOGY SATELLITE	UNK		UNK	0	0	0	1000 (EST)	NA	NA	NA	-	-	
7														
8														
9														
10														
11														
12														
13														

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	FOREIGN LOW EARTH ORBIT OBSERVATIONS																											
1	MOS -1 (MARINE OBS.SAT)	D	JAPAN NASDA	D	3		1															1		C	N-II	T	F	565 SUN SYNCH 99
2	MOS -2, -3	D	JAPAN NASDA	D	3							1			1							2		F	H-IA	T	P	565 SUN SYNCH 99
3	MOS -4A, -4B, -5A, -5B	D	JAPAN NASDA	D	3													2			2	4		F	H-II	T	P	565 SUN SYNCH 99
4	EGP (EXPERIMENTAL GEODETIC PAYLOAD)	D	JAPAN NASDA	D	5		1															1		P	H-IA	T	F	932 CIRCULAR
5	J-ERS -1 (EARTH REMOTE SENSING)	D	JAPAN NASDA	D	2							1										1		P	H-IA	T	P	355 SUN SYNCH
6	J-ERS -2A, -2B, -3A, -3B	D	JAPAN NASDA	D	3											2			2			4		F	H-II	T	P	355 SUN SYNCH
7	RADARSAT	D	CANADA	D	5						1					1						2		P	STS	W	P	373 POLAR
8	ERS -1 (EARTH RESOURCES SAT)	D	ESA	D	3					1												1		P	AR-4	K	F	465 SUN SYNCH
9	ERS -2,-3,-4	D	ESA	D	3								1			1			1			3		F	AR-4	K	P	465 SUN SYNCH
10	SPOT -1, -2	D	FRANCE	D	4	1			1													2		C	AR-2	K	F	517 SUN SYNCH 98.7
11	SPOT F/O	D	FRANCE	D	4								1				1				1	3		F	AR-3	K	P	517 SUN SYNCH 98.7
12	OPERATIONAL LEO	D	EUROPEAN GOV'T/ INDUSTRY	E	5							1			1		1		1		1	5		M	AR-3	K	P	VARIOUS
13	IRS -1A	D	INDIA ISRO	D	2		1															1		F	C-1	P	F	540 SUN SYNCH

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS C	KU	KA	SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH: UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING	STS CHARGE POLICY	NOTES
	FOREIGN LOW EARTH ORBIT OBSERVATIONS													
1	MOS -1 (MARINE OBS.SAT)	NEC		3-AXIS	0	0	0	1650	NA	NA	NA	-	-	
2	MOS -2, -3	UNK		3-AXIS	0	0	0	2640 (EST)	NA	NA	NA	-	-	
3	MOS -4A, -4B, -5A, -5B	UNK		3-AXIS	0	0	0	4400 (EST)	NA	NA	NA	-	-	
4	EGP (EXPERIMENTAL GEODETIC PAYLOAD)	KAWASAKI		NONE	0	0	0	1485	NA	NA	NA	-	-	
5	J-ERS -1 (EARTH REMOTE SENSING)	UNK		3-AXIS	0	0	0	3090 (EST)	NA	NA	NA	-	-	
6	J-ERS -2A, -2B, -3A, -3B	UNK		3-AXIS	0	0	0	4400 (EST)	NA	NA	NA	-	-	
7	RADARSAT	UNK	OLYMPUS CLASS	3-AXIS	0	0	0	4400 (EST)	UNK	7000 (EST)	21.0 (EST)	H	2	
8	ERS -1 (EARTH RESOURCES SAT)	DORNIER		3-AXIS	0	0	0	4750 (EST)	NA	NA	NA	-	-	
9	ERS -2, -3, -4	UNK		3-AXIS	0	0	0	4750 (EST)	NA	NA	NA	-	-	
10	SPOT -1, -2	CNES		3-AXIS	0	0	0	4080	NA	NA	NA	-	-	
11	SPOT F/O	CNES?		3-AXIS	0	0	0	5000 (EST)	NA	NA	NA	-	-	
12	OPERATIONAL LEO	UNK		3-AXIS	0	0	0	5000 (EST)	NA	NA	NA	-	-	
13	IRS -1A	INDIAN		3-AXIS	0	0	0	1980	NA	NA	NA	-	-	

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	FOREIGN LOW EARTH ORBIT OBSERVATIONS																											
1	IRS -2, -3	D	INDIA ISRO	D	2				1		1											2		P	PSLV	I	P	540 SUN SYNCH
2	IRS F/O	D	INDIA ISRO	D	3								1			1			1			3		F	PSLV	I	P	SUN SYNCH
3	SAMRO REPLACEMENT (MILITARY RECON)	D	FRANCE/ GERMANY	M	4			1	1			1	1			1	1			1		7		S	AR-3	K	P	SUN SYNCH
4	TERS (TROPICAL EARTH RESOURCES SAT.)	D	NETH./INDONESIA	D	5												1					1		S	STS ARI	E K	A A	1043 EQUAT.
5	POPSAT -1, -2	D	ESA	D	10								1				1					2		P	ARI	K	P	UNKNOWN
6	VARIOUS CHINESE LEO MISSIONS	D	PEOPLE'S REPUBLIC OF CHINA	D	3		1			1			1			1		1		1	1	7		M	UNKN	S	U	VARIOUS
7	SOUTH AMERICAN LEO SATS	D	VARIOUS	D	3						1			1			1			1		4		M	STS ARI	W K	A A	VARIOUS
8	OTHER FOREIGN LEO	D	VARIOUS	D	3				1			1			1		1		1		1	6		M	UNKN	-	U	CIRCULAR SUN SYNCH
9	TOTAL					1	4	1	4	2	3	5	6	1	3	7	7	3	6	3	6	62						
10																												
11																												
12																												
13																												

XEDL-1 (3-84) 533

TABLE A-18. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	FOREIGN LOW EARTH ORBIT OBSERVATIONS													
1	IRS -2, -3	UNK		3-AXIS	0	0	0	1980 (EST)	NA	NA	NA	-	-	
2	IRS F/O	UNK		3-AXIS	0	0	0	1980 (EST)	NA	NA	NA	-	-	
3	SAMRO REPLACEMENT (MILITARY RECON)	UNK		UNK	0	0	0	3200 (EST)	NA	NA	NA	-	-	
4	TERS (TROPICAL EARTH RESOURCES SAT.)	UNK		3-AXIS	0	0	0	1650 (EST)	UNK	3000 (EST)	6.0 (EST)	V	1	
5	POPSAT -1, -2	UNK		UNK	0	0	0	3400 (EST)	NA	NA	NA	-	-	
6	VARIOUS CHINESE LEO MISSIONS	UNK		UNK	0	0	0	1200 (EST)	NA	NA	NA	-	-	
7	SOUTH AMERICAN LEO SATS	UNK		UNK	0	0	0	2800 (EST)	UNK	4000 (EST)	8.0 (EST)	V	1	
8	OTHER FOREIGN LEO	UNK		UNK	0	0	0	2800 (EST)	NA	NA	NA	-	-	
9														
10														
11														
12														
13														

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	SITE	STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	NAVIGATION AIDS																											
1	TRANSIT F/O	D	U.S. NAVY	M	4	2	2	4														8		C	SCOUT	W	F	600 CIRCULAR 90
2	NAVSAT	D	ESA	E	10						3	6	6	6	6							27		S	ARI	K	P	12-HOUR 55
3	GEOSTAR	D	GEOSTAR CORP.	B	7					1	2						1	2				6		P	STS	E	P	GEOSYNCH TRANSFER
4	TOTAL					2	2	4	0	1	5	6	6	6	6	0	1	2	0	0	0	41						
5																												
6																												
7																												
8																												
9																												
10																												
11																												
12																												
13																												

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	NAVIGATION AIDS													
1	TRANSIT F/O	RCA		3-AXIS	0	0	0	142	NA	NA	NA	-	-	
2	NAVSAT	UNK		UNK	0	0	0	600 (EST)	NA	NA	NA	-	-	
3	GEOSTAR	RCA?		3-AXIS	0	0	0	1400 (EST)	PAM-D	9000 (EST)	8.5 (EST)	V	1	
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	FOREIGN PLANETARY																											
1	GIOTTO	D	ESA	D	1	1																1		C	AR-2	K	F	ESCAPE
2	OTHER ESA PLANETARY	D	ESA	D	0														1			1		M	AR-4	K	P	ESCAPE
3	PLANET-A	D	JAPAN ISAS	D	0	1																1		C	M-3S	A	F	ESCAPE
4	PLANET -B, -C	D	JAPAN ISAS	D	0						1					1						2		M	UNKN	T	U	ESCAPE
5	MUSES -A	D	JAPAN ISAS	D	0					1												1		P	M-3S	T	F	LUNAR
6	OTHER JAPANESE PLANETARY	D	JAPAN ISAS	D	0									1								1		M	UNKN	T	U	ESCAPE
7	OTHER FOREIGN PLANETARY	D	VARIOUS	D	0						1				1					1		3		M	UNKN	-	U	ESCAPE
8	TOTAL					2	0	0	0	1	2	0	0	1	1	1	0	0	1	1	0	10						
9																												
10																												
11																												
12																												
13																												

XBCL-1 (3-84) ECZ

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS C	KU	KA	SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH: UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING	STS CHARGE POLICY	NOTES
	FOREIGN PLANETARY													
1	GIOTTO	BADG		SPIN	0	0	0	1129	NA	NA	NA	-	-	
2	OTHER ESA PLANETARY	UNK		UNK	0	0	0	2500 (EST)	NA	NA	NA	-	-	
3	PLANET-A	UNK		UNK	0	0	0	310	NA	NA	NA	-	-	
4	PLANET -B, -C	UNK		UNK	0	0	0	1000 (EST)	NA	NA	NA	-	-	
5	MUSES -A	UNK		UNK	0	0	0	300 (EST)	NA	NA	NA	-	-	
6	OTHER JAPANESE PLANETARY	UNK		UNK	0	0	0	1000 (EST)	NA	NA	NA	-	-	
7	OTHER FOREIGN PLANETARY	UNK		UNK	0	0	0	1500 (EST)	UNK	NA	NA	-	-	
8														
9														
10														
11														
12														
13														

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	SCIENTIFIC/TECHNICAL DEVELOPMENT																											
1	ATHOS	D	FRANCE	D	7				1													1		C	ARI	K	F	GEOSYNCH TRANSFER
2	HIPPARCOS	D	ESA	D	2				1													1		P	ARI	K	P	NEAR GEO 3
3	ISO (INFRARED SOLAR OBSERVATORY)	D	ESA	D	2								1									1		A	ARI	K	P	21,600 540 5.0
4	OTHER EUROPEAN SCI & TD (SOHO, CLUSTER, ETC.)	D	ESA FRANCE, WGERMANY ITALY	D	2					1		1		1		1		1		1		6		S	ARI STS	E K	P A	VARIOUS
5	ASTRO -C	D	JAPAN ISAS	D	2		1															1		C	M-3S	A	P	300 300
6	EXOS -D	D	JAPAN ISAS	D	2				1													1		C	M-3S	A	P	540 160 65
7	EXOS F/O	D	JAPAN ISAS	D	2						1			1			1			1		4		F	M-3S	A	U	VARIOUS
8	UVSAT	D	JAPAN ISAS	D	2				1													1		P	M-3S	A	U	UNKNOWN
9	MS-T5	D	JAPAN ISAS	D	2	1																1		L	M-3S	A	U	ESCAPE
10	MS F/O	D	JAPAN ISAS	D	2					1			1		1			1			1	5		F	UNKN	A	U	ESCAPE
11	ETS V	D	JAPAN NASDA	D	2			1														1		P	H-IA	T	F	GEOSYNCH TRANSFER
12	ETS VI	D	JAPAN NASDA	D	5								1									1		P	H-II	T	P	GEOSYNCH TRANSFER
13	OPEN-J	D	JAPAN	J	2				2													2		P	N/H	T	P	UNKNOWN

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS C	KU	KA	SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH: UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING	STS CHARGE POLICY	NOTES
	SCIENTIFIC/TECHNICAL DEVELOPMENT													
1	ATHOS	SATCOM		3-AXIS	8	0	3	1930	NA	NA	NA	-	-	
2	HIPPARCOS	MESH		SPIN	0	0	0	1000 (EST)	NA	NA	NA	-	-	
3	ISO (INFRARED SOLAR OBSERVATORY)	UNK		3-AXIS	0	0	0	3900 (EST)	NA	NA	NA	-	-	
4	OTHER EUROPEAN SCI & TD (SOHO, CLUSTER, ETC.)	UNK		UNK	0	0	0	4000 (EST)	UNK	9000 (EST)	9.8 (EST)	H	1	
5	ASTRO -C	NEC		UNK	0	0	0	476	NA	NA	NA	-	-	
6	EXOS -D	NEC		UNK	0	0	0	265	NA	NA	NA	-	-	
7	EXOS F/O	NEC?		UNK	0	0	0	300 (EST)	NA	NA	NA	-	-	
8	UVSAT	UNK		UNK	0	0	0	400 (EST)	NA	NA	NA	-	-	
9	MS-T5	UNK		UNK	0	0	0	300	NA	NA	NA	-	-	LAUNCHED 1-8-85
10	MS F/O	UNK		UNK	0	0	0	300 (EST)	NA	NA	NA	-	-	
11	ETS V	UNK		3-AXIS	0	0	0	1200	NA	NA	NA	-	-	
12	ETS VI	UNK		3-AXIS	0	0	20	2000	NA	NA	NA	-	-	
13	OPEN-J	UNK		UNK	0	0	0	1200 (EST)	NA	NA	NA	-	-	

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	SCIENTIFIC/TECHNICAL DEVELOPMENT																											
1	OTHER M-3S CLASS JAPANESE SCIENTIFIC	D	JAPAN	D	2			1		1		1		1		1		1		1		7		M	M-3S	A	U	UNKNOWN
2	OTHER N/H-CLASS JAPANESE SCIENTIFIC	D	JAPAN ISAS	D	2						1			1			1		1			4		M	N/H	T	U	VARIOUS
3	VIKING	D	SWEDEN	D	1	1																1		C	ARI	K	F	9000 500 98.7
4	ITALIAN SCIENTIFIC PROGRAM	D	ITALY	D	2		1				1				1							3		M	ARI	K	P	UNKNOWN
5	SROSS	D	INDIA ISRO	D	3	1	1	1		1												4		P	ASLV	I	U	VARIOUS
6	SROSS F/O	D	INDIA ISRO	D	3							1		1	1		1		1	1		6		F	ASLV	I	U	VARIOUS
7	INDIAN SUN SYNCH PROTOTYPE	D	INDIA ISRO	D	0					1												1		P	PSLV	I	U	SUN SYNCH
8	OTHER INDIAN S/TD SPACECRAFT	D	INDIA ISRO	D	3							1			1			1			1	4		M	PSLV	I	U	VARIOUS
9	CHINESE S/TD SPACECRAFT	D	PEOPLE'S REPUBLIC OF CHINA	D	0	1			1			1		1			1		1			6		M	UNKN	S	U	VARIOUS
10	OTHER FOREIGN S/TD SPACECRAFT	D	VARIOUS	D	0								1			1			1		1	4		M	UNKN	-	U	VARIOUS
11	TOTAL					4	3	3	7	5	3	5	4	6	4	3	4	4	4	4	3	66						
12																												
13																												

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	SCIENTIFIC/TECHNICAL DEVELOPMENT													
1	OTHER M-3S CLASS JAPANESE SCIENTIFIC	UNK		UNK	0	0	0	400 (EST)	NA	NA	NA	-	-	
2	OTHER N/H-CLASS JAPANESE SCIENTIFIC	UNK		UNK	0	0	0	1200 (EST)	NA	NA	NA	-	-	
3	VIKING	SAAB		SPIN	0	0	0	1200 (EST)	NA	NA	NA	-	-	
4	ITALIAN SCIENTIFIC PROGRAM	UNK		UNK	0	0	0	800 (EST)	NA	NA	NA	-	-	
5	SROSS	ISRO		UNK	0	0	0	330 (EST)	NA	NA	NA	-	-	
6	SROSS F/O	ISRO		UNK	0	0	0	330 (EST)	NA	NA	NA	-	-	
7	INDIAN SUN SYNCH PROTOTYPE	ISRO		UNK	0	0	0	1320	NA	NA	NA	-	-	
8	OTHER INDIAN S/TD SPACECRAFT	ISRO		UNK	0	0	0	1300 (EST)	NA	NA	NA	-	-	
9	CHINESE S/TD SPACECRAFT	CHINA		UNK	0	0	0	2000 (EST)	NA	NA	NA	-	-	
10	OTHER FOREIGN S/TD SPACECRAFT	UNK		UNK	0	0	0	2000 (EST)	NA	NA	NA	-	-	
11														
12														
13														

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	MATERIALS TEST/PROCESSING																											
1	EURECA -1	D	ESA	D	O				1													1		C	STS	E	C	SHUTTLE ORBIT
2	EURECA RETRIEVAL -1	R	ESA	D	O				1													1		C	STS	E	C	SHUTTLE ORBIT
3	EURECA F/O	D	ESA	D	O							1			1			1			1	4		M	STS	E	C	SHUTTLE ORBIT
4	EURECA F/O RETRIEVAL	R	ESA	D	O							1			1			1			1	4		M	STS	E	C	SHUTTLE ORBIT
5	GALLIUM ARSENIDE TEST/PRODUCTION	A	PRIVATE MFG (MRA?)	B	O					1		1	1	1	1	1	1	1	1	1	1	11		S	STS	E	C	SHUTTLE ORBIT
6	HG-CD-TE TEST	A	PRIVATE MFG (HONEYWELL?)	B	O					1												1		P	STS	E	C	SHUTTLE ORBIT
7	HG-CD-TE PRODUCTION	A	PRIVATE MFG (HONEYWELL?)	B	O							1	1	1	1	1	1	1	1	1	1	10		M	STS	E	C	SHUTTLE ORBIT
8	ISO-ELECTRIC FOCUSING (IEF) SEPARATION TESTS	A	PRIVATE MFG	B	O					1	1											2		S	STS	E	C	SHUTTLE ORBIT
9	IEF PRODUCTION	A	PRIVATE MFG	B	O							1	1	1	2	2	2	2	2	3	3	19		M	STS	E	C	SHUTTLE ORBIT
10	MATERIALS RESEARCH	A	PRIVATE MFG (DEERE?)	B	O					1		1		1	1	1	1	1	1	2	2	12		M	STS	E	C	SHUTTLE ORBIT
11	FOREIGN MATERIALS RESEARCH	A	VARIOUS	E	O					1	1	1	2	1	2	2	2	3	3	3	3	24		M	STS	E	C	SHUTTLE ORBIT
12	EOS	D	MDAC/J&J	B	O		1	1														2		P	STS	E	C	SHUTTLE ORBIT
13	EOS	D	MDAC/J&J	B	O					1												1		P	STS	E	C	SHUTTLE ORBIT

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	MATERIALS TEST/PROCESSING													
1	EURECA -1	MBB		3-AXIS	0	0	0	7716	NA	7716	7.5	H	2	
2	EURECA RETRIEVAL -1	MBB		3-AXIS	0	0	0	7716	NA	7716	7.5	H	2	
3	EURECA F/O	MBB		3-AXIS	0	0	0	7700 (EST)	NA	7700 (EST)	7.5 (EST)	H	2	
4	EURECA F/O RETRIEVAL	MBB		3-AXIS	0	0	0	7700 (EST)	NA	7700 (EST)	7.5 (EST)	H	2	
5	GALLIUM ARSENIDE TEST/PRODUCTION	UNK	ATTACHED	NA	0	0	0	6500 (EST)	NA	6500 (EST)	6.0 (EST)	H	1	
6	HG-CD-TE TEST	UNK	ATTACHED	NA	0	0	0	6500 (EST)	NA	6500 (EST)	6.0 (EST)	H	1	
7	HG-CD-TE PRODUCTION	UNK	ATTACHED	NA	0	0	0	6500 (EST)	NA	6500 (EST)	6.0 (EST)	H	1	
8	ISO-ELECTRIC FOCUSING (IEF) SEPARATION TESTS	UNK	ATTACHED	NA	0	0	0	6500 (EST)	NA	6500 (EST)	6.0 (EST)	H	1	
9	IEF PRODUCTION	UNK	ATTACHED	NA	0	0	0	6500 (EST)	NA	6500 (EST)	6.0 (EST)	H	1	
10	MATERIALS RESEARCH	UNK	ATTACHED	NA	0	0	0	6500 (EST)	NA	6500 (EST)	6.0 (EST)	H	1	
11	FOREIGN MATERIALS RESEARCH	UNK	ATTACHED	NA	0	0	0	6500 (EST)	NA	6500 (EST)	6.0 (EST)	H	1	
12	EOS	FAIR?	LEASE-CRAFT?	3-AXIS	0	0	0	28000 (EST)	NA	28000 (EST)	25.8 (EST)	H	1	
13	EOS	FAIR?	LEASE-CRAFT?	3-AXIS	0	0	0	28000 (EST)	NA	28000 (EST)	25.8 (EST)	H	1	

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	MATERIALS TEST/PROCESSING																											
1	EOS	X	MDAC/J&J	B	O					1			3									4		P	STS	E	C	SHUTTLE ORBIT
2	EOS	X	MDAC/J&J	B	O						1		1	3	2	2	2	2	2	2	2	19		P	STS	E	C	SHUTTLE ORBIT
3	EOS	X	MDAC/J&J	B	O						1	2		1	2	2	2	2	2	2	2	18		P	STS	E	C	SHUTTLE ORBIT
4	OTHER MPS PRODUCTION	A	VARIOUS (E.G., 3M)	B	O								1	1								2		M	STS	E	C	SHUTTLE ORBIT
5	OTHER MPS PRODUCTION	D	VARIOUS (E.G., 3M)	B	O										1							1		M	STS	E	C	SHUTTLE ORBIT
6	OTHER MPS PRODUCTION	X	VARIOUS (E.G., 3M).	B	O										1			3				4		M	STS	E	C	SHUTTLE ORBIT
7	OTHER MPS PRODUCTION	X	VARIOUS (E.G., 3M)	B	O											1		1	3	2	2	9		M	STS	E	C	SHUTTLE ORBIT
8	OTHER MPS PRODUCTION	X	VARIOUS (E.G., 3M)	B	O											1	2		1	2	2	8		M	STS	E	C	SHUTTLE ORBIT
9	OTHER MPS PRODUCTION	A	VARIOUS	B	O											2	1					3		M	STS	E	C	SHUTTLE ORBIT
10	OTHER MPS PRODUCTION	D	VARIOUS	B	O													2	1	2	1	6		M	STS	E	C	SHUTTLE ORBIT
11	TOTAL					0	1	1	2	7	4	9	10	10	15	15	14	20	17	20	21	166						
12																												
13																												

XBL 811-1133

TABLE A-1B. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	MATERIALS TEST/PROCESSING													
1	EOS	FAIR?	LEASE-CRAFT?	3-AXIS	0	0	0	35000 (EST)	NA	35000 (EST)	32.4 (EST)	H	1	
2	EOS	FAIR?	LEASE-CRAFT?	3-AXIS	0	0	0	42250 (EST)	NA	42250 (EST)	39.0 (EST)	H	1	
3	EOS	FAIR?	LEASE-CRAFT?	3-AXIS	0	0	0	50000 (EST)	NA	50000 (EST)	60.0 (EST)	H	1	
4	OTHER MPS PRODUCTION	FAIR?	LEASE-CRAFT?	3-AXIS	0	0	0	6500 (EST)	NA	6500 (EST)	6.0 (EST)	H	1	
5	OTHER MPS PRODUCTION	FAIR?	LEASE-CRAFT?	3-AXIS	0	0	0	28000 (EST)	NA	28000 (EST)	25.8 (EST)	H	1	
6	OTHER MPS PRODUCTION	FAIR?	LEASE-CRAFT?	3-AXIS	0	0	0	35000 (EST)	NA	35000 (EST)	32.4 (EST)	H	1	
7	OTHER MPS PRODUCTION	FAIR?	LEASE-CRAFT?	3-AXIS	0	0	0	42250 (EST)	NA	42250 (EST)	39.0 (EST)	H	1	
8	OTHER MPS PRODUCTION	FAIR?	LEASE-CRAFT?	3-AXIS	0	0	0	50000 (EST)	NA	50000 (EST)	60.0 (EST)	H	1	
9	OTHER MPS PRODUCTION	FAIR?	LEASE-CRAFT?	3-AXIS	0	0	0	16250 (EST)	NA	16250 (EST)	15.0 (EST)	H	1	
10	OTHER MPS PRODUCTION	FAIR?	LEASE-CRAFT?	3-AXIS	0	0	0	32500 (EST)	NA	32500 (EST)	30.0 (EST)	H	1	
11														
12														
13														

TABLE A-1A HIGH MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	MULTISERVICE SPACECRAFT/VEHICLES																											
1	INSAT -IC	D	INDIA ISRO	D	8		1															1		C	STS	E	F	GEOSYNCH TRANSFER
2	INSAT PROTOTYPE	D	INDIA ISRO	D	7				1		1											2		P	STS ARI	E K	P A	GEOSYNCH TRANSFER
3	INSAT -II	D	INDIA ISRO	D	8								1	1							1	3		F	STS ARI	E K	P A	GEOSYNCH TRANSFER
4	SPAS F/O	D	MBB W.GERMANY	G	0					1			1			1		1		1		5		F	STS	E	C	VARIOUS
5	TOTAL					0	1	0	1	1	1	0	2	1	0	1	0	1	0	1	1	11						
6																												
7																												
8																												
9																												
10																												
11																												
12																												
13																												

TABLE A-18. HIGH MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS C	KU	KA	SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH: UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING	STS CHARGE POLICY	NOTES
	MULTISERVICE SPACECRAFT/VEHICLES													
1	INSAT -IC	FORD		3-AXIS	18	0	0	1300	PAM-D	9929	8.2	V	1	
2	INSAT PROTOTYPE	UNK		UNK	24	0	0	1700 (EST)	PAM-D2 ?	15000 (EST)	13.0 (EST)	V	1	
3	INSAT -II	UNK		UNK	24	0	0	1700 (EST)	PAM-D2 ?	15000 (EST)	13.0 (EST)	V	1	
4	SPAS F/O	MBB?	ONBOARD ORBITER	NA	0	0	0	4000 (EST)	NA	4000 (EST)	6.0 (EST)	V	2	
5														
6														
7														
8														
9														
10														
11														
12														
13														

OUTSIDE USERS PAYLOAD MODEL TABLES

LOW MODEL

TABLE A-2A LOW MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	INTERNATIONAL COMMUNICATIONS																											
1	INTELSAT V, F-10	D	INTELSAT	A	7	1																1		L	A/C	E	F	GEOSYNCH TRANSFER
2	INTELSAT V-A, F-11, F-12	D	INTELSAT	A	7	2																2		C	A/C	E	F	GEOSYNCH TRANSFER
3	INTELSAT V-A, F-13, F-14, F-15	D	INTELSAT	A	7		2	1														3		C	AR-2	K	F	GEOSYNCH TRANSFER
4	INTELSAT VI F-1, F-2	D	INTELSAT	A	10			1	1													2		C	STS	E	F	GEOSYNCH TRANSFER
5	INTELSAT VI F-3	D	INTELSAT	A	10					1												1		C	AR-4	K	F	GEOSYNCH TRANSFER
6	INTELSAT VI F-4, F-5	D	INTELSAT	A	10					1		1										2		C	STS AR-4	E K	A A	GEOSYNCH TRANSFER
7	INTELSAT VII	D	INTELSAT	A	10							1	2	2	1			1	1	2		10		O	AR-4 STS	K E	A A	GEOSYNCH TRANSFER
8	OTHER INT. (ORION, CYGNUS, ISI)	D	OTHER	A	10					1	2									1	2	6		P	STS AR-2	E K	P A	GEOSYNCH TRANSFER
9	INMARSAT 1, 2, 3	D	INMARSAT	A	10					1	1	1										3		C	STS ARI	E K	A A	GEOSYNCH TRANSFER
10	INMARSAT 4	D	INMARSAT	A	10								1									1		O	STS ARI	E K	A A	GEOSYNCH TRANSFER
11	INMARSAT F/O	D	INMARSAT	A	10															1	1	2		F	STS ARI	E K	A A	GEOSYNCH TRANSFER
12	PASS	D	PACIFIC AREA SATELLITE SYSTEM	F	10						1			1							1	3		P	STS ARI	E K	A A	GEOSYNCH TRANSFER
13	TOTAL					3	2	2	1	4	4	3	3	3	1	0	0	1	1	4	4	36						

TABLE A-2B. LOW MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	INTERNATIONAL COMMUNICATIONS													
1	INTELSAT V, F-10	FORD		3-AXIS	40	21	0	2315	NA	NA	NA	-	-	LAUNCHED 3-22-85
2	INTELSAT V-A, F-11, F-12	FORD		3-AXIS	44	21	0	2395	NA	NA	NA	-	-	
3	INTELSAT V-A, F-13, F-14, F-15	FORD		3-AXIS	44	21	0	2395	NA	NA	NA	-	-	
4	INTELSAT VI F-1, F-2	HUGHES		SPIN	62	24	0	4800	INT.	35274	27.9	H	1	
5	INTELSAT VI F-3	HUGHES		SPIN	62	24	0	4800	INT.	NA	NA	-	-	
6	INTELSAT VI F-4, F-5	HUGHES		SPIN	62	24	0	4800	INT.	35274	27.9	H	1	
7	INTELSAT VII	UNK		UNK	24	48	0	2500 (EST)	UNK	22500 (EST)	20.0 (EST)	H	1	
8	OTHER INT. (ORION, CYGNUS, ISI)	UNK		UNK	22	0	0	1300 (EST)	UNK	10000 (EST)	8.5 (EST)	V	1	
9	INMARSAT 1, 2, 3	BADG	EUROSTAR	3-AXIS	0	0	0	1600 (EST)	UNK	14550 (EST)	13.0 (EST)	V	1	
10	INMARSAT 4	BADG	EUROSTAR	3-AXIS	0	0	0	1600 (EST)	UNK	14550 (EST)	13.0 (EST)	V	1	
11	INMARSAT F/O	UNK		UNK	0	0	0	1600 (EST)	UNK	14550 (EST)	13.0 (EST)	V	1	
12	PASS	UNK		UNK	12	12	0	1900 (EST)		15000 (EST)	15.0 (EST)	V	1	
13														

TABLE A-2A LOW MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	U.S. DOMESTIC COMMUNICATIONS																											
1	WESTAR 6S	D	WESTERN UNION	B	10		1															1		C	STS	E	F	GEOSYNCH TRANSFER
2	WESTAR F/O	D	WESTERN UNION	B	10		1						2			1	1					5		F	STS	E	P	GEOSYNCH TRANSFER
3	FORDSAT 1, 2	D	FORD AEROSPACE SATELLITE SERV. CORP.	B	10						1	1										2	1	A	STS ARI	E K	P A	GEOSYNCH TRANSFER
4	FORDSAT F/O	D	FORD AEROSPACE SATELLITE SERV. CORP.	B	10																1	1		F	STS	E	P	GEOSYNCH TRANSFER
5	AMERSAT -A, -B	D	AMERICAN SATELLITE COMPANY	B	9	1			1													2		C	STS	E	F	GEOSYNCH TRANSFER
6	AMERSAT K	D	AMERICAN SATELLITE COMPANY	B	10											1			1			2		P	STS	E	P	GEOSYNCH TRANSFER
7	MOBILSAT -1, -2	D	MOBILE SATELLITE CORP., SKYLINK	B	10						1										1	2		P	STS	E	P	GEOSYNCH TRANSFER
8	GSTAR A-1	D	GTE SATELLITE CORP (GSAT)	B	10	1																1		L	AR-3	K	F	GEOSYNCH TRANSFER
9	GSTAR A-2	D	GTE SATELLITE CORP (GSAT)	B	10		1															1		C	AR-3	K	F	GEOSYNCH TRANSFER
10	GSTAR A-3	D	GTE SATELLITE CORP (GSAT)	B	10			1														1		C	STS AR-3	E K	P A	GEOSYNCH TRANSFER
11	GSTAR F/O	D	GTE SATELLITE CORP (GSAT)	B	15											1	1	1				3		F	STS ARI	E K	P A	GEOSYNCH TRANSFER
12	SPACENET -3	D	GTE SPACENET	B	8	1																1		C	AR-3	K	F	GEOSYNCH TRANSFER
13	SPACENET F/O	D	GTE SPACENET	B	15								2	1								3		F	STS ARI	E K	A A	GEOSYNCH TRANSFER

TABLE A-2B. LOW MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	U.S. DOMESTIC COMMUNICATIONS													
1	WESTAR 6S	HUGHES	HS-376	SPIN	24	0	0	1450	PAM-D	9962	8.2	V	1	
2	WESTAR F/O	UNK		UNK	24	0	0	1450 (EST)	PAM-D	10000 (EST)	8.2 (EST)	V	1	
3	FORDSAT 1, 2	FORD		3-AXIS	24	24	0	3100	TOS?	17914	16.5	H	1	
4	FORDSAT F/O	FORD		3-AXIS	24	24	0	3100	TOS?	17914	16.5	H	1	
5	AMERSAT -A, -B	RCA		3-AXIS	24	12	0	1467	PAM-D	10068	8.2	V	1	
6	AMERSAT K	UNK		UNK	24	30	36	2200 (EST)	PAM-A ?	16000	15.0	V	1	
7	MOBILSAT -1, -2	UNK	HS-376 CLASS	UNK	0	27	0	1300 (EST)	PAM-D ?	10000 (EST)	8.2 (EST)	V	1	
8	GSTAR A-1	RCA		3-AXIS	0	24	0	1439	NA	NA	NA	-	-	LAUNCHED 5-7-85
9	GSTAR A-2	RCA		3-AXIS	0	24	0	1439	NA	NA	NA	-	-	
10	GSTAR A-3	RCA		3-AXIS	0	24	0	1439	PAM-D2	13430	8.2	V	1	
11	GSTAR F/O	UNK		UNK	0	36	0	2000 (EST)	PAM-A ?	14000 (EST)	9.0 (EST)	V	1	
12	SPACENET -3	RCA		3-AXIS	24	12	0	1260	NA	NA	NA	-	-	
13	SPACENET F/O	UNK		UNK	36	20	0	1350 (EST)	PAM-D ?	11500 (EST)	8.2	V	1	

XBLC-2 (5-85) SFD

TABLE A-2A LOW MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE																	GROUND SPARE	PROGRAM STATUS	LAUNCH			TRAJECTORY (NMI) (DEG)
						85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL			VEHICLE	SITE	STATUS	APOGEE PERIGEE INCLINATION
	U.S. DOMESTIC COMMUNICATIONS																											
1	SBS -5	D	SATELLITE BUSINESS SYSTEMS	B	10		1															1		C	ARI	K	F	GEOSYNCH TRANSFER
2	SBS -6	D	SATELLITE BUSINESS SYSTEMS	B	10				1													1		C	STS ARI	E K	P A	GEOSYNCH TRANSFER
3	SBS F/O	D	SATELLITE BUSINESS SYSTEMS	B	10					1		1			1			1		1		5		F	STS ARI	E K	P A	GEOSYNCH TRANSFER
4	GALAXY -D	D	HUGHES COMMUNICATIONS INC.	B	9		1															1		C	3920P	E	F	GEOSYNCH TRANSFER
5	GALAXY F/O	D	HUGHES COMMUNICATIONS INC.	B	10									1	1		1	1				4		F	STS	E	P	GEOSYNCH TRANSFER
6	GALAXY K -1, -2, -3	D	HUGHES COMMUNICATIONS INC.	B	10			1	1													2		P	STS	E	P	GEOSYNCH TRANSFER
7	GALAXY K F/O	D	HUGHES COMMUNICATIONS INC.	B	10													1	1			2		P	STS	E	P	GEOSYNCH TRANSFER
8	LEASAT (SYNCOM IV) -3	D	HUGHES COMMUNICATIONS SERVICES, INC.	B	10	1																1		L	STS	E	C	GEOSYNCH TRANSFER
9	LEASAT (SYNCOM IV) -4, -5	D	HUGHES COMMUNICATIONS SERVICES, INC.	B	10	1	1															2		C	STS	E	C	GEOSYNCH TRANSFER
10	TELSTAR 3-D	D	AT&T	B	10	1																1		L	STS	E	F	GEOSYNCH TRANSFER
11	TELSTAR 3 F/O	D	AT&T	B	10									1	1							2		F	STS	E	P	GEOSYNCH TRANSFER
12	SATCOM -I	D	RCA AMERICOM	B	10						1											1		C	STS	E	F	GEOSYNCH TRANSFER
13	SATCOM F/O	D	RCA AMERICOM	B	10					1	1		1							1		4		F A	STS AR-4	E K	P A	GEOSYNCH TRANSFER

TABLE A-2B. LOW MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	U.S. DOMESTIC COMMUNICATIONS													
1	SBS -5	HUGHES	HS-376	SPIN	0	24	0	1438	NA	NA	NA	-	-	
2	SBS -6	HUGHES	HS-393	SPIN	0	24	0	2900 (EST)	INTEGRAL	17000 (EST)	15.0 (EST)	H	1	
3	SBS F/O	HUGHES?	HS-393?	SPIN?	0	24	0	2900 (EST)	INTEGRAL	17000 (EST)	15.0 (EST)	H	1	
4	GALAXY -D	HUGHES	HS-376	SPIN	24	0	0	1174	NA	NA	NA	-	-	
5	GALAXY F/O	HUGHES	HS-393?	SPIN	36	0	0	2900 (EST)	INTEGRAL	17000 (EST)	15.0 (EST)	H	1	
6	GALAXY K -1,-2,-3	HUGHES	HS-393	SPIN	0	23	0	2900 (EST)	INTEGRAL	17107	14.8	H	1	
7	GALAXY K F/O	HUGHES	HS-393	SPIN	0	32	0	2900 (EST)	INTEGRAL	17000 (EST)	15.0 (EST)	H	1	
8	LEASAT (SYNCOM IV) -3	HUGHES	SYNCOM IV	SPIN	0	0	0	2900	INTEGRAL	17260	15.8	H	1	LAUNCH FAILED 4-12-85
9	LEASAT (SYNCOM IV) -4, -5	HUGHES	SYNCOM IV	SPIN	0	0	0	2900	INTEGRAL	17260	15.8	H	1	
10	TELSTAR 3-D	HUGHES	HS-376	SPIN	24	0	0	1436	PAM-D	10100	8.2	V	1	LAUNCHED 6-19-85
11	TELSTAR 3 F/O	UNK		UNK	40	0	0	1700 (EST)	PAM-D2 ?	15000 (EST)	12.0 (EST)	V	1	
12	SATCOM -I	RCA	ADV SATCOM	3-AXIS	24	0	0	1451	PAM-D	10002	9.2	V	1	
13	SATCOM F/O	RCA?	ADV SATCOM	3-AXIS	24	0	0	1450 (EST)	PAM-D2	15000 (EST)	11.5 (EST)	V	1	

TABLE A-2A LOW MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	SITE	STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	U.S. DOMESTIC COMMUNICATIONS																											
1	SATCOM K1, K2, K3	D	RCA AMERICOM	B	10	2		1														3		C	STS	E	F	GEOSYNCH TRANSFER
2	SATCOM K F/O	D	RCA AMERICOM	B	10											2		1				3		F	STS	E	P	GEOSYNCH TRANSFER
3	FLEETSATCOM	D	U.S. NAVY	C	5	1	1	1														3		C	A/C	E	F	GEOSYNCH TRANSFER
4	FLTSATCOM F/O	D	U.S. NAVY	B	10							1	1				1	1				4		F	STS	E	C	GEOSYNCH TRANSFER
5	OTHER NEW KU-BAND USES	D	VARIOUS	B	10									1				1				2		M	STS AR-4	E K	P A	GEOSYNCH TRANSFER
6	OTHER NEW KA-BAND USES	D	VARIOUS	B	8										1					1		2		M	STS	E	P	GEOSYNCH TRANSFER
7	TOTAL					9	7	4	3	2	4	3	6	4	4	5	4	7	2	3	2	69						
8																												
9																												
10																												
11																												
12																												
13																												

TABLE A-2B. LOW MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	U.S. DOMESTIC COMMUNICATIONS													
1	SATCOM K1, K2, K3	RCA?	RCA SATCOM KU	3-AXIS	0	16	0	1461	PAM-D2	15900	11.5	V	1	
2	SATCOM K F/O	RCA?	RCA SATCOM KU	3-AXIS	0	24	0	2300 (EST)	PAM-A ?	15000 (EST)	12.0 (EST)	V	1	
3	FLEETSATCOM	TRW		3-AXIS	0	0	0	2200 (EST)	NA	NA	NA	-	-	
4	FLTSATCOM F/O	UNK		UNK	0	0	0	4500 (EST)	UNKNOWN	35000	30.0	H	1	
5	OTHER NEW KU-BAND USES	UNK		UNK	0	24	0	2200 (EST)	PAM-A ?	16000 (EST)	15.0 (EST)	H	1	
6	OTHER NEW KA-BAND USES	UNK		UNK	0	0	36	2200 (EST)	PAM-A ?	16000 (EST)	15.0 (EST)	H	1	
7														
8														
9														
10														
11														
12														
13														

TABLE A-2A LOW MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	FOREIGN REGIONAL COMMUNICATIONS																											
1	TELESAT -I (ANIK C-3)	D	CANADA	E	7	1																1		L	STS	E	F	GEOSYNCH TRANSFER
2	TELESAT -J (ANIK C-4)	D	CANADA	E	10										1							1		F	STS ARI	E K	A A	GEOSYNCH TRANSFER
3	TELESAT -K, -N (ANIK D-3, D-4)	D	CANADA	E	10						1			1								2		F	STS ARI	E K	A A	GEOSYNCH TRANSFER
4	ARABSAT -A	D	ARAB SATELLITE COMMUNICATIONS ORGANIZATION	E	7	1																1		L	AR-3	K	F	GEOSYNCH TRANSFER
5	ARABSAT -B	D	ARAB SATELLITE COMMUNICATIONS ORGANIZATION	E	7	1																1	1	L	STS	E	F	GEOSYNCH TRANSFER
6	ARABSAT F/O	D	ARAB SATELLITE COMMUNICATIONS ORGANIZATION	E	10								1	1								2		F	STS ARI	E K	A A	GEOSYNCH TRANSFER
7	ITALSAT (PRE-OPERATIONAL)	D	ITALY	D	5						1											1		P	AR-4 STS	K E	P A	GEOSYNCH TRANSFER
8	ITALSAT (OPERATIONAL)	D	ITALY	D	10										1							1		P	ARI STS	K E	P A	GEOSYNCH TRANSFER
9	MORELOS -1, -2	D	MEXICO	E	9	1	1															2		C	STS	E	F	GEOSYNCH TRANSFER
10	MORELOS F/O	D	MEXICO	E	9										1	1						2		F	STS AR-3	E K	P A	GEOSYNCH TRANSFER
11	SBTS -1	D	BRAZIL	E	10	1																1		L	ARI	K	F	GEOSYNCH TRANSFER
12	SBTS -2	D	BRAZIL	E	10		1															1		C	ARI	K	F	GEOSYNCH TRANSFER
13	SBTS F/O	D	BRAZIL	E	10											1	1					2		F	ARI STS	K E	P A	GEOSYNCH TRANSFER

XBCL-1 (3-84) EC2

TABLE A-28. LOW MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACECRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	FOREIGN REGIONAL COMMUNICATIONS													
1	TELESAT -I (ANIK C-3)	HUGHES	HS-376	SPIN	0	24	0	1250	PAM-D	9800	8.2	V	1	LAUNCHED 4-12-85
2	TELESAT -J (ANIK C-4)	UNK		UNK	0	24	0	1350 (EST)	PAM-D	10000 (EST)	8.2 (EST)	V	1	
3	TELESAT -K, -N (ANIK D-3, D-4)	UNK		UNK	24	0	0	1350 (EST)	PAM-D	10000 (EST)	8.2 (EST)	V	1	
4	ARABSAT -A	AERO	SPACEBUS 100	3-AXIS	25	0	0	1296	NA	NA	NA	-	-	LAUNCHED 2-8-85
5	ARABSAT -B	AERO	SPACEBUS 100	3-AXIS	25	0	0	1296	PAM-D	10337	9.8	V	1	LAUNCHED 6-18-85
6	ARABSAT F/O	UNK		UNK	23	12	0	1500 (EST)	PAM-D ?	10500 (EST)	10.5 (EST)	V	1	
7	ITALSAT (PRE-OPERATIONAL)	SELENIA		3-AXIS	0	0	9	1700 (EST)	PAM-D2	14746 (EST)	11.3 (EST)	V	1	
8	ITALSAT (OPERATIONAL)	UNK		3-AXIS	0	0	16	1750 (EST)	PAM-D2	15000 (EST)	11.5 (EST)	V	1	
9	MORELOS -1, -2	HUGHES	HS-376	SPIN	24	12	0	1465	PAM-D	9974	8.2	V	1	-1 LAUNCHED 6-17-85
10	MORELOS F/O	UNK		UNK	24	20	0	1500 (EST)	PAM-D ?	10500 (EST)	8.5 (EST)	V	1	
11	SBTS -1	SPAR	HS-376	SPIN	24	0	0	1450 (EST)	NA	NA	NA	-	-	LAUNCHED 2-8-85
12	SBTS -2	SPAR	HS-376	SPIN	24	0	0	1450 (EST)	NA	NA	NA	-	-	
13	SBTS F/O	UNK		UNK	24	12	0	1500 (EST)	PAM-D ?	10200 (EST)	8.5 (EST)	V	1	

TABLE A-2A LOW MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	SITE	STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	FOREIGN REGIONAL COMMUNICATIONS																											
1	AUSSAT -1, -2	D	AUSTRALIA	E	7	1	1															2		C	STS	E	F	GEOSYNCH TRANSFER
2	AUSSAT -3	D	AUSTRALIA	E	7			1														1		C	AR-3	K	F	GEOSYNCH TRANSFER
3	AUSSAT F/O	D	AUSTRALIA	E	10								1	1	1							3		F	STS ARI	E K	P A	GEOSYNCH TRANSFER
4	PALAPA B-3	D	INDONESIA	E	8			1														1		F	STS	E	F	GEOSYNCH TRANSFER
5	PALAPA F/O	D	INDONESIA	E	10							1				1						2		F	STS ARI	E K	P A	GEOSYNCH TRANSFER
6	ECS -3, -4	D	EUTELSAT	E	7	1		1														2	1	C	ARI	K	F	GEOSYNCH TRANSFER
7	ECS F/O	D	EUTELSAT	E	10									1	1			1		1		4		F	ARI STS	K E	P A	GEOSYNCH TRANSFER
8	TELECOM 1 -B	D	FRANCE	E	7	1																1	1	L	ARI	K	F	GEOSYNCH TRANSFER
9	TELECOM F/O	D	FRANCE	E	10							1	1									2		F	ARI	K	P	GEOSYNCH TRANSFER
10	OLYMPUS (FORMERLY L-SAT)	D	ESA	D	7			1														1	1	C	AR-3	K	F	GEOSYNCH TRANSFER
11	OLYMPUS II	D	ESA	D	10					1												1		F	AR-3	K	F	GEOSYNCH TRANSFER
12	TELE-X (PRECURSOR OF NORDCOM)	D	SWEDEN NORWAY	D	5				1													1		C	AR-3	K	F	GEOSYNCH TRANSFER
13	NORDCOM	D	SWEDEN, NORWAY FINLAND(ICELAND DENMARK)	D	10							1					1					2		P	ARI STS	K E	P A	GEOSYNCH TRANSFER

TABLE A-2B. LOW MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	FOREIGN REGIONAL COMMUNICATIONS													
1	AUSSAT -1, -2	HUGHES	HS-376	SPIN	0	19	0	1430	PAM-D	10008	8.2	V	1	
2	AUSSAT -3	HUGHES	HS-376	SPIN	0	19	0	1430	NA	NA	NA	-	-	
3	AUSSAT F/O	HUGHES?		UNK	0	26	0	1500 (EST)	PAM-D ?	10200 (EST)	8.5 (EST)	V	1	
4	PALAPA B-3	HUGHES	HS-376	SPIN	24	0	0	1437	PAM-D	9992	8.2	V	1	
5	PALAPA F/O	UNK		UNK	24	12	0	1500 (EST)	PAM-D ?	10200 (EST)	9.0 (EST)	V	1	
6	ECS -3, -4	MESH		3-AXIS	0	12	0	1500	NA	NA	NA	-	-	
7	ECS F/O	UNK		UNK	0	16	0	2000 (EST)	NA	NA	NA	-	-	
8	TELECOM 1 -B	MATRA		3-AXIS	9	6	0	1430	NA	NA	NA	-	-	LAUNCHED 5-7-85
9	TELECOM F/O	UNK		UNK	12	12	0	1500 (EST)	PAM-D ?	10200 (EST)	10.0 (EST)	V	1	
10	OLYMPUS (FORMERLY L-SAT)	BADG		3-AXIS	0	7	2	2640	NA	NA	NA	-	-	
11	OLYMPUS II	UNK		UNK	0	12	6	3000 (EST)	NA	NA	NA	-	-	
12	TELE-X (PRECURSOR OF NORDCOM)	EUROSAT		3-AXIS	0	4	0	2860	NA	NA	NA	-	-	
13	NORDCOM	UNK		3-AXIS	0	6	0	3200	TOS ?	22800	20.0 (EST)	H	1	

TABLE A-2A LOW MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	FOREIGN REGIONAL COMMUNICATIONS																											
1	TDF -1, -2	D	FRANCE	D	7		1															1		C	AR-4	K	F	GEOSYNCH TRANSFER
2	TDF F/O	D	FRANCE	D	10									1								1		C	AR-4	K	P	GEOSYNCH TRANSFER
3	TV-SAT (PRE-OPERATIONAL)	D	W. GERMANY	D	7		1															1		C	ARI	K	F	GEOSYNCH TRANSFER
4	TV-SAT (OPERATIONAL)	D	W. GERMANY	D	7				1						1							2		P	ARI	K	P	GEOSYNCH TRANSFER
5	DFS-KOPERIKUS -1	D	W. GERMANY	D	10				1													1		C	AR-4	K	P	GEOSYNCH TRANSFER
6	DFS-KOPERNIKUS F/O	D	W. GERMANY	D	10														1			1		F	ARI STS	K E	P A	GEOSYNCH TRANSFER
7	NATO IV	D	NATO	M	10							1		1								2		P	STS ARI	E K	A A	GEOSYNCH TRANSFER
8	BS 2B	D	JAPAN NASDA	B	5		1															1		C	N-II	T	F	GEOSYNCH TRANSFER
9	BS F/O	D	JAPAN NASDA	D	10					1		1								1		3		F	H-IA	T	P	GEOSYNCH TRANSFER
10	CS -3A, 3B	D	JAPAN NASDA	D	10				1	1												2		A	H-IA	T	P	GEOSYNCH TRANSFER
11	CS -4A, -4B	D	JAPAN NASDA	D	10														1	1		2		P	H-II	T	P	GEOSYNCH TRANSFER
12	INS	D	JAPAN NTT	F	10						1		1								1	3		P	ARI STS	K E	A A	GEOSYNCH TRANSFER
13	STW F/O	D	PEOPLE'S REPUBLIC OF CHINA	D	7		1				1			1		1			1		1	6		P	CZ-3	S	U	GEOSYNCH TRANSFER

TABLE A-2B. LOW MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS C	KU	KA	SPACECRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH: UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING	STS CHARGE POLICY	NOTES
	FOREIGN REGIONAL COMMUNICATIONS													
1	TDF -1, -2	AERO		3-AXIS	0	3	0	2620	NA	NA	NA	-	-	
2	TDF F/O	UNK		3-AXIS	0	5	0	2700 (EST)	NA	NA	NA	-	-	
3	TV-SAT (PRE-OPERATIONAL)	AERO		3-AXIS	0	3	0	2620	NA	NA	NA	-	-	
4	TV-SAT (OPERATIONAL)	UNK		3-AXIS	0	5	0	2700 (EST)	NA	NA	NA	-	-	
5	DFS-KOPERIKUS -1	MBB		3-AXIS	0	16	1	1800 (EST)	NA	NA	NA	-	-	
6	DFS-KOPERNIKUS F/O	MBB?		3-AXIS	0	24	2	2400 (EST)	NA	NA	NA	-	-	
7	NATO IV	UNK		UNK	0	0	0	1750 (EST)	PAM-D2 ?	14100 (EST)	8.0 (EST)	V	1	
8	BS 2B	TOSHIBA		3-AXIS	0	2	0	770	NA	NA	NA	-	-	
9	BS F/O	UNK		3-AXIS	0	4	0	1200 (EST)	NA	NA	NA	-	-	
10	CS -3A, 3B	MELCO		SPIN	0	0	12	1210	NA	NA	NA	-	-	
11	CS -4A, -4B	UNK		UNK	0	0	64	4400 (EST)	NA	NA	NA	-	-	
12	INS	UNK		UNK	0	16	0	2700 (EST)	TOS ?	22700 (EST)	20.5 (EST)	H	1	
13	STW F/O	CHINA		UNK	24	0	0	1900	NA	NA	NA	-	-	

TABLE A-2A LOW MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	FOREIGN REGIONAL COMMUNICATIONS																											
1	CHINA DBS	D	PEOPLE'S REPUBLIC OF CHINA	D	7					1							1					2		D	CZ-3	S	U	GEOSYNCH TRANSFER
2	SKYNET 4-A, 4-B, 4-C	D	GREAT BRITAIN	M	7		1	1	1													3		C	STS	E	F	GEOSYNCH TRANSFER
3	SKYNET F/O	D	GREAT BRITAIN	M	10									1	1	1						3		P	STS	E	P	GEOSYNCH TRANSFER
4	PAM-D CLASS FOREIGN COMM. SATS.	D	VARIOUS	D	7				1			1				1						3		M	STS AR-3	E K	A A	GEOSYNCH TRANSFER
5	PAM-D2 CLASS FOREIGN COMM. SATS	D	VARIOUS	D	7					1			1				1				1	4		M	AR-3 STS	K E	P A	GEOSYNCH TRANSFER
6	OLYMPUS CLASS FOREIGN COMM. SATS.	D	VARIOUS	D	7								1			1			1		1	4		M	AR-4 STS	K E	P A	GEOSYNCH TRANSFER
7	TOTAL					8	8	5	6	5	4	6	6	8	7	7	4	1	4	3	4	86						
8																												
9																												
10																												
11																												
12																												
13																												

XBCL 13-841 EZ

TABLE A-2B. LOW MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS C	KU	KA	SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH: UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING	STS CHARGE POLICY	NOTES
	FOREIGN REGIONAL COMMUNICATIONS													
1	CHINA DBS	RCA?		3-AXIS	0	2	0	1500 (EST)	PAM-D2	13500 (EST)	12.0 (EST)	H	1	
2	SKYNET 4-A, 4-B, 4-C	BADG		3-AXIS	0	0	0	1750 (EST)	PAM-D2 ?	14100	8.0	V	1	
3	SKYNET F/O	UNK		UNK	0	0	0	1750 (EST)	PAM-D2 ?	14000 (EST)	8.0 (EST)	V	1	
4	PAM-D CLASS FOREIGN COMM. SATS.	VARIOUS		UNK	24	0	0	1400 (EST)	PAM-D ?	10000 (EST)	10.0 (EST)	V	1	
5	PAM-D2 CLASS FOREIGN COMM. SATS .	UNK		UNK	0	24	0	1900 (EST)	PAM-D2 ?	15000 (EST)	12.0 (EST)	V	1	
6	OLYMPUS CLASS FOREIGN COMM. SATS.	UNK		UNK	24	12	0	2650 (EST)	TOS ?	20000 (EST)	18.0 (EST)	H	1	
7														ORIGINAL PAGE IS OF POOR QUALITY
8														
9														
10														
11														
12														
13														

XBLC-2 (5-85) SFD

TABLE A-2A LOW MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	U.S. GEOSTATIONARY EARTH OBSERVATIONS																											
1	GOES -G, -H	D	NOAA	C	7		2															2		C	3914	E	P	GEOSYNCH TRANSFER
2	GOES -I, -J, -K	D	NOAA	C	7						1			1	1							3		C	STS	E	P	GEOSYNCH TRANSFER
3	GOES -L, -M	D	NOAA	C	7													1			1	2		O	STS	E	P	GEOSYNCH TRANSFER
4	TOTAL					0	2	0	0	0	1	0	0	1	1	0	0	1	0	0	1	7						
5																												
6																												
7																												
8																												
9																												
10																												
11																												
12																												
13																												

XBL 8312-1138X

TABLE A-2B. LOW MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	U.S. GEOSTATIONARY EARTH OBSERVATIONS													
1	GOES -G, -H	HUGHES		SPIN	0	0	0	975	NA	NA	NA	-	-	
2	GOES -I, -J, -K	FORD		3-AXIS	0	0	0	1200 (EST)	PAM-D ?	9500 (EST)	7.5 (EST)	V	1	
3	GOES -L, -M	FORD		3-AXIS	0	0	0	1200 (EST)	PAM-D ?	9500 (EST)	7.5 (EST)	V	1	
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														

TABLE A-2A LOW MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	FOREIGN GEOSTATIONARY EARTH OBSERVATIONS																											
1	METEOSAT P2/LASSO	D	ESA	D	3		1															1		C	ARI	K	F	GEOSYNCH TRANSFER
2	MOP (METEOSAT OPS. PROGRAM) -1, -2	D	EUMETSAT	D	7			1	1													2		C	ARI	K	F	GEOSYNCH TRANSFER
3	MOP F/O	D	EUMETSAT	D	7											1	1					2		F	ARI	K	P	GEOSYNCH TRANSFER
4	EXPERIMENTAL EARTH RESOURCES	D	ESA	D	3											1						1		M	ARI	K	P	GEOSYNCH TRANSFER
5	GMS F/O	D	JAPAN NASDA	D	7			1							1							2		F	H-IA	T	P	GEOSYNCH TRANSFER
6	GMS-X	D	JAPAN NASDA	D	7														1			1		P	H-IA	T	P	GEOSYNCH TRANSFER
7	OTHER SYNCH. SYSTEM	D	JAPAN NASDA	D	7								1							1		2		M	H-IA	T	P	GEOSYNCH TRANSFER
8	CHINA METSAT	D	PEOPLE'S REPUBLIC OF CHINA	D	5							1					1					2		M	CZ-3	S	P	GEOSYNCH TRANSFER
9	OTHER SYNCH SATELLITES	D	VARIOUS FOREIGN GOVERNMENTS	D	0					1					1				1			3		M	ARI STS	K E	P A	GEOSYNCH TRANSFER
10	GEOS-1	D	JAPAN NASDA	D	7										1							1		P	H-II	T	P	GEOSYNCH TRANSFER
11	TOTAL					0	1	2	1	1	0	1	1	0	3	2	2	0	2	1	0	17						
12																												
13																												

TABLE A-2B. LOW MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	FOREIGN GEOSTATIONARY EARTH OBSERVATIONS													
1	METEOSAT P2/LASSO	AERO		SPIN	0	0	0	770	NA	NA	NA	-	-	
2	MOP (METEOSAT OPS. PROGRAM) -1, -2	AERO		SPIN	0	0	0	770	NA	NA	NA	-	-	
3	MOP F/O	UNK		UNK	0	0	0	1200 (EST)	NA	NA	NA	-	-	
4	EXPERIMENTAL EARTH RESOURCES	UNK		UNK	0	0	0	1800 (EST)	NA	NA	NA	-	-	
5	GMS F/O	NEC?		UNK	0	0	0	1150 (EST)	NA	NA	NA	-	-	
6	GMS-X	UNK		UNK	0	0	0	1800 (EST)	NA	NA	NA	-	-	
7	OTHER SYNCH. SYSTEM	UNK		UNK	0	0	0	1200 (EST)	NA	NA	NA	-	-	
8	CHINA METSAT	CHINA		UNK	0	0	0	1500 (EST)	NA	NA	NA	-	-	
9	OTHER SYNCH SATELLITES	UNK		UNK	0	0	0	1200 (EST)	PAM-D2 ?	9800 (EST)	9.8 (EST)	V	1	
10	GEOS-1	UNK		UNK	0	0	0	1210 (EST)	NA	NA	NA	-	-	
11														
12														
13														

XBLC-2 (5-85) SFD

TABLE A-2A LOW MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	U.S. LOW EARTH ORBIT OBSERVATIONS																											
1	ADVANCED TIROS-N NOAA-G	D	NOAA	C	2	1																1		C	AT-F	W	F	465 456 98.9
2	ADVANCED TIROS-N NOAA-D, NOAA-H NOAA-I, NOAA-J	D	NOAA	C	2			1	1		1	1										4		C	AT-F	W	P	465 456 98.9
3	ADV. TIROS F/O -K, -L, -M, -N	D	NOAA	C	2									1	1		1	1		1		5		F	STS	W	P	465 456 98.9
4	COMMERCIAL LANDSAT	D	EOSAT	B	5					1					1					1		3		D	STS	W	P	VARIOUS
5	OTHER LEO OBSERV.	D	MARKET PROJECTION	B	5							1					1					2		M	STS	W	P	VARIOUS
6	TOTAL					1	0	1	1	1	1	2	0	1	2	0	2	1	0	2	0	15						
7																												
8																												
9																												
10																												
11																												
12																												
13																												

TABLE A-2B. LOW MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	U.S. LOW EARTH ORBIT OBSERVATIONS													
1	ADVANCED TIROS-N NOAA-G	RCA		3-AXIS	0	0	0	1600	NA	NA	NA	-	-	
2	ADVANCED TIROS-N NOAA-D, NOAA-H NOAA-I, NOAA-J	RCA		3-AXIS	0	0	0	1600	NA	NA	NA	-	-	
3	ADV. TIROS F/O -K, -L, -M, -N	UNK		UNK	0	0	0	2400 (EST)	UNK	4000 (EST)	10.0 (EST)	H	2	
4	COMMERCIAL LANDSAT	RCA?		3-AXIS	0	0	0	5000 (EST)	UNK	7500 (EST)	10.0 (EST)	H	1	
5	OTHER LEO OBSERV.	UNK		UNK	0	0	0	3000 (EST)	UNK	4500 (EST)	10.0 (EST)	H		
6														
7														
8														
9														
10														
11														
12														
13														

TABLE A-2A LOW MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	FOREIGN LOW EARTH ORBIT OBSERVATIONS																											
1	MOS -1 (MARINE OBS.SAT)	D	JAPAN NASDA	D	3		1															1		C	N-II	T	F	565 SUN SYNCH 99
2	MOS -2, -3, -4, -5	D	JAPAN NASDA	D	5							1	1				1	1				4		F	H-IA	T	P	565 SUN SYNCH 99
3	EGP (EXPERIMENTAL GEODETIC PAYLOAD)	D	JAPAN NASDA	D	5		1															1		P	H-IA	T	F	932 CIRCULAR
4	J-ERS -1 (EARTH REMOTE SENSING)	D	JAPAN NASDA	D	3								1									1		P	H-IA	T	P	355 SUN SYNCH
5	J-ERS -2, -3	D	JAPAN NASDA	D	3											1			1			2		F	H-IA	T	P	355 SUN SYNCH
6	ERS -1 (EARTH RESOURCES SAT)	D	ESA	D	3						1											1		P	AR-4	K	F	465 SUN SYNCH
7	ERS -2, -3	D	ESA	D	4									1				1				2		F	AR-4	K	P	465 SUN SYNCH
8	SPOT -1, -2	D	FRANCE	D	4		1				1											2		C	AR-2	K	F	517 SUN SYNCH 98.7
9	SPOT F/O	D	FRANCE	D	5										1					1		2		F	AR-3	K	P	517 SUN SYNCH 98.7
10	OPERATIONAL LEO	D	EUROPEAN GOV'T/ INDUSTRY	E	5									1					1			2		M	AR-3	K	P	VARIOUS
11	IRS -1A	D	INDIA ISRO	D	2			1														1		F	C-1	P	F	540 SUN SYNCH
12	IRS -2, -3	D	INDIA ISRO	D	2						1			1								2		P	PSLV	I	P	540 SUN SYNCH
13	IRS F/O	D	INDIA ISRO	D	3													1				1		F	PSLV	I	P	SUN SYNCH

TABLE A-2B. LOW MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	FOREIGN LOW EARTH ORBIT OBSERVATIONS													
1	MOS -1 (MARINE OBS. SAT)	NEC		3-AXIS	0	0	0	1650	NA	NA	NA	-	-	
2	MOS -2, -3, -4, -5	UNK		3-AXIS	0	0	0	2840 (EST)	NA	NA	NA	-	-	
3	EGP (EXPERIMENTAL GEODETIC PAYLOAD)	KAWASAKI		3-AXIS	0	0	0	1485	NA	NA	NA	-	-	
4	J-ERS -1 (EARTH REMOTE SENSING)	UNK		3-AXIS	0	0	0	3090 (EST)	NA	NA	NA	-	-	
5	J-ERS -2, -3	UNK		3-AXIS	0	0	0	3090 (EST)	NA	NA	NA	-	-	
6	ERS -1 (EARTH RESOURCES SAT)	DORNIER		3-AXIS	0	0	0	4750 (EST)	NA	NA	NA	-	-	
7	ERS -2, -3	UNK		3-AXIS	0	0	0	4750 (EST)	NA	NA	NA	-	-	
8	SPOT -1, -2	CNES		3-AXIS	0	0	0	4080	NA	NA	NA	-	-	
9	SPOT F/O	CNES?		3-AXIS	0	0	0	5000 (EST)	NA	NA	NA	-	-	
10	OPERATIONAL LEO	UNK		3-AXIS	0	0	0	5000 (EST)	NA	NA	NA	-	-	
11	IRS -1A	INDIAN		3-AXIS	0	0	0	1980	NA	NA	NA	-	-	
12	IRS -2, -3	UNK			0	0	0	1980 (EST)	NA	NA	NA	-	-	
13	IRS F/O	UNK		3-AXIS	0	0	0	1980 (EST)	NA	NA	NA	-	-	

TABLE A-2A LOW MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	FOREIGN LOW EARTH ORBIT OBSERVATIONS																											
1	SAMRO REPLACEMENT (MILITARY RECON)	D	FRANCE/ GERMANY	M	4					1				1				1				3		S	AR-3	K	P	SUN SYNCH
2	VARIOUS CHINESE LEO MISSIONS	D	PEOPLE'S REPUBLIC OF CHINA	D	3				1			1				1			1			4		M	UNKN	S	U	VARIOUS
3	SOUTH AMERICAN LEO SATS	D	VARIOUS	D	3							1			1			1			1	4		M	STS ARI	W K	A A	VARIOUS
4	OTHER FOREIGN LEO	D	VARIOUS	D	3								1				1				1	3		M	UNKN	-	U	CIRCULAR SUN SYNCH
5	TOTAL					0	3	1	1	1	3	3	3	4	2	2	2	5	3	1	2	36						
6																												
7																												
8																												
9																												
10																												
11																												
12																												
13																												

TABLE A-2B. LOW MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS C	KU	KA	SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING	STS CHARGE POLICY	NOTES
	FOREIGN LOW EARTH ORBIT OBSERVATIONS													
1	SAMRO REPLACEMENT (MILITARY RECON)	UNK		UNK	0	0	0	3200 (EST)	NA	NA	NA	-	-	
2	VARIOUS CHINESE LEO MISSIONS	UNK		UNK	0	0	0	1200 (EST)	NA	NA	NA	-	-	
3	SOUTH AMERICAN LEO SATS	UNK		UNK	0	0	0	2800 (EST)	UNK	4000 (EST)	8.0 (EST)	V	1	
4	OTHER FOREIGN LEO	UNK		UNK	0	0	0	2800 (EST)	NA	NA	NA	-	-	
5														
6														
7														
8														
9														
10														
11														
12														
13														

XBLC-2 (5-85) SFD

TABLE A-2A LOW MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE																	GROUND SPARE	PROGRAM STATUS	LAUNCH			TRAJECTORY (NMI) (DEG)
						85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL			VEHICLE	SITE	STATUS	APOGEE PERIGEE INCLINATION
	NAVIGATION AIDS																											
1	TRANSIT F/O	D	U.S. NAVY	M	4				2		2		2		2							8		C	SCOUT	W	F	600 CIRCULAR 90
2	TOTAL					0	0	0	2	0	2	0	2	0	2	0	0	0	0	0	0	8						
3																												
4																												
5																												
6																												
7																												
8																												
9																												
10																												
11																												
12																												
13																												

TABLE A-2B. LOW MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	NAVIGATION AIDS													
1	TRANSIT F/O	RCA		3-AXIS	0	0	0	142	NA	NA	NA	-	-	
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
13														

TABLE A-2A LOW MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	FOREIGN PLANETARY																											
1	GIOTTO	D	ESA	D	1	1																1		C	AR-2	K	F	ESCAPE
2	OTHER ESA PLANETARY	D	ESA	D	0														1			1		M	AR-4	K	P	ESCAPE
3	PLANET-A	D	JAPAN ISAS	D	0		1															1		C	M-3S	A	F	ESCAPE
4	PLANET -B, -C	D	JAPAN ISAS	D	0							1						1				2		M	UNKN	T	U	ESCAPE
5	OTHER FOREIGN PLANETARY	D	VARIOUS	D	0											1						1		M	UNKN	-	U	ESCAPE
6	TOTAL					1	1	0	0	0	0	1	0	0	0	1	0	1	1	0	0	6						
7																												
8																												
9																												
10																												
11																												
12																												
13																												

TABLE A-2B. LOW MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS C	EQUIVALENT 36-MHZ TRANSPONDERS KU	EQUIVALENT 36-MHZ TRANSPONDERS KA	SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH: UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING	STS CHARGE POLICY	NOTES
	FOREIGN PLANETARY													
1	GIOTTO	BADG		SPIN	0	0	0	1129	NA	NA	NA	-	-	
2	OTHER ESA PLANETARY	UNK		UNK	0	0	0	2500 (EST)	NA	NA	NA	-	-	
3	PLANET-A	UNK		UNK	0	0	0	310	NA	NA	NA	-	-	
4	PLANET -B, -C	UNK		UNK	0	0	0	1000 (EST)	NA	NA	NA	-	-	
5	OTHER FOREIGN PLANETARY	UNK		UNK	0	0	0	1500 (EST)	UNK	NA	NA	-	-	
6														
7														
8														
9														
10														
11														
12														
13														

TABLE A-2A LOW MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	SCIENTIFIC/TECHNICAL DEVELOPMENT																											
1	ATHOS	D	FRANCE	D	7					1												1		C	ARI	K	F	GEOSYNCH TRANSFER
2	HIPPARCOS	D	ESA	D	2					1												1		P	ARI	K	P	NEAR GEO 3
3	ISO (INFRARED SOLAR OBSERVATORY)	D	ESA	D	2										1							1		A	ARI	K	P	21,600 540 5.0
4	OTHER EUROPEAN SCI & TD (SOHO, CLUSTER, ETC.)	D	ESA FRANCE,WGERMANY ITALY	D	2							1				1					1	3		S	ARI STS	E K	P A	VARIOUS
5	ASTRO -C	D	JAPAN ISAS	D	2		1															1		C	M-3S	A	P	300 300
6	EXOS -D	D	JAPAN ISAS	D	2					1												1		C	M-3S	A	P	540 160 65
7	EXOS F/O	D	JAPAN ISAS	D	2									1			1				1	3		M	M-3S	A	U	VARIOUS
8	UVSAT	D	JAPAN ISAS	D	2					1												1		P	M-3S	A	U	UNKNOWN
9	MS-T5	D	JAPAN ISAS	D	2	1																1		L	M-3S	A	U	ESCAPE
10	MS F/O	D	JAPAN ISAS	D	2								1							1		2		F	UNKN	A	U	ESCAPE
11	ETS V	D	JAPAN NASDA	D	2				1													1		P	H-IA	T	F	GEOSYNCH TRANSFER
12	ETS VI, VII	D	JAPAN NASDA	D	5										1						1	2		P	H-II	T	P	GEOSYNCH TRANSFER
13	OPEN-J	D	JAPAN	J	2					2												2		P	N/H	T	P	UNKNOWN

TABLE A-2B. LOW MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS C	KU	KA	SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH: UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING	STS CHARGE POLICY	NOTES
	SCIENTIFIC/TECHNICAL DEVELOPMENT													
1	ATHOS	SATCOM		3-AXIS	8	0	3	1930	NA	NA	NA	-	-	
2	HIPPARCOS	MESH		SPIN	0	0	0	1000 (EST)	NA	NA	NA	-	-	
3	ISO (INFRARED SOLAR OBSERVATORY)	UNK		UNK	0	0	0	3900 (EST)	NA	NA	NA	-	-	
4	OTHER EUROPEAN SCI & TD (SOHO, CLUSTER, ETC.)	UNK		UNK	0	0	0	4000 (EST)	UNK	9000 (EST)	9.8 (EST)	H	1	
5	ASTRO -C	NEC		UNK	0	0	0	476	NA	NA	NA	-	-	
6	EXOS -D	NEC		UNK	0	0	0	265	NA	NA	NA	-	-	
7	EXOS F/O	NEC?		UNK	0	0	0	300 (EST)	NA	NA	NA	-	-	
8	UVSAT	UNK		UNK	0	0	0	400 (EST)	NA	NA	NA	-	-	
9	MS-T5	UNK		UNK	0	0	0	310	NA	NA	NA	-	-	LAUNCHED 1-8-85
10	MS F/O	UNK		UNK	0	0	0	300 (EST)	NA	NA	NA	-	-	
11	ETS V	UNK		3-AXIS	0	0	0	1200	NA	NA	NA	-	-	
12	ETS VI, VII	UNK		3-AXIS	0	0	20	2000	NA	NA	NA	-	-	
13	OPEN-J	UNK		UNK	0	0	0	1200 (EST)	NA	NA	NA	-	-	

TABLE A-2A LOW MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	SCIENTIFIC/TECHNICAL DEVELOPMENT																											
1	OTHER M-3S CLASS JAPANESE SCIENTIFIC	D	JAPAN	D	2							1				1				1		3		M	M-3S	A	U	UNKNOWN
2	OTHER N/H-CLASS JAPANESE SCIENTIFIC	D	JAPAN ISAS	D	2									1					1			2		M	N/H	T	U	VARIOUS
3	VIKING	D	SWEDEN	D	1		1															1		C	ARI	K	F	9000 500 98.7
4	ITALIAN SCIENTIFIC PROGRAM	D	ITALY	D	2								1					1				2		M	ARI	K	P	UNKNOWN
5	SROSS	D	INDIA ISRO	D	3		1		1													2		P	ASLV	I	U	VARIOUS
6	SROSS F/O	D	INDIA ISRO	D	3							1			1			1			1	4		P	ASLV	I	F	UNKNOWN
7	INDIAN SUN SYNCH PROTOTYPE	D	INDIA ISRO	D	0						1											1		P	PSLV	I	U	SUN SYNCH
8	OTHER INDIAN S/TD SPACECRAFT	D	INDIA ISRO	D	3									1			1			1		3		M	PSLV	I	U	VARIOUS
9	CHINESE S/TD SPACECRAFT	D	PEOPLE'S REPUBLIC OF CHINA	D	0		1				1				1				1			4		M	UNKN	S	U	VARIOUS
10	OTHER FOREIGN S/TD SPACECRAFT	D	VARIOUS	D	0								1			1			1			3		M	UNKN	-	U	VARIOUS
11	TOTAL					1	4	0	2	6	2	3	3	3	4	3	2	2	3	3	4	45						
12																												
13																												

XBCL 13-841 EC3

TABLE A-2B. LOW MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	SCIENTIFIC/TECHNICAL DEVELOPMENT													
1	OTHER M-3S CLASS JAPANESE SCIENTIFIC	UNK		UNK	0	0	0	400 (EST)	NA	NA	NA	-	-	
2	OTHER N/H-CLASS JAPANESE SCIENTIFIC	UNK		UNK	0	0	0	1200 (EST)	NA	NA	NA	-	-	
3	VIKING	SAAB		SPIN	0	0	0	1200 (EST)	NA	NA	NA	-	-	
4	ITALIAN SCIENTIFIC PROGRAM	UNK		UNK	0	0	0	800 (EST)	NA	NA	NA	-	-	
5	SROSS	ISRO		UNK	0	0	0	330 (EST)	NA	NA	NA	-	-	
6	SROSS F/O	ISRO		UNK	0	0	0	330	NA	NA	NA	-	-	
7	INDIAN SUN SYNCH PROTOTYPE	ISRO		UNK	0	0	0	1320	NA	NA	NA	-	-	
8	OTHER INDIAN S/TD SPACECRAFT	ISRO		UNK	0	0	0	1300 (EST)	NA	NA	NA	-	-	
9	CHINESE S/TD SPACECRAFT	CHINA		UNK	0	0	0	2000 (EST)	NA	NA	NA	-	-	
10	OTHER FOREIGN S/TD SPACECRAFT	UNK		UNK	0	0	0	2000 (EST)	NA	NA	NA	-	-	
11														
12														
13														

TABLE A-2A LOW MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	LAUNCH SCHEDULE 85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	MATERIALS TEST/PROCESSING																											
1	EURECA -1	D	ESA	D	O			1														1		C	STS	E	C	SHUTTLE ORBIT
2	EURECA RETRIEVAL -1	R	ESA	D	O			1														1		C	STS	E	C	SHUTTLE ORBIT
3	EURECA F/O	D	ESA	D	O									1						1		2		M	STS	E	C	SHUTTLE ORBIT
4	EURECA F/O RETRIEVAL	R	ESA	D	O									1						1		2		M	STS	E	C	SHUTTLE ORBIT
5	GALLIUM ARSENIDE TEST/PRODUCTION	A	PRIVATE MFG (MRA?)	B	O						1			1		1		1		1		5		S	STS	E	C	SHUTTLE ORBIT
6	HG-CD-TE TEST/PRODUCTION	A	PRIVATE MFG (HONEYWELL?)	B	O				1	1												2		P	STS	E	C	SHUTTLE ORBIT
7	ISO-ELECTRIC FOCUSING (IEF) SEPARATION TESTS	A	PRIVATE MFG	B	O					1	1											2		S	STS	E	C	SHUTTLE ORBIT
8	MATERIALS RESEARCH	A	PRIVATE MFG (DEERE?)	B	O					1		1		1		1		1		1		6		M	STS	E	C	SHUTTLE ORBIT
9	FOREIGN MATERIALS RESEARCH	A	VARIOUS	E	O			1		1	1	1	1	1	2	1	2	1	2	2	2	18		M	STS	E	C	SHUTTLE ORBIT
10	EOS	D	MDAC/J&J	B	O				2	3	1											6		P	STS	E	C	SHUTTLE ORBIT
11	OTHER PHARMACEUTICAL TEST	A	VARIOUS	B	O								1	1		1	1	1		1	1	7		M	STS	E	C	SHUTTLE ORBIT
12	TOTAL					0	0	3	3	7	4	2	2	6	2	4	3	4	2	7	3	52						
13																												

TABLE A-2B. LOW MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS			SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH				STS CHARGE POLICY	NOTES
					C	KU	KA		UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING		
	MATERIALS TEST/PROCESSING													
1	EURECA -1	MBB		3-AXIS	0	0	0	7716	NA	7716	7.5	H	2	
2	EURECA RETRIEVAL -1	MBB		3-AXIS	0	0	0	7716	NA	7716	7.5	H	2	
3	EURECA F/O	MBB		3-AXIS	0	0	0	7700 (EST)	NA	7700 (EST)	7.5 (EST)	H	2	
4	EURECA F/O RETRIEVAL	MBB		3-AXIS	0	0	0	7700 (EST)	NA	7700 (EST)	7.5 (EST)	H	2	
5	GALLIUM ARSENIDE TEST/PRODUCTION				0	0	0	6500 (EST)	NA	6500 (EST)	6.0 (EST)	H	1	
6	HG-CD-TE TEST/PRODUCTION				0	0	0	6500 (EST)	NA	6500 (EST)	6.0 (EST)	H	1	
7	ISO-ELECTRIC FOCUSING (IEF) SEPARATION TESTS				0	0	0	6500 (EST)	NA	6500 (EST)	6.0 (EST)	H	1	ORIGINAL PAGE IS OF POOR QUALITY
8	MATERIALS RESEARCH				0	0	0	6500 (EST)	NA	6500 (EST)	6.0 (EST)	H	1	
9	FOREIGN MATERIALS RESEARCH				0	0	0	6500 (EST)	NA	6500 (EST)	6.0 (EST)	H	1	
10	EOS	FAIR	LEASECRAFT		0	0	0	28000 (EST)	NA	28000 (EST)	25.8 (EST)	H	1	
11	OTHER PHARMACEUTICAL TEST	FAIR	LEASECRAFT		0	0	0	6500 (EST)	NA	6500 (EST)	6.0 (EST)	H	1	
12														
13														

XBLC-2 (5-85) SFD

TABLE A-2A LOW MODEL

LINE NUMBER	MISSION	MISSION TYPE	SPONSOR	OPERATOR TYPE	DESIGN LIFE	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	TOTAL	GROUND SPARE	PROGRAM STATUS	LAUNCH VEHICLE	LAUNCH SITE	LAUNCH STATUS	TRAJECTORY (NMI) (DEG) APOGEE PERIGEE INCLINATION
	MULTISERVICE SPACECRAFT/VEHICLES																											
1	INSAT -IC	D	INDIA ISRO	D	8		1															1		C	STS	E	F	GEOSYNCH TRANSFER
2	INSAT PROTOTYPE	D	INDIA ISRO	D	7					1												1		P	STS ARI	E K	P A	GEOSYNCH TRANSFER
3	INSAT F/O	D	INDIA ISRO	D	10							1					1					2		F	STS ARI	E K	P A	GEOSYNCH TRANSFER
4	SPAS F/O	D	MBB W.GERMANY	G	0					1				1			1			1		4		F	STS	E	C	VARIOUS
5	TOTAL					0	1	0	0	2	0	1	0	1	0	0	2	0	0	1	0	8						
6																												
7																												
8																												
9																												
10																												
11																												
12																												
13																												

TABLE A-2B. LOW MODEL

LINE NUMBER	MISSION	SPACECRAFT BUILDER	SPACECRAFT DESCRIPTION	STABILIZATION	EQUIVALENT 36-MHZ TRANSPONDERS C	KU	KA	SPACE-CRAFT WEIGHT (LBS) BOL	CONFIGURATION FOR STS LAUNCH: UPPER STAGE (PKM) USED	LIFTOFF WEIGHT (LBS)	LIFTOFF LENGTH (FT)	MOUNTING	STS CHARGE POLICY	NOTES
	MULTISERVICE SPACECRAFT/VEHICLES													
1	INSAT -IC	FORD		3-AXIS	18	0	0	1300	PAM-D	9929	8.2	V	1	
2	INSAT PROTOTYPE	UNK		UNK	18	0	8	1700 (EST)	PAM-D2 ?	15000 (EST)	13.0 (EST)	V	1	
3	INSAT F/O	UNK		UNK	24	0	8	1700 (EST)	PAM-D2 ?	15000 (EST)	13.0 (EST)	V	1	
4	SPAS F/O	MBB?	ONBOARD ORBITER		0	0	0	4000 (EST)	NA	4000 (EST)	6.0 (EST)	V	2	
5														
6														
7														
8														
9														
10														
11														
12														
13														

XBLC-2 (5-85) SFD

APPENDIX B

to

OUTSIDE USERS PAYLOAD MODEL

BIBLIOGRAPHY

JULY 1985

APPENDIX B
BIBLIOGRAPHY

BCL Models

"Outside Users Payload Model", July 1984.

Technical Papers

"Future Development of the INMARSAT System", AIAA paper 84-0750.

Hoeber, Christopher, F., and Barberis, Neil J., "Design Summary of the INTELSAT V Spacecraft", J. Spacecraft, Vol. 20, No. 4, July-August, 1983.

"The Franco-German DBS Program TV-SAT/TDF-1", AIAA paper 84-0661.

"AUSSAT-Australia's Communications Satellite System", AIAA paper 84-0712.

"TELE-X, The First Step in a Satellite Communications System for the Nordic Countries", AIAA paper 84-0713.

"Mexico's First Domestic Satellite", AIAA paper 84-0716.

"Telstar 3 Spacecraft Design Summary", AIAA paper 82-0552.

"The GSTAR 60 Mb/s & 90 Mb/s Services", AIAA paper 82-0493.

"The Spacenet Satellites", AIAA paper 82-0520.

"Ten-Year Life Intelsat VI Spacecraft", AIAA paper 82-0517.

"Palapa--Past, Present, and Future", AIAA paper 82-0473.

"The European Communications Satellite System (ECS)", AIAA paper 82-0468.

"The Impact of New Technology on Satellite Radiocommunication", paper prepared for the FCC 1985 Space WARC Advisory Committee by Anthony M. Rutkowski, revised 15 November 1982.

"Satellite Competition with Optical Fiber", paper presented at Satellite Summit by A. M. Rukowski, 1 April 1985.

Periodicals in English

Aerospace Daily	July 27, 30, 1984 August 8, 9, 10, 13, 24, 27, 30, 1984 September 4, 5, 13, 18, 20, 24, 28, 1984 October 4, 12, 19, 22, 25, 26, 1984 November 6, 9, 13, 1984 December 3, 4, 5, 13, 21, 1984 January 2, 4, 8, 9, 10, 14, 17, 18, 1985 February 4, 19, 28, 1985 March 7, 15, 1985 April 19, 23, 1985 May 7, 1985 June 5, 13, 1985
Aviation International	May 31, 1984
Aviation Week and Space Technology	June 25, 1984 July 23, 30, 1984 August 6, 13, 27, 1984 September 3, 10, 17, 24, 1984 October 8, 15, 22, 29, 1984 November 5, 12, 19, 1984 December 3, 10, 1984 January 7, 14, 21, 28, 1985 February 4, 25, 1985 March 11, 18, 25, 1985 April 1, 8, 15, 22, 29, 1985 May 27, 1985 June 3, 17, 1985
Business Week	October 18, 1983 December 23, 1983 June 18, 1984 July 9, 1984
Communications News	May 1984 August 1984 October 1984 December 1984 January 1985 February 1985 March 1985 April 1985 May 1985

Satellite Week	July 23, 30, 1984 August 13, 20, 27, 1984 September 3, 10, 17, 24, 1984 October 8, 15, 22, 29, 1984 November 5, 12, 19, 26, 1984 December 3, 10, 24, 1984 January 7, 14, 21, 28, 1985 February 4, 11, 25, 1985 March 4, 11, 1985 April 22, 29, 1985 May 6, 13, 20, 1985 June 3, 10, 24, 1985
Space Business News	June 4, 1984 October 22, 1984 January 21, 28, 1985 March 25, 1985 April 27, 1985 May 6, 20, 1985
Space Commerce Bulletin	July 6, 20, 1984 August 3, 17, 1984 September 14, 28, 1984 October 12, 26, 1984 November 9, 23, 1984 December 7, 1984 January 18, 1985 February 1, 15, 1985 April 26, 1985 May 10, 24, 1985 June 7, 1985
Spaceflight	April 1984 June 1984
The Wing Newsletter	May 30, 1984 July 4, 18, 1984 August 1, 1984 September 12, 1984 October 31, 1984 January 9, 1985 April 10, 1985

Periodicals in a Foreign Language

Air et Cosmos	September 8, 1984

APPENDIX C

to

OUTSIDE USERS PAYLOAD MODEL

ACRONYM LIST

JULY 1985

CI

APPENDIX C

LIST OF ACRONYMS

AFSAT	-	AFrican SATellite
AKM	-	Apogee Kick Motor
AMS	-	African/Mediterranean Satellite (Israeli consortium)
ARABSAT	-	ARAB SATellite Communications Organization
ASTRO	-	ASTROphysical Satellite (Japan-ISAS)
ATHOS	-	Applied Technologique Hyperfrequences en Orbite Synchrone (France)
AUSSAT	-	AUStralian SATellite
BS	-	Broadcast Satellite (Japan-NASDA)
BSS	-	Broadcast Satellite Service
CNES	-	Centre National d'Etudes Spatiales (National Center for Space Studies) (France)
COMSAT	-	COMmunications SATellite Corporation (U.S.)
CS	-	Communications Satellite (Japan-NASDA)
DBS	-	Direct Broadcast Satellite
DOD	-	Department of Defense (U.S.)
ECS	-	European Communications Satellite
EGP	-	Experimental Geodetic Program Satellite (Japan)
ELV	-	Expendable Launch Vehicle
EOS	-	Electrophoresis Operations in Space
EOSAT	-	Earth Observation SATellite Co. (Joint venture of RCA & Hughes Aircraft Co.)
ERS	-	Earth Resources Satellite (ESA)
ESA	-	European Space Agency

ISAS - Institute of Space and Aeronautical Sciences (Tokyo University, Japan)

ISI - International Satellites, Inc.

ISO - Infrared Solar Observatory (ESA)

ISPM - International Solar Polar Mission

ISRO - Indian Space Research Organization

ITALSAT - ITALian SATellite

JSC - Japan Communications Satellite Company (a joint venture of C. Itoh, Mitsui, and Hughes Communications)

JEA - Joint Endeavor Agreement

J-ERS - Japanese Earth Remote Sensing Satellite

LSAT - Large SATellite (ESA-developed satellite bus; now called Olympus)

LEO - Low Earth Orbit

LEASAT - LEAsed SATellite

MBB - Messerschmitt-Bolkow-Blohm GmbH. (Germany)

MDAC/JJ - McDonnell Douglas Astronautics Corporation/Johnson and Johnson

MITI - Ministry of International Trade and Industry (Japan)

MMSAT - Martin-Marietta SATellite

MOBILSAT - MOBILe SATellite System

MOP - Meteosat Operational Program (Eumetsat)

MOS - Maritime Observation Satellite (Japan-NASDA)

MPS - Materials Processing in Space

MRA - Microgravity Research Associates

MSAT - Mobile Communications SATellite (Canada)

MSS - Mobile Satellite Service

S/TD	-	Scientific/Technical Development
STS	-	Space Transportation System (Space Shuttle System) (U.S.)
SYLDA	-	SYsteme de Lancement Double "Ariane" (System for a double launch on Ariane) (France)
SYNCOM	-	SYNchronous COMmunications Satellite (same as LEASAT)
TDF	-	Telediffusion de France (Television Broadcasting of France)
TDRSS	-	Tracking and Data Relay Satellite System (U.S.)
TERS	-	Tropical Earth Resources Satellite (Indonesia/Netherlands)
TOS	-	Transfer Orbit Stage
UNISAT	-	UNIted SATellites (A consortium of British Aerospace Dynamics, GEC-Marconi and British Telecom)
UN-ITU	-	United Nations International Telecommunications Union
WARC	-	World Administrative Radio Conference
WTR	-	Western Test Range (at Vandenberg AFB)
UAPT	-	Union Africaine des Postes et Telecommunications (Organization of 14 central African states)