



COMMERCIAL SPACE TRANSPORTATION: 1997 YEAR IN REVIEW







Associate Administrator for Commercial Space Transportation (AST)

January 1998

Cover Photo Credits (from top):

International Launch Services (1997). Image is of the Atlas 2A launch on March 8, 1997, from Cape Canaveral Air Station. It successfully orbited the Tempo direct broadcast satellite for Space Systems/Loral.

McDonnell Douglas (1997). Image is of the Delta 2 7920 launch on May 5, 1997, from Vandenberg Air Force Base. It successfully orbited the first five Iridium communication satellites for Iridium Inc.

Orbital Sciences Corporation (1997). Image is of the Pegasus XL that launched from Vandenberg Air Force Base on August 1, 1997. It successfully orbited the OrbView 2 (Seastar) remote sensing satellite.

Lockheed Martin (1997). Image is of the Athena 1 that launched from Vandenberg Air Force Base on August 23, 1997. It successfully orbited the NASA Lewis experimental imaging satellite.

INTRODUCTION

In 1997, U.S. launch service providers conducted 17 launches licensed by the Federal Aviation Administration (FAA), an increase of 55 percent over the 11 launches conducted in 1996. Of these 17, 14 were internationally competed commercial launches, resulting in a 40 percent share of the world's market for commercial launches. Revenues from these FAA-licensed commercial space launches reached \$940 million in 1997, an increase of 48 percent over 1996 revenues of \$635 million. Over the past five years, revenues have increased by more than a factor of three, up from \$295 million in 1993.

The FAA issued seven new launch operator licenses and license renewals in 1997, bringing the total number of licenses issued to 38. The FAA also issued two launch site operator licenses to the Spaceport Florida Authority and the Virginia Commercial Space Flight Authority.

In addition, 1997 saw the emergence of the market for launches to deploy the world's first low Earth orbit (LEO) communication systems. In 1997, both Iridium and Orbcomm began fullscale respective deployment of their communications constellations. Forty-six satellites of the 66-satellite Iridium constellation were deployed in 1997. In December, Orbital Sciences launched eight satellites of the 28-satellite Orbcomm constellation.

Commercial Space Transportation: 1997 Year in Review summarizes U.S. and international launch activities for calendar year 1997 and provides a historical look at the past five years of commercial launch activities. This report has three parts:

- 1997 U.S.-Licensed Commercial Activity
- 1997 Worldwide Launch Activity
- Five-Year Space Transportation Trends

ABOUT THE ASSOCIATE ADMINISTRATOR FOR COMMERCIAL SPACE TRANSPORTATION (AST)

The Federal Aviation Administration's Associate Administrator for Commercial Space Transportation (AST) licenses and regulates U.S. commercial space launch activity as authorized Executive Order 12465, by Commercial Expendable Launch Vehicle Activities, and the Commercial Space Launch Act of 1984. AST's mission is to regulate the U.S. commercial launch industry and license commercial launch operations to ensure public health and safety and the safety of property and to protect national security and foreign policy interests of the United during States commercial launch operations. In addition, the Commercial Space Launch Act of 1984 and the 1996 National Space Policy directs the Federal Aviation Administration to encourage, facilitate, and promote commercial space launches.

1997 U.S.-LICENSED COMMERCIAL ACTIVITY

In 1997, U.S. launch service providers conducted 17 launches licensed by the Federal Aviation Administration (FAA) (see Table 1). This is the largest number of FAA-licensed launches conducted in any one year and represents a 55 percent increase over the 11 FAA-licensed orbital launches in 1996 (Figure 1). Of the United States' 17 FAA-licensed launches, 14 were internationally competed launch events.¹ A total of 38 orbital launch events were conducted in 1997 by U.S. launch providers, including launches of the Space Shuttle and other civil and military payloads.

Record Revenues

Last year was also a record year for U.S. commercial space transportation revenues. Revenues from FAA-licensed launches totaled an estimated \$940 million, a 48 percent increase over 1996 revenues of \$635 million (Figure 2). Over the past five years, revenues have increased by more than a factor of three, up from \$295 million in 1993.

Date	Vehicle	Payload	Launch Outcome	Orbit
Feb. 15	Atlas 2AS	JCSAT 4	Success	GEO
Mar. 8	Atlas 2A	Tempo 2	Success	GEO
Apr. 21	Pegasus XL	Minisat 01 Celestis 1	Success	LEO
May 5	Delta 2 7920	Iridiums 1-5	Success	LEO
May 20	Delta 2 7925	Thor 2	Success	GEO
Jul. 9	Delta 2 7920	Iridiums 13-17	Success	LEO
Jul. 27	Atlas 2AS	Superbird C1	Success	GEO
Aug. 1	Pegasus XL*	OrbView-2 (SeaStar)	Success	LEO
Aug. 20	Delta 2 7920	Ìridiums 18-22	Success	LEO
Aug. 23	Athena 1*	Lewis	Success	LEO
Sep. 4	Atlas 2AS	GE 3	Success	GEO
Sep. 26	Delta 2 7920	Iridiums 34-38	Success	LEO
Oct. 5	Atlas 2AS	EchoStar 3	Success	GEO
Nov. 8	Delta 2 7920	Iridiums 39-43	Success	LEO
Dec. 8	Atlas 2AS	Galaxy 8I	Success	GEO
Dec. 20	Delta 2 7920	Iridiums 44-48	Success	LEO
Dec. 23	Pegasus XL*	Orbcomms 5-12	Success	LEO

* Not internationally competed.

¹ "Internationally competed" refers to launch opportunities available, in principle, to international launch providers, and not captive to one company or country's vehicle.

Figure 1. U.S.-Licensed Orbital Launch Events

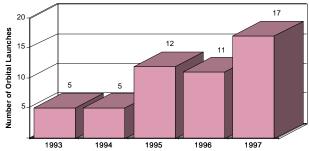
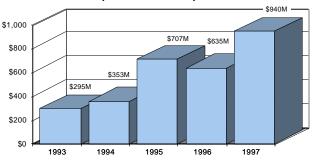


Figure 2. Revenues for U.S.-Licensed Orbital Launch Events (in U.S. millions)



New Launch Licenses Issued in 1997

The Federal Aviation Administration issued seven new launch operator licenses and license renewals in 1997, bringing the total number of licenses issued by AST since its inception to 38. A total of 84 licensed launches have been conducted as of December 31, 1997.

Spaceport Licenses Issued in 1997

The FAA also issued two launch site operator licenses: one to the Spaceport Florida Authority and one to the Virginia Commercial Space Flight Authority. The Spaceport Florida Authority was issued a license to operate a commercial launch site on Cape Canaveral Air Station.² The Virginia Commercial Space Flight Authority was issued a license to operate the Virginia Space Flight Center at Wallops Island. A third spaceport, the California Spaceport, was licensed in 1996.

² The first FAA-licensed spaceport launch was NASA's Lunar Prospector aboard Lockheed Martin's new Athena-2 on January 6, 1998 from Spaceport Florida.

LEO Market Emerges

The sharp increase in U.S. commercial launch activities in 1997 can be attributed to the emergence of the market for launches to low Earth orbit (LEO), which accounted for 10 of the 17 FAA-licensed launches. A total of 42 payloads were launched to LEO on these FAA-licensed launches in 1997 (Figure 3).

Six of the seven U.S. commercial launches to LEO were Delta 2 launch vehicles, deploying 30 Iridium satellites. Iridium, owned by Motorola and a number of international partners, will provide seamless, global, mobile telephone services. A total of 46 satellites of the planned 66-satellite constellation were deployed in 1997 by six launches of the Delta 2 (five Iridium satellites per launch), two launches of Russia's Proton vehicle (seven per launch), and one launch of China's Long March 2C (two satellites).

On December 23, a Pegasus began full-scale deployment of the Orbcomm system with the launch of eight satellites. The 28-satellite Orbcomm system will provide two-way narrowband data communications worldwide.

 Table 2. United States Launch Vehicle Performance in 1997

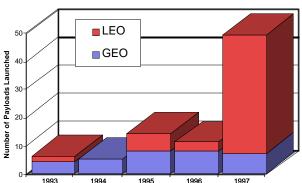
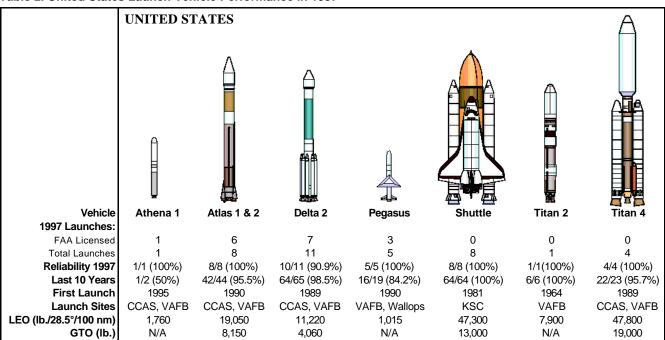


Figure 3. Payloads Launched on U.S.-Licensed Launches, by Orbit (1993-1997)

Other U.S. Launch Activities

U.S. launches in 1997 were conducted by seven launch vehicle families (see Table 2 below). Noteworthy events include Lockheed Martin's first successful launch of the Athena launch vehicle (formerly the Lockheed Martin Launch Vehicle, or LMLV), deploying NASA's Lewis remote sensing spacecraft on August 23.

The United States experienced only one launch failure in 1997: an Air Force Delta 2 on January 17 in a non-commercial launch. The accident, due to a failure in one of nine solid rocket boosters, caused a four-month hiatus in Delta 2 launches.



1997 WORLDWIDE LAUNCH ACTIVITY

Worldwide, a record 35 internationally competed commercial launches took place in 1997, nearly double the number of commercial launches in 1996. Of these, 14 were conducted by U.S. launch vehicles and 21 were conducted by foreign launch vehicles (Table 3). The United States had the largest share of the commercial launch market last year, capturing 40 percent (Figure 6).

Overall, there were a total of 89 orbital launch events and 150 payloads launched worldwide in 1997 for commercial, civil, and military purposes. These launches are summarized and listed in an appendix to this report. The United States conducted more launches than any other nation in 1997 with 38 launches, as well as the largest number of commercial launches. Russia followed with 29 launches, two more than in Europe's Arianespace conducted the 1996. second largest number of commercial launches with 11, a commercial record for the Ariane 4 launch vehicle.

Date	Vehicle	Payload	Launch Outcome	Orbit
lan 20	Ariana (A)	05.0		GEO
Jan. 30	Ariane 44L	GE 2	Success	GEO
F .1. 00		Nahuel 1A	0	050
Feb. 28	Ariane 44P	Intelsat 8 F1	Success	GEO
Apr. 16	Ariane 44LP	BSAT 1	Success	GEO
		Thaicom 3	0	050
May 24	Proton SL-12	Telstar 5	Success	GEO
Jun. 3	Ariane 44L	Inmarsat 3 F4	Success	GEO
		Insat 2D	-	
Jun. 18	Proton SL-12	Iridiums 6-12	Success	LEO
Jun. 25	Ariane 44P	Intelsat 8 F2	Success	GEO
Aug. 8	Ariane 44P	PAS 6	Success	GEO
Aug. 19	Long March 3B	Agila 2	Success	GEO
Aug. 28	Proton SL-12	PAS 5	Success	GEO
Sep. 2	Ariane 44LP	Hot Bird Plus 3	Success	GEO
		Meteosat 7		
Sep. 14	Proton SL-12	Iridiums 27-33	Success	LEO
Sep. 23	Ariane 44P	Intelsat 8 F3	Success	GEO
Oct. 17	Long March 3B	APStar 2R	Success	GEO
Nov. 12	Ariane 44L	IndoStar 1	Success	GEO
		Sirius 2		
Dec. 2	Ariane 44P	JCSAT 5	Success	GEO
Dec. 3	Proton SL-12	Astra 1G	Success	GEO
Dec. 8	Long March 2C	Iridiums 25 - 26	Success	LEO
Dec. 21	Ariane 44P	Intelsat 8 F4	Success	GEO
Dec. 23	Proton SL-12	Asiasat 3	Failure	GEO
Dec. 24	START 1	EarlyBird 1	Success	LEO

Table 3. 1997 Non-U.S. Commercial Launch Events

Figure 4. 1997 Worldwide Orbital Launch Events

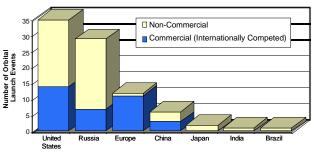


Table 4. Orbital Launch Events in 1997

	Non- Commercial Launches	Commercial Launches	TOTAL Launches
United States	24	14	38
Russia	22	7	29
Europe	1	11	12
China	3	3	6
Japan	2	0	2
India	1	0	1
Brazil	1	0	1
TOTAL	54	35	89

Figure 5. Total Worldwide Market Share for 1997

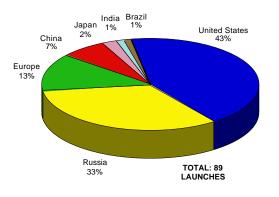
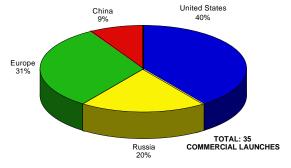


Figure 6. Worldwide Commercial Market Share for 1997



Worldwide Payload Summary

More than 75 commercial payloads³ were launched into orbit in 1997, three times that of 1996. In fact, there were more worldwide commercial payloads launched last year than military and civil government payloads.

The United States had, by far, the greatest number of commercial payload deployments in 1997, launching 39 commercial satellites and a total of 68 payloads. In fact, more than half of the commercial payloads last year were launched by U.S. launch service providers (Figure 9). Most of these payloads were Iridium satellites (30 in all for the United States) to low Earth orbit. Similarly, Russia launched a high percentage of commercial payloads last year, carrying 14 Iridium satellites to orbit on two Proton launches. After the United States, Russia launched the most payloads in 1997, carrying a 33 percent of the total (Figure 8).

Launch Activities by Country

<u>**Russia**</u> – In its second year of commercial launch activity, Russia became firmly established in 1997 as a commercial launch provider, conducting six commercial Proton launches and one commercial START-1 launch. In 1997, Russia conducted 29 launches overall for 33 percent of the world's total launches.

Launches for Russia's civil and military space programs continued a post-Cold War decline, falling to only 22 launches from a high of nearly 100 launches annually in the mid-1980s. Russia conducted six missions to the Mir space station and five launches of civil government payloads. The remaining 11 non-commercial launches were of Russian military satellites.

³ "Commercial payload" numbers do not include the eight Orbcomm and one OrbView satellites, which were launched on FAA-licensed vehicles but were not launched as the result of an international competition.

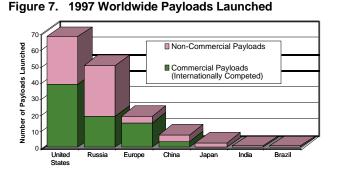
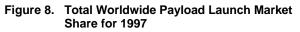


Table 5. Payloads Launched in 1997

	Non- Commercial Payloads	Commercial Payloads	TOTAL Payloads Launched
United States	29	39	68
Russia	31	19	50
Europe	4	15	19
China	4	4	8
Japan	3	0	3
India	1	0	1
Brazil	1	0	1
TOTAL	73	77	150



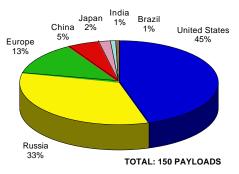
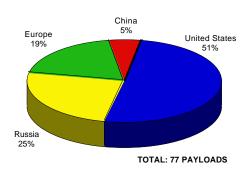


Figure 9. Worldwide Commercial Payload Launch Market Share for 1997



Of the six commercial Proton missions, four were contracted through U.S.-based International Launch Services (ILS), a marketing partnership originally established in 1993 by Lockheed Martin of the United States and Proton's manufacturers, Khrunichev and Energia of Russia. All four launches carried payloads to GEO. The two remaining commercial Proton missions delivered seven Iridium satellites each into LEO and were contracted directly with Khrunichev. Russia also suffered its first commercial launch failure on December 23. The Proton's Block DM upper stage failed, leaving Asiasat 3 in a useless orbit.

On December 24, a Russian START-1 launched EarthWatch's commercial remote sensing spacecraft, EarlyBird, in the first dedicated commercial launch of a non-U.S. small launch vehicle. Although the launch was successful, contact with EarlyBird was lost and its status remains uncertain. The launch was also the first commercial launch from Russia's new Svobodny launch site in the Russian far east. **Europe** – In 1997, Arianespace's Ariane 4 conducted 11 launches, deploying 15 commercial GEO payloads (see Tables 4 & 5, above) and two civil satellites. This is an increase over 13 payloads in 1996. Despite a record number of commercial launches, Europe's Arianespace held, for the first time ever, a smaller share of the commercial launch market in 1997 (31 percent) than did the United States (40 percent).

Europe's Ariane 5 conducted its first successful launch on October 30. However, premature shutdown of the main stage resulted in lower than expected performance. The Ariane 5, designed as a successor to the Ariane 4, failed in its first launch attempt in June 1996. The third flight of the Ariane 5, expected for mid-1998, is expected to carry a commercial payload.

<u>China</u> – China conducted six launches in 1997, three of which were internationally competed commercial launches. China conducted two commercial GEO launches, the same as in 1996, and one launch of two Iridium satellites to LEO,

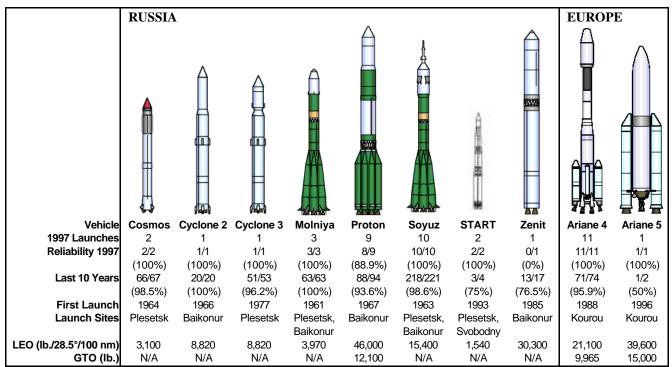


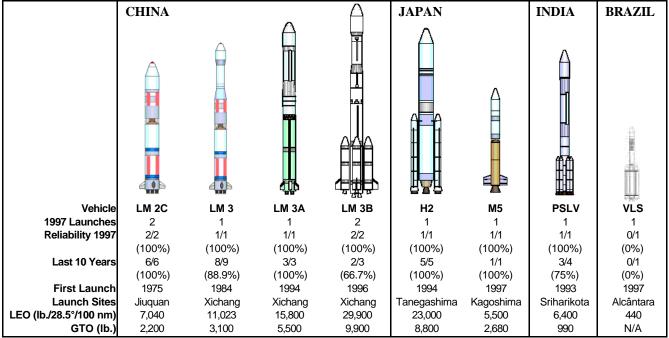
 Table 6. Russian and European Launch Vehicle Performance in 1997

for a total of four commercial payloads (see Table 5) and five percent of the world's total payloads launched (see Figure 8). China also conducted a non-commercial launch of two dummy Iridium satellites to demonstrate the March's multiple-payload launching Long capability. All six of China's Long March launches were successful in 1997, which stands in contrast to the Long March's poor performance during the previous two years (Long March had a 57-percent success rate for that period). Two of four launches in 1996 and one of three launches in 1995 resulted in failure.

Japan – Japan's National Space Development Agency (NASDA) launched the H2 rocket in November 1997, carrying the Japanese ETS-7 and Japanese/NASA TRMM satellites to GEO. NASDA also successfully launched a sub-orbital vehicle, Test Rocket for Space Experiment (TR-1A), in September. The Japanese Institute of Space and Astronautical Science (ISAS) had the first launch of the new M5 vehicle in 1997, successfully launching the Muses-B satellite into an elliptical orbit. <u>India</u> – India's Polar Satellite Launch Vehicle (PSLV) launched the IRS-1D satellite into a lower than intended orbit in September 1997, in the fourth launch of the PSLV since its introduction in 1993. Although the PSLV is offered commercially, it has yet to launch any commercial payloads or sign any commercial launch contracts.

Brazil - On November 2, Brazil attempted to launch its first indigenously developed launch vehicle, the Veiculo Lancador de Satellites (VLS) from its Alcântara launch site. The first flight of the VLS small launch vehicle ended in failure when one of the four solid boosters failed to ignite, and the vehicle was destroyed. The VLS would have deployed Brazil's SCD-2A data relay satellite for use in climate monitoring. Had the VLS been successful, Brazil would have become the ninth nation to place a satellite in orbit by its own efforts and the first South or Central American nation to achieve this goal. Brazil plans to launch one VLS rocket per year for the next few years and intends to eventually begin selling VLS launch services commercially.





FIVE-YEAR SPACE TRANSPORTATION TRENDS

The global commercial space transportation experienced consistent industry has and aggressive growth since 1993 (Figure 12). From 1993 to 1997, worldwide commercial launches have increased at a rate of approximately 41 percent each year, while overall launch rates have remained steady over the past five years (approximately 84 launches per year). Nineteen ninety-seven saw a record increase, 66 percent from the previous year, and a record 35 commercial orbital launch events (Table 8). Commercial launches in 1997 accounted for about 43 percent of total worldwide launches, while 1996 commercial launches made up only 31 percent of the total.

Worldwide commercial launch revenues for the same period showed comparable growth. Combined worldwide commercial revenues were \$2.4 billion last year, a 57-percent jump from revenues in 1996. Russia nearly tripled its commercial revenues last year at \$351 million from \$120 million in 1996. The United States showed a 76 percent growth last year in revenues over 1996 for internationally competed launches.

Nineteen ninety-seven also saw the largest number of payloads to orbit, 150 total, a more than 50 percent increase over 1996. The vast majority of payloads in 1997 went to low Earth

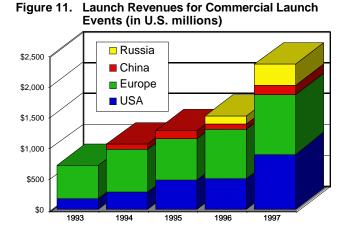


Figure 12. Five-Year Summary (1993 - 1997) Launches by Launch Event Type

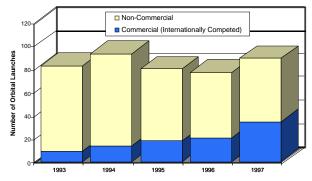


 Table 8.
 Five-Year Summary (1993 - 1997)

 Launches by Launch Event Type

	Non- Commercial	Commercial	TOTAL
1993	74	9	83
1994	79	14	93
1995	62	18	80
1996	56	21	77
1997	54	35	89

Figure 13. Five-Year Summary (1993 - 1997) Commercial Payloads Launched, by Orbit

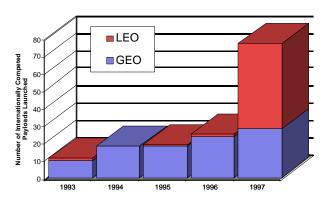


 Table 9.
 Five-Year Summary (1993 - 1997)

 Commercial Payloads Launched, by Orbit

	GEO	LEO	TOTAL
1993	10	1	11
1994	18	0	18
1995	18	1	19
1996	24	1	25
1997	28	49	77

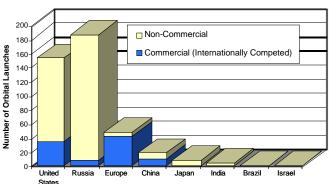
orbit (LEO), most notably because of the 46 Iridium satellites launched. In fact, 1997 saw more than double the number of LEO payloads than in the previous year.

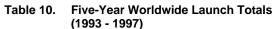
For the past five years, from 1993 through 1997, the United States and Russia have led the world in total orbital launch events (see Figure 14). Russia has conducted the most launches during this period with 186 (see Table 10) with U.S. launch service providers closely behind at 153. Russia's launch rate has been dropping, however, at an average annual rate of 11 percent each year, in part due to Russia's waning economic support for space activities.

Europe remains a distant third with only 49 orbital launch events. Yet. Europe's Arianespace is noted as having conducted the largest number of commercial launches for this period, with 42 internationally competed launch events, for a 44 percent share of the commercial market (Figure 16). Europe's Arianespace commercial launches outnumbered non-commercial launches by a ratio of six to one. U.S. launch service providers performed 36 commercial launch events during this period. which is close in number to that of Arianespace, and amounts to a 37 percent commercial market share.

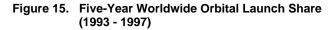
In terms of overall launch activity for the period 1993 through 1997, Russia holds the largest share of the world's total launches with 44 percent (see Figure 15) but the smallest share in terms of commercial launches (only nine percent). Nineteen ninety-seven was Russia's second year of commercial launch activity, but Russia's launch providers have already captured nearly as many commercial launches as China, which has been conducting commercial launches since 1990.

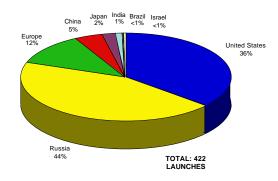
Figure 14. Five-Year Worldwide Launch Totals (1993 - 1997)

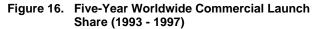


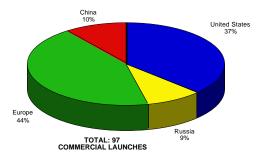


	Non- Commercial Launches	Commercial Launches	TOTAL
United States	117	36	153
Russia	177	9	186
Europe	7	42	49
China	9	10	19
Japan	8	0	8
India	5	0	5
Brazil	1	0	1
Israel	1	0	1
TOTAL	325	97	422









1997 Launch Events

DATE	VEHICLE	SITE	PAYLOAD	OPERATOR	MANUFACTURER	USE	LAUNCH \$	L	COME M
1/12/97	Shuttle Atlantis	KSC	STS 81	NASA	Rockwell International	Crewed	~188.3M	S	S
1/17/97	Delta 2 7925	CCAS	Navstar GPS 2R- 1	DoD	Rockwell International	Navigation	~47.5M	F	F
1/30/97	Ariane 44L	Kourou	GE 2	GE Americom	Lockheed Martin	Communication	~100M	S	S
			Nahuel 1A	Nahuelsat	Aerospatiale	Communication			
2/10/97	Soyuz SL-4	Baikonur	Soyuz TM-25	RKK Energia	RKK Energia	Crewed	~18.5M	S	S
2/11/97	Shuttle Discovery	KSC	STS 82	NASA	Rockwell International	Crewed	~188.3M	S	S
2/12/97	M 5	Kagoshima	Muses B	ISAS	NEC	Scientific	~44.0M	Š	S
2/14/97	Cyclone SL-14	Plesetsk	Gonets D1 04-06 (3 sats)	Smolsat (NPO PM, et. al)	NPO PM	Communication	~12.5M	Š	S
2/11/01			Kosmos 2337 - 2339	Russian MoD	AO Polyot	Communication	12.010	U	U
2/15/97	Atlas 2AS	CCAS	JCSAT 4	JAST	Hughes	Communication	~95M	s	S
2/23/97	Titan 4B/IUS	CCAS	DSP 18	DoD	TRW	Military	N/A	S	S
2/23/97	Ariane 44P	Kourou	Intelsat 8 F1	Intelsat	Lockheed Martin	Communication	~82.5M	S	S
3/4/97	START 1	Svobodny		Russian MoD	Russia		~02.5101 ~7.5M	S	S
	-	,	Zeya			Geodesy			
3/8/97	Atlas 2A	CCAS	Tempo 2	TCI	Space Systems/Loral	Communication	~72.5M	S	S
4/4/97	Shuttle Columbia	KSC	STS 83	NASA	Rockwell International	Crewed	~188.3M	S	Ρ
4/4/97	Titan 2	VAFB	DMSP 5D-2-F14	DoD	Lockheed Martin	Meteorological	~43.9875M		S
4/6/97	Soyuz SL-4	Baikonur	Progress M-34	RKK Energia	RKK Energia	Supply	~18.5M	S	S
4/9/97	Molniya SL-6	Plesetsk	Kosmos 2340	Russian MoD	NPO Lavotchkin	Military	N/A	S	S
4/16/97	Ariane 44LP	Kourou	BSAT 1	Telecom. Advan. Org.	Hughes	Communication	~87.5M	S	S
			Thaicom 3	Shinawatra Sat. Ltd.	Aerospatiale	Communication			
4/17/97	Cosmos SL-8	Plesetsk	Kosmos 2341	Russian MoD	NPO PM	Navigation	~10M	S	S
4/21/97	Pegasus XL	Spain	Celestis 1	Celestis	Celestis	Other	~13M	S	S
			Minisat 01	INTA	INTA	Scientific		-	-
4/25/97	Atlas 1	CCAS	GOES 10	NOAA	Space Systems/Loral	Meteorological	~65M	S	S
5/5/97	Delta 2 7920	VAFB	Iridiums 1-5	Iridium, Inc.	Lockheed Martin	Communication	~45.7M	s	s
5/11/97	Long March 3A	Xichang	DFH 3-2	Chinese Brdcst. Sat. Corp.	CAST (CAST)	Communication	~40M	s	s
5/14/97	Molniva SL-6	Plesetsk	Kosmos 2342	Russian MoD	NPO Lavotchkin		~40M	S	S
	,					Military			
5/15/97	Shuttle Atlantis	KSC	STS 84	NASA	Rockwell International	Crewed	~188.3M	S	S
5/15/97	Soyuz SL-4	Baikonur	Kosmos 2343	Russian MoD	TsSKB Progress	Military	~18.5M	S	S
5/20/97	Zenit 2 SL-16	Baikonur	Kosmos F1-1997	Russia	Russia	Military	~32.5M	F	F
5/20/97	Delta 2 7925	CCAS	Thor 2	Telenor A.S.	Hughes	Communication	~47.5M	S	S
5/24/97	Proton SL-12	Baikonur	Telstar 5	AT&T	Space Systems/Loral	Communication	~60M	S	S
6/3/97	Ariane 44L	Kourou	Inmarsat 3 F4 Insat 2D	Inmarsat ISRO	Lockheed Martin ISRO	Communication Communication	~100M	S	S
6/6/97	Proton SL-12	Baikonur	Kosmos 2344	Russian MoD	Russian MoD	Military	~60M	S	S
6/10/97	Long March 3	Xichang	FY 2-B	CAST	Shanghai Inst. of Sat. Eng.	Meteorological	~37.5M	S	S
6/18/97	Proton SL-12	Baikonur	Iridiums 6-12	Iridium, Inc.	Lockheed Martin	Communication	~60M	S	S
6/25/97	Ariane 44P	Kourou	Intelsat 8 F2	Intelsat	Lockheed Martin	Communication	~82.5M	S	S
7/1/97	Shuttle Columbia	KSC	STS 83R	NASA	Rockwell International	Crewed	~188.3M	Š	S
.,			Wake Shield Facility 4	Space Vacuum Epitaxy Center	Space Industries, Inc.	Microgravity		•	•
7/5/97	Soyuz SL-4	Baikonur	Progress M-35	RKK Energia	RKK Energia	Supply	~18.5M	s	S
7/9/97	Delta 2 7920	VAFB	Iridiums 13-17	Iridium, Inc.	Lockheed Martin	Communication	~45.7M	s	s
7/23/97	Delta 2 7925	CCAS	Navstar GPS 2R- 2	DoD	Lockheed Martin	Navigation	~47.5M	s	S
7/27/97	Atlas 2AS	CCAS	Superbird C1		Hughes	Communication	~47.5M	S	S
		VAFB		Space Communications Corp. OSC	OSC		~95M ~13M	S	S
8/1/97	Pegasus XL	=	OrbView-2 (SeaStar)			Remote Sensing			
8/5/97	Soyuz SL-4	Baikonur	Soyuz TM-26	RKK Energia	RKK Energia	Crewed	~18.5M	S	S
8/7/97	Shuttle Discovery	KSC	CRISTA SPAS 2 SEDSat 1 STS 85	NASA/DARA NASA NASA	MBB Erno U. of Ala./Huntsville Rockwell International	Scientific Scientific Crewed	~188.3M	S	S
8/8/97	Ariane 44P	Kourou	PAS 6	PanAmSat	Space Systems/Loral	Communication	~82.5M	s	S
8/14/97	Proton SL-12	Baikonur	Kosmos 2345	Russian MoD	Russian MoD	Military	~60M	S	S
						,		S S	-
8/19/97 8/20/97	Long March 3B	Xichang	Agila 2	Mabuhay Phil. Sat. Corp.	Space Systems/Loral	Communication	~65M		S
	Delta 2 7920	VAFB	Iridiums 18-22	Iridium, Inc.	Lockheed Martin	Communication	~57.1M	S	S
	Athena 1	VAFB	Lewis	NASA	TRW	Remote Sensing	~15M	S	F

1997 Launch Events

B/2597 Delia 2 7930 CCAS ACE MASA NASA Scientific -47.5M S 8/2807 Profin SI-12 Ballonur PAS 5 Pan/MSI Highsis Commitation -47.5M S S 8/2807 Profin SI-12 Ballonur PAS 5 Pan/MSI Highsis Commitation -47.5M S S 8/2807 Motion SI-12 Ballonur PAS 5 Euristai Anonpaliale Communication -47.5M S S 8/2807 Motion 4LIP Motional 7 Euristai Anonpaliale Metocological -46.4M S S 8/4407 Proton SL-12 Ballonur Indum, Inc. Lockheed Marin Communication -43.4M S S 8/2507 Fortal Analysis Inc. Lockheed Marin Communication -43.4M S S 8/2507 Fortal Analysis Inc. Lockheed Marin Communication -43.4M S S 8/2507 Fortal Analysis Inc. Communication	DATE	VEHICLE	SITE	PAYLOAD	OPERATOR	MANUFACTURER	USE	LAUNCH \$	OUT L	COME M
B28297 Polgasis XL, 9/197 VAFB Instant FORTE F84-1 Fausan DoD Los Alterna March 2C Milliary -13M S S 9/197 Arian 44.P Kourou Hot Bird Pits 3 Eurobast March 2C Communication -47.5M S S 9/197 Arian 44.P Kourou GE Americon Losheed Marin Communication -49.5M S S 9/2397 Arian 44.P Kourou Intelast 8 GE Americon Losheed Marin Communication -49.5M S S 9/2397 Camore 5L-B Pisoetak Failad 102/V Russian MoD Analysis Inc. Final Analysis Inc. Final Analysis Inc. Communication -10M NA S S 9/2397 Ariatie Attamits KG STS 8 NASA Rockal International Crewed -18.3M S S 9/2397 Tranglahima Tatasasi 6 NASA Rockal International Crewed -18.5M S S 9/2397 Faita Tataga	8/25/97	Delta 2 7920	CCAS			NASA	Scientific			
9/19/1 Long Match 2C Taiyuan Indum MFS 1-2 China Aerospace Corp. Lockheed Martin Test -17.5M S S 9/297 Alas 2AC Townus dation Communication Communication -67.5M S S 9/297 Alas 2AC CAS GE 3 GE American Anterospace Communication -45.5M S S 9/297 Alame 44P Kourou Inteliati Lockheed Martin Communication -45.5M S S 9/2197 Connon SL-8 Picestak Field Anjesta Inc. Communication -45.5M S S 9/2197 Shutle Attaints KSC TS 86 NASA Routwain Communication NA S S 9/2197 Shutle Attaints KSC STS 86 NASA Routwain Communication NA S S 9/2197 PSLV Sinhairkota IRS10 IISRO Routwain Communication -47.5M S S 9/219	8/28/97	Proton SL-12	Baikonur	PAS 5	PanAmSat	Hughes	Communication	~60M	S	S
B/2/97 Ariane 44.LP Kourou Hot Ring Plus 3 Meteosart 102 Eutelisat Maters Macconi Communication	8/29/97	Pegasus XL	VAFB	FORTE P94-1	DoD	Los Alamos National Laboratory	Military	~13M	S	S
M489Atas 2AS GCASCCAS GE 3Eumetisat GE 3Metional Lockheed MartinMeterological Communication $-48.4M$ $-48.4M$ SS9/1397Arane 42P Stanne 42PKouruuIntelsat 87 Intelsat 87 Stanne 42PIntelsat 87 Intelsat 81 Stanne 42PIntelsat 87 Intelsat 81 Stanne 42PIntelsat 87 Intelsat 81 Stanne 42PCommunication $-42.5M$ Stanne 42P $-42.5M$ Stanne 42P $-42.5M$ Stanne 42P $-42.5M$ 	9/1/97	Long March 2C	Taiyuan	Iridium MFS 1 - 2	China Aerospace Corp.	Lockheed Martin	Test	~17.5M	S	S
BM/477 Alias 2AS CCAS GE 3 GE Americom Lockheed Martin Communication -48.MI S S 9/14/07 Proton SL-12 Baikonur Inteliast 87.3 Final Analysis Inc. Communication -43.MI S S 9/23/97 Smane 44.P Kourou Inteliast 87.3 Final Analysis Inc. Communication -100.MI S S 9/23/97 Smattle Atlantis KS State Analysis Inc. Communication -100.MI NA S S 9/23/97 Stattle Atlantis KS State Atlantis KS S S 9/23/97 Contast 2760 VAFB Indium, Inc. Lockheed Martin Communication -17.80.MI S S 9/23/97 State Atlantis KS1 Indium, Inc. Lockheed Martin Communication -17.80.MI S S 9/23/97 State 2700 VAFB Indiums 10-3 Indiums Inc. Lockheed Martin Communication -18.50.K S S S <	9/2/97		Kourou	Hot Bird Plus 3	Eutelsat	Matra Marconi	Communication	~87.5M	S	S
BM/477 Alias 2AS CCAS GE 3 GE Americom Lockheed Martin Communication -48.MI S S 9/14/07 Proton SL-12 Baikonur Inteliast 87.3 Final Analysis Inc. Communication -43.MI S S 9/23/97 Smane 44.P Kourou Inteliast 87.3 Final Analysis Inc. Communication -100.MI S S 9/23/97 Smattle Atlantis KS State Analysis Inc. Communication -100.MI NA S S 9/23/97 Stattle Atlantis KS State Atlantis KS S S 9/23/97 Contast 2760 VAFB Indium, Inc. Lockheed Martin Communication -17.80.MI S S 9/23/97 State Atlantis KS1 Indium, Inc. Lockheed Martin Communication -17.80.MI S S 9/23/97 State 2700 VAFB Indiums 10-3 Indiums Inc. Lockheed Martin Communication -18.50.K S S S <									_	-
9/14/97 Pettors SL-12 Barkonur Indiums 27-33 Indiums 27-33 Indiums 27-33 Indiums 27-33 Indiums 27-33 Communication -4.3.4M S S 9/23/97 Cosmos SL-8 Plesetsk Final Analysis Inc. Final Analysis Inc. Communication -108.4S S S 9/23/97 Shuttle Attinitis KSC STS 86 NASA AD Polyoit Navigation -108.3M S S 9/23/97 Tk-1A Taregashima Takesali 6 NASDA Microgravity NA S S 9/2697 Mohinya SL-6 Plesetsk Mohinya 3-49 Russian PTT NPCM Communication -108.4M S S 9/2697 Mohinya SL-6 Plesetsk Mohiny Intels at SA Microgravity NA S S 9/2697 Moka S	9/4/97	Atlas 2AS	CCAS				0	~95M	s	S
992397 Aname 4.P Kourou Intelsat P.3 Intelsat P.3 Intelsat P.3 Intelsat P.3 Intelsat P.3 Intelsat P.3 Continuination -82.5M S S 922397 Conso SL-8 Plestsk Faisat QV Faisat QV Raisian MoD AO Polyot Navigation -82.5M S S 922397 Mainya SL-6 Plestsk Mohnya SL-9 Russian MDD Roken C Communication NA S S 926397 Shuttle Atlantis KSC STS 86 NASA Roken C Communication NA S S 926397 PSLV Stinatikona IRS10 IsRO IsRO Continuination -40.5M S S 10/6767 Soyuz SL-4 Bakonur Progress M-36 RKK Energia KK Energia Supply -18.5M S S 10/16767 Soyuz SL-4 Pisetsk Folon NLT SASA Aerospatiale Scientific N/A S S 10/0307 Tran AB/Centaur </td <td></td>										
9/23/97 Cosmos SL-8 Piesetsk Final Analysis Inc. Final Analysis Inc. Communication -10M S S 9/25/97 Nuttle Attantis KSC STS 86 NASA Rockwell International Communication -168.3/M S S 9/25/97 Nuttle Attantis KSC STS 86 NASA Rockwell International Communication -168.3/M S S 9/25/97 TR 1.4 Tanegashima Takesaki 6 NASDA Microgravity NA<										
Bits of the Allenits KSC STS 65 NASA Rousian MoD AO Polya Navgation 9/25/97 Molhya 5.6 Plesetsk Molhya 3.49 Russian PTT NPO PM Communication N/A S S 9/25/97 Molhya 5.6 Plesetsk Molhya 3.49 Russian PTT NPO PM Communication N/A S S 9/25/97 Molhya 5.6 Plesetsk Molhya 3.49 Risting NASDA NASDA NASDA NASDA N/A S S 9/25/97 Molhya 5.6 Piston N/A S<										-
9/25/97 Nutlik Allania KSC STS 86 NASA Rockwell International Crewed -188.3M S S 9/25/97 TR 1A Tanegashima Takesaki 6 NASDA NASDA Microgravity N/A S S 9/25/97 TR 1A Tanegashima Takesaki 6 NASDA NASDA Microgravity N/A S S 9/25/97 TR 1A Tanegashima Takesaki 6 NASDA NASDA Microgravity N/A S S 9/25/97 TR 1A Baikonur Progress M/A6 Rick Energia Supply -18.5M S 9/25/97 Taka AB/Centaur Progress M/A6 Rick Energia Supply -18.5M S S 10/15/97 Taka AB/Centaur CCAS Cassini NASA JatProjuston Laboratory Scientific N/A S S 10/15/97 Taka AB/Centaur CCAS Cassini NASA JatProjuston Laboratory Scientific -14.90 N/A S	5/25/91	CO31103 3L-0	Fleselsk		,			~10101	3	5
93/25/97 Mohiny 3-46 Plestsk Mohiny 3-49 Russian PTT NPO PM Communication NA S S 93/25/97 Tanegashima Takesaki 6 NASDA NASDA NASDA Margarina 93/25/97 Delta 2 7820 VAFB Indiums 34-38 Indium, Inc. Lockheed Martin Communication -47.5M S S 10/5/97 Atlas 2AS CCAS EchoStar 3 EchoStar Statellite Cop. Lockheed Martin Communication -45.5M S S 10/5/97 Soyuz SL-4 Plesetsk Foton N-11 Space Research Institute (K) KR Encriga Skreet Martin Communication -45.5M S S 10/17/97 Itan 4B/Centaur CCAS Casa MASA Jac Propulsion Laboratory Scientific -45.5M S S 10/2297 Pegasus XL Waltops Flight Facility STEP 4 DoDUSAF Trave Communication -7.25.M S S 10/2297 Pegasus XL Waltop Step Flight Facitty Stepr	0/25/07	Chuttle Atlantia	KSC					100 214	c	c
94/26/97 Dela 27820 YR 1 Å Takegaskin Takegaskin Takegaskin Takegaskin NASDA McCommunication A7.5M S S 92/26/97 Dela 27820 Shharkola IRS 10 ISRO ISRO ISRO Communication A7.5M S S 90/597 Suyuz SL-4 Baikonur Progress M-36 RKK Energia Supply -18.5M S S 10/597 Suyuz SL-4 Baikonur Progress M-36 RKK Energia RKK Energia Supply -18.5M S S 10/1977 Titan 4B/Centur CAS Cassini NASA Aerospatial Scientific NA S S 10/1797 Long March 3B Xichang AFStar 2R APT Statilite Co., Ltd. Space Systems/Loral Communication -65M S S 10/2397 Tan 4 VAFB USG Sovernment Lockheed Martin Communication -120.0M S S 10/2397 Tan 4 CAS DSC Si Gold										
9/26/97 Delta 2 7820 VAFB Indiums 34-38 Indium, Inc. Lockheed Marin Communication 4.75M S S 10/5/97 Nulss 2AS CAS EchoStar 3 EchoStar Satellite Cop. Lockheed Marin Communication 95M S S 10/5/97 Soyuz SL-4 Plesetsk Foton N-11 Space Research Institute (IKI) KB Photon Microgravity -18.5M S S 10/5/97 Soyuz SL-4 Plesetsk Foton N-11 Space Research Institute (IKI) KB Photon Microgravity -18.5M S S 10/1797 Long March 3B Xichang APStar 2R APS satellite Co., Ltd. Space Systems/Loral Communication -66M S S 10/2397 Titan 4B/Centaur VarBgs Fleipf Faolity STEP 4 DoD/USAF TRW Development -130M S S 10/2397 Atias 2A CCAS DSG (III 3-0 DoD Arianespace Experimential -122.06M S S 10/2497 Ari				,		-				-
gl/2017 PSLV Sthats 2AS CCAS ErboStar 3 EchoStar 3 stellie Corp. Lockheed Martin Communication -95 M S S 10/5/97 Soyuz SL-4 Baikonur Progress M-36 RKK Energia RKK Energia Supply -18.5M S S 10/5/97 Titan 48/Centaur CCAS Cassini DLR Research Institute (IKI) KB Photon Microgravity -18.5M S S 10/15/97 Titan 48/Centaur CCAS Cassini DLR APT Stallite Co., Ltd. Space Systems/Loal Scientific N/A S S 10/17/97 Titan 4 Varbes Eight 72.8 APT Stallite Co., Ltd. Space Systems/Loral Communication -65M S S 10/22/97 Pegasus XL Waltops Flight Facility, STEP 4 DoD/USAF TRW Development -13M S S S 10/24/97 Ariane 5 Kourou Magsat H Arianespace Arianespace Arianespace Arianespace Experimental -129.06					-	-				
10:6/97 Altas 2AS CCAS EchoStar 3 EchoStar 3 EchoStar 3 EchoStar 3 EchoStar 3 EchoStar 3 Stellite Corp. Lockneed Martin Communication -95M S S 10/979 Soyuz SL-4 Plesetsk Foton N-11 Space Research Institute (IKI) KB Photon Micro and the scientific NA S S 10/15/97 Titan 4B/Centaur CCAS Cassini NASA Jet Propulsion Laboratory Scientific NA S S 10/17/97 Long March 3B Xichang APStar 2R APT Starbillie Co., Ltd. Space Systems/Loral Communication -e5M S S 10/20297 Pegasus XL Waltops Flight Facility USA 133 U.S. Government Lockheed Martin Miliny -170M S S 10/20297 Pegasus XL Waltops Flight Facility USA 133 U.S. Government Lockheed Martin Miliny -72.5M S S 10/2097 Arian 5 Kourou Magast H Arianespace Arianespace					,					
10/597 Soyuz SL-4 Baikonur Progress M-36 RKK Energia RKK Energia Supply -18.5M S S 10/9797 Soyuz SL-4 Plesetsk For N-11 Space Research Institute (IKI) KB Photon Micro Scientific NASA Scientific		-		-			0			-
10/9/97 Soyuz SL-4 Plesetsk From N-11 Space Research Institute (IKI) KB Photon Microgravity 18.5M S S 10/15/97 Titan 4B/Centaur CCAS Cassini NASA Jel Propulsion Laboratory Scientific NA S S 10/17/97 Long March 3B Xichang APStar 2R APT Satellite Co., Ltd. Space Systems/Loral Communication -65M S S 10/20297 Pregasus XL Walops Flight Facility STEP 4 DoD/USAF TrW Development -13M S S 10/20397 Titan 4 VAFB DoO/USAF TrW Development -170M S S 10/20397 Ariane 5 Kourou Magast H Arianespace Arianespace Scientific -129.06M S S 11/2097 VLS Alcantaria SG22A LoA Kale Communication -147.5M S S 11/1207 VLS Alcantaria SG22A LoA Kale					•					-
Internal 10/15/97Mirka Titan 4B/Centaur CCASDir Cassini HuygensDir Rayser-Threde AerospatialeScientific AerospatialeNA SS10/17/97Titan 4B/Centaur VAPBAPBar 2R VAPBAPT Statellite Co., Lid. DoD/USAFSpate 2R TRWDommunication Development Lockheed MartinOmmunication Arrase-65M SS10/23/97Titan 4 VAPBVAPB USA 133US Government Falcon GoldLockheed Martin AF Academy/U of Col.AF Academy/U of Col. AF Academy/U of Col.Experimental Experimental Arrase-72.5M ArraseS10/30/97Ariane 5Kourou Magast H Teamsat 1ESA BSC D 2AIAE ESAAF Academy/U of Col.AF Academy/U of Col. AF Academy/U of Col.Experimental Experimental -72.5M-72.90M AS11/297VLS Titan 4/Centaur CCASAlcantara Usat 362SCD 2A A LAEIAE LAEIndium CommunicationN/A -75.5MF11/1297VLS AlcantaraAlcantara Usat 364 364SCD 2A USA 136Indium, Inc. Usat 369 343Indium, Inc. Usat 364 364Indium, Inc. DevtothkinCommunication Communication-47.5M -47.5MS11/1297Ariane 44L KourouFIS 7 Tames 55 87NASA NASANASA Rockwell International NASACockwell International Communication-100M -47.5MS11/1297H 2TanegashimaFIS 7 TAMSANASA Sarata 201-04NASA NASANASA Rockwell International Communicatio				0	0	0				
10/15/97 Titan 48/Centaur Hurgens CCAS ESA Cassini Hurgens NASA ESA Apropulsion Laboratory Apropulsion Laboratory Scientific Scientific N/A S S 10/17/97 Long March 38 Nichang Millops Flight Facility 10/2397 APStar 2R API Satellite Co., Ltd. Space Systems/Loral Communication -65M S S 10/2397 Titan 4 VAFB DoD/USAF TRW Development -13M S S 10/2497 Attas 2A CCAS DSCS III 3-10 DoD Ackedemy/U. of Col. AF Academy/U. of Col. <	10/9/97	Soyuz SL-4	Plesetsk	Foton N-11	Space Research Institute (IKI)	KB Photon	Microgravity	~18.5M	S	S
HurgensESAAerospatialeScientific $10/17/97$ Pegasus XLWaltops Flight FacilitySTEP 4DoD/USAFTRWDevelopment $-13M$ SF $10/22/97$ Pegasus XLWaltops Flight FacilitySTEP 4DoD/USAFTRWDevelopment $-13M$ SF $10/22/97$ Atlas 2ACGASDSCS III 3-10DoDoLockheed MartinCommunication $-72.5M$ SS $10/24/97$ Atlas 2ACGASDSCS III 3-10DoDoArf academy/L of CoLExperimental $-129.06M$ SS $10/30/97$ Arlane 5KourouMagsat HArianespaceArianespaceExperimental $-129.06M$ SS $11/2/97$ VLSAlcantaraSCD 2AIAEIAECommunication N/A FF $11/5/97$ Delta 27925CCASNavstar GPS 2-28DoDRockwell InternationalNavigation $-47.5M$ SS $11/12/97$ VLSAlcantaraSCD 2AIAEIAECommunication $-47.5M$ SS $11/12/97$ Poton SL-12BaikonurCoupon/Bankir 1Global Information Systems, Inc.NPO LavotchkinCommunication $-47.5M$ SS $11/12/97$ Ariane 44LKourouIndoEsra 1PT MediaCitra IndoStarOSC (OSC)Communication $-10.4M$ SS $11/12/97$ Ariane 44LKourouSTS 87NASARockwell InternationalCrewed $-18.5M$ S				Mirka	DLR	Kayser-Threde	Scientific			
10/17/97 Long March 3B Xichang APÉsiar 2R APT Satellite Co., Ltd. Space Systems/Loral Communication -65M S S 10/22/97 Tita 4 VAB USA 133 US. Government Lockheed Martin Development -13M S S 10/24/97 Atlas 2A CCAS DSCS III 3-10 DoD Lockheed Martin Communication -72.5M S S 10/23/97 Atlas 2A CCAS DSCS III 3-10 DoD Lockheed Martin Communication -72.5M S S 11/297 Atlas 2A CCAS Navstar GPS 2-28 DoD Arianespace ESA Scientific 11/15/97 Tita 4/Centaur CCAS Navstar GPS 2-28 DoD Rockwell International Navigation -47.5M S S 111/197 Tita 4/Centaur CCAS USA 136 USA 1060 Navigation -47.5M S S 111/197 Total 2 Bakonur CoupyBankir 1 Global Information Systems, Inc. NPO Lavotth	10/15/97	Titan 4B/Centaur	CCAS	Cassini	NASA	Jet Propulsion Laboratory	Scientific	N/A	S	S
10/22/97 Pegäsus XL Palas 2A Wallops Flight Facility VAFB STEP 4 DoD/USAF TRW Development 13M S F 10/23/97 Atias 2A CCAS DSCS III 3-10 Falcon Gold Dab Lockheed Martin Military 170M S S 10/23/97 Atias 2A CCAS DSCS III 3-10 Falcon Gold AF Academy/U. of Col. AF Academy/U. of Col. Experimental 129.06M S S 10/30/97 Ariane 5 Kourou Magast H Arianespace Arianespace Experimental 129.06M S <td< td=""><td></td><td></td><td></td><td>Huygens</td><td>ESA</td><td>Aerospatiale</td><td>Scientific</td><td></td><td></td><td></td></td<>				Huygens	ESA	Aerospatiale	Scientific			
10/22/97 Pegasus XL Walkops Flight Facility STE P 4 USA 133 USAF 33 USA Fast TRW Development -13M S S 10/24/97 Atlas 2A CCAS DSCS III 3-10 Do Lockheed Martin Communication -72.5M S S 10/30/97 Ariane 5 Kourou Maqaat H Arianespace Arianespace Experimental -129.06M S S 11/2/97 VLS Alcantara SCD 2A IAE IAE Communication NA F F 11/1/97 VLS Alcantara SCD 2A IAE IAE Navigation -47.5M S S 11/1/97 Delta 27920 VAFB Iridium, 1nc. Lockheed Martin Communication -47.5M S S 11/1/197 Peton SL-12 Baikonur Coupon/Bankir 1 Global Information System, Inc. NPO Lavotchkin Communication -47.5M S S 11/12/97 Ariane 44L Kourou IndoSlar 1 PT MediaCitr	10/17/97	Long March 3B	Xichang	APStar 2R	APT Satellite Co., Ltd.	Space Systems/Loral	Communication	~65M	S	S
10/23/97 Titan 4 VAFE USA 133 U.S. Government Lockheed Martin Military -170M S S 10/24/97 Atlas 2A CCAS DSCS III 3-10 DoD Lockheed Martin Cornunication -72.5M S S 10/30/97 Ariane 5 Kourou Maqsat H Arianespace Arianespace Experimental -129.0M S S 11/2/97 VLS Alcantara SCD 2A IAE IAE Communication N/A F F 11//297 Titan 4/Centaur CCAS Navstar GPS 2-28 DoD Rockwell International Navigation -47.5M S 11//197 Titan 4/Centaur CCAS USA 136 U.S. Government Boeing Military -255M S 11/12/97 Protex 2D VAFB Iridium, Inc. Coxheed Martin Communication -40M S 11/12/97 Protex 2D VAFB Iridium, SP-43 Protex 2D S S 11/12/97 Pr				STEP 4			Development	~13M	S	F
10/24/97 Atlas 2A CCAS DSCS III 3-10 Dod Lockheed Martin Communication -72.5M S S 10/30/97 Ariane 5 Kourou Maqsat H Arianespace Arianespace Experimental -129.06M S S 11/2/97 VLS Alcantara SCD 2A IAE IAE Communication NA F F 11/2/97 VLS Alcantara SCD 2A IAE IAE Communication NA F F 11//297 Delta 2 7925 CCAS Navstar GPS 2-28 DoD Rockwell International Navigation -47.5M S S 11//297 Detato 2 7920 VAFB Iridiums 39-43 Iridium, nc. Lockheed Martin Communication -47.5M S S 11/12/97 Proton SL-12 Baikonur Coupon/Bankir 1 Global Information Systems, Inc. NPO Loxotchkin Communication -47.5M S S 11/12/97 Sytuz SL-4 Plesetsk Resurs1 NASA<				-						
10/30/97Ariane 5KourouMagast H Magast H Teamsat 1ArianespaceArianespaceArianespaceExperimental Experimental-129.06MSS11//2/97VLSAlcantaraSCD 2AIAEIAEIAECommunicationN/AFF11//2/97VLSAlcantaraSCD 2AIAEIAECommunicationN/AFF11//5/97Delta 27925CCASNavstar GPS 2-28DoDRockwell InternationalMavigation-47.50MSS11//2/97Titan 4/CentaurCCASUSA 136U.S. GovernmentBoeingMilitary-255MSS11//2/97Proton SL-12BalkonurCoupon/Bankir 1PT Medicitra IndoStarOSC (OSC)Communication-46.0MSS11/12/97Ariane 44LKourouIndoStar 1PT Medicitra IndoStarOSC (OSC)Communication-100.MSS11/12/97Shuttle ColumbiaKSCSTS 87NASANASANASANASAScientific-18.3MSS11/12/97H 2TanegashimaETS 7NASANASANASANASAScientific-191.2MSS11/28/97H 2TanegashimaETS 7NASA/AACANASANASACommunication-60MSS11/28/97Ariane 44PKourouEquator-SNASA/AACANASANASACommunication-191.2MSS11/28/97Y 2Baikonur <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>,</td> <td></td> <td></td> <td>-</td>							,			-
10/30/97 Ariane 5 Kourou Magsat H Teamsat 1 Arianespace Arianespace Experimental ESA -129.06M S S 11/2/97 VLS Alcantara SCD 2A IAE IAE Communication N/A F F 11/2/97 Delta 2 7920 CCAS Navstar GPS 2-28 Do D Rockwell International Navigation -47.5M S S 11//297 Titan 4/Centur CCAS USA 136 U.S. Government Beeing Military -47.5M S S 11//297 Proton SL-12 Balkonur Coupon/Banki 1 Global Information Systems, Inc. NPO Lavotchkin Communication -40.0M S S 11/1/297 Ariane 44L Kourou IndoStr1 PT MediaCitar IndoStar OSC (OSC) Communication -100M S S 11/18/97 Souta E-44 Plesetsk Resurs-F1M Russian MoD TSKB Remote Sensing -18.5M S S 11/18/97 H2 Tanegashima ET	10/2 1/01		00,10					72.00	U	U
Tambat 1ESAESAScientific11//297VLSAlcantaraSCD 2AIAEIAECommunicationN/AFF11//5/97Delta 2 7925CCASNavistar GPS 2-28DoDRockwell InternationalNavigation-47.5MS11//5/97Titan 4/CentaurCCASUSA 136U.S. GovernmentBoeingMilitary-255MS11//297Proton SL-12BaikonurCoupon/Bankir 1Global Information Systems, Inc.NPO LavotchkinCommunication-47.5MS11/12/97Ariane 44LKourouIndoStar 1PT MediaCitra IndoStarOSC (OSC)Communication-60MSS11/12/97Soyuz SL-4PlesetskResurs-F 1MRussian MoDTsSKBRemote Sensing-188.3MSS11/12/97Systems, Inc.NSABAerospatialeCommunication-191.2MSS11/12/97Futne ColumbiaKSCSTS 87NASANASANASAScientific-88.3MS11/12/97H 2TanegashimaETS 7NASANASANASAScientific-89.5MSS11/28/97Proton SL-12BaikonurAstra 1GSESJCSAT 5JASTHughesCommunication-60MSS12/2/97Ariane 44PKourouEquator-SNASA/DARAMaxA MaxA MaxA InstituteScientific-82.5MSS12/2/97Ariane 44PKourouEquator-SJASTJAST </td <td>10/30/97</td> <td>Ariano 5</td> <td>Kourou</td> <td></td> <td>,</td> <td></td> <td></td> <td>~129.06M</td> <td>S</td> <td>S</td>	10/30/97	Ariano 5	Kourou		,			~129.06M	S	S
11/2/97VLSAlcantaraSCD 2AIAEIAECommunicationN/AFF11/5/97Delta 2 7925CCASNavstar GPS 2-28Do DoRockwell InternationalNavigation47.5MSS11/7/97Titan 4/CentaurCCASUSA 136U.S. GovernmentBoeingMilitary255MSS11/1/297Priton SL-12BaikonurCoupomBankir 1Global Information Systems, Inc.NPO LavotchkinCommunication-47.5MSS11/1/297Ariane 44LKourouIndoStar 1PT MediaCitra IndoStarOSC (OSC)Communication-100MSS11/1/297Ariane 44LKourouIndoStar 1PT MediaCitra IndoStarOSC (OSC)Communication-108.0MSS11/1/297Soyuz SL-4PlesetskResure-F 1MRussian MoDTSSKBRemote Sensing-18.5MSS11/12/97Soyuz SL-4PlesetskResure-F 1MNASANASANASACerewed-18.3MSS11/12/97H 2TanegashimaET 57NASDAToshibaDevelopment-19.2MSSS11/28/97H 2TanegashimaAstra 1GSE SHughesCommunication-60MSSS12/2/97Ariane 44PKourouEduorsJASTHughesCommunication-95MSSSSSSSSSSSSSSS<	10/00/07	Andre J	Roulou					~123.000	0	0
11/5/97Delta 2 7925CCASNavstar GPS 2-28DoDRockwell InternationalNavigation-47.5MSS11/7/97Titan 4/CentaurCCASUSA 136U.S. GovernmentBoeingMilitary-255MS11/8/97Totan 4/CentaurCCASUSA 136U.S. GovernmentBoeingMilitary-255MS11/1/2/97Proton SL-12BaikonurCoupon/Bankir 1Global Information Systems, Inc.NPO LavotchkinCommunication-60MSS11/1/2/97Ariane 44LKourouIndoStar 1PT MediaCitra IndoStarOSC (OSC)Communication-100MSS11/1/8/97Soyuz SL-4PlesetskResurs-F 1MRussian MoDTSKBRemote Sensing-18.5MSS11/1/9/97Shutle ColumbiaKSCSTS 87NASANASARockwell InternationalCrewed-191.2MSS11/28/97H 2TanegashimaETS 7NASDA/NASANASANASAScientific-82.5MSS12/2/97Ariane 44PKourouEquator-SNASA/DARAMAX Planck InstituteScientific-82.5MSS12/2/97Ariane 44PKourouEquator-SNASA/DARAMASA GoddardRemote Sensing-17.5MSS12/2/97Ariane 44PKourouEquator-SNASA/DARAMax Planck InstituteScientific-82.5MSS12/2/97Ariane 44PKourouETS 7NASA/DARA<	11/2/07	VIE	Alcontoro		-			NI/A	F	F
11/7/97Titan 4/Centaur Delta 2 7920CCASUSA 136U.S. GovernmentBoeingMilitary255MSS11/12/97Delta 2 7920VAFBIridium, 39-43Iridium, Inc.Lockheed MartinCommunication47.5MS11/12/97Proton SL-12BikonurCoupon/Bankir 1Global Information Systems, Inc.NPO LavotchkinCommunication60MS11/12/97Ariane 44LKourouIndoStar 1PT MediaCitra IndoStarNSABAerospatialeCommunication100MSS11/19/97Soyuz SL-4PlesetskResurs-F 1MRussian MoDTsSKBRemote Sensing-185.3MSS11/19/97Shuttle ColumbiaKSCSTS 87NASARockwell InternationalCrewed-188.3MSS11/28/97H 2TanegashimaETS 7NASDA/NASANASARockwell InternationalCrewed-191.2MSS12/2/97Ariane 44PKourouEquator-SNASA/DARANASA CoddardRemote Sensing-191.2MSSS12/3/97Proton SL-12BaikonurAstra 1GSESHughesCommunication-60MSSS12/3/97Long March 2CTaiyuanIridium, Inc.Lockheed MartinCommunication-95MSSS12/3/97Long March 2CTaiyuanIridiums 42-26Iridium, Inc.Lockheed MartinCommunication-47.5MSS12/3/97 <td< td=""><td></td><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td>-</td><td></td></td<>		-							-	
11/8/97Delta 2 7920VAFBIridiums 39-43Iridium, Inc.Lockheed MartinCommunication-47.5MSS11/12/97Proton SL-12BaikonurCoupon/Bankir 1Global Information Systems, Inc.NPO LavotchkinCommunication-60MSS11/12/97Ariane 44LKourouIndoStar 1PT MediaCitra IndoStarOSC (OSC)Communication-100MSS11/12/97Syuz SL-4PlesetskResurs-F 1MRussian MoDTSSKBRemote Sensing-18.5MSS11/19/97Shuttle ColumbiaKSCST 87NASANASANASACrewed-18.5MSS11/12/97H 2TanegashimaETS 7NASANASANASAScientific-19.12MSSS11/28/97H 2TanegashimaETS 7NASDA/NASANASA CoddardRemote Sensing-191.2MSSS12/297Ariane 44PKourouEquator-SNASA/DARAMax Planck InstituteScientific-82.5MSS12/297Ariane 44PKourouEquator-SJASTHughesCommunication-60MSS12/297Ariane 44PKourouIridiums 25-26Iridium, Inc.Lockheed MartinCommunication-17.5MSS12/8/97Long March 2CTaiyuanIridiums 25-26Iridium, Inc.Lockheed MartinCommunication-17.5MSS12/20/97Soyuz SL-4Biakonur										
11/12/97Proton SL-12 Information SupportBaikonur KourouCoupon/Bankir 1 IndoStar 1 Sirius 2 Sirius 2 Sirius 2 NSABGlobal Information Systems, Inc. PT MediaCitra IndoStar NSABNPO LavotchkinCommunication Communication60M 100MSS11/12/97Ariane 44LPlesetskResurs-F 1M Spartan 201-04Russian MoDTsSKBRemote Sensing Communication18.5MSS11/19/97Shuttle ColumbiaKSCSTS 87 Spartan 201-04NASARockwell International TRMMCrewed Crewed188.3MSS11/28/97H 2TanegashimaETS 7 Rusra 201-04NASANASARemote Sensing Communication60MSS12/2/97Ariane 44PKourouEquator-S JCSAT 5 JASTNASA/DARAMax Planck InstituteScientific Communication82.5MSS12/3/97Proton SL-12BaikonurAstra 1GSESHughesCommunication Communication60MSS12/8/97Long March 2C TaiyuanIndiums 25-26Iridium, Inc.Lockheed MartinCommunication Communication-41.5MSS12/2/97Soyuz SL-4BaikonurKosmos 2347Russian MoDRussian MoDRussian TBAMilitary Military-18.5MSS12/20/97Soyuz SL-4BaikonurProgress M-37RKK EnergiaRKK EnergiaSupply-18.5MSS12/20/97Soyuz SL-4BaikonurProgress M						0	,			
11/12/97Ariane 44LKourouIndoStar 1 Strius 2PT MediaCitra IndoStar NSABOSC (OSC)Communication~100MSS11/18/97Soyuz SL-4 PlesetskPlesetskResurs-F 1M Spartan 201-04NSABAerospatialeCommunication~10.0MSS11/19/97Shuttle ColumbiaKSCSTS 87 Spartan 201-04NASARockwell InternationalCrewed Crewed~18.5MSS11/28/97H 2TanegashimaETS 7 TAnegashimaNASANASANASAScientific12/2/97Ariane 44PKourouEquator-S UCSAT 5NASA/DARAMax Planck InstituteScientific Communication~191.2MSS12/2/97Proton SL-12BaikonurAstra 1GSESHughesCommunication communication~82.5MS12/8/97Atlas 2ASCCASGalaxy 8IPanAmSatHughesCommunication communication~95MS12/8/97Atlas 2ASCCASGalaxy 8IPanAmSatHughesCommunication communication~12.5MS12/8/97Kug SL-44PlesetskKosmos 2347Russian MoDNPO KometaMilitary suja 10.0L~12.5MS12/20/97Soyuz SL-4PlesetskKosmos 2348Russian MoDRussia TBAMilitary suja TBA~18.5MS12/20/97Soyuz SL-4PlesetskKosmos 2347Russian MoDNPO KometaMilitary suja TBA~18.5MS12/20/97Soyuz					, -					-
NAMESirtus 2NSABAerospatialeCommunication11/18/97Soyuz SL-4PlesetskResurs-F 1MRussian MoDTsSKBRemote Sensing~18.5MS11/19/97Shuttle ColumbiaKSCSTS 87NASARockwell InternationalCrewed~18.3MSS11/19/97Shuttle ColumbiaKSCSTS 87NASARockwell InternationalCrewed~18.3MSS11/28/97H 2TanegashimaETS 7NASDAToshibaDevelopment~191.2MSS12/2/97Ariane 44PKourouEquator-SNASA/DARAMASA GoddardRemote Sensing~82.5MS12/3/97Proton SL-12BaikonurAstra 1GSESHughesCommunication~60MSS12/8/97Altas 2ASCCASGalaxy 8IPanAmSatHughesCommunication~60MSS12/8/97Cyclone SL-14BaikonurKosmos 2347Russian MoDNPO KometaMilitary~12.5MSS12/8/97Soyuz SL-4PlesetskKosmos 2348Russian MoDRussian BADNPO KometaMilitary~18.5MSS12/20/97Soyuz SL-4PlesetskKosmos 2347Russian MoDRussia TBAMilitary~18.5MSS12/20/97Soyuz SL-4PlesetskKosmos 2348Russian MoDRussia TBAMilitary~18.5MSS12/20/97Soyuz SL-4BaikonurProgress M-37 <td></td> <td></td> <td></td> <td></td> <td>,</td> <td></td> <td></td> <td></td> <td></td> <td></td>					,					
11/18/97Soyuz SL-4 11/19/97Plesetsk SCResurs-F 1M STS 87 Spartan 201-04Russian MoDTsSKBRemote Sensing Rockwell International18.5M CrewedSS11/28/97H 2TanegashimaETS 7 RMMNASANASANASANASANASAScientific11/28/97H 2TanegashimaETS 7 RMMNASDAToshibaDevelopment Remote Sensing18.5M 18.2MSS12/297Ariane 44PKourouEquator-S Equator-SJASTHughesCommunication 82.5MSS12/397Proton SL-12BaikonurAstra 1GSESHughesCommunication 95M95MSS12/8/97Long March 2CTaiyuanIridiums 25-26Iridium, Inc.Lockheed MartinCommunication 912.M18.5MSS12/29/97Cyclone SL-14BaikonurKosmos 2347Russian MoDNPO KometaMilitary 18.5M18.5MSS12/20/97Soyuz SL-4PlesetskKosmos 2348Russian MoDRussia TBAMilitary 18.5M18.5MSS12/20/97Soyuz SL-4BaikonurProgress M-37RKK EnergiaRKK EnergiaSupply18.5MSS12/20/97Soyuz SL-4BaikonurProgress M-37RKK EnergiaRKK EnergiaSupply18.5MSS12/20/97Soyuz SL-4BaikonurProgress M-37RKK EnergiaCommunication47.5MS<	11/12/97	Ariane 44L	Kourou			()		~100M	S	S
11/19/97Shuttle ColumbiaKSCSTS 87 Spartan 201-04NASARockwell International NASACrewed Scientific~188.3MSS11/28/97H 2TanegashimaETS 7 TRMMNASDAToshibaDevelopment Proton SL-12~191.2MSS12/2/97Ariane 44PKourouEquator-S JCSAT 5NASDA/NASANASA GoddardMax Planck InstituteScientific Scientific~82.5MSS12/2/97Proton SL-12BaikonurAstra 1GSESHughesCommunication - 60M~60MSS12/2/97Long March 2CTaiyuanIridiums 25-26Iridium, Inc.Lockheed MartinCommunication - 95M~12.5MSS12/2/97Soyuz SL-4PlesetskKosmos 2347Russian MoDNPO KometaMilitary - 12.5M~12.5MSS12/20/97Soyuz SL-4BaikonurProgress M-37RKK EnergiaRKK EnergiaSupply~18.5MSS12/20/97Delta 2 7920VAFBIridiums 44-48Iridium, Inc.Lockheed MartinCommunication~47.5MSS12/20/97Poton SL-12BaikonurProgress M-37RKK EnergiaRKK EnergiaSupply~18.5MSS12/20/97Pota 2 7920VAFBIntelsat 8 F4IntelsatLockheed MartinCommunication~47.5MSS12/23/97Proton SL-12BaikonurAsiasat 3Asia Sat. Telecom. Ltd.HughesCommunication<					-					
Spartan 201-04NASANASAScientific11/28/97H 2TanegashimaETS 7NASDAToshibaDevelopment~191.2MSS12/2/97Ariane 44PKourouEquator-SNASA/DARAMAS Planck InstituteScientific~82.5MS12/3/97Proton SL-12BaikonurAstra 1GSESHughesCommunication~60MSS12/8/97Atlas 2ASCCASGalaxy 8IPanAmSatHughesCommunication~95MSS12/8/97Cyclone SL-14BaikonurKosmos 2347Russian MoDNPO KometaMilitary~12.5MSS12/20/97Soyuz SL-4PlesetskKosmos 2347Russian MoDRussian TBAMilitary~18.5MSS12/20/97Soyuz SL-4BaikonurProgress M-37RKK EnergiaRKK EnergiaSupply~18.5MSS12/20/97Polta 2 7920VAFBIridiums 44-48Iridium, Inc.Lockheed MartinCommunication~47.5MSS12/20/97Polta 2 7920VAFBIridiums 44-48Iridium, Inc.Lockheed MartinCommunication~47.5MSS12/20/97Porto SL-12BaikonurAsiasat 3Asia St. Telecom. Ltd.HughesCommunication~47.5MSS12/20/97Pegasus XLVAFBOrbcomms 05-12OrbcommOSCCommunication~13MSS							0			-
11/28/97H 2TanegashimaETS 7 TRMMNASDAToshibaDevelopment Remote Sensing~191.2MSS12/2/97Ariane 44PKourouEquator-S JCSAT 5NASA/DARAMax Planck InstituteScientific Communication~82.5MS12/3/97Proton SL-12BaikonurAstra 1GSESHughesCommunication - 60MS12/8/97Atlas 2ASCCASGalaxy 8IPanAmSatHughesCommunication - 95M~95MS12/8/97Long March 2CTaiyuanIridiums 25-26Iridium, Inc.Lockheed MartinCommunication - 12/9/97~12.5MSS12/6/97Soyuz SL-4PlesetskKosmos 2347Russian MoDNPO KometaMilitary - 12.5M~12.5MSS12/20/97Soyuz SL-4BaikonurProgress M-37RKK EnergiaRKK EnergiaSupply~18.5MSS12/20/97Delta 2 7920VAFBIridiums 44-48Iridium, Inc.Lockheed MartinCommunication - 47.5M~47.5MSS12/20/97Peita 2 7920VAFBIridiums 44-48Iridium, Inc.Lockheed MartinCommunication - 47.5M~47.5MSS12/20/97Proton SL-12BaikonurIntelsat 8 F4IntelsatLockheed MartinCommunication - 47.5M~47.5MSS12/23/97Proton SL-12BaikonurAsiasat 3Asia Sat. Telecom. Ltd.HughesCommunication - 47.3M~5.5S<	11/19/97	Shuttle Columbia	KSC	STS 87	NASA	Rockwell International	Crewed	~188.3M	S	S
TRMMNASDA/NASANASA GoddardRemote Sensing12/2/97Ariane 44PKourouEquator-S LCSAT 5NASA/DARAMax Planck InstituteScientific Communication~82.5M\$\$12/3/97Proton SL-12BaikonurAstra 1GSESHughesCommunication~60M\$\$12/8/97Atlas 2ASCCASGalaxy 8IPanAmSatHughesCommunication~95M\$\$12/8/97Long March 2CTaiyuanIridiums 25-26Iridium, Inc.Lockheed MartinCommunication~17.5M\$\$12/9/97Cyclone SL-14BaikonurKosmos 2347Russian MoDNPO KometaMilitary~12.5M\$\$12/20/97Soyuz SL-4PlesetskKosmos 2348Russian MoDRussia TBAMilitary~18.5M\$\$12/20/97Soyuz SL-4BaikonurProgress M-37RKK EnergiaRKK EnergiaSupply~18.5M\$\$12/20/97Delta 2 7920VAFBIridiums 44-48Iridium, Inc.Lockheed MartinCommunication~47.5M\$\$12/20/97Proton SL-12BaikonurIntelsat 8 F4IntelsatLockheed MartinCommunication~47.5M\$\$12/23/97Proton SL-12BaikonurAsiasat 3Asia Sat. Telecom. Ltd.HughesCommunication~60M%\$12/23/97Pegasus XLVAFBOrbcomms 05-12OrbcommOSCCommunication~13M\$\$ <td></td> <td></td> <td></td> <td>Spartan 201-04</td> <td>NASA</td> <td>NASA</td> <td>Scientific</td> <td></td> <td></td> <td></td>				Spartan 201-04	NASA	NASA	Scientific			
12/2/97Ariane 44PKourouEquator-S JCSAT 5NASA/DARAMax Planck InstituteScientific Communication~82.5MS12/3/97Proton SL-12BaikonurAstra 1GSESHughesCommunication~60MSS12/8/97Atlas 2ASCCASGalaxy 8IPanAmSatHughesCommunication~95MSS12/8/97Long March 2CTaiyuanIridiums 25-26Iridium, Inc.Lockheed MartinCommunication~17.5MSS12/9/97Cyclone SL-14BaikonurKosmos 2347Russian MoDNPO KometaMilitary~12.5MSS12/16/97Soyuz SL-4PlesetskKosmos 2348Russian MoDRussia TBAMilitary~18.5MSS12/20/97Soyuz SL-4BaikonurProgress M-37RKK EnergiaRKK EnergiaSupply~18.5MSS12/20/97Delta 2 7920VAFBIridiums 44-48Iridium, Inc.Lockheed MartinCommunication~42.5MSS12/20/97Proton SL-12BaikonurProgress M-37RKK EnergiaRKK EnergiaSupply~18.5MSS12/20/97Potta 2 7920VAFBIridiums 44-48Iridium, Inc.Lockheed MartinCommunication~42.5MSS12/20/97Proton SL-12BaikonurAsiasat 3Asia Sat. Telecom. Ltd.HughesCommunication~82.5MSS12/23/97Proton SL-12BaikonurAsiasat 3	11/28/97	H 2	Tanegashima	ETS 7	NASDA	Toshiba	Development	~191.2M	S	S
JCSAT 5JASTHughesCommunication12/3/97Proton SL-12BaikonurAstra 1GSESHughesCommunication~60MSS12/8/97Atlas 2ASCCASGalaxy 8IPanAmSatHughesCommunication~95MSS12/8/97Long March 2CTaiyuanIridiums 25-26Iridium, Inc.Lockheed MartinCommunication~17.5MSS12/9/97Cyclone SL-14BaikonurKosmos 2347Russian MoDNPO KometaMilitary~12.5MSS12/16/97Soyuz SL-4PlesetskKosmos 2348Russian MoDRussia TBAMilitary~18.5MSS12/20/97Soyuz SL-4PlesetskKosmos 2348Russian MoDRussia TBAMilitary~18.5MSS12/20/97Soyuz SL-4PlesetskKosmos 2348Russian MoDRussia TBAMilitary~18.5MSS12/20/97Deita 2 7920VAFBIridiums 44-48Iridium, Inc.Lockheed MartinCommunication~47.5MSS12/20/97Proton SL-12BaikonurAsiasat 3Asia Sat. Telecom. Ltd.HughesCommunication~42.5MSS12/23/97Proton SL-12BaikonurAsiasat 3Asia Sat. Telecom. Ltd.HughesCommunication~60MFF12/23/97Pegasus XLVAFBOrbcomms 05-12OrbcommOSCCommunication~13MS				TRMM	NASDA/NASA	NASA Goddard	Remote Sensing			
12/3/97Proton SL-12BaikonurAstra 1GSESHughesCommunication~60MSS12/8/97Atlas 2ASCCASGalaxy 8IPanAmSatHughesCommunication~95MSS12/8/97Long March 2CTaiyuanIridiums 25-26Iridium, Inc.Lockheed MartinCommunication~17.5MSS12/9/97Cyclone SL-14BaikonurKosmos 2347Russian MoDNPO KometaMilitary~12.5MSS12/16/97Soyuz SL-4PlesetskKosmos 2348Russian MoDRussia TBAMilitary~18.5MSS12/20/97Soyuz SL-4BikonurProgress M-37RKK EnergiaRKK EnergiaSupply~18.5MSS12/20/97Delta 2 7920VAFBIridiums 44-48Iridium, Inc.Lockheed MartinCommunication~47.5MSS12/20/97Proton SL-12BaikonurAsiasat 3Asia Sat. Telecom. Ltd.HughesCommunication~42.5MSS12/23/97Proton SL-12BaikonurAsiasat 3Asia Sat. Telecom. Ltd.HughesCommunication~60MFF12/23/97Pegasus XLVAFBOrbcomms 05-12OrbcommOSCCommunication~13MSS	12/2/97	Ariane 44P	Kourou	Equator-S	NASA/DARA	Max Planck Institute	Scientific	~82.5M	S	S
12/3/97Proton SL-12BaikonurAstra 1GSESHughesCommunication~60MSS12/8/97Atlas 2ASCCASGalaxy 8IPanAmSatHughesCommunication~95MSS12/8/97Long March 2CTaiyuanIridiums 25-26Iridium, Inc.Lockheed MartinCommunication~17.5MSS12/9/97Cyclone SL-14BaikonurKosmos 2347Russian MoDNPO KometaMilitary~12.5MSS12/16/97Soyuz SL-4PlesetskKosmos 2348Russian MoDRussia TBAMilitary~18.5MSS12/20/97Soyuz SL-4BikonurProgress M-37RKK EnergiaRKK EnergiaSupply~18.5MSS12/20/97Delta 2 7920VAFBIridiums 44-48Iridium, Inc.Lockheed MartinCommunication~47.5MSS12/20/97Proton SL-12BaikonurAsiasat 3Asia Sat. Telecom. Ltd.HughesCommunication~42.5MSS12/23/97Proton SL-12BaikonurAsiasat 3Asia Sat. Telecom. Ltd.HughesCommunication~60MFF12/23/97Pegasus XLVAFBOrbcomms 05-12OrbcommOSCCommunication~13MSS					JAST	Huahes	Communication			
12/8/97Atlas 2ASCCASGalaxy 8IPanAmSatHughesCommunication-95MSS12/8/97Long March 2CTaiyuanIridiums 25-26Iridium, Inc.Lockheed MartinCommunication~17.5MSS12/9/97Cyclone SL-14BaikonurKosmos 2347Russian MoDNPO KometaMilitary~12.5MSS12/16/97Soyuz SL-4PlesetskKosmos 2348Russian MoDRussia TBAMilitary~18.5MSS12/20/97Soyuz SL-4BaikonurProgress M-37RKK EnergiaRKK EnergiaSupply~18.5MSS12/20/97Delta 2 7920VAFBIridiums 44-48Iridium, Inc.Lockheed MartinCommunication~47.5MSS12/20/97Proton SL-12BaikonurAsiasat 3Asia Sat. Telecom. Ltd.HughesCommunication~82.5MS12/23/97Proton SL-12BaikonurAsiasat 3Asia Sat. Telecom. Ltd.HughesCommunication~60MFF12/23/97Pegasus XLVAFBOrbcomms 05-12OrbcommOSCCommunication~13MSS	12/3/97	Proton SL-12	Baikonur	Astra 1G	SES		Communication	~60M	S	S
12/8/97Long March 2CTaiyuanIridiums 25-26Iridium, Inc.Lockheed MartinCommunication~17.5MSS12/9/97Cyclone SL-14BaikonurKosmos 2347Russian MoDNPO KometaMilitary~12.5MSS12/16/97Soyuz SL-4PlesetskKosmos 2348Russian MoDRussia TBAMilitary~18.5MSS12/20/97Soyuz SL-4BaikonurProgress M-37RKK EnergiaRKK EnergiaSupply~18.5MSS12/20/97Delta 2 7920VAFBIridiums 44-48Iridium, Inc.Lockheed MartinCommunication~47.5MSS12/21/97Ariane 44PKourouIntelsat 8 F4IntelsatLockheed MartinCommunication~82.5MSS12/23/97Proton SL-12BaikonurAsiasat 3Asia Sat. Telecom. Ltd.HughesCommunication~60MFF12/23/97Pegasus XLVAFBOrbcomms 05-12OrbcommOSCCommunication~13MSS						-				
12/9/97Cyclone SL-14BaikonurKosmos 2347Russian MoDNPO KometaMilitary~12.5MS12/16/97Soyuz SL-4PlesetskKosmos 2348Russian MoDRussia TBAMilitary~18.5MS12/20/97Soyuz SL-4BaikonurProgress M-37RKK EnergiaRKK EnergiaSupply~18.5MSS12/20/97Delta 2 7920VAFBIridiums 44-48Iridium, Inc.Lockheed MartinCommunication~47.5MSS12/21/97Ariane 44PKourouIntelsat 8 F4IntelsatLockheed MartinCommunication~82.5MSS12/23/97Proton SL-12BaikonurAsiasat 3Asia Sat. Telecom. Ltd.HughesCommunication~60MFF12/23/97Pegasus XLVAFBOrbcomms 05-12OrbcommOSCCommunication~13MSS										-
12/16/97Soyuz SL-4PlesetskKosmos 2348Russian MoDRussia TBAMilitary~18.5MSS12/20/97Soyuz SL-4BaikonurProgress M-37RKK EnergiaRKK EnergiaSupply~18.5MSS12/20/97Delta 2 7920VAFBIridiums 44-48Iridium, Inc.Lockheed MartinCommunication~47.5MSS12/21/97Ariane 44PKourouIntelsat 8 F4IntelsatLockheed MartinCommunication~82.5MSS12/23/97Proton SL-12BaikonurAsiasat 3Asia Sat. Telecom. Ltd.HughesCommunication~60MFF12/23/97Pegasus XLVAFBOrbcomms 05-12OrbcommOSCCommunication~13MSS					, -					
12/20/97Soyuz SL-4BaikonurProgress M-37RKK EnergiaRKK EnergiaSupply~18.5MSS12/20/97Delta 2 7920VAFBIridiums 44-48Iridium, Inc.Lockheed MartinCommunication~47.5MSS12/21/97Ariane 44PKourouIntelsat 8 F4IntelsatLockheed MartinCommunication~82.5MSS12/23/97Proton SL-12BaikonurAsiasat 3Asia Sat. Telecom. Ltd.HughesCommunication~60MFF12/23/97Pegasus XLVAFBOrbcomms 05-12OrbcommOSCCommunication~13MSS										
12/20/97Delta 2 7920VAFBIridiums 44-48Iridium, Inc.Lockheed MartinCommunication~47.5MS12/21/97Ariane 44PKourouIntelsat 8 F4IntelsatLockheed MartinCommunication~82.5MS12/23/97Proton SL-12BaikonurAsiasat 3Asia Sat. Telecom. Ltd.HughesCommunication~60MFF12/23/97Pegasus XLVAFBOrbcomms 05-12OrbcommOSCCommunication~13MS										
12/21/97Ariane 44PKourouIntelsat 8 F4IntelsatLockheed MartinCommunication~82.5MS12/23/97Proton SL-12BaikonurAsiasat 3Asia Sat. Telecom. Ltd.HughesCommunication~60MFF12/23/97Pegasus XLVAFBOrbcomms 05-12OrbcommOSCCommunication~13MSS										-
12/23/97Proton SL-12BaikonurAsiasat 3Asia Sat. Telecom. Ltd.HughesCommunication~60MFF12/23/97Pegasus XLVAFBOrbcomms 05-12OrbcommOSCCommunication~13MSS										
12/23/97 Pegasus XL VAFB Orbcomms 05-12 Orbcomm OSC Communication ~13M S S										
										-
12/24/97 START 1 Svobodny Earlybird 1 Earthwatch, Inc. CTA (now OSC) Remote Sensing ~7.5M S TBA									-	-
	12/24/97	START 1	Svobodny	Earlybird 1	Earthwatch, Inc.	CTA (now OSC)	Remote Sensing	~7.5M	S	TBA

= Commercial Launch Event