

## Commercial Space Transportation

# QUARTERLY LAUNCH REPORT

Featuring the launch results from the previous quarter and forecasts for the next two quarters.



### 4th Quarter 1996

United States Department of Transportation • Federal Aviation Administration

Associate Administrator for Commercial Space Transportation

## 4TH QUARTER REPORT

### Objectives

*This report summarizes recent and scheduled worldwide commercial, civil, and military orbital space launch events. Scheduled launches listed in this report are vehicle/payload combinations that have been identified in open sources, including industry references, company manifests, periodicals, and government documents. Note that such dates are subject to change.*

*This report highlights commercial launch activities, classifying commercial launches as one or more of the following:*

- *Internationally competed launch events (i.e., launch opportunities considered available in principle to competitors in the international launch services market),*
- *Any launches licensed by the Office of the Associate Administrator for Commercial Space Transportation of the Federal Aviation Administration under U.S. Code Title 49, Section 701, Subsection 9 (previously known as the Commercial Space Launch Act), and*
- *Certain European launches of post, telegraph and telecommunications payloads on Ariane vehicles.*

**Photo credit:** International Launch Services (1996). Image is of the Atlas 2A launch on September 8, 1996, from Cape Canaveral Air Station. It successfully orbited the GE-1 communications satellite for GE Americom.

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**SUMMARY**

**Third  
Quarter 1996  
Launch Events**

- Eight United States launches included two Atlas, two Delta, two Pegasus and one each of the heavy-lifting Titan and Shuttle. Of these, two were commercial and all were successful.
- The Russian Republic/CIS launched its second ever commercial Proton SL-12, as well as a domestic Proton, two Soyuz SL-4s, two Molniya SL-6s, one Cosmos SL-8, and a Ukrainian-built Zenit SL-16. All eight of these launches were successful.
- Europe launched five geosynchronous satellites in three problem-free launches of the Ariane 4. Two of these launches were commercial.
- Japan successfully launched its H-2 launch vehicle with two satellites on board.
- China's Long March series was launched twice but only succeed once with its second launch failing to reach a geosynchronous orbit.

**Fourth Quarter 1996  
& First Quarter 1997  
Scheduled Launch Events**

- 
- Twenty-three launches are planned from United States launch ranges; of these, 12 are commercial. Two Atlas and six Delta launches are planned, along with two launches of the Lockheed Martin Launch Vehicle (LMLV-1), one launch of the OSC Taurus, with additional launches to be made by the Pegasus, Titan, and Shuttle.
  - The Russian Republic/CIS plans 15 launches, three of which will be commercial. Two of these commercial launches will be on the Proton vehicle and the other is slated for the Cosmos.
  - Five commercial Ariane 4 launches are planned for the upcoming two quarters.
  - Japan will launch a scientific payload on its M-5 launcher.
  - Brazil will launch its first VLS launch vehicle carrying the SCD 3 satellite.
  - China projects four launches, two of which are commercial.

SUMMARY

Commercial Products and Services

Fourth Quarter 1996 and First Quarter 1997

The Lewis and Clark remote sensing satellites produced under NASA’s Small Spacecraft Technology Initiative by TRW and CTA Space Systems respectively are advanced technology remote sensing demonstrators. In addition to their remote sensing mission they will demonstrate other advanced spacecraft technologies, open non-aerospace commercial markets for those technologies, and supply data for educational programs through chosen high schools and universities. Both satellites will be launched by the Lockheed Martin Launch Vehicle.

Lewis

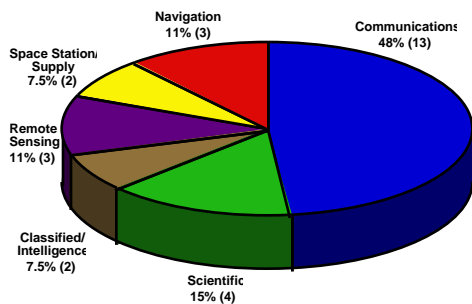
The Lewis satellite, built by TRW, will introduce the first “hyper-spectral” imaging system. It will have a sensor that reads 384 different spectral bands and can edit clouds. These sensing capabilities will allow for fine distinctions in the objects being observed with a wide range of possible applications, from forestry to disaster management. The Lewis spacecraft cost \$59 million to build and launch.

Clark

CTA’s Clark will carry 36 advanced technologies ranging from advanced power generation systems and thermal control, to new attitude determination and control technologies, to new instrument applications. The satellite also includes a very high resolution optical sensor capable of stereo imaging and cloud editing capability. Uses could include urban planing, public utility cable or pipeline management. The Clark satellite cost \$49 million to build and launch.

Payload Use Analysis

Third Quarter 1996



For the period of July through September, the third quarter of 1996, the types of payloads launched were communications (48%), scientific (15%), intelligence/classified (7.5%), remote sensing (11%), navigation (11%), and space station supply (7.5%).

All of the commercial payloads in the third quarter were related to communications.

**LAUNCH SCHEDULE**

**Scheduled Launch Events**

<b>Vehicle</b>	<b>Payload</b>	<b>Site</b>
<b>OCTOBER 1996</b>		
Pegasus XL	SAC-B HETE	Wallops Flight
Shtil 2	Kompass	TBA
<b>NOVEMBER 1996</b>		
Ariane 44LP	Arabsat 2B Measat 2	Kourou
Atlas 2A	Hot Bird 2	CCAS
Delta 2 7925	Iridium (3)	VAFB
Delta 2 7925	Mars Global Surveyor 1	CCAS
Proton SL-12	Mars 96	Tyuratam
Shuttle Columbia	STS-80 ORFEUS SPAS 2	KSC
Soyuz SL-4	Bion 11	Plesetsk
Soyuz SL-4	Progress M-33	Tyuratam
TBA	Kosmos 96-11	TBA
<b>DECEMBER 1996</b>		
Ariane 4	PAS 6	Kourou
Atlas 2	Inmarsat 3 F3	CCAS
Cosmos SL-8	Earlybird 1	Plesetsk
Delta 2 7925	Mars Pathfinder	CCAS
Pegasus XL	Minisat 01	Spain
Proton SL-12	Tempo 2	Tyuratam
Titan 4	Classified	VAFB
TBA	Kosmos 96-12	TBA

**LAUNCH SCHEDULE**

**Scheduled Launch Events**

Continued

<b>Vehicle</b>	<b>Payload</b>	<b>Site</b>
<b>JANUARY 1997</b>		
Ariane 4	GE-2 Nahuel 1A	Kourou
Atlas 2AS	JCSat 4	CCAS
Delta 2 7925	Iridium (5)	VAFB
LMLV 1	Clark	VAFB
Long March 3	FY 2-B	Xichang
Long March 3B	APStar 2R	Xichang
M-5	Muses B	Kagoshima
Pegasus XL	SWAS	VAFB
Proton SL-12	Iridium (7)	Tyuratam
Shuttle Atlantis	STS 81	KSC
Soyuz SL-4	Progress M-34	Tyuratam
Titan 4/Centaur	DSP 19	CCAS
VLS	SCD 3	Alcantara
TBA	Kosmos 97-01	TBA
<b>FEBRUARY 1997</b>		
Ariane 4	Indostar-1	Kourou
Delta 2	Thor 2A	CCAS
LMLV 1	Lewis	VAFB
Long March 3B	Mabuhay	Xichang
Shuttle Discovery	STS 82	KSC
Taurus 1	Geosat Follow-On 1	VAFB
TBA	Kosmos 97-02	TBA
<b>MARCH 1997</b>		
Ariane 4	Hot Bird 3	Kourou
Pegasus XL	FORTE	TBA
Pegasus XL	Seastar	VAFB
Shuttle Columbia	STS 83	KSC
Soyuz SL-4	Progress M-35	Tyuratam
Soyuz SL-4	Soyuz TM-25	Tyuratam
TBA	Kosmos 97-03	TBA

**LAUNCH SCHEDULE**

**For the Fourth Quarter of 1996  
and the First Quarter 1997**

**Additional Launch Events  
to be Announced<sup>†</sup>**

<b>Vehicle</b>	<b>Payload</b>	<b>Site</b>
<b>FOURTH QUARTER OF 1996</b>		
Texus*	RE	Esrangle
Long March 3A	DFH 3-2	Xichang
<b>FIRST QUARTER OF 1997</b>		
Delta 2 7925	Navstar GPS 2R-1	CCAS

<sup>†</sup> This section summarizes launches and payloads that are expected to occur during the next two quarters. Exact launch dates were not available prior to publication of this report

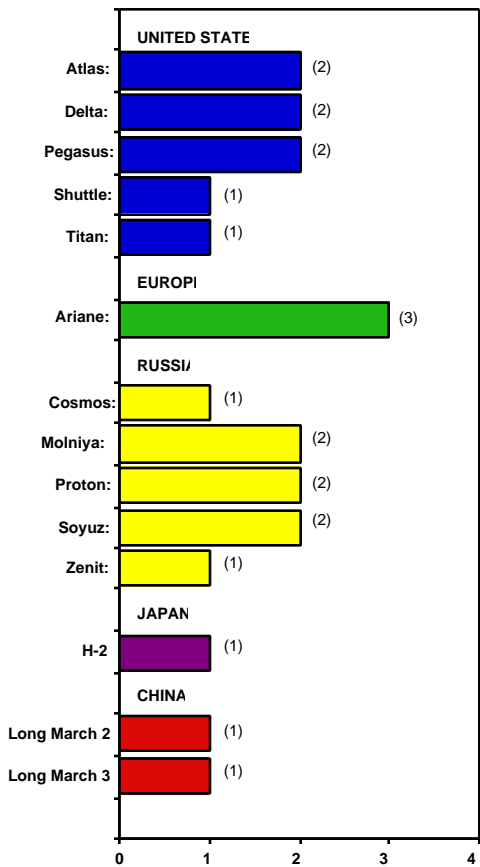
\* Denotes a suborbital launch



# LAUNCH REPORT

## Launch Events

Third Quarter  
1996



Number of Launches  
July - September 1996

Five countries conducted launches in the third quarter. Of these, the United States and the Russian Republic/CIS were tied in launch activity with eight launches each. Commercial launches numbered two and one respectively.

The United States launched one classified military payload on a Titan 4, two Navstar GPS satellites, and a commercially-launched military communications satellite (UFO-7), as well as two small science missions (TOMS and FAST). In addition, it launched GE-1, a civil communications satellite, and conducted a fourth Mir docking mission to replace a U.S. astronaut and to conduct re-supply operations.

The Russian Republic/CIS launched a navigation payload and a signals intelligence satellite, both under the Kosmos designation (2334 and 2333). Two space station-related missions were conducted with the Progress M-32 re-supply and TM-24 crewed flights. Russia/CIS also carried out three communications satellite launches of a domestic Molniya 1T, an Ekspress, and the commercial Inmarsat 3 F2. Russia also launched two scientific satellites, Magion 5 and Prognoz Interbal-A. Two Latin American satellites, the Argentine Mu-Sat and the Mexican Unamsat B, piggy-backed their way to orbit on Russian launches.

Europe made three successful launch attempts that put three commercial and two non-commercial communication satellites into orbit. Arabsat 2A and Turksat 1C were launched commercially on an Ariane 44L. Echostar 2 was launched on the Ariane 42P (also a commercial launch). Italsat 2 and Telecom 2D were non-commercial satellites launched together on an Ariane 44L.

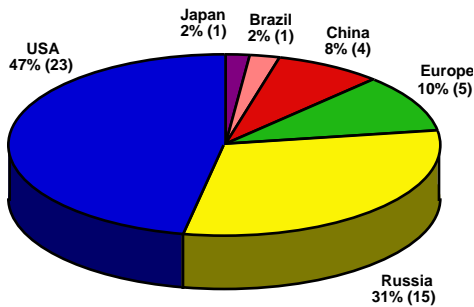
China had the only launch failure last quarter. This failure occurred when Chinasat 7 was stranded in a low orbit by the premature engine cut off of its Long March 3 launch vehicle. China did successfully launch the commercial APStar 1A on a Long March 2E the previous month.

Japan conducted one launch, successfully deploying the ADEOS 1 earth observation satellite and the small JAS-2 amateur radio satellite on its H-2's fourth flight.

**LAUNCH REPORT**

**Scheduled Launch Events**

Fourth Quarter 1996  
and First Quarter 1997



Scheduled Launch Events, by Region  
October 1996 - March 1997

(includes small launch vehicles,  
excludes sub-orbital launch events)

In the next six months, 49 orbital launches are planned internationally. Of these launches, close to half (23) will be US launches. The Russian Republic/CIS will make 15 launches, Europe five, China four, and Japan one. Brazil will join the space club with the first launch of its VLS launch vehicle.

The United States will conduct four remote sensing, two scientific, and six communications launches (the latter include the initial two Iridium launches). The United States will also launch an experimental satellite, a Navstar GPS satellite, and three intelligence/classified satellites. Four space shuttle missions are planned for a variety of purposes. In addition, two robotic probes will be sent to Mars.

The Russian Republic/CIS will have 15 launches of which one is a communications payload launch (the first Proton Iridium launch) and one is a remote sensing payload (EarthWatch's Earlybird-1). Two payloads will be of a general scientific nature and a third will go to Mars. Four missions will be flown to support the Mir space station: one crewed Soyuz TM-25 and three Progress cargo missions. The purpose of the five predicted Kosmos launches is currently unknown.

Japan will launch a scientific payload on the first launch of its M-5 vehicle.

Europe will launch five Ariane 4s with eight communications satellites as payloads.

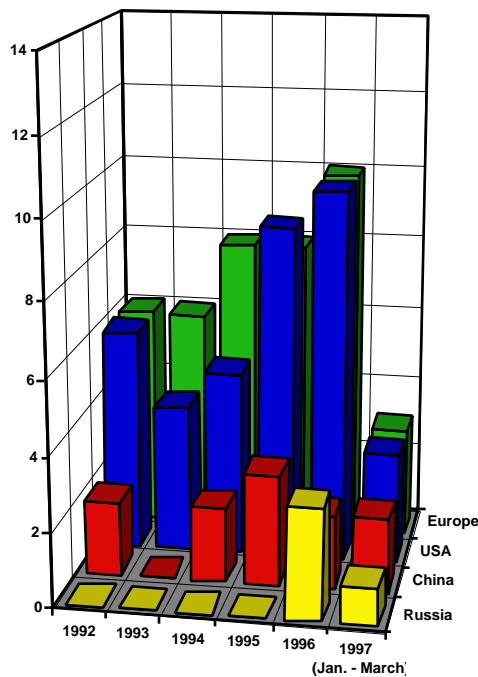
China will launch both a Chinese-built communications satellite and a Chinese-built weather satellite, plus two commercial communications satellites.

Brazil will launch its SCD satellite on its first VLS launch vehicle as the first in a series of four test launches of this new Brazilian launch vehicle.

**LAUNCH REPORT**

**Scheduled Commercial Launch Events**

Fourth Quarter 1996 and First Quarter 1997



Commercial Launch Events  
January 1992 - March 1997  
(Small Vehicles Excluded)

Of the 49 projected launches (which includes small vehicles) in the next two quarters, 22 are commercial and of these 12 will be launched by the United States. Atlas and Delta launch vehicles are slated for three commercial launches each in the next two quarters, all communications satellites. Included in these are the first two launches of Iridium satellites. Orbital Sciences Corporation's Pegasus will also make three commercial launches orbiting four satellites: two scientific, one experimental, and one remote sensing. OSC will make the second launch of its Taurus launch vehicle carrying the Geosat Follow-on. Lockheed Martin's LMLV-1 will return to flight with the launches of NASA's Small Satellite Technology Initiative Lewis and Clark satellites.

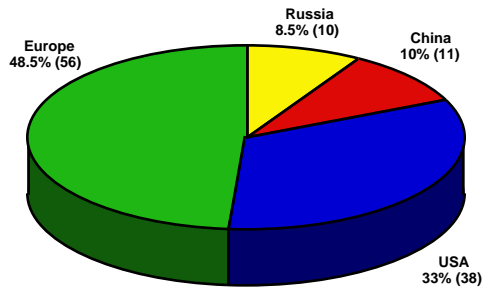
Arianespace will conduct five commercial Ariane 4 launches, putting eight geosynchronous communications satellites in orbit.

The Russian Republic/CIS will launch three commercial payloads. Two of these payloads will be communications satellites carried by Proton launch vehicles and the third will be the Earlybird-1 remote sensing satellite on a Cosmos launch vehicle.

China is planning two commercial launches. The first launch will carry the APStar 2R, replacing APStar 2 which was lost when its Long March 2E failed in January 1995. The other launch will carry the Philippines' first communications satellite, Mabuhay-1. This limited manifest reflects the results of three failures in six attempts over two years. After these two launches, there are no more commercial geosynchronous missions planned on the Long March at this time.

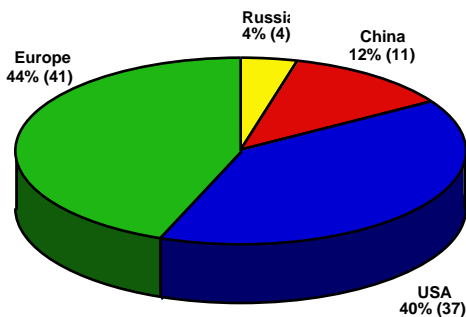
LAUNCH REPORT

Commercial Launch Trends



Commercially Launched Payloads Market Trend  
January 1992 - March 1997

(Small Vehicles Excluded)



Commercial Launch Market Trend  
January 1992 - March 1997

(Small Vehicles Excluded)

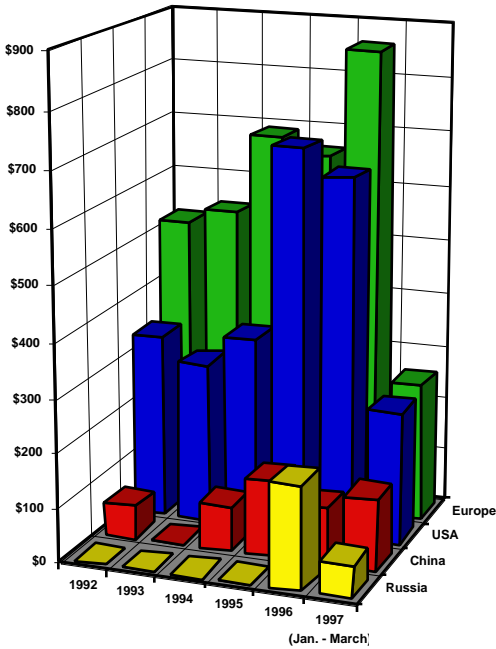
Over the period of January 1992 through March 1997 the United States has captured 40 percent of the world's commercial launches (excluding small vehicles). Figured in terms of payloads, the United States launched 33 percent of all payloads carried on commercial launches in this period. Arianespace conducted another 44 percent of commercial launches and launched 48.5 percent of all commercially launched payloads. The remaining 16 percent of launches and 18.5 percent of payloads is divided between the Russian Republic/CIS and China.

Over the nine month period covered by this report (and excluding small vehicle launch events), the United States has a 38 percent share of commercial launches and 39 percent of payloads commercially launched. Arianespace drops to a 33 percent share of commercial launches, losing its lead to the United States. In terms of commercially launched payloads, Arianespace holds a 28 percent share.

The launch of 15 Iridium satellites to LEO during this period affects the payload percentages considerably. This is because all 15 satellites are being sent into orbit over the course of three launch events. The first eight satellites will be launched on two Delta vehicles, Iridium 1 through Iridium 3 will go up in November and Iridium 4 through Iridium 8 will be launched in January. Iridium 16 through Iridium 22 are scheduled for launch on a commercial Proton SL-12 launch in January. Ignoring these Iridium launches, Arianespace would have a 48 percent share of commercially launched payloads while the United States would hold only 29 percent.

**LAUNCH REPORT**

**Commercial Launch Revenues**



Commercial Launch Revenues by Region (in US \$ Millions)\*  
January 1992 - March 1997

\* Approximate revenues based on actual price quotes and historical price averages. Figures shown in constant 1994 dollars. Includes small vehicles.

The next two quarter's commercial launch revenues are expected to amount to \$1,177 million. Of this Europe will receive \$428 million or 36 percent. On the other hand the United States has a 39 percent share of these launch revenues with \$455 million.

It is worth noting, however, that the United States will make 12 commercial launches of all sizes in this period as opposed to the five planned by Arianespace. As a result, United States commercial launch providers are increasing their share of the world's commercial launch revenues.

As for 1996, the United States and Europe are projected to finish the year with \$659 million and \$860 million respectively (or 36 percent and 47 percent of the world's total commercial launch revenues respectively). The Russian Republic/CIS is projected to complete its first commercial launch year with ten percent (or \$190 million) of the world's total commercial launch revenues. China will finish with \$102 million, or six percent (down three percent from last year).

## Trends in Space Launch Services: Globalization and Commercial Development

Launch service providers are leading the globalization of the space industry by forming international partnerships. The end of the Cold War has created an environment that favors cooperation between manufacturers of high technology launch systems, with less emphasis on national security concerns. As a result, an international marketplace in launch vehicle manufacturing has emerged in which manufacturers can coordinate and consolidate their technologies.

These companies offer a variety of launch vehicles from multiple countries and manufacturers, and can launch them from multiple launch sites. Launch customers now have the opportunity to choose from a wider assortment of launch vehicles and can benefit from the lower costs provided by a highly competitive market (see graph of the Global Commercial Launch Trend on page SR-3). The major players in the launch industry are diversifying to provide launch services across the full range of the market, from light weight

The most visible entrants in the global commercial launch market are a series of partnerships between western companies and the space enterprises in the former Soviet Union.

### International Launch Services (ILS)

A partnership between Lockheed Martin of the United States and Khrunichev and Energia of Russia, ILS offers customers the choice of the Atlas or the Proton launch vehicle for geosynchronous payloads. This arrangement allows customers to take advantage of greater flexibility in scheduling as well as cost benefits from consolidation of services.

### Starsem

A partnership between Arianespace and Aerospatiale of France, and the Russian Space Agency (RKA) and the Samara Space Center of Russia, Starsem will offer commercial launches on Russia's Soyuz launch vehicle. With Soyuz's ability to launch intermediate weight payloads to low earth

Launch Partnership	Companies Involved in Partnership	Launch Vehicle(s)	Payload Class
International Launch Services	Lockheed Martin Khrunichev Energia	Proton Atlas	Heavy Medium
Starsem	Arianespace Aerospatiale Russian Space Agency Samara Space Center	Soyuz	Medium
Sea Launch	Boeing Kvaerner Yuzhnoye	Zenit	Heavy

#### Major International Launch Partnerships

LEO payloads to heavy geosynchronous satellites.

orbit, Starsem complements Ariane 5's heavy lift capability and allows Arianespace to compete across a wide range of launch services.

# Special Report

SR-2

## Sea Launch

Sea Launch represents an innovative partnership between Boeing of the United States, the ship-building company Kvaerner of Norway, and Yuzhnoye of Ukraine. Launching the Ukrainian Zenit from an ocean platform, Sea Launch provides a unique option for customers seeking to place their payloads in geosynchronous orbit. The ability of Sea Launch to launch from near the equator increases the maximum payload mass that Zenit can place in orbit.

ILS, Starsem, and Sea Launch also offer services on existing launch vehicles.

## Other Launch Partnerships

In addition to the three partnerships described above, the manufacturers of the Cosmos, Cyclone, and Rokot launch vehicles all have international partners to market their vehicles. The Surf venture, using a converted submarine ballistic missile system, also involves a U.S.-Russian partnership.

International partnerships are also being formed to take advantage of proven launch vehicle components. For example, Pratt and Whitney and Aerojet both have agreements to market Russian propulsion technology. The selection of the Russian RD-180 engine for the new Atlas 2AR and potentially for Lockheed Martin's Evolved Expendable Launch Vehicle (EELV) demonstrates how manufacturers can take advantage of foreign technologies now available in the international market. There are also several proposals to use Ariane 5 components for the EELV program.

Kistler Aerospace Corporation plans to use Russian designed NK-33 engines on its K-1 two-stage reusable launch vehicle and is

seeking an FAA license for a series of test flights.

Domestically, Lockheed Martin is developing the Atlas 2AR on a commercial basis, with company funding. In addition, Lockheed Martin recently won the NASA competition for the X-33, a technology pathfinder for the next generation reusable launch vehicle. The company contributed approximately one fourth of the early development costs for the X-33, and is expected to fully fund development of the orbital vehicle if the demonstrator is successful.

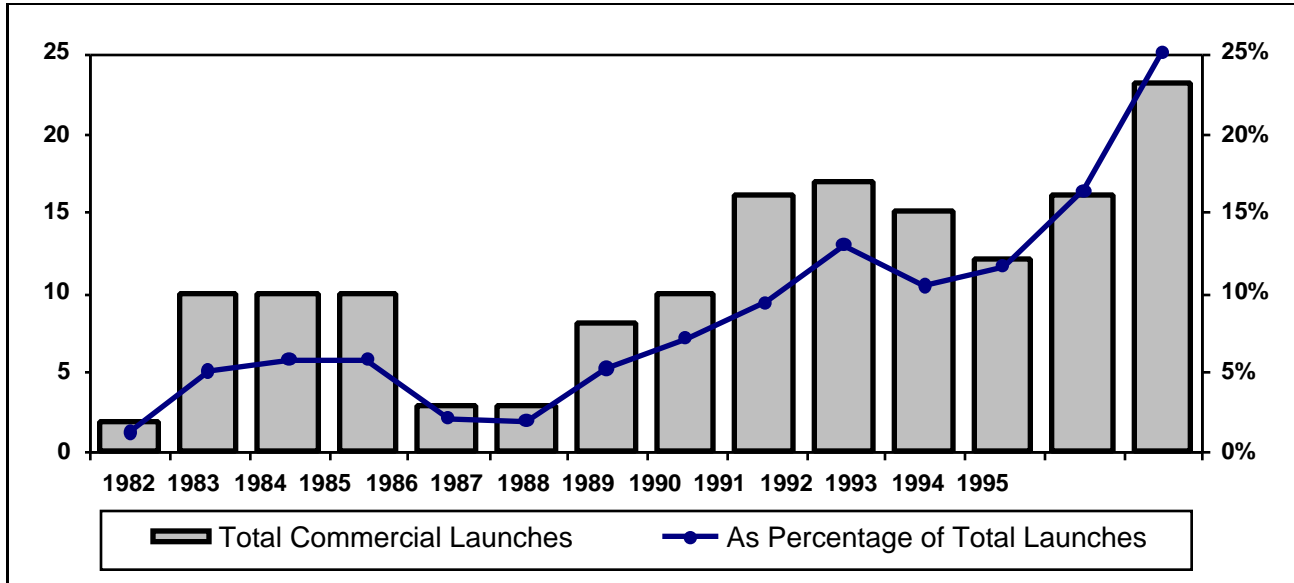
## Global Satellite Partnerships

The trend toward manufacturers forming consolidated service companies is not limited to the launcher market. Satellite manufacturers are also involved in the emergence of new international satellite communications services. Hughes has announced it will acquire PanAmSat and has shown interest in acquiring Nethold, a satellite television service provider based in the Netherlands. Such measures would allow Hughes to consolidate its television broadcast services into a global network.

Similarly, equity stake holders in Iridium include a wide variety of companies involved in satellite manufacturing as well as in communications services. The result is a consolidated commercial company that is service-oriented and can take advantage of opportunities in the international telecommunications market.

If Hughes' plan for the broadcast television market is carried out, it will become the single largest private satellite communications system provider, second only to the government-sponsored Intelsat organization in terms of overall system size.

# Special Report



Global Commercial Launch Trend, 1982 - 1995



## GLOSSARY

For proper interpretation of the data in this report, the following definitions should be understood:

**Commercial Launch Events:** A commercial launch event is an internationally competed launch event, as defined below, and/or any launch licensed by the Department of Transportation/Office of Commercial Space Transportation (DoT/OCST), under the Commercial Space Launch Act (CSLA), or certain Post, Telegraph and Telecommunications launches.

**Commercial Launch Revenue:** Commercial launch revenues are generated from launch services provided by private and government licensed entities. It is understood that commercial launch providers of different countries operate within different economic, policy, and procedural contexts which affect the respective prices for a launch contract, however, this report does not attempt to adjust its data for these factors.

**Geosynchronous Orbit (GEO):** An orbit approximately 22,300 miles above the equator in which a payload completes one orbit around the Earth every 24 hours.

**Geosynchronous Transfer Orbit (GTO):** A temporary orbit used to later place payloads in a geosynchronous orbit.

**Internationally-Competed Launch Events:** An internationally competed launch event results from a launch opportunity which is available in principle to competitors in the international launch services market.

**Low Earth Orbit (LEO):** An orbit range on the order of 100-1000 nautical miles.

**Market Share:** That segment of a commercial market which is captured by a specified entity.

**Microgravity:** An environment in which gravitational forces are essentially nonexistent. Microgravity is used for materials processing, life-sciences, and other experiments. Suborbital flights generally are conducted to expose experimental payloads to a brief microgravity environment. Microgravity is also utilized for orbiting payloads.

**Orbital Insertion:** The point of a launch event at which a payload has attained planned orbital velocity and finally separates from its launch vehicle.

**Payload:** Cargo to be jettisoned or released which may include attached kick motors.

**Payload Mass Class:** Payloads are categorized in the following mass classes:

Microsat	0 - 200 lbs	Small	201 - 2,000 lbs
Medium	2,001 - 5,000 lbs	Intermediate	5,001 - 10,000 lbs
Large	10,001 - 20,000 lbs	Heavy	over 20,000 lbs

**Scheduled Launch Events:** Future launch events associated with specific dates as reported in open sources.

**Secondary Payload:** A payload of lesser dimensions and weight than the primary payload(s). These payloads are launched along with primary payload(s) due to excess launch capacity.

**Suborbital:** A term used to describe a launch event or payload that does not achieve a full earth orbit.

## ACRONYMS

ADEOS	Advanced Earth Observing Satellite	LMLV	Lockheed Martin Launch Vehicle
APT	Asia Pacific Telecommunications	Measat	Malaysian East Asia Satellite
ASCO	Arab Satellite Communications Organization	MEO	Middle Earth Orbit
BSAT	Broadcast Satellite System Corp. Satellite	MoD	Ministry of Defense
CAST	Chinese Academy of Space Technology	MSAT	Mobile Satellite Communications System
CCAS	Cape Canaveral Air Station	MSTI	Miniature Sensor Technology Integration
CIS	Commonwealth of Independent States	NASA	National Aeronautics and Space Administration
DASA	Deutsche Aerospace	NASDA	National Space Development Agency (Japan)
DFH	Dong Fang Hong	NIVR	Netherlands Agency for Aerospace Programs
DGA	Delegation Generale pour l'Armement	nMI	Nautical Mile
DMSP	Defense Meteorological Satellite Program	NOAA	National Oceanic and Atmospheric Administration
DoD	Department of Defense	NPO	Scientific Production Organization
DoT	Department of Transportation	OBS	Observation Technology Experiment Equipment
DSP	Defense Support Program	OCST	Office of Commercial Space Transportation
ELI	Elliptical	ORFEUS-SPAS	Orbiting and Retrievable Far and Extreme UV Spectrometer Space Pallet Satellite
ELINTS	Electronic intelligence satellites	OSC	Orbital Sciences Corporation
ELV	Expendable Launch Vehicle	PAS	Pan American Satellite
ESA	European Space Agency	PSLV	Polar Satellite Launch Vehicle
EXT	Extra-Orbital	PTT	Post, Telegraph and Telecommunications
FAA	Federal Aviation Administration	SAC	Satellite de Aplicaciones Cientificas
FAST	Fast Auroral Snapshot Explorer	SCD	Satellite de Coleta de Dados
Faisat	Final Analysis, Inc. Satellite	SES	Societe Europeene des Satellites
FORTE	Fast On-orbit Recording of Transient Events	SSTI	Small Spacecraft Technology Initiative
FY	Feng Yun	STS	Space Transportation System
GE	General Electric	SWAS	Submillimeter Wave Astronomy Satellite
GEO	Geosynchronous Orbit	TMI	Telesat Mobile, Inc.
GTO	Geosynchronous Transfer Orbit	TOMS	Total Ozone Mapping Spectrometer
HETE	High Energy Transient Experiment	TR	Test Rocket
IKI	Space Research Institute	UFO	Ultra-high Frequency Follow-On
INMARSAT	International Maritime Satellite Organization	UNAM	Autonomous University of Mexico
INTELSAT	International Telecommunications Satellite Organization	VAFB	Vandenberg Air Force Base
IRS	Indian Remote Sensing	VLS	Veiculo Lancador de Satellites
ISRO	Indian Space Research Organization	XA	Experimental Advanced
JAS	Japanese Amateur Satellite	XL	Extra Long
JPL	Jet Propulsion Laboratory		
KSC	Kennedy Space Center		
LEO	Low Earth Orbit		

## Chartacteristics of Cited payloads

Vehicle Designation	(Success + Partial) / Attempts	LEO 28 Degrees		GTO		GEO		Suborbital		Price per Launch (Approximate)	Launch Sites
<b>Heavy</b>											
Long March 3B	0/1 0%	29900 lbs	13600 kg	9900 lbs	4500 kg	4950 lbs	2250 kg	N/A	N/A	\$60-70M	Xichang
Proton SL-12	188/209 89%	46297 lbs	21000 kg	12100 lbs	5500 kg	4850 lbs	2200 kg	N/A	N/A	\$50-70M	Tyuratam
Shuttle Atlantis	16/16 100%	47300 lbs	21455 kg	13007 lbs	5900 kg	5202 lbs	2360 kg	N/A	N/A	\$161-215M	KSC
Shuttle Columbia	20/20 100%	47300 lbs	21455 kg	13007 lbs	5900 kg	5202 lbs	2360 kg	N/A	N/A	\$161-215M	KSC
Shuttle Discovery	22/22 100%	47300 lbs	21455 kg	13007 lbs	5900 kg	5202 lbs	2360 kg	N/A	N/A	\$161-215M	KSC
Titan 4	9/10 90%	39100 lbs	17736 kg	14000 lbs	6350 kg	N/A	N/A	N/A	N/A	\$160-180M	CCAS, VAFB
Titan 4/Centaur	7/7 100%	39100 lbs	17736 kg	14000 lbs	6350 kg	10200 lbs	4627 kg	N/A	N/A	\$240-270M	CCAS
Zenit 2 SL-16	23/27 85%	30300 lbs	13740 kg	N/A	N/A	N/A	N/A	N/A	N/A	\$25-40M	Tyuratam
<b>Intermediate</b>											
Ariane 42P	9/10 90%	13400 lbs	6100 kg	6260 lbs	2840 kg	N/A	N/A	N/A	N/A	\$60-75M	Kourou
Ariane 44L	20/21 95%	21100 lbs	9600 kg	9965 lbs	4520 kg	N/A	N/A	N/A	N/A	\$90-110M	Kourou
Ariane 44LP	14/15 93%	18300 lbs	8300 kg	8950 lbs	4060 kg	N/A	N/A	N/A	N/A	\$80-95M	Kourou
Atlas 2	9/9 100%	14500 lbs	6580 kg	6200 lbs	2810 kg	3086 lbs	1400 kg	N/A	N/A	\$60-70M	CCAS
Atlas 2A	8/8 100%	16050 lbs	7280 kg	6700 lbs	3039 kg	3306 lbs	1500 kg	N/A	N/A	\$65-80M	CCAS
Atlas 2AS	7/7 100%	19050 lbs	8640 kg	7950 lbs	3606 kg	4604 lbs	2090 kg	N/A	N/A	\$90-100M	CCAS, VAFB
H 2	4/4 100%	23000 lbs	10500 kg	8800 lbs	4000 kg	4800 lbs	2200 kg	N/A	N/A	\$181-200M	Tanegashima
Long March 2E	6/8 75%	19400 lbs	8800 kg	7430 lbs	3370 kg	3300 lbs	1500 kg	N/A	N/A	\$40-50M	Xichang
Long March 3A	2/2 100%	15800 lbs	7200 kg	5500 lbs	2500 kg	2700 lbs	1230 kg	N/A	N/A	\$35-45M	Xichang
Soyuz SL-4	930/937 99%	15400 lbs	7000 kg	N/A	N/A	N/A	N/A	N/A	N/A	\$12-25M	Plesetsk, Tyuratam
<b>Medium</b>											
Delta 2 7925	32/32 100%	11220 lbs	5089 kg	4060 lbs	1840 kg	2000 lbs	907 kg	N/A	N/A	\$45-50M	CCAS, VAFB
Long March 3	9/10 90%	11023 lbs	5000 kg	3100 lbs	1400 kg	1600 lbs	730 kg	N/A	N/A	\$35-40M	Xichang
<b>Small</b>											
Cosmos SL-8	405/409 99%	3100 lbs	1400 kg	N/A	N/A	N/A	N/A	N/A	N/A	\$10-10M	Kapustin Yar, Plesetsk, Tyuratam
LMLV 1	0/1 0%	1755 lbs	800 kg	N/A	N/A	N/A	N/A	N/A	N/A	\$14-16M	CCAS, VAFB
M 5		400 lbs	1800 kg	2680 lbs	1215 kg	1080 lbs	490 kg	N/A	N/A	\$41-46M	Kagoshima
MSLS A	1/1 100%	300 lbs	136 kg	N/A	N/A	N/A	N/A	N/A	N/A	\$5-8M	VAFB
Molniya SL-6	288/303 95%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	\$12-25M	Plesetsk, Tyuratam VAFB, Wallops
Pegasus XL	3/5 60%	943 lbs	428 kg	322 lbs	146 kg	181 lbs	82 kg	N/A	N/A	\$12-14M	Island
Shtil 2		1213 lbs	550 kg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Taurus 1	1/1 100%	3100 lbs	1400 kg	990 lbs	450 kg	N/A	N/A	N/A	N/A	\$17-25M	VAFB

## Chartacteristics of Cited payloads

Vehicle Designation	(Success + Partial) / Attempts	LEO 28 Degrees		GTO		GEO		Suborbital		Price per Launch (Approximate)	Launch Sites
VLS		440 lbs	200 kg	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Alcantara
<b>Suborbital</b>											
Delta Clipper XA	3/4 100%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	White Sands
TR 1A	4/4 100%	N/A	N/A	N/A	N/A	N/A	N/A	1653 lbs	750 kg	N/A	Tanegashima
Texas	27/29 93%	N/A	N/A	N/A	N/A	N/A	N/A	661 lbs	300 kg	N/A	Esrance

### Characteristics of sited Payloads

Payload	Use	Payload Price (Approx)	Orbit Type	Orbital Apogee	Orbital Perigee	Mass at Launch lb	Mass at Launch kg	Mass in Orbit lb	Mass in Orbit kg	Freq Bands & Transponders	Stabilization	Power Supply at EOL
APStar 1A	Communications	N/A	GEO TBA	35750 nMi	35750 nMi	3086 lbs	1400 kg	1235 lbs	560 kg	24 C	Spin	N/A
APStar 2R	Communications	N/A	GEO TBA	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A
Arabsat 2A	Communications	N/A	GEO TBA	35779 nMi	35750 nMi	7700 lbs	3493 kg	N/A	N/A	22 C, 12 Ku, 2S	3-axis	N/A
Arabsat 2B	Communications	N/A	GEO TBA	35779 nMi	35750 nMi	7700 lbs	3493 kg	N/A	N/A	20 C, 12 Ku, 2S	3-axis	N/A
ChinaSat 7	Communications	N/A	GEO 110.5 E	N/A	N/A	1388 lbs	630 kg	559 lbs	253 kg	24 C	Spin	N/A
DFH 3-2	Communications	N/A	GEO TBA	N/A	N/A	4850 lbs	2200 kg	N/A	N/A		3-axis	N/A
EchoStar 2	Communications	N/A	GEO 175 W	N/A	N/A	6393 lbs	2900 kg	N/A	N/A	16 Ku	3-axis	N/A
Ekspress 2	Communications	N/A	GEO 103 E	35788 nMi	34732 nMi	5512 lbs	2500 kg	N/A	N/A	10 C, 2 Ku	3-axis	2400
GE 1	Communications	N/A	GEO 103 W	35880 nMi	N/A	5500 lbs	2495 kg	N/A	N/A	24 C, 24 Ku	3-axis	N/A
GE 2	Communications	N/A	GEO TBA	35880 nMi	N/A	5500 lbs	2495 kg	N/A	N/A	24 C, 24 Ku	3-axis	N/A
Hot Bird 2	Communications	N/A	GEO 13 E	N/A	N/A	6380 lbs	2894 kg	N/A	N/A		N/A	N/A
Hot Bird 3	Communications	N/A	GEO 13 E	N/A	N/A	6380 lbs	2894 kg	N/A	N/A	20	N/A	N/A
IndoStar 1	Communications	N/A	GEO 106.1 E	N/A	N/A	3053 lbs	1385 kg	N/A	N/A		N/A	N/A
Inmarsat 3 F2	Communications	\$80M	GEO TBA	35987 nMi	35881 nMi	4362 lbs	1979 kg	2423 lbs	1099 kg	2 C, L	3-axis	2400
Iridium 1	Communications	\$5M	LEO	776 nMi	776 nMi	1500 lbs	680 kg	N/A	N/A	Ka, L	3-axis	N/A
Iridium 2	Communications	\$5M	LEO	776 nMi	776 nMi	1500 lbs	680 kg	N/A	N/A	Ka, L	3-axis	N/A
Iridium 3	Communications	\$5M	LEO	776 nMi	776 nMi	1500 lbs	680 kg	N/A	N/A	Ka, L	3-axis	N/A
Iridium 4	Communications	\$5M	LEO	776 nMi	776 nMi	1500 lbs	680 kg	N/A	N/A	Ka, L	3-axis	N/A
Iridium 5	Communications	\$5M	LEO	776 nMi	776 nMi	1500 lbs	680 kg	N/A	N/A	Ka, L	3-axis	N/A
Iridium 6	Communications	\$5M	LEO	776 nMi	776 nMi	1500 lbs	680 kg	N/A	N/A	Ka, L	3-axis	N/A
Iridium 7	Communications	\$5M	LEO	776 nMi	776 nMi	1500 lbs	680 kg	N/A	N/A	Ka, L	3-axis	N/A
Iridium 8	Communications	\$5M	LEO	776 nMi	776 nMi	1500 lbs	680 kg	N/A	N/A	Ka, L	3-axis	N/A
Iridium 16	Communications	\$5M	LEO	776 nMi	776 nMi	1500 lbs	680 kg	N/A	N/A	Ka, L	3-axis	N/A
Iridium 17	Communications	\$5M	LEO	776 nMi	776 nMi	1500 lbs	680 kg	N/A	N/A	Ka, L	3-axis	N/A
Iridium 18	Communications	\$5M	LEO	776 nMi	776 nMi	1500 lbs	680 kg	N/A	N/A	Ka, L	3-axis	N/A
Iridium 19	Communications	\$5M	LEO	776 nMi	776 nMi	1500 lbs	680 kg	N/A	N/A	Ka, L	3-axis	N/A
Iridium 20	Communications	\$5M	LEO	776 nMi	776 nMi	1500 lbs	680 kg	N/A	N/A	Ka, L	3-axis	N/A
Iridium 21	Communications	\$5M	LEO	776 nMi	776 nMi	1500 lbs	680 kg	N/A	N/A	Ka, L	3-axis	N/A
Iridium 22	Communications	\$5M	LEO	776 nMi	776 nMi	1500 lbs	680 kg	N/A	N/A	Ka, L	3-axis	N/A
Italsat 2	Communications	N/A	GEO 10.2 E	35870 nMi	35703 nMi	N/A	N/A	N/A	N/A		N/A	N/A
JAS 2	Communications	N/A	LEO	1333 nMi	833 nMi	N/A	N/A	N/A	N/A		N/A	N/A
JCSAT 4	Communications	N/A	GEO TBA	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A
Mabuhay 1	Communications	N/A	GEO TBA	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A
Measat 2	Communications	\$110M	GEO 148 E	N/A	N/A	2646 lbs	1200 kg	1442 lbs	654 kg	10 C, 3 Ku	Spin	N/A
Molniya 1T-1996	Communications	N/A	ELI	38736 nMi	444 nMi	3858 lbs	1750 kg	N/A	N/A	3 C	3-axis	1000
Nahuel 1A	Communications	\$91M	GEO 70 W	N/A	N/A	4012 lbs	1820 kg	N/A	N/A	18 Ku	N/A	N/A
SCD 3	Communications	N/A	LEO	750 nMi	750 nMi	N/A	N/A	N/A	N/A		N/A	N/A
Telecom 2D	Communications	N/A	GEO 3 E	35987 nMi	35987 nMi	N/A	N/A	N/A	N/A		N/A	N/A
Thor 2A	Communications	N/A	GEO TBA	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A
Turksat 1C	Communications	N/A	GEO 50 W	N/A	N/A	N/A	1783 kg	2377 lbs	1078 kg	16 Ku	3-axis	2900
UFO 7	Communications	\$181M	GEO TBA	35750 nMi	35750 nMi	6319 lbs	2866 kg	2304 lbs	1045 kg	EHF, UHF	3-axis	2500

### Characteristics of sited Payloads

Payload	Use	Payload Price (Approx)	Orbit Type	Orbital Apogee	Orbital Perigee	Mass at Launch lb	Mass at Launch kg	Mass in Orbit lb	Mass in Orbit kg	Freq Bands & Transponders	Stabilization	Power Supply at EOL
Soyuz TM-24	Crewed	N/A	LEO	409 nMi	394 nMi	15587 lbs	7070 kg	14969 lbs	6790 kg		N/A	N/A
Soyuz TM-25	Crewed	N/A	LEO	409 nMi	394 nMi	15587 lbs	7070 kg	14969 lbs	6790 kg		N/A	N/A
DSP 19	Intelligence	N/A	GEO	35750 nMi	35750 nMi	5203 lbs	2360 kg	N/A	N/A		N/A	1274
FORTE	Intelligence	\$27M	LEO	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A
Kosmos 2333	Intelligence	N/A	LEO	852 nMi	849 nMi	N/A	N/A	N/A	N/A		N/A	N/A
Mars 96	Mars	N/A	EXT	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A
Mars Global Surveyor 1	Mars	\$49M	EXT	N/A	N/A	2200 lbs	998 kg	N/A	N/A		N/A	N/A
FY 2-B	Meteorological	N/A	GEO 105 E	N/A	N/A	2646 lbs	1200 kg	1323 lbs	600 kg		Spin	N/A
Wake Shield Facility 3	Microgravity	N/A	LEO	N/A	N/A	3748 lbs	1700 kg	N/A	N/A		N/A	N/A
Kosmos 2334	Navigation	N/A	LEO	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A
Navstar GPS 2-26	Navigation	\$59M	MEO	20228 nMi	20139 nMi	4147 lbs	1881 kg	2050 lbs	930 kg	L	Spin	710
Navstar GPS 2-27	Navigation	\$59M	MEO	20183 nMi	20183 nMi	4147 lbs	1881 kg	2050 lbs	930 kg	L	Spin	710
Navstar GPS 2R- 1	Navigation	\$27M	MEO	20183 nMi	20183 nMi	4480 lbs	2032 kg	2370 lbs	1075 kg	L	3-axis	1125
ADEOS 1	Remote Sensing	\$620M	LEO	831 nMi	801 nMi	7716 lbs	3500 kg	7055 lbs	3200 kg	Ka, S, 3 X	3-axis	4500
Clark	Remote Sensing	\$45M	LEO	459 nMi	N/A	612 lbs	278 kg	N/A	N/A		N/A	N/A
Geosat Follow-On 1	Remote Sensing	N/A	LEO	800 nMi	782 nMi	576 lbs	261 kg	N/A	N/A		N/A	N/A
Lewis	Remote Sensing	\$51M	LEO	505 nMi	N/A	804 lbs	365 kg	N/A	N/A		N/A	N/A
Mu-Sat	Remote Sensing	N/A	ELI	1170 nMi	236 nMi	N/A	N/A	N/A	N/A		N/A	N/A
Seastar	Remote Sensing	\$45M	LEO	800 nMi	N/A	604 lbs	274 kg	N/A	N/A		N/A	N/A
TOMS 1	Remote Sensing	\$42M	LEO	955 nMi	955 nMi	650 lbs	295 kg	N/A	N/A		3-axis	N/A
Bion 11	Scientific	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A
FAST	Scientific	N/A	ELI	4175 nMi	351 nMi	331 lbs	150 kg	331 lbs	150 kg		Spin	N/A
HETE	Scientific	N/A	LEO	550 nMi	N/A	265 lbs	120 kg	N/A	N/A		Spin	70
Kompass	Scientific	N/A	LEO	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A
Magion 5	Scientific	N/A	ELI	19186 nMi	770 nMi	N/A	N/A	N/A	N/A		N/A	N/A
Muses B	Scientific	N/A	ELI	20000 nMi	N/A	1760 lbs	798 kg	N/A	N/A		N/A	N/A
OBS 2	Scientific	N/A	SUB	N/A	N/A	N/A	N/A	N/A	N/A		N/A	N/A
ORFEUS SPAS 2	Scientific	N/A	LEO	160 nMi	160 nMi	7900 lbs	3583 kg	N/A	N/A		N/A	N/A
Prognoz Interbal-A	Scientific	N/A	ELI	19196 nMi	791 nMi	1764 lbs	800 kg	N/A	N/A		Spin	N/A
SAC B	Scientific	\$6M	LEO	500 nMi	N/A	770 lbs	349 kg	N/A	N/A		3-axis	N/A
SWAS	Scientific	N/A	LEO	N/A	N/A	397 lbs	180 kg	397 lbs	180 kg		3-axis	N/A
Unamsat B	Scientific	N/A	LEO	670 nMi	670 nMi	N/A	N/A	N/A	N/A		N/A	N/A
Progress M-32	Supply	N/A	LEO	406 nMi	390 nMi	15983 lbs	7250 kg	N/A	N/A		N/A	N/A
Progress M-33	Supply	N/A	LEO	406 nMi	390 nMi	15983 lbs	7250 kg	N/A	N/A		N/A	N/A
Progress M-34	Supply	N/A	LEO	N/A	N/A	15983 lbs	7250 kg	N/A	N/A		N/A	N/A
Progress M-35	Supply	N/A	LEO	N/A	N/A	15983 lbs	7250 kg	N/A	N/A		N/A	N/A

## Launch Events\*

### July 1996-September 1996

Launch Date	Vehicle	Payload	Operator	Manufacturer	Int'l Comp	Launch Type	Launch Outcome	Mission Outcome
<b>China</b>								
<b>Long March</b>								
July 2 1996	Long March 2E	APStar 1A	APT Satellite Co., Ltd.	Hughes	Yes	Commercial	Success	Success
August 18 1996	Long March 3	ChinaSat 7	Ministry of Posts and Telecommunications	Hughes	No	Non-Commercial	Failure	Failure
<b>Europe (ESA)</b>								
<b>Ariane</b>								
July 9 1996	Ariane 44L	Arabsat 2A	ASCO	Aerospatiale	Yes	Commercial	Success	Success
		Turksat 1C	Turkish Telecom	Aerospatiale	Yes	Commercial	Success	Success
August 8 1996	Ariane 44L	Italsat 2	Telespazio	Alenia Spazio	No	Non-Commercial	Success	Success
		Telecom 2D	France Telecom/DGA	Matra Marconi	No	Non-Commercial	Success	Success
September 10 1996	Ariane 42P	EchoStar 2	EchoStar Satellite Company	Lockheed Martin Astro Space	Yes	Commercial	Success	Success
<b>Japan</b>								
<b>H</b>								
August 16 1996	H 2	ADEOS 1	NASDA	Mitsubishi/NEC/Toshiba	No	Non-Commercial	Success	Success
		JAS 2		Nippon Electric Co.	No	Non-Commercial	Success	Success
<b>TR</b>								
September 25 1996	TR 1A*	OBS 2	NASDA	Ishikawajima-Harima Heavy Industries	No	Non-Commercial	Success	Success
<b>Russia/CIS</b>								
<b>Cosmos</b>								

\*High-profile suborbital launch events included

## Launch Events\*

### July 1996-September 1996

Launch Date	Vehicle	Payload	Operator	Manufacturer	Int'l Comp	Launch Type	Launch Outcome	Mission Outcome
September 25 1995	Cosmos SL-8	Kosmos 2334	Russia/CIS	AO Polyot	No	Non-Commercial	Success	Success
		Unamsat B	Autonomous University of Mexico (UNAM)		No	Non-Commercial	Success	Success
<b>Molniya</b>								
August 15 1996	Molniya SL-6	Molniya 1T-1996	Russia/CIS PTT	NPO Prikladnoi Mekhaniki	No	Non-Commercial	Success	Success
August 29 1996	Molniya SL-6	Magion 5	Czech Republic	Geophysical Institute	No	Non-Commercial	Success	Success
		Mu-Sat	Argentina	Instituto Universitario Aeronautico de Cordoba	No	Non-Commercial	Success	Success
		Prognoz Interbal-A	Intercosmos	NPO Lavotchkin	No	Non-Commercial	Success	Success
<b>Proton</b>								
September 6 1996	Proton SL-12	Inmarsat 3 F2	Inmarsat	Lockheed Martin Astro Space	Yes	Commercial	Success	Success
September 26 1996	Proton SL-12	Ekspress 2	Informkosmos	NPO Prikladnoi Mekhaniki	No	Non-Commercial	Success	Success
<b>Soyuz</b>								
August 1 1996	Soyuz SL-4	Progress M-32	RKK Energia	RKK Energia	No	Non-Commercial	Success	Success
August 17 1996	Soyuz SL-4	Soyuz TM-24	RKK Energia	RKK Energia	No	Non-Commercial	Success	Success
<b>Zenit</b>								
September 4 1996	Zenit 2 SL-16	Kosmos 2333	Russia/CIS MoD	KB Yuzhnoe	No	Non-Commercial	Success	Success
<b>United States</b>								
<b>Atlas</b>								
July 25 1996	Atlas 2	UFO 7	DoD	Hughes	No	Commercial	Success	Success
September 8 1996	Atlas 2A	GE 1	GE Americom	Lockheed Martin	Yes	Commercial	Success	Success
<b>Delta</b>								
July 15 1996	Delta 2 7925	Navstar GPS 2	DoD	Rockwell International	No	Non-Commercial	Success	Success

\*High-profile suborbital launch events included

## Launch Events\*

### July 1996-September 1996

Launch Date	Vehicle	Payload	Operator	Manufacturer	Int'l Comp	Launch Type	Launch Outcome	Mission Outcome
September 12 1996	Delta 2 7925	Navstar GPS 2 DoD 27		Rockwell International	No	Non-Commercial	Success	Success
<b>Delta Clipper</b>								
July 31 1996	Delta Clipper XA*	N/A	N/A	N/A	No	Non-Commercial	Failure	Failure
<b>Pegasus</b>								
July 2 1996	Pegasus XL	TOMS 1	NASA	TRW	No	Non-Commercial	Success	Success
August 21 1996	Pegasus XL	FAST	NASA	NASA	No	Non-Commercial	Success	Success
<b>Shuttle</b>								
September 16 1996	Shuttle Atlantis	STS 79	NASA	Rockwell International	No	Non-Commercial	Success	TBD
<b>Titan</b>								
July 2 1996	Titan 4	Classified USA-125	DoD	DoD	No	Non-Commercial	Success	Success

\*High-profile suborbital launch events included



## Future Launch Events\* October 1996-March 1997

Launch Date	Vehicle	Payload	Operator	Manufacturer	Int'l Comp	Launch Type	Launch Site
<b>Brazil</b>							
<b>VLS</b>							
January 1997	VLS	SCD 3	IAE	IAE	No	Non-Commercial	Alcantara
<b>China</b>							
<b>Long March</b>							
4th Qtr 1996	Long March 3A	DFH 3-2	Chinese Broadcasting Satellite Corp.	Chinese Academy of Space Technology (CAST)	No	Non-Commercial	Xichang
January 1997	Long March 3B	APStar 2R	APT Satellite Co., Ltd.	Space Systems/Loral	Yes	Commercial	Xichang
January 1997	Long March 3	FY 2-B	Chinese Academy of Space Technology	Shanghai Institute of Satellite Engineering	No	Non-Commercial	Xichang
February 1997	Long March 3B	Mabuhay 1	Mabuhay Philippine Satellite, Inc.	Space Systems/Loral	Yes	Commercial	Xichang
<b>Europe (ESA)</b>							
<b>Araine</b>							
November 13 1996	Ariane 44LP	Arabsat 2B Measat 2	ASCO Bina Riang Pte. Ltd.	Aerospatiale Hughes	Yes	Commercial	Kourou
December 17 1996	Ariane 4-TBA	PAS 6	Alpha Lyracom Pan American Satellite	Space Systems/Loral	Yes	Commercial	Kourou
January 17 1997	Ariane 4-TBA	GE 2	GE Americom	Martin Marietta Astro Space	Yes	Commercial	Kourou
February 1997	Ariane 4-TBA	Nahuel 1A IndoStar 1	Nahuelsat Bimantara Citra of Jakarta	Aerospatiale CTA, Inc.	Yes	Commercial	Kourou
March 1997	Ariane 4-TBA	Hot Bird 3	Eutelsat	Matra Marconi	Yes	Commercial	Kourou
<b>Germany</b>							
<b>Texus</b>							
4th Qtr 1996	Texus *		DASA	DASA	No	Non-Commercial	Esrangle

\*High-profile suborbital launch events included

## Future Launch Events\* October 1996-March 1997

Launch Date	Vehicle	Payload	Operator	Manufacturer	Int'l Comp	Launch Type	Launch Site
<b>Japan</b>							
<b>M</b>							
January 1997	M 5	Muses B	ISAS	NEC	No	Non-Commercial	Kagoshima
<b>Russia/CIS</b>							
<b>Cosmos</b>							
December 1996	Cosmos SL-8	Earlybird 1	Earthwatch, Inc.	Defense Systems, Inc.	Yes	Commercial	Plesetsk
<b>Proton</b>							
November 16 1996	Proton SL-12	Mars 96	Space Research Institute (IKI)	NPO Lavotchkin	No	Non-Commercial	Tyuratam
December 16 1996	Proton SL-12	Tempo 2	Tempo Satellite, Inc.	Space Systems/Loral	Yes	Commercial	Tyuratam
January 1997	Proton SL-12	Iridium 16	Iridium, Inc.	Lockheed Martin	Yes	Commercial	Tyuratam
		Iridium 17	Iridium, Inc.	Lockheed Martin			
		Iridium 18	Iridium, Inc.	Lockheed Martin			
		Iridium 19	Iridium, Inc.	Lockheed Martin			
		Iridium 20	Iridium, Inc.	Lockheed Martin			
		Iridium 21	Iridium, Inc.	Lockheed Martin			
		Iridium 22	Iridium, Inc.	Lockheed Martin			
<b>Shtil</b>							
October 1996	Shtil 2	Kompass	Russia/CIS	Russia/CIS	Yes	Non-Commercial	TBA
<b>Soyuz</b>							
November 15 1996	Soyuz SL-4	Progress M-33	RKK Energia	RKK Energia	No	Non-Commercial	Tyuratam
November 1996	Soyuz SL-4	Bion 11	Russia/CIS	Russia/CIS	No	Non-Commercial	Plesetsk
January 1997	Soyuz SL-4	Progress M-34	RKK Energia	RKK Energia	No	Non-Commercial	Tyuratam
March 1997	Soyuz SL-4	Soyuz TM-25	RKK Energia	RKK Energia	No	Non-Commercial	Tyuratam
March 1997	Soyuz SL-4	Progress M-	RKK Energia	RKK Energia	No	Non-Commercial	Tyuratam

\*High-profile suborbital launch events included

## Future Launch Events\* October 1996-March 1997

Launch Date	Vehicle	Payload	Operator	Manufacturer	Int'l Comp	Launch Type	Launch Site
<b>TBA</b>							
November 1996	TBA	Russia/CIS Kosmos 96-11	Russia/CIS MoD	Russia/CIS	No	Non-Commercial	TBA
December 1996	TBA	Russia/CIS Kosmos 96-12	Russia/CIS	Russia/CIS	No	Non-Commercial	TBA
January 1997	TBA	Russia/CIS Kosmos 97-01	Russia/CIS	Russia/CIS	No	Non-Commercial	TBA
February 1997	TBA	Russia/CIS Kosmos 97-02	Russia/CIS	Russia/CIS	No	Non-Commercial	TBA
March 1997	TBA	Russia/CIS Kosmos 97-03	Russia/CIS	Russia/CIS	No	Non-Commercial	TBA
<b>United States</b>							
<b>Atlas</b>							
November 13 1996	Atlas 2A	Hot Bird 2		Matra Marconi	Yes	Commercial	CCAS
December 21 1996	Atlas 2	Inmarsat 3 F3	Inmarsat	Lockheed Martin Astro Space	Yes	Commercial	CCAS
January 1997	Atlas 2AS	JCSAT 4	Japan Satellite System, Inc.	Hughes	Yes	Commercial	CCAS
<b>Delta</b>							
November 06 1996	Delta 2 7925	Mars Global Surveyor 1	NASA	Martin Marietta Astro Space	No	Non-Commercial	CCAS
November 14 1996	Delta 2 7925	Iridium 1	Iridium, Inc.	Lockheed Martin	Yes	Commercial	VAFB
		Iridium 2	Iridium, Inc.	Lockheed Martin	Yes	Commercial	VAFB
		Iridium 3	Iridium, Inc.	Lockheed Martin	Yes	Commercial	VAFB
December 02 1996	Delta 2 7925	Mars Pathfinder	NASA	Jet Propulsion Laboratory	No	Non-Commercial	CCAS
January 23 1997	Delta 2 7925	Iridium 4	Iridium, Inc.	Lockheed Martin	Yes	Commercial	VAFB
January 23 1997	Delta 2 7925	Iridium 5	Iridium, Inc.	Lockheed Martin	Yes	Commercial	VAFB
January 23 1997	Delta 2 7925	Iridium 6	Iridium, Inc.	Lockheed Martin	Yes	Commercial	VAFB
January 23 1997	Delta 2 7925	Iridium 7	Iridium, Inc.	Lockheed Martin	Yes	Commercial	VAFB
January 23 1997	Delta 2 7925	Iridium 8	Iridium, Inc.	Lockheed Martin	Yes	Commercial	VAFB
February 22 1997	Delta 2 7925	Thor 2A	Tele-TV A/S	Hughes	Yes	Commercial	VAFB

\*High-profile suborbital launch events included

## Future Launch Events\* October 1996-March 1997

Launch Date	Vehicle	Payload	Operator	Manufacturer	Int'l Comp	Launch Type	Launch Site
1st Qtr 1997	Delta 2 7925	Navstar GPS 2R- 1	DoD	Lockheed Martin Astro Space	No	Non-Commercial	CCAS
<b>LMLV</b>							
January 1997	LMLV 1	Clark	NASA	CTA Space Systems, Inc.	No	Commercial	VAFB
February 1997	LMLV 1	Lewis	NASA	TRW	No	Commercial	VAFB
<b>Pegasus</b>							
October 25 1996	Pegasus XL	HETE	Massachusetts Institute of Technology	AeroAstro	Yes	Commercial	Wallops Flight Facility
		SAC B	Argentina	National Commission on Space Activities (CONAE)			
December 07 1996	Pegasus XL	Minisat 01	INTA	INTA	Yes	Commercial	Spain
January 15 1997	Pegasus XL	SWAS	Smithsonian Astrophysical Observatory	NASA	No	Non-Commercial	VAFB
March 01 1997	Pegasus XL	Seastar	Orbital Sciences Corp. (OSC)	Orbital Sciences Corp. (OSC)	No	Commercial	VAFB
March 15 1997	Pegasus XL	FORTE	DoD	Los Alamos National Laboratory	No	Non-Commercial	TBA
<b>Shuttle</b>							
November 08 1996	Shuttle Columbia	STS 80	NASA	Rockwell International	No	Non-Commercial	KSC
		Wake Shield Facility 3	Space Vacuum Epitaxy Center	Space Industries, Inc.			
		ORFEUS SPAS 2	NASA/DARA	MBB Erno			
January 12 1997	Shuttle Atlantis	STS 81	NASA	Rockwell International	No	Non-Commercial	KSC
February 13 1997	Shuttle Discovery	STS 82	NASA	Rockwell International	No	Non-Commercial	KSC

\*High-profile suborbital launch events included

## Future Launch Events\* October 1996-March 1997

Launch Date	Vehicle	Payload	Operator	Manufacturer	Int'l Comp	Launch Type	Launch Site
March 27 1997	Shuttle Columbia STS 83		NASA	Rockwell International	No	Non-Commercial	KSC
<b>Taurus</b>							
February 1997	Taurus 1	Geosat Follow On 1	DoD	Ball Aerospace	No	Commercial	VAFB
<b>Titan</b>							
December 18 1996	Titan 4	Classified 1996-B	DoD	N/A	No	Non-Commercial	VAFB
January 20 1997	Titan 4/Centaur	DSP 19	DoD	TRW	No	Non-Commercial	CCAS

\*High-profile suborbital launch events included