Commercial Space Transportation

QUARTERLY LAUNCH REPORT

Featuring the launch results from the 3rd quarter 2002 and forecasts for the 4th quarter 2002 and 1st quarter 2003

Quarterly Report Topic:

Commercial Space and Launch Insurance: Current Market and Future Outlook

4th Quarter 2002

United States Department of Transportation • Federal Aviation Administration
Associate Administrator for Commercial Space Transportation
800 Independence Ave. SW • Room 331
Washington, D.C. 20591

Introduction

The Fourth Quarter 2002 Quarterly Launch Report features launch results from the third quarter of 2002 (July-September 2002) and launch forecasts for the fourth quarter of 2002 (October-December 2002) and first quarter of 2003 (January-March 2003). This report contains information on worldwide commercial, civil, and military orbital space launch events. Projected launches have been identified from open sources, including industry references, company manifests, periodicals, and government sources. Projected launches 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)

Contents

Cover: The inaugural launch of Lockheed Martin's Atlas 5, carrying Hot Bird 6, takes place from Cape Canaveral Air Force Station on August 21, 2002. The Atlas 5, which is marketed by International Launch Services (ILS), was developed under the Evolved Expendable Launch Vehicle (EELV) program managed by the United States Air Force.

Third Quarter 2002 Highlights

The United States may stop exporting rocket parts to Japan unless the Japanese government agrees to revise a technology transfer agreement with the U.S. Government. Without the requested revision, the U.S. will stop exporting key components used on the Japanese H 2A launch vehicle, a move that would delay the program.

RSC Energia is planning to upgrade the Soyuz with an Onega upper stage similar to the Fregat, enhancing that vehicle's geostationary transfer orbit (GTO) capacity. Flight tests are expected to begin in 2005.

International Launch Services successfully launched the first Atlas 5 booster from Pad 41 at Cape Canaveral on August 21, carrying the Hot Bird 6 communications satellite to geosynchronous orbit (GEO). The Atlas 5 401 launch was the first launch of a vehicle developed under the U.S. Air Force (USAF) Evolved Expendable Launch Vehicle (EELV) program. Meanwhile, Boeing is preparing for the first launch of its EELV, the Delta 4, later this year.

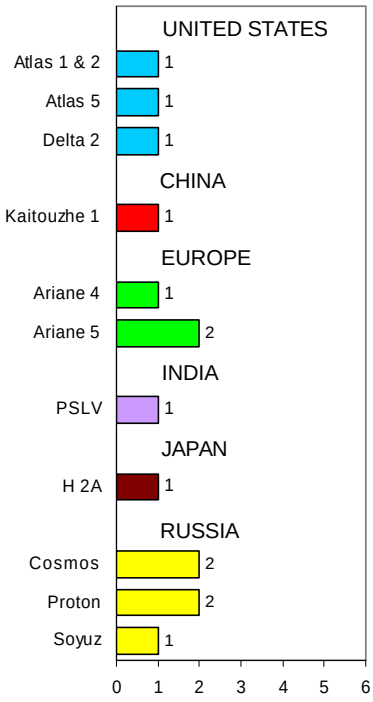
Boeing and Lockheed Martin are each asking for $100 million in government subsidies to keep their respective Delta 4 and Atlas 5 launch vehicle businesses alive. Despite the fact that these vehicles were developed under the auspices of the USAF, the companies are concerned that a dramatic downturn in demand for launch vehicles worldwide will translate to losses in the years to come. When the EELV program was started in 1996, market projections were robust.

China’s new Kaitouzhe 1, a small, commercially available launch vehicle using solid propellant, suffered a launch failure on September 15, 2002, from Taiyuan. The vehicle was carrying a micro-payload built by Tsinghua University.

Vehicle Use

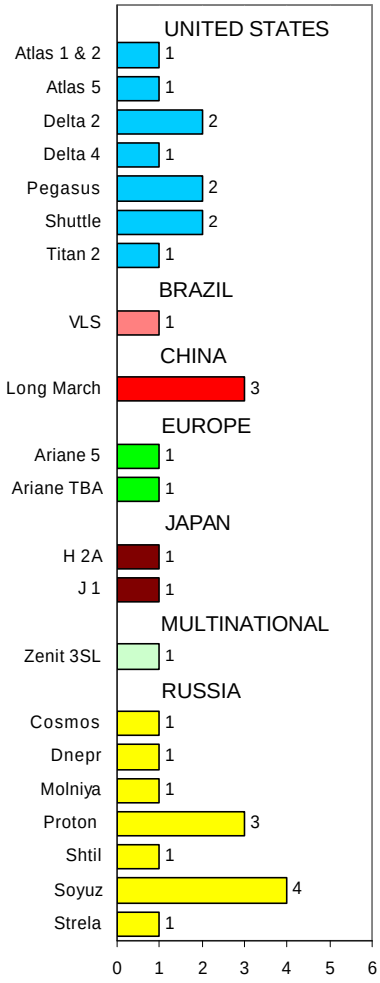
(July 2002 – March 2003)

Figure 1: Third Quarter 2002 Total Launch Vehicle Use



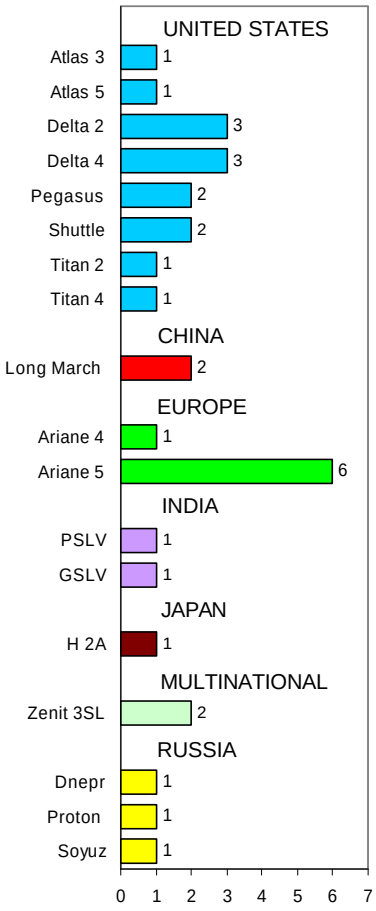
Total = 14

Figure 2: Fourth Quarter 2002 Total Projected Launch Vehicle Use



Total = 31

Figure 3: First Quarter 2003 Total Projected Launch Vehicle Use

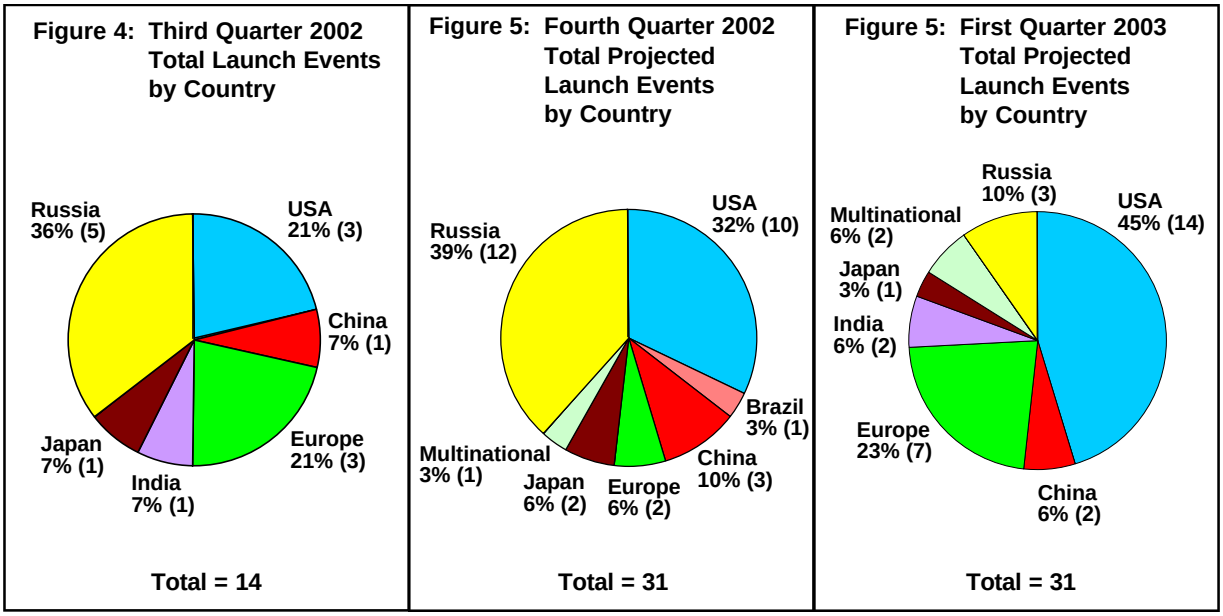


Total = 31

Figures 1-3 show the total number of orbital launches (commercial and government) of each launch vehicle that occurred in the third quarter of 2002 and that are projected for the fourth quarter of 2002 and first quarter of 2003. These launches are grouped by the country in which the primary vehicle manufacturer is based. Exceptions to this grouping are launches performed by Sea Launch, which are designated as multinational.

Total Launch Events by Country

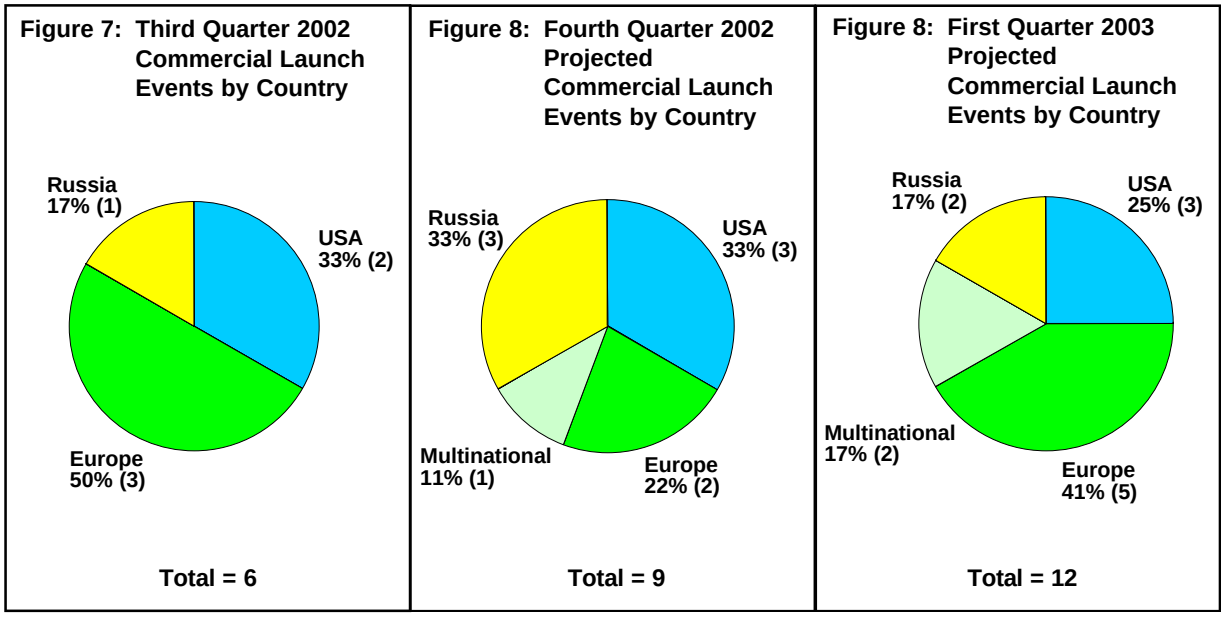
(July 2002 – March 2003)



Figures 4-6 show all orbital launch events (commercial and government) that occurred in the third quarter of 2002 and that are projected for the fourth quarter of 2002 and first quarter of 2003.

Commercial Launch Events by Country

(July 2002 – March 2003)

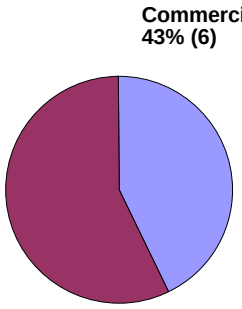


Figures 7-9 show all *commercial* orbital launch events that occurred in the third quarter of 2002 and that are projected for the fourth quarter of 2002 and first quarter of 2003.

Commercial vs. Non-commercial Launch Events

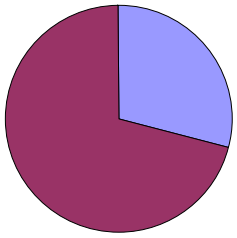
(July 2002 – March 2003)

Figure 10: Third Quarter 2002 Commercial vs. Non-commercial Launch Events



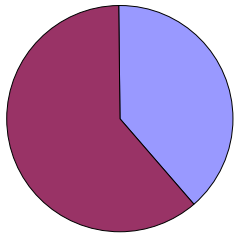
Total = 14

Figure 11: Fourth Quarter 2002 Projected Commercial vs. Non-commercial Launch Events



Total = 31

Figure 12: First Quarter 2003 Projected Commercial vs. Non-commercial Launch Events



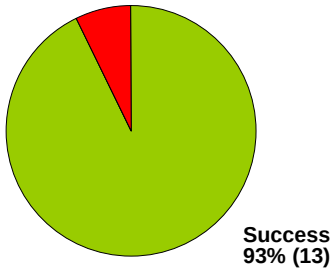
Total = 31

Figures 10-12 show commercial vs. non-commercial orbital launch events that occurred in the third quarter of 2002 and that are projected for the fourth quarter of 2002 and first quarter of 2003.

Third Quarter 2002 Launch Successes vs. Failures

(July 2002 – September 2002)

Figure 13: Total Launch Successes vs. Failures



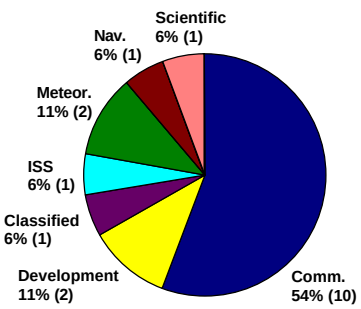
Total = 14

Figure 13 shows successful vs. failed orbital launch events that occurred in the third quarter of 2002.

Payload Use

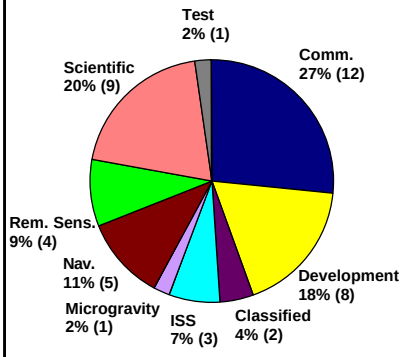
(July 2002 – March 2003)

Figure 14: Third Quarter 2002 Payload Use



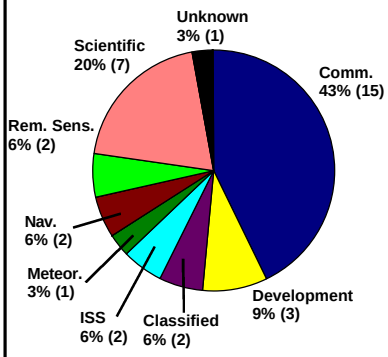
Total = 18

Figure 15: Fourth Quarter 2002 Projected Payload Use



Total = 45

Figure 16: First Quarter 2003 Projected Payload Use



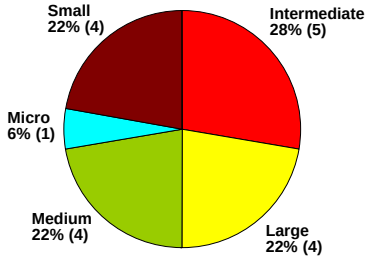
Total = 35

Figures 14-16 show total payload use (commercial and government), actual for the third quarter of 2002 and that are projected for the fourth quarter of 2002 and first quarter of 2003. The total number of payloads launched may not equal the total number of launches due to multi-manifesting, i.e., the launching of more than one payload by a single launch vehicle.

Payload Mass Class

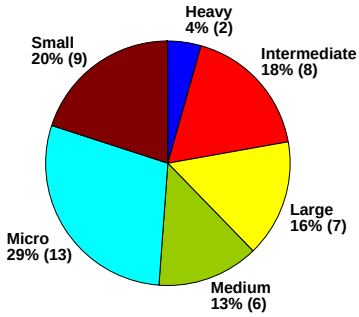
(July 2002 – March 2003)

Figure 17: Third Quarter 2002 Payload Mass Class



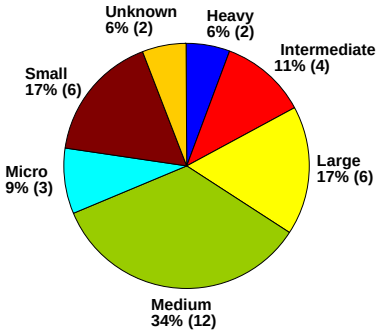
Total = 18

Figure 18: Fourth Quarter 2002 Projected Payload Mass Class



Total = 45

Figure 19: First Quarter 2003 Projected Payload Mass Class



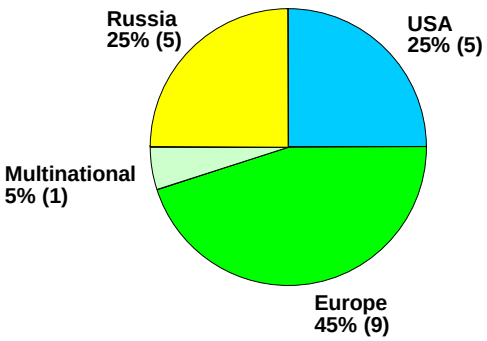
Total = 35

Figures 17-19 show total payloads by mass class (commercial and government), actual for the third quarter of 2002 and projected for the fourth quarter of 2002 and first quarter of 2003. The total number of payloads launched may not equal the total number of launches due to multi-manifesting, i.e., the launching of more than one payload by a single launch vehicle. Payload mass classes are defined as Micro: 0 to 91 kilograms (0 to 200 lbs.); Small: 92 to 907 kilograms (201 to 2,000 lbs.); Medium: 908 to 2,268 kilograms (2,001 to 5,000 lbs.); Intermediate: 2,269 to 4,536 kilograms (5,001 to 10,000 lbs.); Large: 4,537 to 9,072 kilograms (10,001 to 20,000 lbs.); and Heavy: over 9,073 kilograms (20,000 lbs.).

Commercial Launch Trends

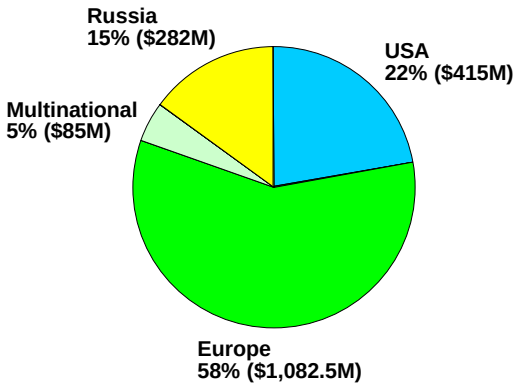
(October 2001 – September 2002)

Figure 20: Commercial Launch Events, Last 12 Months



Total = 20

Figure 21: Commercial Launch Revenue, Last 12 Months



Total = $1,864.5M

Figure 20 shows commercial launch events for the period October 2001 to September 2002 by country.

Figure 21 shows commercial launch revenue for the period October 2001 to September 2002 by country.

Figure 22: Commercial Launch Events by Country, Last Five Years

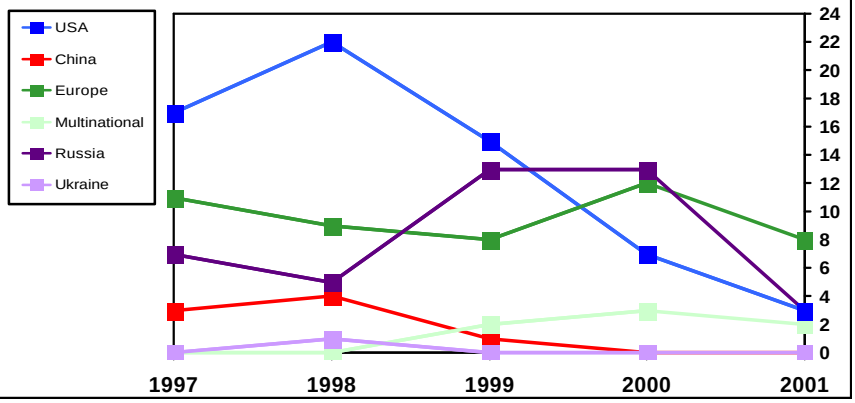


Figure 22 shows commercial launch events by country for the last five full years.

Figure 23: Commercial Launch Revenue (in $ million) by Country, Last Five Years

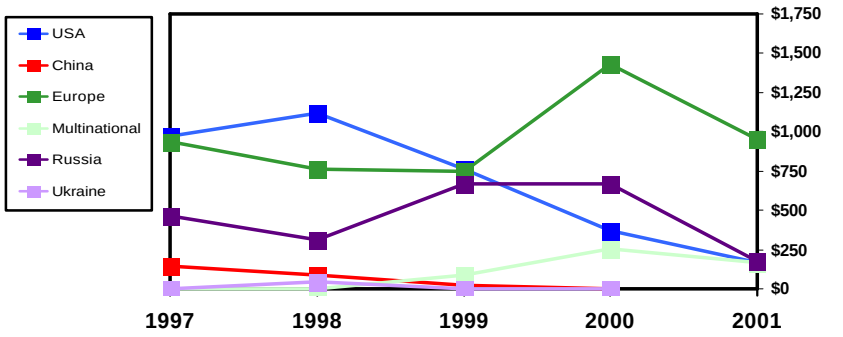


Figure 23 shows commercial launch revenue by country for the last five full years.

Commercial Space and Launch Insurance: Current Market and Future Outlook

INTRODUCTION

Since our last review of the space and launch insurance industry (see "Update of the Space and Launch Insurance Industry," 4th quarter, 1998 Quarterly Launch Report), many changes have occurred in the market. This report endeavors to examine the current market situation and to explore what causes insurance market changes. We also examine how and why this market moves over time and discuss the future outlook for space insurance.*

OVERVIEW OF SPACE INSURANCE

The insurance market for the commercial space transportation industry is a global one, with satellite owners, satellite manufacturers, launch services providers, insurance brokers, underwriters, financial institutions, reinsurers, and government agents worldwide cooperating in order to coordinate an insurance package for any given commercial satellite launch.

Space Insurance Types

Within the space insurance market, many different types of coverage are available. Some of the key ones are noted here.

Pre-launch insurance covers damage to a satellite or launch vehicle during the construction, transportation, and processing phases prior to launch.

* This report does not address Federal Aviation Administration (FAA) requirements governing the financial responsibility that licensed launch operators must demonstrate. FAA requirements address insurance covering third-party liability and damage to government property that may result from FAA-licensed launches. For more information on licensee financial responsibility requirements, liability, and the U.S. liability risk-sharing regime, please see U.S. Department of Transportation/Federal Aviation Administration, *Liability Risk-Sharing Regime for U.S. Commercial Space Transportation: Study and Analysis*, April 2002.

Launch insurance covers losses of a satellite occurring during the launch phase of a project. It insures against complete launch failures as well as the failure of a launch vehicle to place a satellite in the proper orbit.

In-orbit policies insure satellites for in-orbit technical problems and damages once a satellite has been placed by a launch vehicle in its proper orbit.

Re-launch guarantees are a form of risk management in which a launch company acts as an insurance provider to its customers. When a launch fails and a customer has agreed to accept a re-launch in lieu of a cash payment, the launch services provider re-launches a customer's replacement payload. The launch services provider often will protect itself by purchasing insurance for a series of launches, thus spreading risk over a number of events and receiving better rates than could be obtained for a single launch event.

Space Insurance Finance

Space insurance is usually a small, specialty line of business within a larger multinational insurance conglomerate. Several of these umbrella companies are headquartered in tax haven environments (like Bermuda and the Cayman Islands) and offer various specialty insurance, reinsurance, and financial services to a variety of international clients.[1] Most of these umbrella insurance companies are publicly traded.

Insurance conglomerates typically have large premium bases to protect themselves in the extremely volatile insurance market. These conglomerates invest premium income and can return high profits on their investments, especially when located in favorable tax environments.

After negotiating a space insurance policy, many underwriters also seek additional financial backing. Reinsurers and financial institutions can buy participation in any insurance package from an underwriter. Generally, rein-

surers and financiers take on the same risks as underwriters and are similarly affected by mission successes and losses. The participation of these additional financial backers allows underwriters to spread risk throughout many layers of the insurance industry. Reinsurers do not analyze any technical information, but instead depend on underwriters' evaluations of risk to determine their level of involvement.

Underwriting Process

The process of insuring a satellite is a complex one. Typically for a given launch project, either the satellite owner or manufacturer begins by choosing an insurance broker. This broker becomes the primary agent responsible for transmitting information between the insured party and the underwriters.

The underwriting process for a project begins when the broker presents technical reports and contractual and financial information to a number of international underwriters. In order to decide what kind of coverage they can offer, the various underwriters conduct in-depth technical analyses of the satellite and the launch vehicle. The respective reliabilities of the launch vehicle variant, satellite model, and the satellite's intended orbit are evaluated. Details such as launch site location, contract specifics, and satellite finance and value are also taken into account.

When the various evaluations are complete, potential underwriters present the broker with bids containing information regarding capacity, premiums, and terms and conditions that they feel that they can offer the insurance client.

CURRENT MARKET CONDITIONS

In our last look at insurance (see "Update of the Space and Launch Insurance Industry," 4th quarter, 1998 Quarterly Launch Report), the insurance market was a buyers', or "soft," market. The number of insured launches had been steadily increasing. Capacity was growing, and the amount of coverage available for a single launch had been rising for 12 years. Premiums were low, and contracts covering satellite launches plus five years on orbit were common.

Over the last several years, the space insurance market has "hardened." The current situation is very different from that described in the 1998 report. The following discussion explains the characteristics of the current market.

Capacity

Capacity for a single satellite launch is the entire amount of coverage that insurance companies are willing to underwrite for the project. Total yearly space market capacity is the theoretical amount of coverage available for all commercial space activities in a given year.

At the time of our 1998 special report on space insurance, capacity available for a single launch was increasing steadily. In the current market, however, capacity is decreasing; the stated capacity for the entire space insurance industry has fallen from $1.3 billion in 1999 to $840 million in 2002, as shown in Figure 1.[2] The actual total capacity in 2002 is $500-$550 million for launch-plus-one-year-in-orbit risks and $300-$350 million for in-orbit risks.[3]

Premiums

Premiums are payments for an insurance policy made by the insured to the insurer. Premium prices are usually determined as a rate, or percentage of the total value of the policy. An insurer's revenues for a given project are determined by premiums received for that project, minus claims paid out.

Premiums for both launch and in-orbit coverage have been rising steadily since our 1998 special report. Figure 2 shows that 2001 launch-plus-one-year policy rates averaged around 15 percent, whereas rates in 1998 averaged only seven percent.

Figures 1 and 2 demonstrate the inverse relationship between capacity and premiums. When economic conditions are generally favorable, insurance companies experience good financial results and are able to offer high capacity and low rates. Alternatively, when insurance companies experience poor financial results, capacity drops and premiums rise.

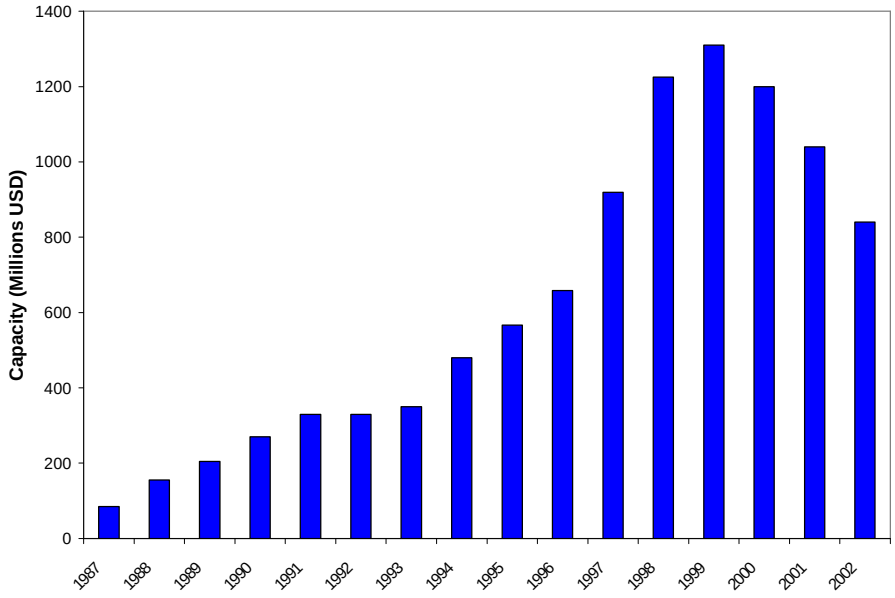


Figure 1. Stated Insurance Capacity (Source: Willis Inspace)

Technical and Underwriting Requirements

In addition to higher premiums and lower capacity, insurance customers in 2002 must deal with tighter underwriting and technical scrutiny. Technical examinations of vehicles and technology are more rigorous, and requirements are stricter. Exclusions for losses resulting from terrorism and generic defects in a particular model of satellite are now common in policies. New and higher deductibles are set to ensure that clients do everything possible to reduce risk.

Coverage Periods

In the last two years, the coverage periods available to satellite insurance customers have been decreasing. Starting in 1995, "launch-plus" contracts became available to insure a satellite against damage occurring during launch plus a period of six months following launch. Over the next few years, launch-plus contracts began to offer two, then three years of coverage following launch. Starting in 1998, launch-plus-five policies became common throughout the industry. With the current

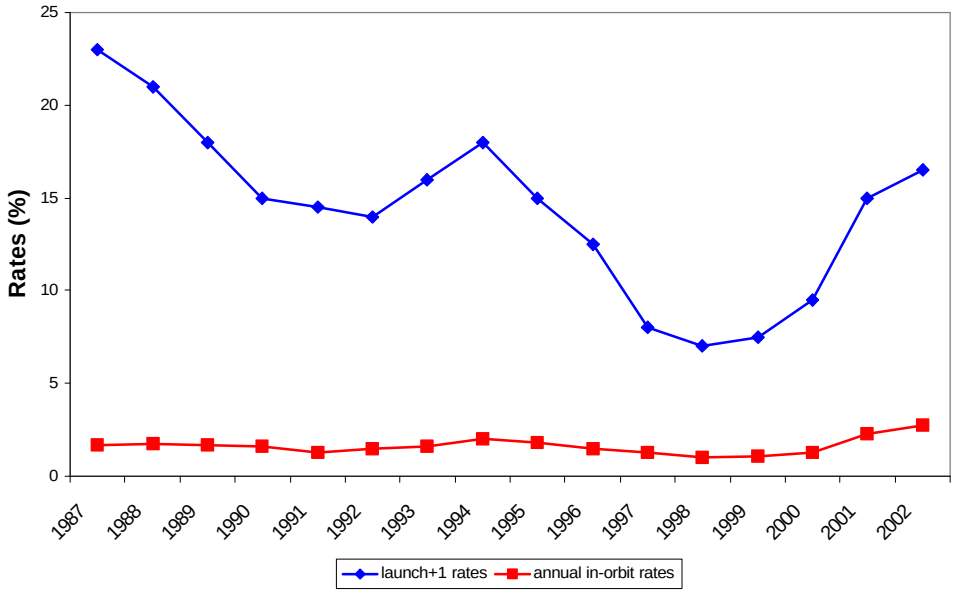


Figure 2. Launch+1 and In-Orbit Premiums (Source: Willis Inspace)

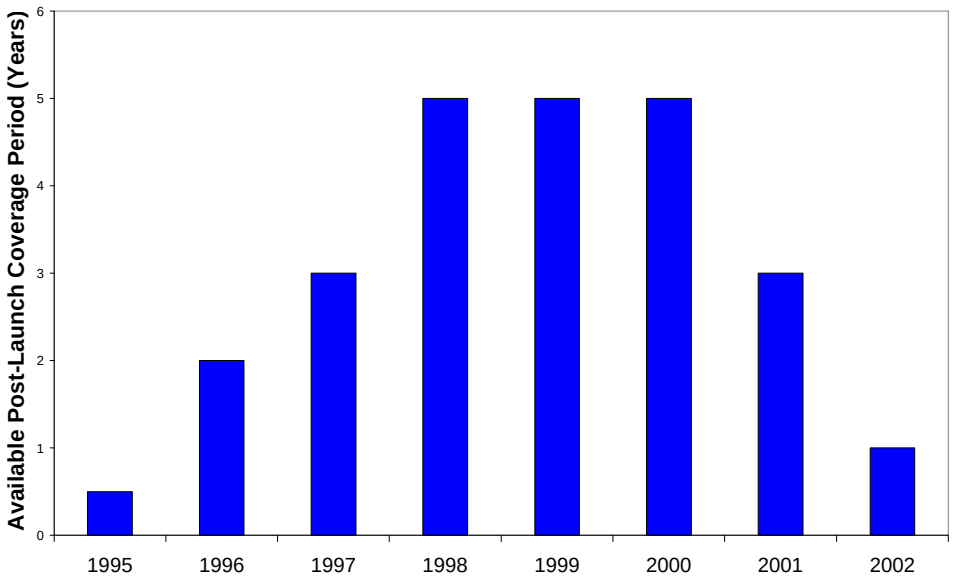


Figure 3: Post-Launch Coverage Period

hard market and the spate of launch and on-orbit losses between 1998 and 2001, the available launch-plus coverage period has declined. In 2002, launch-plus contracts available at competitive prices cover satellites for no more than one year after launch.[4] Figure 3 illustrates trends in post-launch coverage periods over the last eight years.

CAUSES OF SPACE INSURANCE MARKET DOWNTURN

Insurance cycles, general economic conditions, launch and in-orbit losses, and commercial space industry changes have combined to decrease profitability for insurers and thus to harden the space insurance market.

Insurance Cycles

Most insurance markets behave in a cyclical nature over time. At the start of a typical insurance cycle, insurers lower premiums charged in order to compete for business. The insurance industry experiences a "soft," or buyers', market as customers are able to shop around for the best premiums and coverage. The cycle turns when insurance profits begin to fall. The insurance market then enters a period of capacity shortage as firms retain earnings in order to cover current claims. Firms also begin to raise prices in order to increase revenues. The industry then enters a "hard" market, in which insurance buyers must accept limited coverage and high premiums.

It is generally believed that a number of factors influence the insurance cycle. Interest rates (which affect insurance company premium and investment income) and time lags in information used to set pricing both contribute to the cyclical nature of the industry.[5] More importantly, insurance markets are believed to be “capacity-constrained.”[6] In the capacity-constraint model of insurance cycles, changes to supply and demand of capital cause changes in capacity.[7] Insurance companies report lower capacity as the cost of raising external capital becomes higher than that of retaining earnings.

One factor that can trigger this capacity crunch is an exogenous shock due to an unexpected loss. Payment of claims resulting from such a loss reduces capital available to insurance companies. Revenues for that financial period fall, and internally generated capital becomes more attractive to insurance companies than capital from external sources. The pool of capital available to insurance companies shrinks, and these insurers are able to offer less capacity to insurance clients in the following financial period. As a result of the decreased amount of capacity, the need to raise internally generated revenue, and the falling revenues in the previous period,

insurers must increase the prices on their policies. After a period of high prices and retained earnings, insurance profits begin to rise, and insurers are able to offer higher capacity. With more capacity available on the market for launches, insurance companies begin to lower their rates in order to compete for business. These trends continue until another shock to capital supply or demand occurs.

The insurance cycle is easily visible in the space insurance market. A variety of factors make the market very volatile. The space market is a unique insurance market; it involves a relatively small number of underwriters and expensive catastrophic coverage. Technical requirements are necessarily very strict. Reliability is a crucial underwriting determinant but is also difficult to gauge accurately with such a small number of annual commercial launches. Since a majority of the premiums paid on a policy applies to the launch portion of the coverage period, and since an accident at launch can result in instantaneous total mission failure, large amounts of money are either made or lost in the first half hour of any mission.

Figures 1 and 2 trace capacity and premiums, respectively, in the space insurance market over the last fifteen years; the cyclical behavior of these variables is easily observable. In the mid-1980s, a string of launch failures dramatically reduced industry capacity. As a result, premiums rose, and technical requirements became stricter. The 1990s saw an expansion in number of launches and available capacity. With the increasing profitability of the insurance industry and the entry of new capital, soft market conditions returned.

After a slight decline mid-decade, the space insurance market again softened in the late-1990s with launch-plus-one premiums as low as seven percent and total market capacity soaring to levels well above $1 billion. Since this time, the market has turned yet again. In response to a variety of causes, cyclical market forces have contributed to the market downturn observable in 2002.

General Market Conditions

In the months prior to September 11, all commercial insurance markets were hardening as insurance companies experienced poor financial results following the low pricing of the past years. By mid-August 2001, insurance companies, began to raise prices. The devastation resulting from the events of September 11 cost an already hardening market $40-$70 billion.[8] Available funds were tapped to pay these claims and perceptions of risk changed. The ensuing capacity crunch particularly hurt space insurance, which shares a common capital pool with aviation.[9]

In addition to the strain resulting from insurance cycle and general market conditions and September 11 repercussions, the space insurance market has felt pressure from many commercial launch industry-related changes.

Number of Launches

The annual number of insured commercial launches has decreased in recent years, although 2002 already has seen an increased volume of commercial launch activity compared to 2001. This general decline in launch activity drastically reduces the amount of premium income available to insurers and causes capacity offered to insurance customers to fall and premium rates paid by policyholders to rise. Figure 4 on the next page illustrates recent worldwide commercial launch activity.

Claims/Losses and Reliability

As previously mentioned, launch vehicle and satellite reliability are important rate determinants for underwriters. Establishing reliability, with so few annual launches and so many variables affecting a mission, is a long and difficult process.

A launch vehicle or satellite failure is costly to all involved parties. For example, the manufacturer of a failed vehicle and its current and future contracted clients face additional insurance difficulties as a result of the associated decline in reliability of the failed launch vehicle. As perceived reliability decreases, available coverage drops and premiums rise. The effect of a failure can dramatically affect capacity and premiums for all those seeking space insurance.

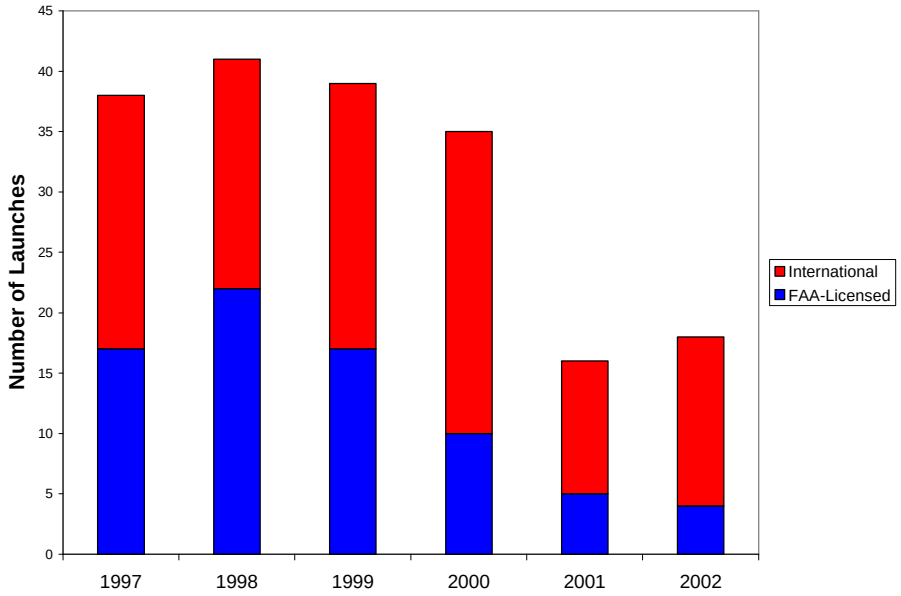


Figure 4. Annual World Commercial Launches

The last several years have also seen many significant losses. In 2001, an Ariane 5G upper stage failure led to the loss of the Artemis and BSAT-2B satellites, resulting in $150 million in claims. In September 2001, an Orbital Sciences Taurus 2110 failure led to the loss of Orbview 4 and an additional $75 million in claims.[10]

In addition, on-orbit defects are affecting the capacity available for satellite purchasers. In 2001, PanAmSat and Arabsat solar array failures cost the insurance industry $253 million and $173 million, respectively.[11] Anomalies like those on Boeing's 702 satellite model, announced in September 2001, are expected to affect premiums for all current and future operators of these satellite models. None of the 702 claims have been resolved.

Figure 5 on the following page illustrates space insurance claims resolved to date over the last 15 years.

ITAR

In evaluating risks, many non-U.S. space insurance underwriters face obstacles in the form of International Traffic in Arms Regulations (ITAR). When a client or broker is unable to obtain a license from the United States State Department to share a launch vehicle or satellite's technical details with non-U.S. underwriters, international insurers are forced to either decline the risk or else to offer policies based on insubstantial technical information. In the instance that international insurers are unable to participate in underwriting a particular risk, capacity available for the vehicle in question is reduced.

TRENDS AND OUTLOOK

The current and future insurance markets must deal with new technologies entering the marketplace. Arianespace's Ariane 5-ECA, Boeing's Delta 4 and Lockheed Martin's Atlas 5 are all relatively new vehicles that face unique challenges in the 2002 space insurance market. These new launchers have been designed to deliver larger satellites into space.

In the past, new technologies have been subject to intense scrutiny from underwriters. Establishing reliability is an uphill battle that all launch vehicles must initially face, and usually three to four successful launches are required in order for a vehicle to be considered commercially insurable at reasonable terms.[12] Until reliability is ascertained, the Lockheed Martin Atlas 5 and Boeing Delta 4 Evolved Expendable Launch Vehicles' launch insurance premiums are expected to comprise 12 to 15

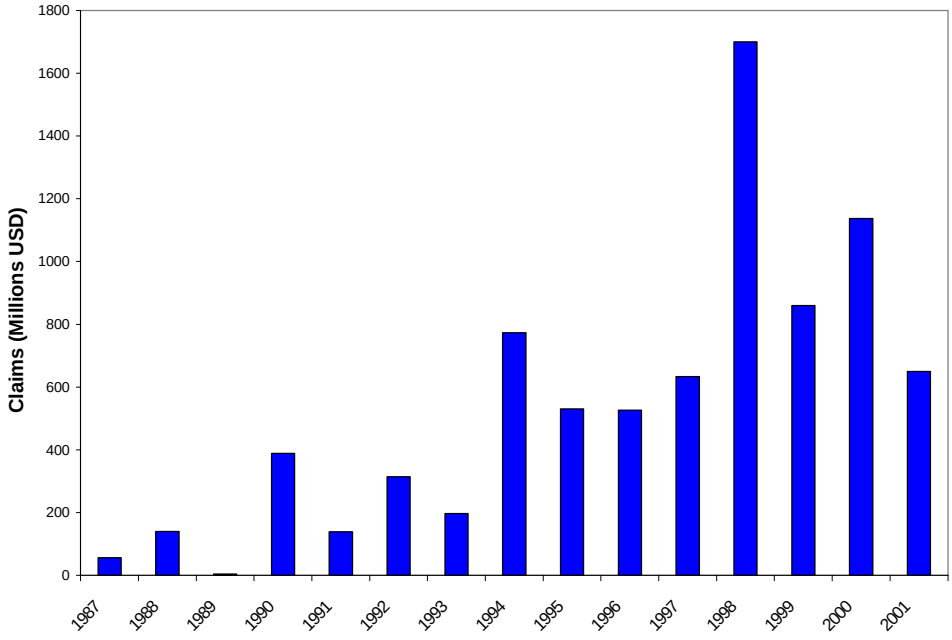


Figure 5. Annual Space Insurance Claims Resolved to Date

percent of the launch vehicles' prices.[13] In addition to large coverage costs arising from their relatively unproven technologies, these vehicles will also need more high-priced insurance because they will be carrying larger, more valuable payloads. This next generation of heavy-lift launch vehicles is capable of carrying more than one payload, making the potential cost to insurers of a launch failure even greater.

Launch vehicle manufacturers are taking different approaches to deal with the current market conditions. Re-launch guarantees remain a common way for launch services providers with vehicles that are expensive to insure to reduce insurance costs. Arianespace is operating a division to self-insure its Ariane launches when insurance market offerings are insufficient.[14] Satellite operators are also considering self-insurance. After a series of disputes with underwriters, EchoStar is considering providing in-orbit backup rather than securing insurance. An executive from EchoStar estimated that the current cost of all insurance expenses for one satellite launch could just as easily pay for a second launch of an equivalent backup vehicle.[15]

CONCLUDING REMARKS

Although space insurance is currently experiencing a hard market, if space insurance continues to behave cyclically, conditions will eventually return to their previous soft market state. With a greater number of launches to prove reliability, rates for new launch vehicles may improve over time. Resolving technical problems on satellites will help to reduce in-orbit rates. Current high premiums and improving economics conditions will help insurers to rebuild capacity. As capacity improves, underwriters will lower premiums to compete for insurance clients.

[1] Communication with Devin Fairbanks, Brockbank Insurance Services, Inc., 9 July 2002.

[2] Communication with Willis Inspace, 1 July 2002.

[3] Communication with Willis Inspace, 12 October 2002.

[4] Communication with Willis Inspace, 1 July 2002.

[5] Neil A. Doherty and James R. Garven, "Insurance Cycles: Interest Rates and the Capacity Constraint Model" (working paper), November 1994.

[6] Anne Gron, "Capacity Constraints and Cycles in Property-Casualty Insurance Markets," *Rand Journal of Economics* 25 (Spring 1994): 110-127.

[7] Communication with Dr. Anne Gron, Kellogg Graduate School of Management, Northwestern University, 28 June 2002.

[8] Communication with Willis Inspace, 1 July 2002.

[9] International Space Brokers, "An Update on the Space Insurance Market," presentation to the Commercial Space Transportation Advisory Committee (COMSTAC), 23 May 2002.

[10] International Space Brokers, "An Update on the Space Insurance Market," presentation to COMSTAC, 23 May 2002.

[11] International Space Brokers, "An Update on the Space Insurance Market," presentation to COMSTAC, 23 May 2002.

[12] Communication with Willis Inspace, 1 July 2002.

[13] Communication with John Vinter, International Space Brokers, 15 October 2002.

[14] Communication with Suzy Chambers, Arianespace, 18 July 2002.

[15] Peter B. de Selding, "Insurance Underwriters Using Rate Hikes to Recover Losses," *Space News* (13 May 2002): 19.

Third Quarter 2002 Orbital Launch Events

Date		Vehicle	Site		Payload or Mission	Operator	Use	Vehicle Price	L	M
7/3/2002		Delta 2 7425-10	CCAFS		Contour	NASA	Scientific	$45-55M	S	F
7/5/2002	√	Ariane 5G	Kourou	*	Stellat 5	France Telecom	Communications	$150-180M	S	S
				*	N-Star C	NTT Mobile Communications Network, Inc.	Communications			S
7/8/2002		Cosmos	Plesetsk		Kosmos 2390	Russian Ministry of Defense	Communications	$12-14M	S	S
					Kosmos 2391	Russian Ministry of Defense	Communications			S
7/25/2002		Proton	Baikonur		Kosmos 2392	Russian Ministry of Defense	Classified	$75-95M	S	S
8/21/2002	√	+ Atlas 5 401	CCAFS	*	Hot Bird 6	Eutelsat	Communications	$75-90M	S	S
8/22/2002	√	Proton	Baikonur	*	EchoStar 8	Echostar Communications Corporation	Communications	$75-95M	S	S
8/28/2002	√	Ariane 5G	Kourou	*	Atlantic Bird 1	Eutelsat	Communications	$150-180M	S	S
					MSG 1	Eumetsat	Meteorological			S
9/6/2002	√	Ariane 44L	Kourou	*	Intelsat 906	Intelsat	Communications	$100-125M	S	S
9/10/2002		H 2A 202	Tanegashima		DRTS W	National Space Development Agency	Communications	$75-95M	S	S
					USERS 1	Institute for Unmanned Space Experiment Free Flyer	Development		S	S
9/12/2002		PSLV	Professor Satish Dhawan Space Center		Metsat	Indian Space Research Organization	Meteorological	$15-25M	S	S
9/15/2002		Kaituozhe 1	Taiyuan		Tsinghua TBA	Tsinghua University	Development	TBA	F	F
9/18/2002	√	+ Atlas 2AS	CCAFS	*	Hispasat 1D	Hispasat	Communications	$90-105M	S	S
9/25/2002		Soyuz	Baikonur		Progress ISS 9P	ISS Partner Nations	ISS	$30-40M	S	S
9/26/2002		Cosmos	Plesetsk		Nadezhda M 2	Russian Ministry of Defense	Navigation	$12-14M	S	S

√ Denotes commercial launch, defined as a launch that is internationally-competed or FAA-licensed.

+ Denotes FAA-licensed launch.

* Denotes a commercial payload, defined as a spacecraft that serves a commercial function or is operated by a commercial entity.

L and M refer to the outcome of the **L**aunch and **M**ission (immediate status of the payload upon reaching orbit): S = success, P = partial success, F = failure

Note: All launch dates are based on local time at the launch site at the time of launch.

Fourth Quarter 2002 Projected Orbital Launch Events

Date			Vehicle	Site		Payload or Mission	Operator	Use	Vehicle Price
10/7/2002			Shuttle Atlantis	KSC		STS 112	NASA	Crewed	$300M
						ISS 9A	ISS Partner Nations	ISS	
10/15/2002			Soyuz	Plesetsk		Foton 13	Rosaviakosmos	Microgravity	$30-40M
10/17/2002			Proton	Baikonur		INTEGRAL	European Space Agency	Scientific	$75-95M
10/22/2002			Molniya	Plesetsk		Molniya 3 TBA	Russian Ministry of Defense	Communications	$30-40M
10/28/2002			Soyuz	Baikonur		Soyuz ISS 5S	ISS Partner Nations	ISS	$30-40M
10/29/2002			Cosmos	Plesetsk		Nadezhda M 3	Russian Ministry of Defense	Navigation	$12-14M
						AlSat 1	National Center for Space Technology (Algeria)	Scientific	
10/2002	√		Shtil	Barents Sea		Cosmos 1	The Planetary Society	Development	$0.1-0.3M
11/3/2002	√	+	Delta 4 Medium-Plus (4,2)	CCAFS	*	Eutelsat W5	Eutelsat	Communications	$75-90M
11/5/2002			H 2A 202	Tanegashima		ADEOS 2	National Space Development Agency	Remote Sensing	$75-95M
						WEOS	Chiba Institute of Technology	Scientific	
					*	FedSat 1	Cooperative Research Centre for Satellite Systems/Space Innovations Ltd.	Communications	
						MicroLabSat	National Space Development Agency	Scientific	
11/8/2002	√		Ariane 5 ESC-A	Kourou	*	Stentor 5	Centre Nationale d'Etudes Spatiales/France Telecom	Communications	$150-180M
					*	Hot Bird 7	Eutelsat	Communications	
11/10/2002			Shuttle Endeavour	KSC		STS 113	NASA	Crewed	$300M
						ISS 11A	ISS Partner Nations	ISS	
11/21/2002			Atlas 2A	CCAFS		TDRS J	NASA	Communications	$90-105M
11/26/2002	√		Proton	Baikonur	*	Astra 1K	SES Astra	Communications	$75-95M
11/2002	√		Ariane TBA	Kourou	*	NSS 6	New Skies Satellites N.V.	Communications	TBA
11/2002			Delta 2 7925-10	CCAFS		Navstar GPS 2R-8	USAF	Navigation	$45-55M
						XSS-10	Air Force Research Laboratory	Development	

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Fourth Quarter 2002 Projected Orbital Launch Events

Date		Vehicle	Site		Payload or Mission	Operator	Use	Vehicle Price
11/2002		Soyuz	Baikonur		Kosmos TBA 12	Russian Ministry of Defense	Classified	$30-40M
12/1/2002		Pegasus XL	VAFB		SORCE	University of Colorado	Scientific	$12-15M
12/4/2002	√	Dnepr 1	Svobodny		RUBIN 2	Carlo Gavazzi Space	Development	$10-20M
				*	LatinSat 1	Aprize Satellite	Communications	
				*	LatinSat 2	Aprize Satellite	Communications	
					SaudiSat 2	SaudiSat	Development	
					Unisat 2	Italian Space Agency	Development	
12/15/2002	√	+ Zenit 3SL	Odyssey Launch Platform	*	Horizons 1	Horizons	Communications	$75-95M
12/15/2002		Delta 2 7320	VAFB		ICESat	NASA	Scientific	$45-55M
					CHIPSat	NASA	Scientific	
12/17/2002	√	+ Atlas 5 TBA	CCAFS	*	Nimiq 2	Telesat Canada	Communications	$75-90M
12/2002		Proton	Baikonur		Glonass M R4	Russian Ministry of Defense	Navigation	$75-95M
					Glonass M R5	Russian Ministry of Defense	Navigation	
					Glonass M R6	Russian Ministry of Defense	Navigation	
12/2002		Titan 2	VAFB		Coriolis	USN	Scientific	$30-40M
12/2002		VLS	Alcantara		SATEC	Instituto Nacional de Pesquisas Espaciais	Development	$6-7M
					NanoPehuenSat	Universidad Nacional del Comahue	Development	
12/2002	√	+ Pegasus XL	VAFB	*	OrbView 3	ORBIMAGE	Remote Sensing	$12-15M
4Q/2002		J 1	Tanegashima		OICETS	National Space Development Agency	Scientific	$40-50M
4Q/2002		Strela	Baikonur	*	Strela Test Payload	NPO Machinostroyeniya	Test	TBA
4Q/2002		Long March 2F	Jiuquan		Shenzhou 4	China National Space Administration	Development	N/A
4Q/2002		Long March 2C	Taiyuan		FSW 18	Central Military Commission (China)	Classified	$20-25M
4Q/2002		Soyuz	Plesetsk		Resurs F2	Rosaviakosmos	Remote Sensing	$30-40M
4Q/2002		Long March 1D	Jiuquan		Tansuo 1	Harbin Institute of Technology (China)	Remote Sensing	$10-15M

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First Quarter 2003 Projected Orbital Launch Events

Date		Vehicle	Site		Payload or Mission	Operator	Use	Vehicle Price
1/9/2003		Delta 2 7920H	CCAFS		Space Infrared Telescope Facility	NASA	Scientific	$50-60M
1/12/2003		Ariane 5G	Kourou		Rosetta Orbiter	European Space Agency	Scientific	$150-180M
					Rosetta Lander	European Space Agency	Scientific	
1/16/2003		Shuttle Columbia	KSC		STS 107	NASA	Scientific	$300M
1/21/2003		Titan 4B/Centaur	CCAFS		Milstar F6	USAF	Communications	$350-450M
1/30/2003	√ +	Atlas 3B	CCAFS	*	AsiaSat 4	Asia Satellite Telecommunications Co. (Asiasat)	Communications	$90-105M
1/2003	√	Zenit 3SL	Odyssey Launch Platform	*	Thuraya 2	Thuraya Satellite Communciations Company	Communications	$75-95M
1/2002		Delta 2 7925-10	CCAFS		Navstar GPS 2R-9	USAF	Navigation	$45-55M
					ProSEDS 2	NASA	Development	
2/1/2003		Pegasus XL	CCAFS		GALEX	NASA	Scientific	$12-15M
2/2003		H 2A TBA	Tanegashima		Japan Radar 1	Japan Defense Agency	Classified	$75-95M
					Japan Optical 1	Japan Defense Agency	Classified	
3/1/2003		Pegasus XL	VAFB		Scisat 1	Canadian Space Agency	Scientific	$12-15M
3/1/2003		Shuttle Atlantis	KSC		STS 114	NASA	Crewed	$300M
					ISS ULF-1	ISS Partner Nations	ISS	
1Q/2003	√ +	Atlas 5 TBA	CCAFS	*	Hellas-Sat 2	Hellas-Sat	Communications	$75-90M
1Q/2003	√	Dnepr 1	Svobodny	*	QuakeSat	QuakeFinder LLC	Scientific	$10-20M
1Q/2003	√	Ariane 5G	Kourou	*	Optus C1	Optus Communications Pty. Ltd.	Communications	TBA
1Q/2003	√	Zenit 3SL	Odyssey Launch Platform	*	Telstar 8	Loral Skynet	Communications	$75-95M
1Q/2003		Soyuz	Baikonur		Progress ISS 10P	ISS Partner Nations	ISS	$30-40M
1Q/2003		Titan 2	VAFB		DMSP 5D-3-F16	USAF/NOAA	Meteorological	$30-40M
1Q/2003		Delta 2 7925-10	CCAFS		Navstar GPS 2RM-11	USAF	Navigation	$45-55M
1Q/2003		PSLV	Professor Satish Dhawan Space Center		IRS P6	Indian Space Research Organization	Remote Sensing	$15-25M
1Q/2003		Ariane 5G	Kourou		SMART 1	European Space Agency	Development	$150-180M
1Q/2003	√	Ariane 5G	Kourou	*	SatMex 6	Satelites Mexicanos	Communications	$150-180M

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+ Denotes FAA-licensed launch.

* Denotes a commercial payload, defined as a spacecraft that serves a commercial function or is operated by a commercial entity.

APPENDIX C: FIRST QUARTER 2003 PROJECTED LAUNCH EVENTS

First Quarter 2003 Projected Orbital Launch Events

Date		Vehicle	Site		Payload or Mission	Operator	Use	Vehicle Price
1Q/2003		Delta 4 Medium	CCAFS		DSCS 3-13	USAF	Communications	$75-90M
1Q/2003		Delta 4 Heavy	CCAFS	*	Delta 4 TBA 2	TBA	TBA	$150M
1Q/2003	√	Ariane 44L	Kourou	*	Intelsat 907	Intelsat	Communications	$100-125M
1Q/2003		GSLV	Professor Satish Dhawan Space Center		Gsat 3	Indian Space Research Organisation	Communications	$25-45M
1Q/2003	√	Ariane 5G	Kourou	*	Amos 2	Israel Aircraft Industries	Communications	$150-180M
1Q/2003	√ +	Delta 4 Medium-Plus (4,2)	CCAFS	*	Estrela do Sul	Loral Skynet do Brasil	Communications	$75-90M
1Q/2003	√ +	Proton	Baikonur	*	AMC 9	SES Americom	Communications	$75-95M
1Q/2002		Long March TBA	Taiyuan		Chuang Xing 1	Chinese Academy of Sciences	Communications	TBA
1Q/2002		Long March TBA	TBA		OlympicSat 1 OlympicSat 2	Tsinghua University Various Chinese highschools	Development Remote Sensing	TBA
1Q/2003	√ +	Ariane 5G	Kourou	*	BSat 2C	Broadcasting Satellite System Corporation	Communications	TBA

√ Denotes commercial launch, defined as a launch that is internationally-competed or FAA-licensed.

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