

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.

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.

Third-party liability and government property insurances protect launch service providers and their customers in the event of public injury or government property damage, respectively, caused by launch or mission failure. In the United States, Federal Aviation Administration regulations require that commercial launch licensees carry insurance to cover third-party and government property damage claims that might result from launch activity. Because these insurances are obtained from a different pool than the previous types of coverage, these insurances are beyond the scope of this report. For more information on licensee financial responsibility requirements, liability, and 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.

Re-launch guarantees are a form of launch insurance 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, reinsurers 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

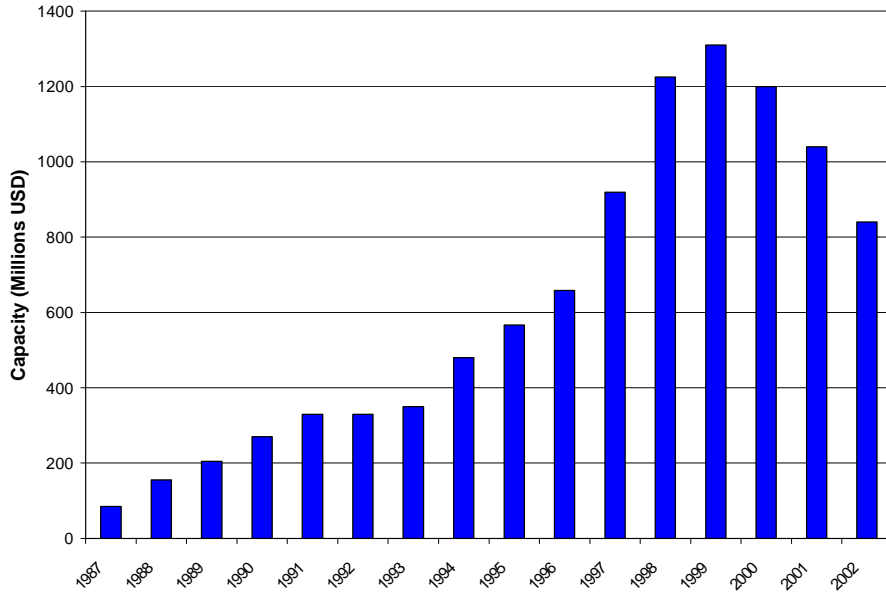


Figure 1. Stated Insurance Capacity (Source: Willis Inspace)

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.

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.

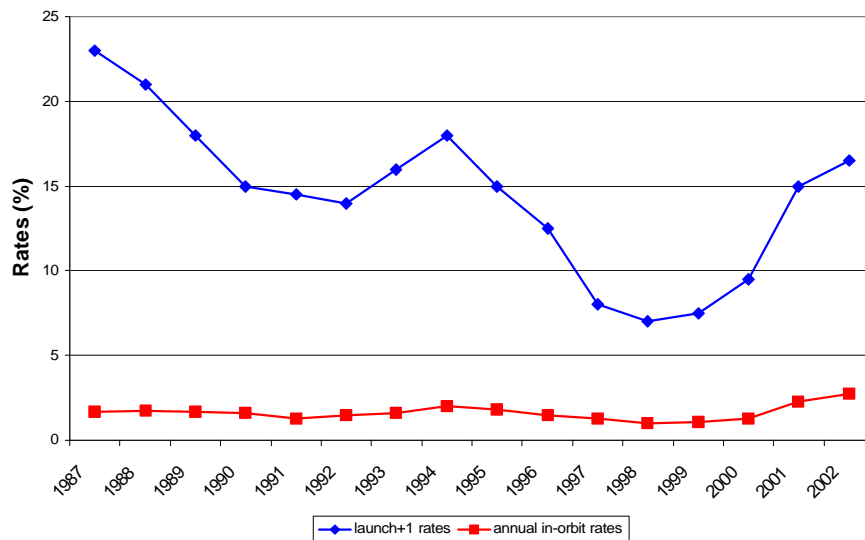


Figure 2. Launch+1 and In-Orbit Premiums (Source: Willis Inspace)

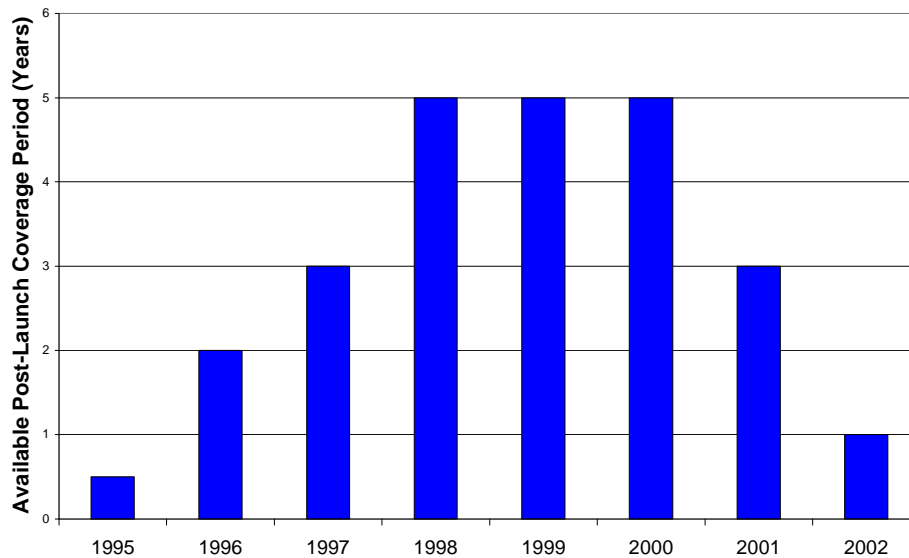


Figure 3: Post-Launch Coverage Period

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 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.

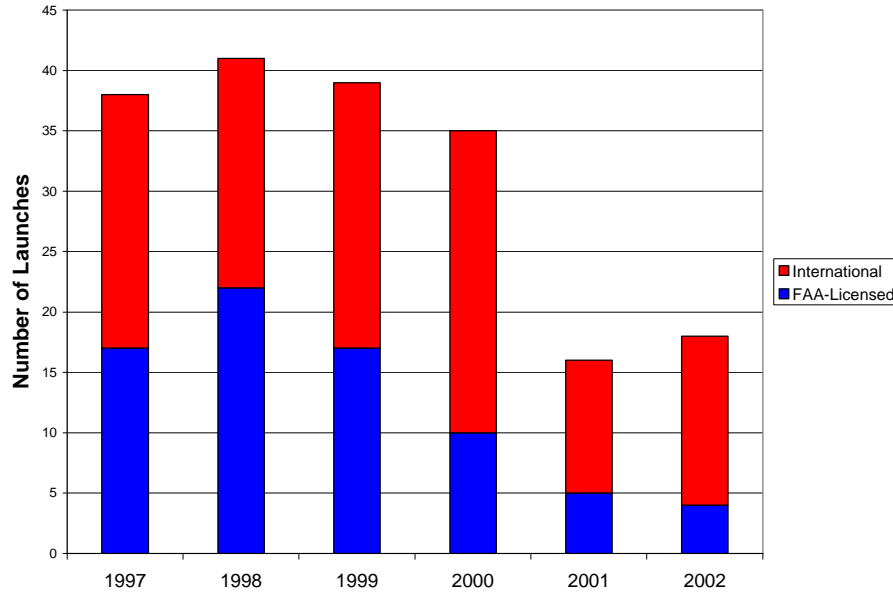


Figure 4. Annual World Commercial Launches

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.

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.

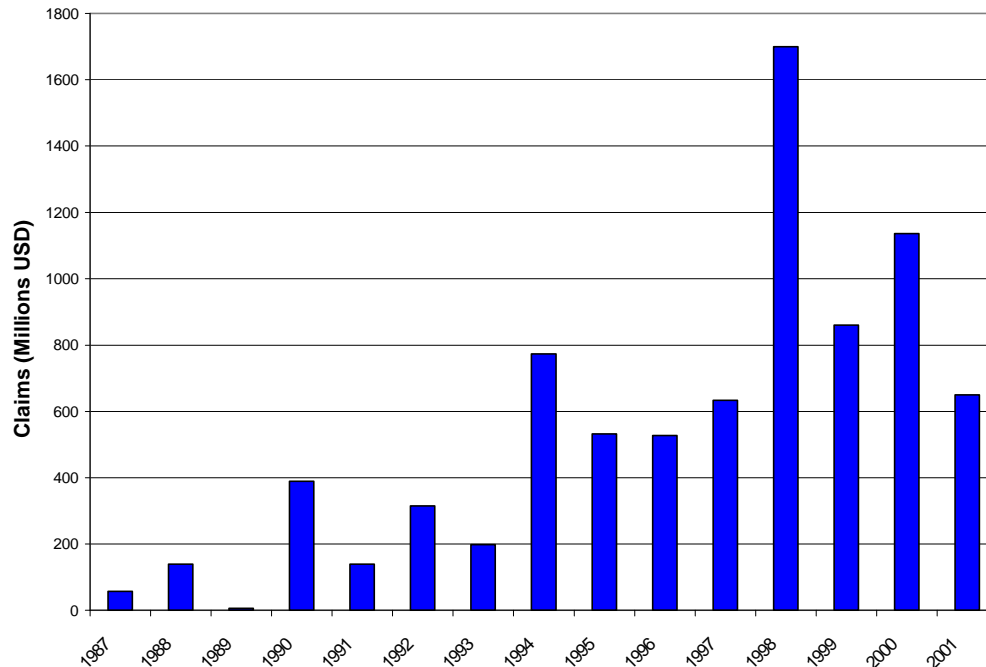


Figure 5. Annual Space Insurance Claims Resolved to Date

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 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.