Satellite Insurance Rates On the Rise – Market Correction or Overreaction?

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Introduction

In recent years, the satellite insurance market has experienced a great deal of volatility. This is consistent with insurance markets overall, in particular the dramatic rise in insurance rates after 9/11/01. In addition, the satellite insurance industry rate increases have been directly related to the increase in the number of insurance claims.

Satellite insurance rates are affected by several factors, primarily the levels of anomalies, or malfunctions, in the operation of a satellite. While anomalies occur every day within the global satellite fleet, it is severe anomalies resulting in a total or partial inability for the satellite to perform its mission that can trigger an insurance claim. Thus, satellite insurers are very sensitive to any increase in satellite anomalies, which can be a leading indicator of decreased satellite reliability.

However, the situation surrounding the increase in satellite anomalies is complex. Many factors have contributed to this increase, only some of which are directly related to satellite reliability. A sentiment exists in parts of the satellite manufacturing community that the satellite insurance industry has overreacted to the increase in anomalies. The recent insurance rate increases have affected the already-thin profit margins associated with satellite manufacturing and, in some cases, jeopardized the economic viability of certain satellite ventures.

The satellite insurance industry argues that it is simply correcting a situation that produced large losses. If not for this correction, insurers would be forced to abandon the satellite industry for more favorable markets.

There are elements of truth in both positions, and Futron does not take sides in this White Paper. Instead document attempts to clarify some of the issues through an objective analysis of satellite insurance, reliability, and performance. This White Paper also includes a technical analysis of the range of anomalies experienced in recent years, and puts this in the context of the increased number and complexity of satellites launched. Futron's primary findings include:

- In the last four years, space insurance rates have risen by 129%.
- In the last four years, major on-orbit anomalies have risen by 146%.
- There has been a significant increase in the number of GEO commercial communications satellites – the on-orbit population of such satellites doubled between 1996 and April 2002.
- Technical complexity of satellites has increased significantly over the last five years. For example, the average payload power almost tripled from 2.3 kW in 1996 to 6.3 kW in 2001.
- The anomaly rate of new satellites is relatively high in the first two years of a satellite's life, then drops dramatically and continues to decline thereafter.
- Satellite manufacturers are implementing stringent quality control standards in the design and manufacturing process.

Analysis Methodology

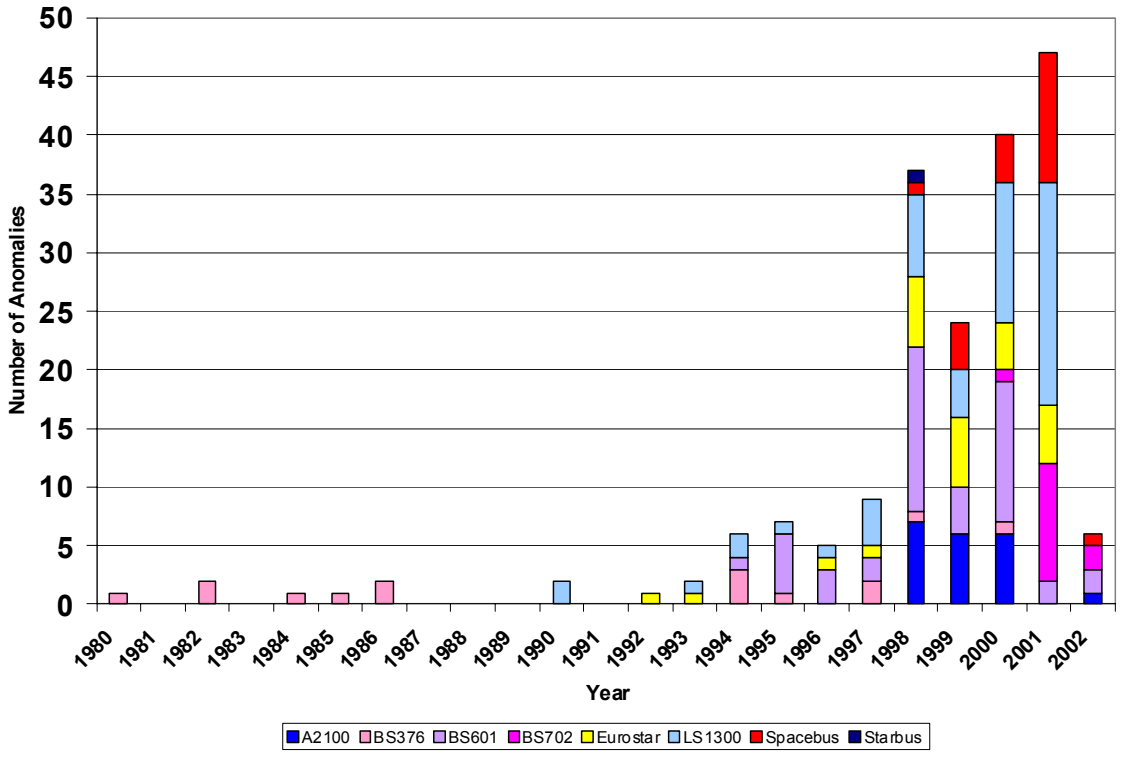
For the analyses included in this White Paper, Futron studied different kinds of anomalies by bus type from various perspectives. A primary source of data was the Air Claims database, which was augmented with data from Futron's proprietary databases and from an analysis of publicly-available information. In addition, Futron interviewed experienced individuals from leading companies in the space insurance industry. The results from these interviews were used to crosscheck data from the database. The results were also used to determine how the space insurance market is likely to determine rates in the near term, what factors underwriters consider in that process, and the relative importance of those factors.

Futron restricted the analysis to anomalies for on-orbit satellites only; anomalies related to launch vehicles are not included in this analysis. The types of anomalies included in this analysis are primarily limited to anomalies that caused some loss of capability. This White Paper focuses on GEO commercial communications satellite buses currently on-orbit and built by the six major manufacturers: Alcatel, Astrium, Boeing, Lockheed Martin, Space Systems Loral, and Orbital Sciences Corporation.

Satellite Anomalies: The Raw Numbers

A significant increase in the number of anomalies (both bus and payload) for all of the major bus types occurred in 1998, as illustrated in Figure 1. However, there are many factors at work that contributed to this increase, only some of which are directly related to reliability. A few of these contributing factors are discussed later.

Figure 1: Number of Anomalies by Bus Type (1980 – 2002)



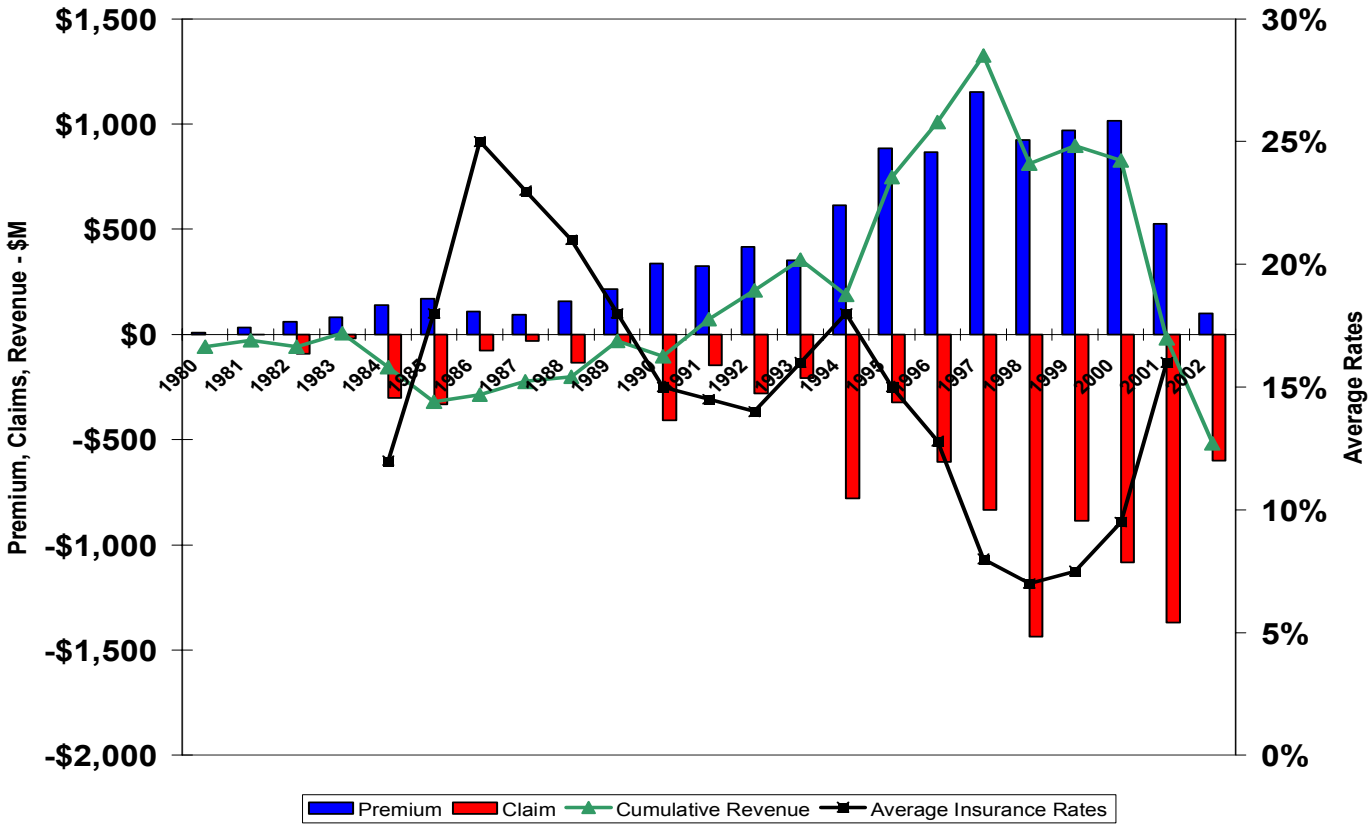
Insurance Industry Impact

For each satellite insured, a unique evaluation is conducted to determine the amount of risk associated with the asset, which partially determines the insurance rate. The other aspect that determines the insurance rate is the amount of capital (capacity) available in the insurance markets for space insurance. This theoretical capacity is affected by two major factors: the number and size of satellite insurance claims paid historically and the impact outside insurance claims have on the confidence of the industry.

Recently, insurance capacity has decreased by $400M, from a high of $1.3B in 1999[1] to approximately $900M in 2002. In the last five years, the rate for launch plus 12 months of on-orbit coverage has gone from a low of 7% of satellite and launch vehicle value in 1998 to around 16% today. This represents a 129% premium increase in the last four years. In addition, the terms of the insurance coverage are changing to include more exclusions, new and increased deductibles, and reduced coverage time. These changes were in direct response to the increase in anomalies shown in Figure 1.

Figure 2 shows the insurance premiums[2], claims[3], cumulative revenue, and average insurance rates[4] of the space insurance industry from 1980 to April 2002. Figure 2 illustrates the recent decrease in the cumulative revenue that contributes to the difficulty in attracting capacity.

Figure 2: Space Industry Insurance Financial Metrics



[1] Willis, presentation to SSPI, March 12, 2002
[2] US Aviation Underwriters, Inc.
[3] Ibid.
[4] Willis, presentation to SSPI, March 12, 2002

Some Contributing Factors

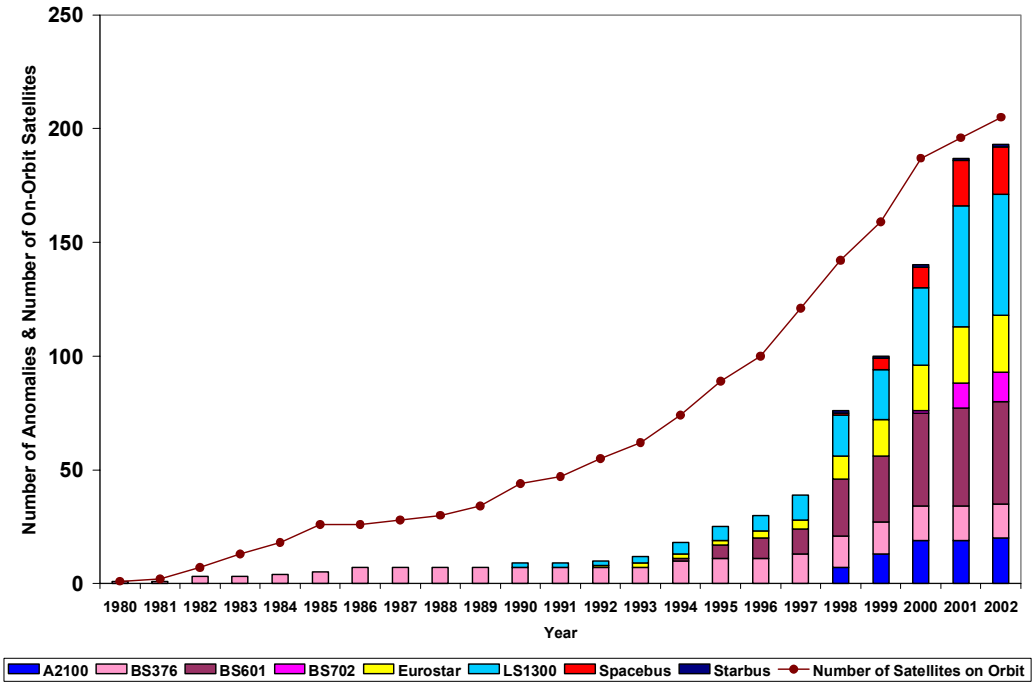
As mentioned earlier, many factors, not just a decrease in satellite reliability, contributed to the increase in anomalies. These factors include:

1. A significant increase in the number of on-orbit satellites;
2. A significant increase in the technical complexity of satellites;
3. A shortened manufacturing schedule; and
4. A change in the nature of the satellite insurance business.

Factor 1: The Number of Satellites

Futron has overlaid the cumulative number of satellite anomalies with the number of on-orbit satellites (major bus types being examined in this study) by year in Figure 3. As shown, the number of anomalies has increased as the number of satellites has increased. This does not fully explain the increase, as the "gap" between the number of anomalies and the number of satellites closes in the latter years, but it is clearly a contributing factor.

Figure 3: Cumulative Number of Satellite Anomalies with the Number of Satellites On-Orbit (1980 – 2002)

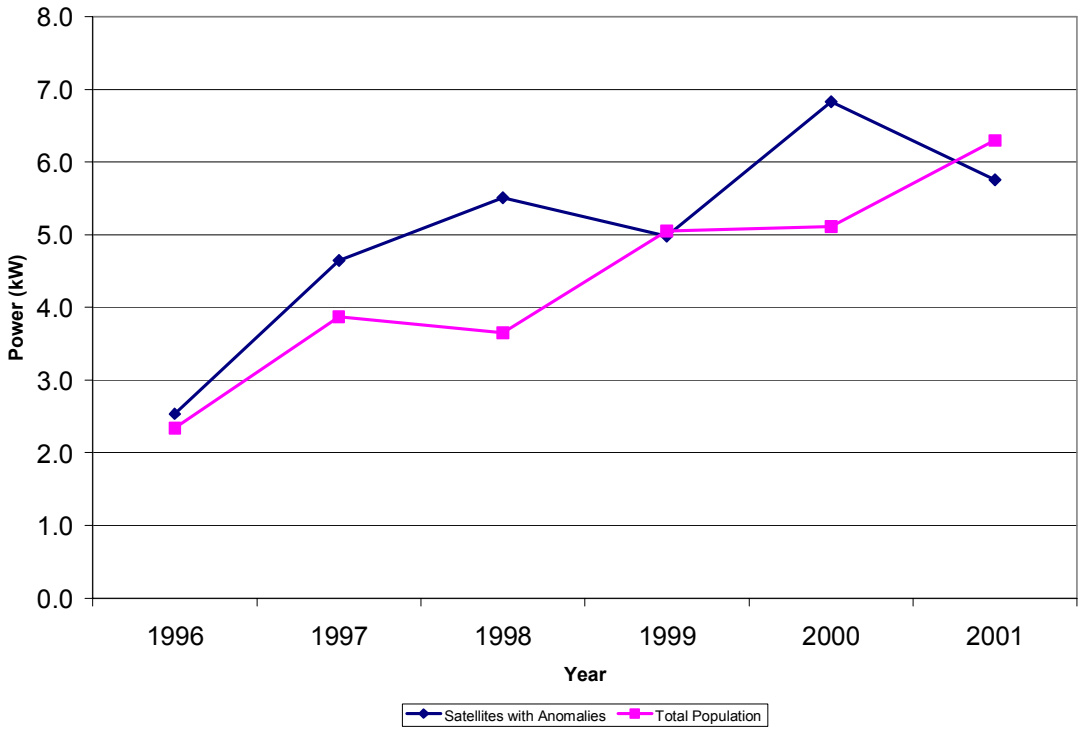


Factor 2: Technical Complexity

The technical complexity of satellites has increased significantly. The average power level of satellites launched from 1996 to 2001 has tripled. Figure 4 shows a year-by-year growth trend in average power of all GEO satellites launched and those that have experienced anomalies. The average power of the satellites experiencing anomalies is higher than the average power of the total population. This suggests that the added technical complexity is a contributing factor to increased anomalies.

In addition, the average mass of satellites launched has increased 50% over the last five years and the average design life has increased from 10 years to 15 years. This increase in capability offers a much more robust product to the commercial satellite operator than was available five years ago. Such improved satellites produce significantly more revenue and enable satellite operators to offer more advanced services, including consumer-based services that deliver very high revenue streams. However, this advanced technology is more complex than previous systems and comes with a higher associated risk of failure.

Figure 4: Average Payload Power for GEO Commercial Satellites (1996 – 2001)



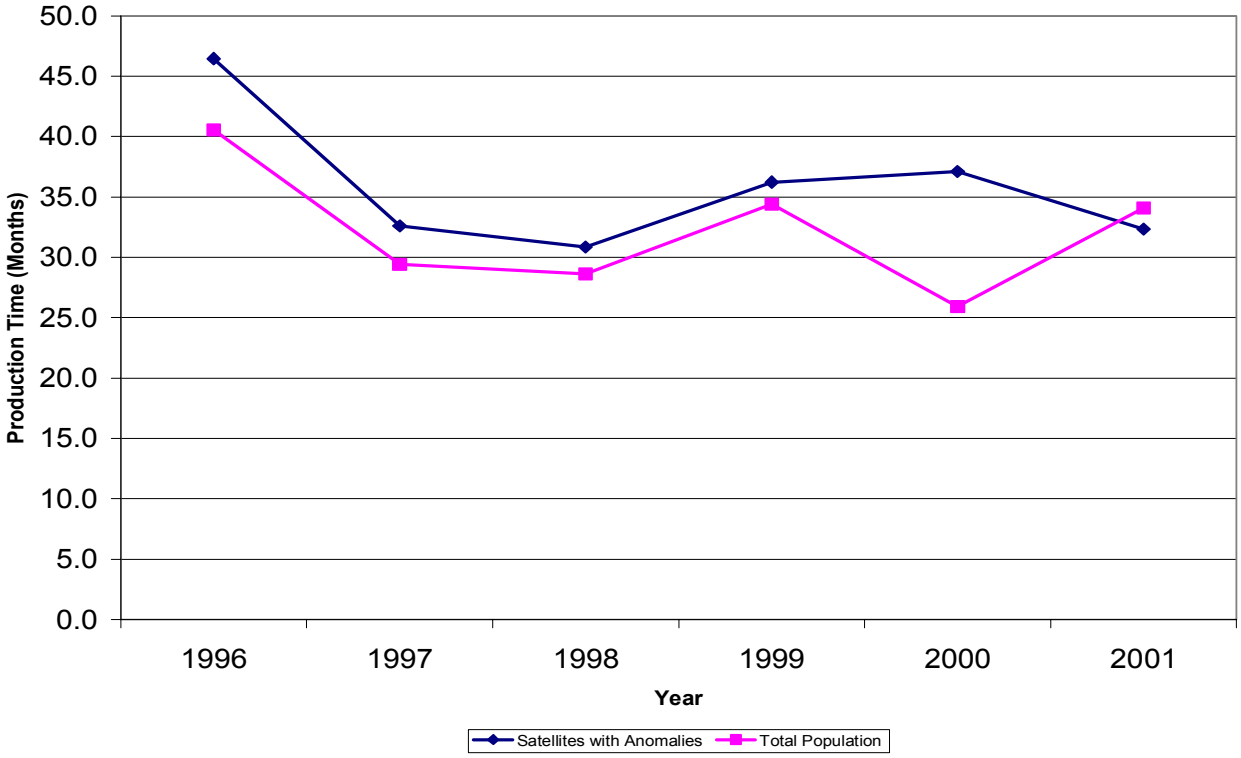
Factor 3: Manufacturing Cycle

GEO commercial satellite manufacturers have decreased the number of months from contract award to satellite launch. This decrease has been accomplished through streamlined production processes and standardized product lines. Figure 5 illustrates this shorter production cycle. While Figure 5 shows that satellites with anomalies have a slightly longer production cycle than those without anomalies, the overall cycle has decreased.

This decrease has enabled satellite operators to enter the market quicker, providing customers with additional capability in a much shorter time frame. These benefits significantly reduce the business risk for satellite operators. However, shortened production cycles put pressure on

manufacturers to perform less rigorous analysis, test, and evaluation on satellites prior to delivery. With proven technologies, this is generally not a problem and represents an appropriate balance between testing and risk. However, with advanced technology, shortened production cycles increase the possibility of anomalies.

Figure 5: Average Production Cycle for GEO Commercial Satellites (1996 – 2001)



Factor 4: The Insurance Business

The nature of the satellite insurance business has unquestionably changed over the years. The satellite manufacturing business is intensely competitive with significant overcapacity and razor-thin profit margins. The implications of a satellite anomaly are much higher than they were in the past. This situation has heightened the sensitivity associated with anomalies – they receive more media coverage and more scrutiny from the affected parties.

Also, satellite operators have become savvier in their use of insurance. For example, on-orbit satellite insurance was very rare ten years ago; however, today it is rare for a satellite to be launched *without* on-orbit insurance. In addition, satellite insurers are getting more sophisticated in their policy structures, conditions, and rate settings. All these business changes would have increased the number of claims even if satellite reliability had not changed.

Satellite Bus Comparative Analysis

By definition, for each insurance claim, a loss caused by the claim is filed for compensation. The value of that claim will depend on the anomaly's impact to the satellite's revenue generating ability. Some anomalies result in the total loss of a satellite and all revenue, and some result in partial loss of revenue generating capacity. The dollar value of each insurance claim for each bus type from 1996 to April 2002 is shown, in Figure 6. It is worth noting that there are more BS601 satellites on-orbit than any other shown which contributes to the high total claim amount.

Also, very large satellites, such as the BS702, will inherently have larger claims because of their higher cost and associated larger revenue generating ability.

Figure 6: Insurance Loss Anomaly Values by Bus Type (1996 - April 2002)

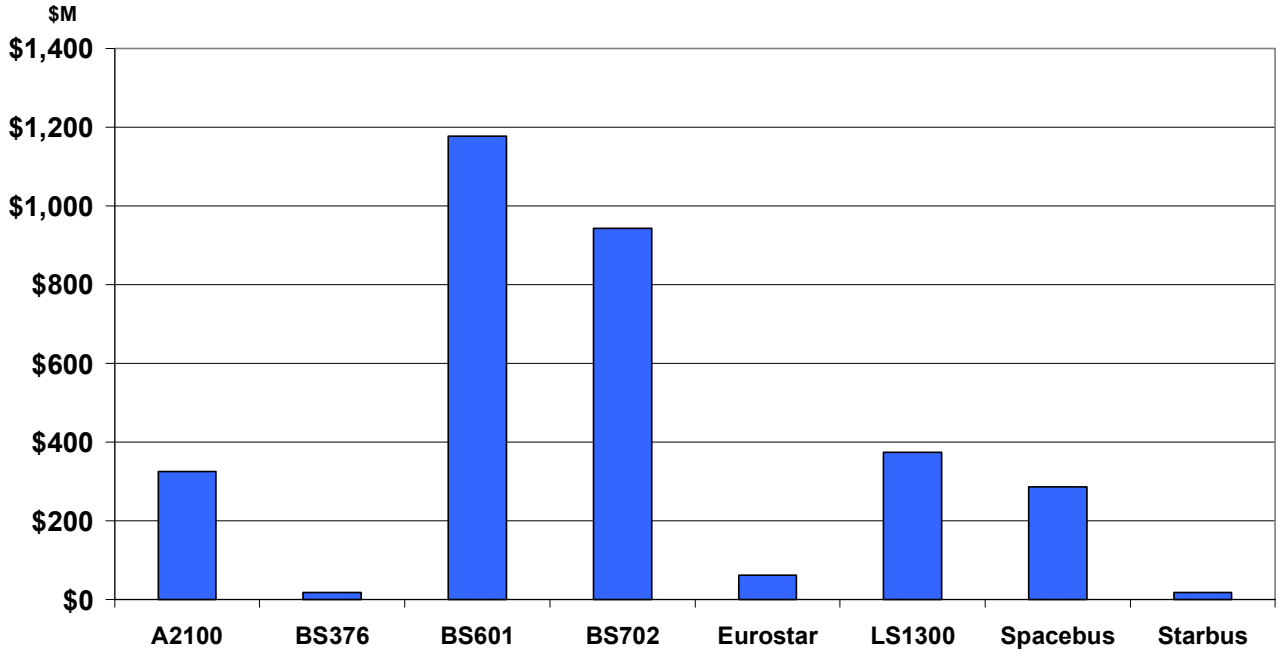
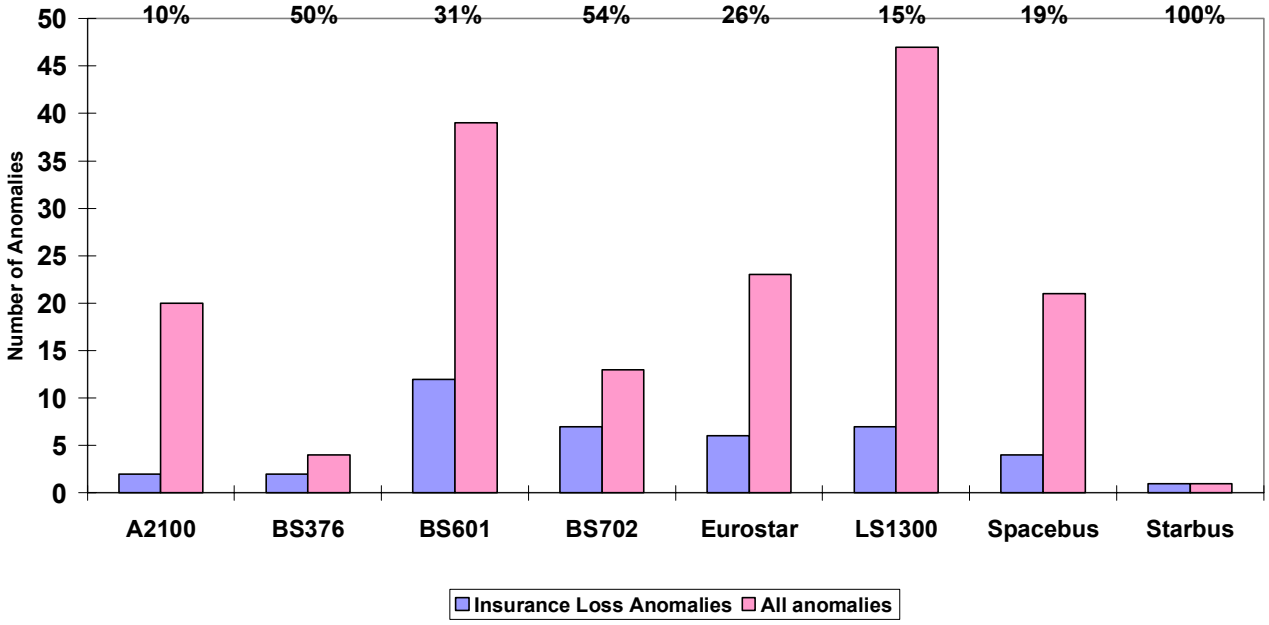


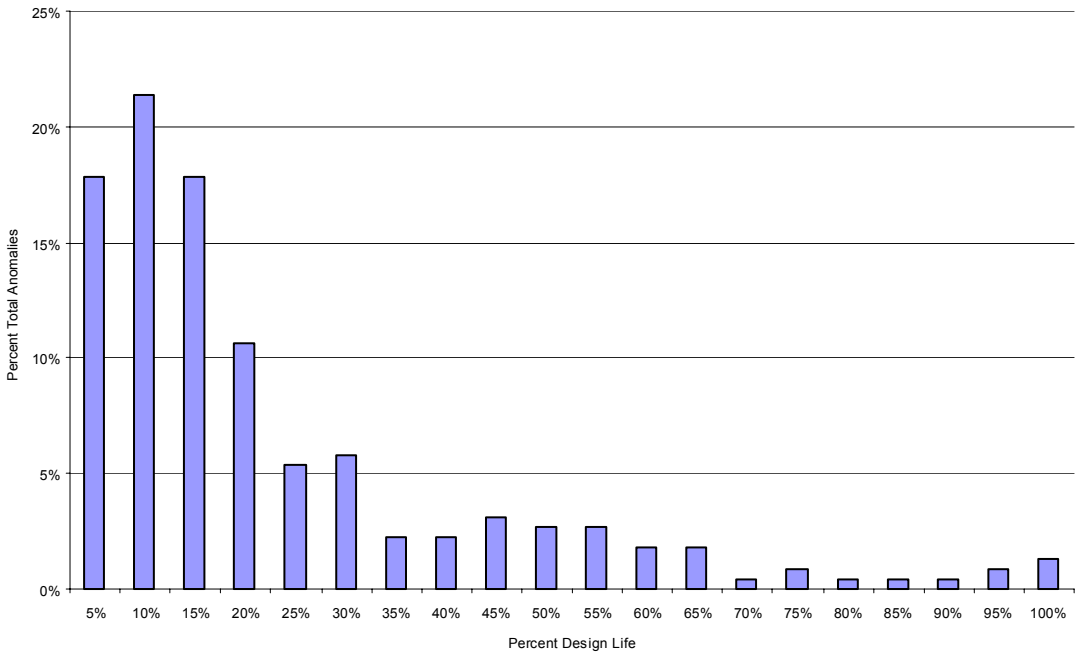
Figure 7 illustrates the number of anomalies that resulted in insurance claims compared to total anomalies for each bus type from 1996 to April 2002. The percentage of insurance claim anomalies to total anomalies is displayed. Again, it is important to note that there are many ways to "slice and dice" anomaly data to show various perspectives of satellite reliability, a practice known as normalizing the data. Both Figures 6 and 7 use total anomaly amounts and have not been normalized in any way.

Figure 7: Insurance Claim Anomalies vs. Total Anomalies (1996 – April 2002)



Futron shows another interesting phenomenon in studying the satellite anomaly data – infant mortality. Most anomalies occur early in the satellite design life, as shown in Figure 8. After reaching 15% of design life, the anomaly rate declines precipitously and continues to decline thereafter. This infant mortality trend is fairly typical in industries that produce technically complex hardware.

Figure 8: Anomalies as Percent of Satellite Design Life (satellites launched from 1985 to 2001)



Quality Control Initiatives

In addition to designing and building satellites that are more resistant to anomalies, the recent upturn in anomalies over the last five years has prompted the satellite manufacturers to implement stringent quality control processes and standards that will guard against future increases in anomalies. Boeing Satellite Systems (BSS), the manufacturer of the BS376, BS601 and BS702, has recently restructured satellite operations. Randy Brinkley, president of BSS, has stated, "We will significantly increase our emphasis on product and enterprise-wide quality, and we are also restructuring to enhance our business agility to respond to market changes and to meet the needs of our customers."[5] This renewed emphasis on quality control is a clear indication that the outlook for the future of GEO commercial communications satellites will be one of high reliability and growth.

In addition to the efforts by the manufacturers, satellite operators themselves have recognized the value of adding time, effort and expense up front for monitoring and testing during the manufacturing process. While such monitoring and testing adds to the cost of the satellites, it results in lower insurance rates.

[5] Boeing press release, February 21, 2002

Futron Overview

Futron Corporation is a technology management consulting firm. Since its founding in 1986, Futron Corporation has established an outstanding track record as a high performance consultant. Futron is headquartered in Bethesda, Maryland with offices in Houston, Texas and Washington D.C. Currently, Futron employs over 100 professionals and has annual revenues over $11M.

Futron's headquarters in Bethesda, Maryland

Summary of Capabilities

Futron's Space and Telecommunications Division is the industry leader in researching, analyzing, and forecasting space and telecommunications markets and programs. Futron offers our commercial and government clients a suite of proprietary, leading-edge analytic methodologies. Our world-class team of market and policy analysts, economists, and engineers bring unparalleled skills and expertise to each account.

- We have surveyed hundreds of aerospace firms to develop a unique revenue, employment, and productivity profile of the industry.

- We have developed country-by-country models of demand for telecommunication services that aggregate a global forecast up from the individual household PC or business network; these models have accurately predicted future launch levels and business changes in the satellite industry.

- Futron helps clients win competitions, analyze competitors, estimate costs and prices, and track opportunities.

- Futron also performs cost estimates and economic analyses. Futron generates bottoms up, parametric, and analogous cost estimates for commercial satellite and launch vehicle programs.

- Futron provides a subscription-based service providing information on every FCC satellite application filed since 1990. Futron's FCCFilings.com is the only source for competitive intelligence and business data contained in FCC satellite licensing documents.

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