

Selecting a Launch Vehicle: What Factors Do Commercial Satellite Customers Consider?

Introduction

Commercial satellite owners and operators clearly have the luxury of choice when it comes to selecting a launch vehicle to transport their assets into orbit. Whether the final destination is low-earth orbit (LEO), geostationary orbit (GEO), or somewhere in between, the world supply of launchers able to deliver satellites to orbit has exceeded demand each year for more than a decade. While established launch companies in the United States, France, Russia, and China work to introduce increasingly capable versions of their rockets, new players such as Japan, India, and Israel continue to make headway in the

development of their own launchers with the hope of offering commercial services.

While the wide assortment of launch vehicles available today affords satellite owners and operators numerous deployment options, this situation has created an extremely competitive business environment for launch companies worldwide. Indeed, the competitive market has had a major impact on U.S. share of commercial launches. Commanding about 50 percent of commercial launches during the mid-1990s, U.S. launch providers' share of the market now hovers around the 20 percent level (Figure 1).

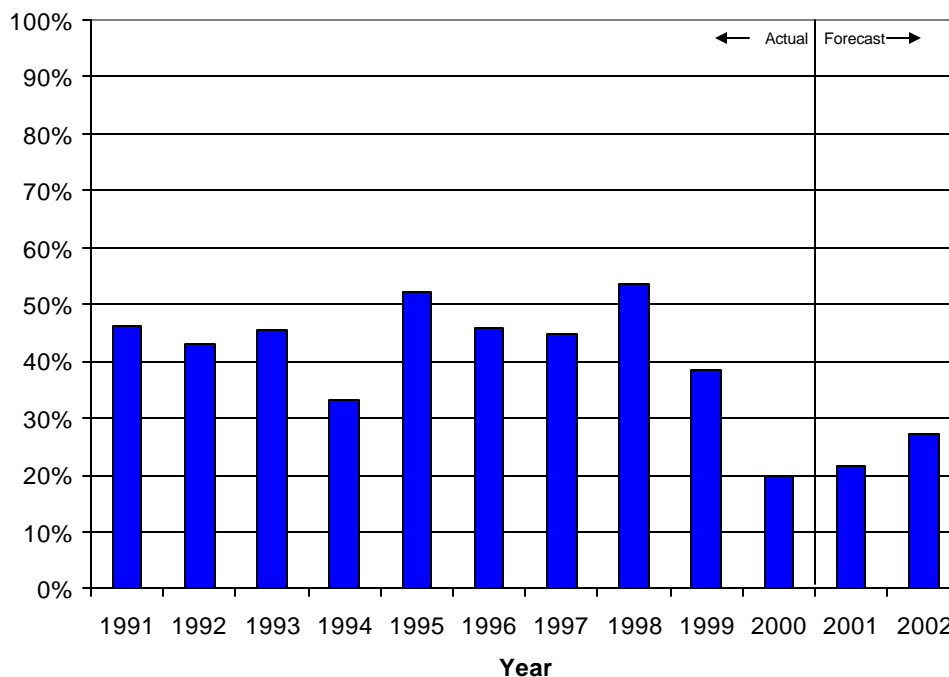


Figure 1. U.S. Share of Worldwide Commercial Launches

U.S. vehicles carried into orbit 38 percent of U.S. commercial satellites and just 8 percent of foreign commercial satellites that rode on commercial launches in the year 2000.^{1,2}

How can U.S. launch companies capture a greater share of the worldwide commercial satellite launch market in the upcoming years? The answer requires a solid understanding of the criteria commercial satellite owners and operators value and follow most often when evaluating launch vehicle choices. This report considers a number of those selection factors, as offered by a variety of commercial companies owning and operating satellites.

Sources and Nature of Data

The data on commercial satellite owners' and operators' launch vehicle selection criteria used to compile this report came from two primary sources. One source was the results of a customer satisfaction survey conducted by a U.S. launch vehicle service provider. This survey reported the responses of 62 launch customers, including NASA, the U.S. Air Force, and domestic and international commercial satellite owners and operators. Several questions focused on factors

¹ Commercial launches are defined here as those launches licensed by the FAA, internationally competed, or privately financed.

² These percentages omit launches by Sea Launch, a joint venture of the United States, Russia, Ukraine, and Norway.

customers considered most important in evaluating launch vehicles. In addition, the FAA completed eight interviews on this issue with commercial communications satellite owners and operators. The companies interviewed represented a variety of demographics and interests: some were domestic while others were foreign, some were interested in GEO satellites while others focused on LEO constellations, some companies were well-established while others had recently started up, and most had used vehicles from more than one country. An additional interview was conducted with the National Reconnaissance Office (NRO) for comparison to the commercial respondents.

Launch Vehicle Selection Criteria

This section discusses the factors launch vehicle customers consider in evaluating vehicles, based on the responses given in the launch customer satisfaction survey as well as the FAA-conducted interviews. The factors are discussed here in an order that roughly reflects the frequency with which they were cited, starting with those mentioned most often.

Reliability of Launcher

The NRO and six of the eight companies interviewed by the FAA said that a launcher's reliability—its state of having low risk of technical failure based on a history of prior mission success—is one of the most

important factors they consider in evaluating a launch vehicle for use. According to the launch company customer satisfaction survey results analyzed, both U.S. and foreign companies consider reliability to be one of the three most important factors, while reliability by far tops NASA's and the Air Force's lists of selection criteria. Customers sending payloads to both GEO and LEO agree on reliability's significance.

According to several of the commercial entities interviewed, launcher reliability is critical because reliable launch vehicles increase the chances that payloads will reach orbit. In the case of a new satellite venture, a launch failure could substantially delay the time it takes a company to get its satellite(s) deployed and thus enter the market. Business ventures that must replace satellites to operate efficiently or effectively and those that need to deploy satellites to expand business also sense the import of launcher reliability. The NRO explained the criticality of launcher reliability to its goal of 100 percent mission success. In these cases, technical conservatism typically prevails over other factors. In contrast, government or private technology demonstration missions whose failures would not significantly affect a program or business may be more inclined to weigh reliability and costs of launchers more equally.

Prospective satellite customers thus tend to place great emphasis on whether a launch vehicle is "proven"—that is, whether it has a

positive record of launch success. One commercial interviewee said that his company's minimum threshold for launch success is 90 percent. Companies also consider the success history of launcher components; some indicated their willingness to fly payloads on new vehicle models using components with strong records of success. The NRO indicated that it would consider flying payloads on an emerging launch system depending on the concept's viability, credibility, and demonstration and risk reduction data. A launch company's longevity in business contributes to at least one satellite owner's sense of a launcher's reliability.

Most companies interviewed said that they are willing to pay more for a high reliability vehicle. Of those, most indicated that they would pay a little, but not a lot more, for reliability; one U.S. company that has bought launchers from several countries expressed its willingness to "pay a premium" for vehicle reliability. Another company warned, however, that it would not purchase the most reliable of rockets if the cost were prohibitive. Several brought up the fact that choosing a vehicle with high reliability translates into reduced insurance rates for companies who choose them.

Launcher Performance and Suitability

Domestic commercial and government respondents to the launch customer survey, the NRO, and seven of the eight commercial interviewees indicated that a

vehicle's performance and suitability to carry the satellite(s) onboard is one of the most important factors in their evaluations of launchers. International respondents to the launch company's survey ranked the combination of performance and suitability fourth in importance.

Performance of a vehicle comprises its capability of lifting a certain payload mass to a desired orbit and its ability to insert its payload(s) into the proper orbit. Launching a satellite into space but failing to deliver it to the correct orbit could effectively render it useless. Suitability refers to both the vehicle's compatibility with various types of payloads and its payload margins. Payload margins equate to "wiggle room" for satellites: a vehicle with wide margins is often desirable because more changes can then be made to a satellite (e.g., it can grow in size or weight) without affecting the satellite's ability to ride on that vehicle.

Both GEO and LEO customers are concerned about the payload weight a vehicle can carry. GEO satellite owners seek heavy-lift vehicles because their satellites are becoming increasingly heavy and need to travel into a high orbit. LEO constellation ventures tend to seek launch vehicles that can accommodate and deploy several satellites into orbit at once. One interviewee explained that paying for a large vehicle could offset the costs of having to miniaturize satellite components to make their satellites fit on smaller vehicles.

Launcher Price

The price of a launch vehicle is one of the top factors in launcher selection for all of the survey respondents and interviewees. This metric, however, ranked highest for international commercial entities and tied with reliability and performance for domestic commercial groups, whereas it fell beneath reliability and performance for the government clients.

Constituting roughly 25 percent or more of a satellite project's total cost, launch price, including insurance, is a major concern of satellite companies and the government for good reason. Virtually all companies interviewed stressed their attraction to launch service providers offering competitive prices. Several expressed that a significant increase in launch prices would have an impact on their rate of expansion or replacement of satellites and could potentially put them out of business.

Some of the companies interviewed explained that their assessment of launcher price is folded into a larger measure called "present value," which also accounts for the payment schedule a launcher is willing to offer. Small and start-up companies are particularly interested in a flexible payment schedule that allows them to defer expenses as much as possible. Even more established companies view vendor financing as selling points as long as financing rates are acceptable. One commercial interviewee said his company prefers to make payments as the launch provider achieved

various milestones of their contract. A few satellite owners also indicated that launch providers' willingness to invest in their satellite systems factors into their decisions.

Availability and Schedule

Only half of the companies interviewed expressed the importance of choosing a launcher whose availability is compatible with their desired launch schedules. Some of these respondents stressed the importance of finding a launch provider or providers that could meet the special requirements of particular satellite systems; for example, LEO constellations require several launches within a short period of time. The selection of providers for these satellites' deployment often comes down to which launch vehicle(s) can launch several times per year or can meet a demanding timetable; in many cases, this means a satellite customer must end up relying on several different providers. One LEO system owner said that securing a niche in the market and then developing an image as a good and reliable communications service provider is dependent on launching satellites in a short period of time and without delay. A GEO satellite system owner said that time until launch availability is especially relevant for those needing to replace satellites destroyed in a launch failure. Some companies said that another consideration is that different vehicles have different turnaround times and abilities to respond to customers' requests to change a launch date.

One U.S. satellite company interviewed indicated that it was wary of scheduling launches with providers who sometimes bump commercial launches to give priority to government needs. Another interviewee favors vehicles that use mobile launch platforms because they offer relatively great availability and a high range manifest and because vehicle configurations can be changed fairly easily. Several agreed that in spite of the potential cost savings, they prefer to schedule satellite launches independently rather than have them partnered with other spacecraft launching on the same vehicle because such a partnership could result in less control over launch schedule.

U.S. Technology Transfer Safeguards

In concurrence with the responses of international respondents to the launch customer satisfaction survey analyzed, every foreign-based satellite owner that the FAA interviewed expressed that U.S. technology transfer safeguards are a major factor in their evaluations of U.S. launch companies. Before a U.S. launch company can discuss the technical details of a business deal with a foreign satellite customer, it must obtain a marketing license from the State Department. The launch company must get another government license, a Technical Assistance Agreement, to physically work with a foreign company on matters such as integrating the company's payload onto the vehicle.

These licenses can take several months to procure. As a result, working with a U.S. launch provider presents many difficulties for an international satellite owner. These firms must contemplate whether the U.S. launch provider will be able to secure the appropriate licenses to work with their company (a situation that can vary based on international political conditions) and, if so, whether the licensing process will affect their ability to launch when desired. Time is an essential element for companies to fulfill their business plans.

U.S. launch providers must also obtain U.S. government-issued licenses to supply insurance companies, often located abroad, with technical information to determine their rates. This requirement often further delays business dealings between the launch provider and payload customer.

Licensing issues are also a major consideration of U.S. satellite owners in evaluating foreign launch providers. One U.S. satellite operator that uses U.S.-built satellites indicated that current U.S. satellite export controls have made doing business with even those launch providers based in countries with good U.S. relations very difficult. The delays these controls cause, however, have not stopped several companies from engaging in the export licensing process because they believe that a foreign launcher provides the best available value. Export controls also make procuring

U.S.-built satellites a challenge for foreign satellite companies.

Customer Relations and Partnerships

Most of the companies interviewed by the FAA said that the quality of the relationship they established with a launch service provider also has an influence on their vehicle selections. Most agreed that they value providers who convey professionalism, are sensitive to their needs, and respond to their needs quickly. Also critical is a good working relationship during both the negotiations and procurement stages, especially when problems arose. The ease with which companies could communicate with launch providers over national and cultural divides is also important. According to one respondent, good rapport between the satellite's manufacturer and potential launch providers is also desirable.

Some satellite companies stressed their interest in developing solid, long-term relationships and partnerships with launch providers. According to one interviewee, developing partnerships with just a few providers is preferable to turning to newcomers: repeat and consistent business can enable both the satellite operator and launch provider to offer each other mutual benefits. Such partnerships can allow the partners to offer each other preferred prices for products and services (Alenia Spazio and Boeing recently created a partnership in which Alenia Spazio would provide fuel tanks for the Delta 2's upper stage in

exchange for Delta launches at discounted prices for its satellite customers). In addition, using the same launcher repeatedly can allow a satellite owner to reap the benefits of bulk buying. The potential for engaging in future collaborative work with the launch company or its parent corporation is often a major consideration for satellite owners as well.

Incidentally, some of the interviewees that agreed on the value of partnerships with launch providers indicated that attractive prices or other enticing factors offered by new launch providers might persuade them to consider options beyond the launch providers they patronized most often.

Terms and Conditions

A few interviewees indicated that the terms and conditions to which a launch provider is willing to agree in a contract is another factor in their selection process. Terms and conditions include issues such as payment schedule, payload integration and launch schedule, liability, and contract termination. The issue of liability is particularly important to those who commented on terms and conditions: these satellite owners made clear that they expect a launch company to share with them the financial risk associated with a launch failure. Specifically, these companies said they expect a launch company to offer a replacement launch at little or no cost, share in the loss of revenue due to their satellites' inability to reach orbit, and/or shoulder the cost

of higher insurance premiums on future launches.

Conclusion

While the particular requirements and resources of satellite owners and operators ultimately determine their launch vehicle selections, the above discussion reveals that most commercial operators and at least one government operator consider many common factors, with vehicle reliability, performance and suitability, and price topping the list. The majority of the commercial satellite companies the FAA interviewed and that responded to the launch company customer survey have used multiple types of launchers to deploy their satellites, indicating that launch procurers rarely confine themselves to a single launcher but prefer to diversify their choices. In doing so, a company makes decisions based on not one but many factors, evaluating them and making trade-offs to achieve an optimal combination of technical, programmatic, financial, and contractual factors.