

Space Industry Struggling for Lift-off

By Masahiko Shimizu

The space industry has two areas of business. One is the space equipment business, which involves the technological development and production of space equipment, including rockets and artificial satellites. The other is the space utilization business, which provides services via space equipment.

In the space equipment market especially, the two businesses are closely linked because they provide the supply and demand. The main feature of this market is that the biggest user is the government, which promotes a space development program—a kind of space utilization business—for noncommercial purposes. So actually, we could say that the space industry has three areas of business, because the space utilization business can be divided again into public and private sectors.

The United States is the only country in which the three types of space business have formed industrial bases within the national economy and have become commercialized. The next highest stage of development can be seen in Europe, where each of the three types of business has transcended the framework of the national economy. Governments and private companies in France, Germany and other European countries have cooperated technologically and financially to create a regional space industry.

Recently, the Soviet Union and China have also achieved advances in state-funded technological development and are seeking to make inroads into the international market with their state-run industries.

The space industries of the United States and Europe are already looking beyond the national or regional market and are competing vigorously for a larger share of the international market.

In contrast, Japan's space industry is lagging quite a long way behind in all three sectors. In particular, while Japan's space equipment business, most of which

consists of satellite and rocket production, has reached quite a high level in terms of technological development, actual production remains small. It is difficult to get any exact figures for the total production value of Japan's space equipment business, but it is safe to assume that at the end of the 1980s it had reached around ¥200 billion.

In the context of Japan's present industrial structure, this is quite large for a single business unit of a company but extremely small for a whole industry. Even in a breakdown of Japanese industries into subsectors giving a total of 150 different industries, it would not be unusual for a single industry's production value to exceed that figure. In other words, the production value of the space industry is not enough to guarantee a stable industrial base.

As proof of this, Japan still has no company that specializes in the production of space equipment. Japan's space equipment business is carried out as a single business unit by firms that possess the technological capability but nevertheless manufacture other products as their main line of business.

Creating markets

In the 1990s Japan's space utilization business has jumped ahead of the space equipment business following the rapid expansion of the satellite communications and satellite broadcasting businesses, which both provide services by utilizing artificial satellites. These businesses have done more than just send ground-based technologies into space; they are creating new markets by developing new services with better content and quality.

In the field of satellite communications, the formation of satellite telecommunications networks within individual corporate organizations is creating new markets in addition to conventional telecommunication functions. In the field of

Photo: NASDA



Launch of a rocket carrying the Yuri No. 3 broadcast satellite. Although Japan has technology development capabilities, the production value of the space industry is not enough to guarantee a stable industrial base.

satellite broadcasting, Japan at present has three public and private satellite broadcasting channels, but the number is scheduled to increase to nine in early 1992. And five more channels are expected to begin operation in six years time. Since the additional channels will be allotted to private broadcasters, the satellite broadcasting business in Japan looks set to develop rapidly as a commercial space utilization service.

In response to these developments, a major change is taking place on the demand side for satellite broadcasting: Television sets capable of receiving satellite broadcasting are becoming very popular. Indeed, these days nearly all of the televisions on display in the windows of electrical appliance stores in Japan have satellite broadcast reception capability.

Compared with the space industry in the United States and Europe, which are already engaged in fierce competition in the international market, Japan's space industry is still in its infancy in terms of both the size of the market and the stage of development of the industry. Among

the three businesses that make up the industry, however, Japan's space utilization business has already taken off, as shown by satellite broadcasting and satellite communications.

As I stated earlier, the space equipment business and the space utilization business are the supplier and user of space equipment, a tangible asset. If these two businesses are strongly connected within the national economy, the development of the space utilization business should induce the growth of the space equipment business by increasing the demand for space equipment.

In Japan, however, the two businesses are not very closely connected. Ironically, the development of the space utilization business has had the greatest economic effect on the market for new TV sets, which are supplied by electrical appliance makers. Recently a gap has appeared in the growth of the two space businesses in Japan. To understand why the space equipment business is in a state of stagnation, let us look at the space equipment market in Japan.

Japan's space equipment business is centered mainly on the domestic market, and most of the demand in the domestic market comes from the government's space development program. The same is true in the United States and Europe. Indeed, one of the main features of the space equipment market anywhere is that the government provides most of the

demand. But in Japan's case, the dependence on government demand is much greater than elsewhere.

Indeed, the size of the government's budget for its space development program corresponds almost exactly with the size of the domestic market. Roughly speaking, about 80% of the production value of Japan's space equipment business goes to the domestic market, and almost all of this depends on the government's space development budget. In particular, Japan's space industry depends almost completely on the government for rocket and artificial satellite demand.

Smaller budget

Just for the record, the Japanese government's budget for space development peaked at 0.05% of gross national product in the mid-1970s, then dropped rapidly to 0.036% in 1985. The corresponding 1985 figure for the United States was 0.184% (about five times higher) and for France 0.102% (about three times higher). These figures, provided by the Society of Japanese Aerospace Companies, show the smallness of both Japan's space development budget and its space equipment market.

The government's space development program does not directly aim to promote the growth of the space equipment business or the development of the industry. Since the size of the government's budget virtually determines the size of the domestic market, however, the growth of the business and the government's space development program are closely intertwined. If the scale of the domestic market remains at the present level, it will give rise to two major problems.

First, the unit cost of production of space equipment will become fixed at a relatively high level. In the case of rockets and artificial satellites especially, a huge amount of funds are needed for research and development prior to production. These R&D expenses are included in the production cost of the equipment. So the smaller the volume of production, the higher will be the ratio of R&D spending in the unit cost of production. Clearly,

the business will suffer from a lack of economies of scale. With small-scale production, this lack will become more significant, and the unit cost of production will rise. At present, Japan's space equipment makers are producing space equipment at a ridiculously high cost.

Second, the economic efficiency of the government's space development program will decline. Assuming that the government's budget equals the cost of the space development program, then the size of the budget determines the size of the domestic market. So if the budget is small, the market will remain small, and there will be an absence of economies of scale in the production of space equipment. As a result, the equipment the government will have to purchase will be very expensive.

If the government's space development budget is C , and the amount of equipment that can be purchased with this budget is X , then the X/C ratio measures the economic efficiency of the government's space development program. The opposite ratio, C/X , indicates the unit cost of production of space equipment. Given the size of the government's space development budget at present, it is clear that the economic efficiency of the space development program is low and that the production cost of space equipment is high.

The first problem explains why, in comparison with the U.S. and European space equipment businesses, which have relatively large production scales, Japan's space equipment business cannot be internationally competitive in terms of production cost. This lack of international competitiveness ensures that Japan's space equipment business must rely on the domestic market.

Japan's space equipment business and space development program are both burdened by the lack of economies of scale and are therefore having to struggle to get off the ground.

Masahiko Shimizu is professor of economics with the Department of Economics at Keio University.



Photo: Japan Satellite Broadcasting Inc.

Japan's space utilization has jumped ahead of the space equipment business following the rapid expansion of satellite communication and broadcasting.