CBO TESTIMONY

Statement of
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before the
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NOTICE

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Mr. Chairman, I appreciate the opportunity to testify before this Subcommittee concerning the Congressional Budget Office (CBO) report, Encouraging Private Investment in Space Activities and related issues. The report focused on three sectors of commercial space activity: providing launch services by large unmanned rockets, producing information based on data gathered by satellites through land remote sensing, and developing science and technology related to the processing of materials under microgravity conditions.

The U.S. Commercial Space Policy Guidelines and the specific issues the Committee raised can be addressed by presenting the CBO's review of conditions in space markets and policy options to maintain or increase private investment. The report's major finding was that policies and programs aimed at creating large new markets in the near future are not likely to succeed. However, the same policies and programs may succeed in encouraging new private investment in producing goods and services necessary for the public sector's space program. In doing so, they could permit a more efficient and cost-effective space effort. Evidence supporting the latter conclusion is limited because it is too early to evaluate fully the results of recent efforts.

The U.S. industry that produces large capacity launch vehicles now shows signs of delivering some of the benefits that have been used to justify the policy of commercializing space. The Delta, Atlas, and Titan vehicles have won contracts for about a third of the commercial launches that have been scheduled into the mid-1990s. As commercial practices are carried over to the U.S government or "captive" launch market, the U.S. public sector stands to benefit through lower-cost launch services.

The commercialization program has required the government to change its behavior as a buyer of expendable launch vehicles. This change has also succeeded in affecting the performance of U.S. suppliers. Recent changes in procurement practices that shift the focus from procuring launch vehicles to procuring launch services require the contractor to accept responsibility for the entire launch process as well as the construction of the vehicle. By placing government payloads on a service basis, the government makes its requirements complementary to those of the commercial market, permitting providers of launch services to standardize their procedures and thus to benefit from economies of scale in launch operations.

The case of General Dynamics and its Atlas family of launch vehicles shows how commercialization can save the public money. In bidding to provide satellite launch services for the government, General Dynamics has sought to recover only its recurring costs of vehicle production and an associated profit. The company is seeking to recover its nonrecurring costs, including those for plant, vehicle and operational improvements, in the commercial market. General Dynamics estimates that as a result, the cost to the government of each launch it purchases is 25 percent lower than the average price for commercial customers. General Dynamics claims that its Atlas 2 vehicle can place a satellite in orbit at a cost of 60 percent less per pound than that of the last Atlas 1s purchased by the government. Twenty percent of this reduction can be attributed to new commercial practices.

Beyond the mid-1990s, the prospects for U.S. producers and the market as a whole are not as bright. The demand for satellite launches in the commercial market is expected to average between 15 and 20 satellites annually through 1994, but only 12 to 17 satellites a year thereafter through 2000. At the same time, space launch capacity provided by China, Japan, and even the Soviet Union, could increase the supply of launch services in the mid-1990s. Thus, excess supply and subsidized competition could characterize the market in the second half of the 1990s. U.S. producers may be unable to compete without the continued support of the federal government.

Trade policy is perhaps the most pressing issue. The United States could pursue a freer trade policy in the market for launch services. Such a policy would permit Soviet, Chinese, and other groups to launch U.S.-made commercial communications satellites, without attempting to force the price these offerers charge to be on par with that offered by U.S. or European producers. A freer trade policy could even include opening the U.S. government market to foreign suppliers. Freer trade could lower launch prices for commercial satellite owners and ultimately for the consumers of satellite services. Without dramatic changes in the cost of U.S. launch vehicles, however, freer trade could cost U.S. producers market share and even force them out of the commercial market. The loss of commercial market share could spill over into the captive market, since the lower rates of producing vehicles could translate into higher prices for the public sector purchasers of launch services.

An alternative to freer trade would be to negotiate rules of the road with Europe and with new entrants to the market that would force all parties to offer prices on par with those offered by the U.S. and European producers. Such a system would give U.S. private investors a better chance to maintain their market share than would freer trade, but it would by no means guarantee their future. Under a negotiated trade framework, the European launch consortium, Arianespace, and new entrants could offer launch services at lower

prices than U.S. producers by improving their technology or demonstrating that their true economic costs permit them to offer lower prices. U.S. producers are unlikely to achieve competitive reductions in cost because there is no U.S. public effort to reduce costs, and the commercial market is too small to justify the large private investment necessary for new cost-reducing launch technology.

Whatever decision is made regarding trade policy in launch vehicles, the government could lower the cost of commercial space launches by supporting the development of technology and new launch systems. The cost of such efforts could range between $5 billion and $15 billion. The commercial market by itself is not large enough to justify such outlays, but spending at those levels might be warranted in conjunction with a significant increase in public launch activity. A secondary benefit of the higher spending would be to increase commercial sales of U.S. expendable launch vehicles.

DATA GATHERED BY SATELLITES THROUGH LAND REMOTE SENSING

Satellites gather data that can be used to produce information valuable in mineral and petroleum exploration, agricultural and environmental assessment, civil engineering, land use management, forestry, and map making. In 1972, NASA launched the first civilian land remote sensing satellite as a research

and development project. Four satellites later, at the end of 1984, the cumulative public investment in civilian land remote sensing systems stood at $1.5 billion.

In 1984, the Congress decided to commercialize the Landsat system, currently composed of two orbiting satellites and their supporting ground stations. The Earth Observation Satellite Company (EOSAT), a joint venture of Hughes Aircraft and General Electric, was selected to become the private producer of remote sensing data. Currently, EOSAT receives annual subsidies to operate Landsat 4 and 5, and has received public funding to cover most of the cost of building and launching a new satellite, Landsat 6, in 1992.

EOSAT and the policy that created it are in flux. A consensus of recent studies holds that revenue from the sales of data produced by land remote sensing systems of the Landsat type--including Landsat and the European SPOT system--cannot cover the cost of the data they produce. Full commercialization remains a prospect only in the next century. Nevertheless, the value of the data Landsat produces may exceed the costs of its production to the economy as a whole and justify continued public support. This support could be rendered in several different institutional settings, some of which include a role for private investment.

The government could continue the current arrangement of subsidizing a private operator, but this approach could include a larger private contribution to the cost of satellites built during the 1990s. The level of the contribution could be determined in an open competition or by direct negotiation between EOSAT and the government. Alternatively, the government could reassume full responsibility for land remote sensing, assigning a single federal agency or group of agencies the tasks of designing and operating satellites and distributing data. A third option would be to form an international consortium with Europe, Japan, Canada, the Soviet Union, and other countries to share the cost of new satellites in the future. A private operator could be included in this option. The costs of these options through the year 2000 could vary from $500 million to $1.3 billion, depending on the type of satellites built, the share of their cost the federal government covers, and the role the government assumes in operating the system.

The most expensive option would probably be a national system operated by the federal government, since neither a private partner nor a foreign government would share in the costs of satellites. A strength of this option, however, would be its ability to set data prices low, making data more widely available. Both continued research and low data prices are consistent with the view that the total benefits of land remote sensing to the nation far exceed its costs and should be aggressively sought. An important institutional

drawback of this option has been the historical inability of the Landsat system to find a supportive federal agency that views the production of data as a vital part of its mission.

The least costly option open to the federal government, if Landsat-scale satellites are to be supported during the 1990s, may be to retain a private operator for the national system. Under this option, private investment in the production of land remote sensing data could be encouraged if the government shared the cost of new satellites with EOSAT or another private firm. The rationale for this policy would be the superiority of the private sector in determining what satellites should be produced, and in operating the system once in orbit. EOSATs claim that it has lowered the cost of operating Landsat is supported by a doubling of the production of digital data products between 1985 and 1989 at costs no greater than those under government operation. Nevertheless, the price a private operator would charge for data would presumably be higher than that charged by a public operator, and indeed the level of prices charged by a private operator would increase with the amount it contributed to the costs of new satellites. However, this price level could still be below that of the other options, if, for example, a fully public system included very expensive satellites, was operated inefficiently, or came under pressure to recover a part of the capital costs of the system in the prices it charged data consumers. Retaining EOSAT as a private partner

would offer the advantage of continuity to a program that has been beset by political uncertainty throughout its existence. Moving in this direction without competition, however, would not permit a test of other potential investors' willingness to share the cost of satellite systems.

The third option would be to create an international consortium with either a private or a public U.S. representative. Such an arrangement, sharing a single system, would certainly cost less than the various national systems now in operation and those planned for the mid-1990s. The economics of the industry are such that data are produced under conditions of declining average cost, so that no one price for data can permit cost recovery and economic efficiency. A single world producer could overcome this limitation by pricing its data differently when selling to different customers.

From the U.S. perspective, however, a consortium would have drawbacks. Costs could rise substantially if satellite procurement was based on political as well as technical factors. U.S. private firms could be forced to pay higher prices for data under many formulas that involve price discrimination. Finally, a single government-sponsored international monopoly could forestall the current market evolving toward one in which private investment could stand on its own.

In the early 1980s, expectations were high that the pharmaceutical, electronics, and chemicals industries could profitably exploit the low-gravity, or **microgravity,** conditions available in outer space. The increasingly capable public space **program--initially** employing the shuttle and later the space **station--was** to be the springboard for new products and processes that would create billion-dollar markets as early as the 1980s. While experience since then has deflated the vision of large **new** markets in the near term, more modest hopes continue to support both public and private activities.

The ultimate commercial **viability** of processing materials under microgravity conditions in space is yet to be demonstrated. Nevertheless, substantial public resources in the United States, Europe, Japan, and the Soviet Union are being directed toward understanding the behavior of materials under low-gravity conditions. The U.S program is as well supported financially as any of the other national efforts, spending about $100 million in 1991 on the materials-processing science program alone, with additional spending in other accounts on transportation, facilities, and commercial promotion roughly doubling that amount. NASA plans to increase spending in all of these areas, with the science program projected at an annual level of almost $180 million by 1995.

Private investment in materials-processing experiments is very small, both in relation to public spending and to the amounts spent by the would-be industrial beneficiaries in other research areas. The U.S. and foreign programs have sought to increase private spending and general interest by providing a framework for cooperative research and subsidies to lower the cost of experiments. Again the U.S. effort, under the title of Centers for the Commercial Development of Space, compares well with foreign programs.

The current emphasis in processing materials in space is on experimentation and that of applying experimental results to products and processes on earth. The primary emphasis of the U.S., European, and Japanese public efforts is on using the space shuttle and its Spacelab payload as an interim laboratory to generate scientific results and develop technology that will build the potential to use the space station productively sometime in the late 1990s. Delays in the space shuttle flight schedule and in developing the space station program have slowed progress in this primary effort. Government-supported experiments with commercial participation, while also suffering from delays in the shuttle, have provided an alternative path to progress in science and technology, producing experimental results through small-scale, low-cost experiments. The small scale of these experiments has permitted them to fly aboard the shuttle as secondary payloads and to gain access to space on small rockets unaffected by shuttle delays.

ANCHOR TENANCY

Recent initiatives by NASA have sought to expand private participation in processing materials in space from users of experimental facilities to providers of these facilities. Two moves in this direction are an agreement to lease from Spacehab Inc. its Spacehab--a module that expands the shuttle crew area and permits more experiments to be flown on a shuttle mission--and a returnable capsule system that would be placed in orbit by a small rocket and carry small experiments, the Commercial Experimental Transport System. NASA seeks to fund both initiatives under the anchor tenancy approach advocated in the U.S. Commercial Space Policy Guidelines.

As an anchor tenant the government agrees to lease an asset or buy a service from a private investor. Initially, the government is the dominant purchaser. The intent behind the policy, however, is that as the usefulness of the good or service is demonstrated, private businesses and foreign governments will increase their purchases of the asset or service, eventually decreasing the dominance of the U.S. government as a customer. At least two questions have arisen concerning anchor tenancy:

(1) What will alternatives for fulfilling the same mission requirements cost the government? and,

(2) How will the government's commitment to anchor tenancy be treated in the budget?

Anchor tenancy is not guaranteed to cost the government less than the customary system of public procurement. It could cost less if the facilities also provided services to other customers. Customary procurement would cost less, however, if the government is the sole user of the facilities, because the private sector's capital costs are higher. As a tenant the government will pay these costs. Private facilities might also cost less if the customary procurement process ends up increasing the basic cost of the facilities because of bad management or a governmental proclivity to overdesign or to permit too many design changes. But this issue can be separated from the question of whether or not the government should enter into an anchor tenancy arrangement or proceed in the customary way.

The government's dominant position as a customer for orbital facilities implies that, in most cases when customary procurement can be efficiently undertaken, the leasing option will be more expensive. The argument can be made, however, that the higher cost of purchasing private services will

ultimately be justified if they prove to be more productive in attracting new private users to experimenting with microgravity. This proposition has not yet been tested, but it will be if NASA's program to promote private orbital facilities goes forward as planned.

The ultimate benefits and costs of anchor tenancy aside, questions have arisen about the budgetary treatment of arrangements of this type. Current applications of anchor tenancy involve small, start-up firms that require a commitment from the government to obtain debt financing from private banks. The firmest commitment the government can offer would be an appropriation that would (1) provide full funding for the tenancy arrangement before the signing of an agreement and (2) recognize outlays as they occur. This solution avoids leaving the Congress in the position of giving up its oversight prerogatives to avoid financial disruptions. Adequate funds would be provided to fulfill contracts signed by the Executive Branch, and the Congress would not be asked to fund a commitment it has not reviewed, or withhold an appropriation and cause the private business and its banker financial hardship. A full appropriation would, however, limit Congressional flexibility in year-to-year budgetary consideration and would tie up NASA's resources at a time when overall budget constraints are pressing.

Nevertheless, if promoting private orbital facilities is a priority, funding commitments of this type may be necessary. The option to provide only annual appropriations leaves the start-up firm in an untenable position with its banker. Even for Spacehab Inc.--a start-up firm with considerable equity financing-sole reliance on annual appropriations has forced the company to purchase insurance against a failure to appropriate in order to obtain debt financing. The cost of this insurance has added several million dollars to the cost of the service that must be covered in the price charged to the governmental anchor tenant.

The option to provide termination liability--a government commitment to pay the expenses of the private investor in the event of a contract is terminated--also requires an equivalent to full funding in its firmest form. If financed more softly out of unobligated balances within an agency's budget, a funding shortfall for other programs could occur, should the anchor tenancy program be canceled. Moreover, such arrangements are essentially backdoor spending that commit the government to future outlays without explicitly recognizing these commitments in the budget.

Finally, loan guarantees are an option suggested to support anchor tenancy agreements. As a general rule such agreements are treated in the budget as if they were current spending, thus making this option less desirable

than an appropriation that recognizes budget authority when commitments are incurred, but outlays only when actual expenditures are made.

CONCLUSION

Encouraging private investment in space markets would require direct federal spending. One argument for such spending is that public support would allow private investors to overcome existing obstacles and to create large new markets and industries in the near future. This argument is also invoked by those who want to expand the space program by building the space station or a new space launch system. It receives little support from the analysis of the three markets addressed in our study. A second argument for federal support of private investment in space activity asserts that increased private investment in space activity would pay off by reducing the cost to the government of carrying out the public space program. Our study finds limited evidence in all three markets to support this argument.