ECONOMIC PROBLEMS OF ESTABLISHING A COMMUNICATIONS SATELLITE SYSTEM

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The Economic Importance of Communications Satellites

The primary economic role for which communications satellites hold promise is to provide long distance, primarily transoceanic, voice channels at a cost lower than that entailed in alternative communication techniques, such as employment of submarine cables. Two salient characteristics of nearly all proposed satellite systems are (1) they embody a voice channel capacity large relative to those typically observed between major cities around the world, and (2) they entail a high initial cost. In order to make the cost per voice channel competitive with that of alternative transmission techniques, the demand for communications services must be relatively high to absorb the large capacity offered. The question immediately arises, then, regarding the character of future demand for communications services.

In the case of telephone message service between the U.S. and overseas points, demand in terms of number of messages has been rising at 10-15 per cent per year and revenues have been doubling every 4 or 5 years. On the basis of this experience it is not unreasonable to expect that

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revenues will exceed $100 million per year before the end of the decade. Since telephone service is voice channel "intensive" (the band width requirement of a telephone message being much greater than that of, say, a telegraph message), the increase in demand by 1970 is likely by itself to render a satellite system economically attractive as a high capacity method of transmission.

Other kinds of demands are frequently mentioned in connection with satellite service, such as telegraph, facsimile transmission, and television. Because international telegraph is growing at a rate of only 2-3 per cent per year and the service is not voice channel intensive, it can be expected that telegraph will play quite a secondary role to telephone. It is notable that one study group has concluded that by 1970 overseas voice channel use by telephone will exceed by a factor of about 20 the use made by telegraph. While facsimile transmission is voice channel intensive, it currently entails high terminal and distribution costs. In the absence of substantial technological breakthroughs, the prospects of facsimile transmission being a major source of demand do not appear encouraging. Transmission of television programs is indeed voice channel intensive (a television channel is equivalent to 600 telephone voice channels). Nevertheless, the problems of time zone differentials and language differences, along with the low-cost alternatives of shipping tape or film for rebroadcast, render broadcast television demand for satellite communications of only minor importance. However, the possibility remains that in the longer run closed circuit television may constitute a substantial portion of demand.

It appears reasonable to conclude on the basis of current knowledge that telephone service will in the foreseeable future comprise the dominant component of total demand for satellite services. The economic

benefit of voice channel cost reductions induced by satellite usage might well be reflected in this case in reduction of overseas toll-telephone rates and lower delay times in completing calls.

The Problem of Ownership

There is general agreement that a large number of competitively operated satellite systems is not commercially feasible in the early years of operation. The large capacity of even a single system relative to projected demand and the high initial cost render most unlikely our being able to rely on competition among satellite operators to maintain socially desirable business behavior. Whoever owns and operates the first satellite system will probably have, for at least a few years, a monopoly in the sense that he will be the sole seller of satellite communication services. The crucial question -- one that has given rise to no little controversy here in Washington -- is "who shall be allowed to exercise this monopoly privilege?"

In treating this question it is important to bear in mind certain frequently voiced objectives: First, the objective that the satellite firm set prices that do not generate "excessive" profits but prices which, in some sense, reflect the costs incurred in the enterprise. Second, the objective that all common carriers be allowed non-discriminatory access to satellite transmission services. Third, the objective that the firm operate efficiently insofar as striving to minimize costs for a given quality and quantity of output. In this connection they have advocated that satellite equipment suppliers be allowed to compete for sales to the satellite monopoly firm. While the satellite system operator may himself

be a monopolist, it by no means follows that those who manufacture [redacted] satellite equipment must be monopolists. Although it may not be economically feasible to rely on competition in the operation of the system itself, it may very well be feasible to do so among equipment suppliers to assist in maintaining at relatively low levels the costs of satellite operation. Fourth, the objective of attaining an early operational capability with the system, particularly as a means of demonstrating to the world our leadership in peaceful uses of space technology.

Consider now four types of ownership arrangements in terms of the extent to which each is consistent with these objectives:

1. A system owned and operated exclusively by U.S. international common carriers.

2. A system owned and operated by U.S. international common carriers and satellite equipment manufacturers.

3. A system that excludes from ownership both common carriers and equipment manufacturers but is owned instead by a diversity of stockholders, these having by and large no direct business ties in the communications field. The satellite firm would then sell voice channels to the common carriers.

4. A system owned and operated by the government that would sell satellite voice channels to common carriers.

From the standpoint of expediting development and operation of a commercial system, the first of these -- ownership solely by the common carriers -- is likely to be superior to the other three. With centralized ownership the consortium of common carriers would likely prove best able to get a commercially operating system into orbit quickly and, as compared

with operation by a single common carrier, it would reduce the possibilities of discriminatory practices.

On the other hand, a question can be raised about competition, or its potential lack, among suppliers of equipment to the enterprise. It is true that Western Electric, a wholly owned subsidiary of AT&T, is the principal supplier of all communications equipment to the Bell companies. And a major international telegraph company, RCA Communications Inc., is owned by Radio Corporation of America, a manufacturer of electronics equipment. To the extent that common carriers prefer to purchase internally in order to increase the profits of their own equipment companies, outside suppliers would suffer a competitive disadvantage. In this connection, it is notable that although the operations and profits of the common carriers themselves are subject to government regulation, the profits of the equipment suppliers jointly owned with the common carriers are not directly subject to regulation. Of course, one could advocate that the consortium be forced by law to submit to competitive bidding for its equipment requirements. For several reasons it is likely, however, that such regulation would prove very difficult to police.

An alternative approach to the problem involves enlarging the ownership of the consortium to include outside equipment suppliers -- ownership scheme No. 2 above. However this arrangement, which includes a large number of participants, each with his own vested interests, would likely be handicapped in moving quickly toward an operational capability. Furthermore, this method appears not to contribute effectively to competition because free market forces would still not be operating to determine the sales of suppliers. Rather, sales would be more likely

dictated by intracorporate pressures that each participant exerts around the bargaining table.

The third form of ownership -- one that excludes both common carriers and equipment manufacturers -- offers a substantial possibility of competition among equipment suppliers for sales to the firm. If it is desirable to get arms length bargaining between the satellite operator and the suppliers, one approach is to eliminate altogether the tied ownership interests that were the seat of the difficulties in the preceding schemes. But to accomplish this would require that common carriers and suppliers be excluded. The establishment of such an "independent" firm would increase the likelihood that equipment suppliers would be treated on a non-discriminatory basis. In addition this arrangement would facilitate the separation of satellite system costs from all other common carrier operation costs -- a vital characteristic if the satellite firm is to be regulated effectively. This scheme of ownership does, however, have one major drawback: Being a wholly new corporation, it would be faced with the formidable task of developing expertise in the space and communications fields. Such a burden would likely entail a sacrifice in time, resulting in a later operational capability than would be enjoyed under scheme No. 1 above.

The fourth possibility -- government ownership and operation -- shares the advantage of the preceding arrangement in being adaptable to competitive bidding by equipment manufacturers. It also suffers the disadvantage of requiring development of expertise in a new organization that would probably involve a sacrifice in time. Moreover, many share the feeling that this kind of government enterprise is likely to be less efficient than private enterprise. Even with enhanced efficiency through competition

among equipment suppliers, the government firm may still be less inclined to cut costs than the private firm, motivated by its desire to increase profits.

With government operation, the problem of preventing "excess" monopoly profits of satellite services would be less serious than in the other three schemes. At the same time the problem would remain of establishing a rate structure that accurately reflects the underlying cost structure -- even if the firm "breaks even," the differences in prices charged for various services may not be equal to differences in cost.

All the arrangements for private ownership would require regulation by government authority as an extension of the current policy of regulating the operations of common carriers. Unfortunately, the privately held satellite monopoly places a great burden on government regulatory machinery -- if the system is to operate in an economically desirable fashion. To successfully cope with this task may well require a substantial revision of present-day regulatory policies and practices.

Finally, we should note that while in the early years only one satellite system will likely be commercially feasible, a continuing increase in demand for communications over the years may eventually support several systems operating side by side. Therefore, it may be possible to achieve in this later period competition in sales of satellite voice channels as a substitute for the earlier monopolistic market structure. In view of this possibility, it appears desirable that the first satellite firm should be given its franchise with the understanding that monopoly rights are not conferred in perpetuity, but rather that at some future date additional franchises may be given to competing firms.

Early Capability and the Worldwide Nature of the System

Considerable interest has been raised in government circles in recent months in developing a system into which a large number of countries, particularly underdeveloped countries, would have access. Some have argued that the system should, therefore, include a large number of satellite ground stations in many of the smaller nations. On economic grounds this argument is questionable. If the objective is to improve communication channels with the underdeveloped areas, it can, in most cases, be attained at much less cost by establishing relatively few large ground stations around the world in major population centers, in order to tie together the major land masses, and then connecting the underdeveloped countries into the worldwide system by conventional landline. There are primarily two reasons why such a combination of satellite and conventional communication links appear to be superior from a cost standpoint to a system containing a large number of ground stations:

(1) For the kinds of satellite systems nearest at hand, the costs of constructing and operating a satellite ground station are estimated to be quite high. Such an expenditure is economically justified only under conditions of heavy traffic -- conditions likely to be met in the foreseeable future only between large population centers.

(2) As the total number of stations increases, in early economically feasible satellite systems, the problem of interference intensifies as progressively more pairs of stations simultaneously attempt to use the same satellite for a relay. To overcome this problem requires either that the number of satellites be increased (to reduce the likelihood that more than a pair of stations attempt to use any one satellite at the same time),

or that the weight and complexity of the satellite itself be increased to permit simultaneous use by more than one pair of stations. Either of these alternatives would generate a substantial increase in the total system cost.

However, if the demonstration of U.S. leadership in space technology is deemed more important, then programs that cannot be justified on strictly economic grounds may rationally be undertaken. The problem therefore arises about how to proceed efficiently in attaining this objective. Although the over-all satellite program may constitute an effective vehicle for demonstrating U.S. leadership in space technology, some features of the program will contribute more to this than others. To the extent that conflicts arise in simultaneously attaining all of these features, a choice must be made about which ones to stress in future plans. For example, to be the first nation to establish a commercially operating satellite link between even two stations would contribute to the demonstration of U.S. accomplishment. To provide a large number of ground stations throughout the world would also contribute. The crucial question is: To what extent would trying to establish a large number of ground stations delay the initial commercial use of the system? If the United States attaches high priority to having a large number of ground stations around the world, it must consider the increased risk of being the second nation to have an operational satellite system.