THE FINANCIAL CLIMATE FOR SPACE DEVELOPMENT

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It is a pleasure and a priviledge to address this conference on space manufacturing. Even a cursory glance at the titles of the papers you have heard here over the past two days must give a real sense of a future being fulfilled. The process of space development is under way. We are addressing the numerous difficult and messy details that are the critical underpinnings to any large scale effort. The critical technical and political framework for development is gradually being put into place, most recently with the Nelson Downey Space Investment Tax Equity Act, HR 2172, which aims to extend U.S. domestic tax treatment to space based ventures. In essence, space is beginning to move into the mainstream, to be appraised and evaluated as a business opportunity, competing for investor interest with the existing range of investment alternatives. My topic today is the financial climate for space development. My hope today is to lay out some of the parameters for that decision process, to provide a snapshot of how we stack up against the competition, and what this implies for the pace of space development.

Let us begin by outlining what we mean by financial climate.

Financial climate is a generic term which attempts to summarize the availability of money, in terms of amount, length of commitment and price. It is a very sensitive indicator, which varies depending on the opportunities and risks inherent in the investment under study, as well as the source of the funding, whether private, institutional or governmental. However, even before examining the climate specifics for space development, there are two general points to be made.

First, overall availability of money today is exceptionally good. There is a plethora of money chasing relatively few good ideas. The massive corporate decapitalization currently under way, perhaps pioneered by IBM with its 4 million share buyback several years ago, but now widespread, particularly in the energy and aerospace industries, is a tangible illustration that these corporations have more money than they feel they can profitably invest in their own business. The proliferation of multibillion dollar mergers financed by so called "junk bonds", essentially promissory notes, is another indication of the unusual availability of funds in massive quantities. To make the point more clearly, a single deal, the Unocal takeover bid by T. Boone Pickens, is worth over $9 billion, more than the price of the Space Station.

Second, while availability is outstanding, the cost of money is high, at least in the U.S. The highest quality borrower, the U.S. Treasury, is paying over 11 1/2% on long term loans. Higher risk borrowers pay substantially more. This poses a serious obstacle to any long term investment. Given a discount rate of 15%, a minimum estimate at present, a 10 year investment of $1 billion a year would need to generate an annual return of $3 billion forever thereafter to break even. This is an extremely demanding target, perhaps an impossible one. It suggests a fundamental constraint on commercial developments, at least under the present circumstances. Large projects will need to have considerably shorter launch times, perhaps three to five years, to have any chance of attracting financing. Smaller, more research oriented strategic investments are of course not as firmly subject to those limitations, nor are governmentally sponsored efforts, particularly those involving the national security.

Within this background, any investment proposal must satisfy some basic requirements before it is even considered for financing, at least in the commercial world. These include competent management, an adequate market and a reasonably established matrix of legal rules and institutional structures in which to operate. Assuming these needs are satisfied, the financial microclimate for that particular project will then be determined by the size and duration of the commitment needed, the projected return, the technical, political and competitive risks involved and the alternative investment opportunities available.

Given these realities, how does space development rate? More specifically, how and when and by whom is the work we have heard about at this conference going to be funded and implemented? What can be done to promote and accelerate this process, and what are the current show stoppers. In particular, seen that it took only four

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years from the launch of Sputnik I to the orbiting of the first active communications satellite, and only 6 years for commercial Comsat use to become routine, why has the development of other satellite based services been so slow?

In our opinion, this sluggish pace is the direct consequence of the still chaotic legal and institutional environment for space development, compounded by a paucity of management and marketing resources.

That problem is exacerbated in the U.S. by the simultaneous existence of a much larger, much better funded and technically substantially more ambitious military effort, which may eventually spin off significant benefits for the commercial space development effort, but which for now is a competitor for scarce talent. Indeed, it can be said that the financial climate for military space development in the U.S. is nearly optimal, with ample funding, (currently about $15 billion a year) a very ambitious long term program goal, the strategic defense of the U.S. and its allies, strong top level political support, beginning with the President and a highly experienced management cadre, ably directed by Jim Abrahamson, a veteran of the space age.

There is no matching unity of purpose in the effort to develop the commercial sector. However, there is a widespread recognition that space may offer an incomparable new long term business opportunity, perhaps best approximated by the opening of the new world in the 1500s. Some aggressive efforts to explore this new environment, in order to attempt to develop new profit opportunities are the minimum to be expected.

This desire to explore for profit opportunities however should not be taken as a desire to invest in space development. Indeed, given the current financial background and considering the lead times involved, plus uncertainties as to management as well as to the markets and to the matrix, we believe it is premature to expect extensive commercial efforts for space development.

This relatively pessimistic appraisal of the financial climate reflects the current realities of commercial space development. The process is still embryonic, and consequently suffers from a series of handicaps, even disregarding the institutional constraints. A partial listing of these deficiencies includes the following.

First, high entry costs. A shuttle flight costs about $1,000 a pound or better, exclusive of hardware development and operating costs, or of ground support. It appears that the minimum investment to develop a substantial space based product or service is in the $100 million plus class. While there have been exceptions, most strikingly the NBS's monodisperse latex sphere experiments, and perhaps some of the currently ongoing protein crystallization work, these are not high volume commercially oriented products, but rather small scale niche developments, attractive but unlikely to generate more than marginal revenues.

Second, uncertain market demand. New space based services such as mobile communications, navigational information or earth resource data, as well as new space based products such as drugs or specialty materials will need to develop their own markets. The size and price elasticity of these markets is unknown, and hence investors returns are at risk. Moreover, as the market cannot be conveniently explored on a small scale in most instances, investors must accept substantial up front exposure. The analogy in earth bound applications is Federal Express, now a spectacularly successful enterprise, but with a very difficult start, due to the all or nothing nature of the business and the correspondingly high up front launch cost. Space is similar, but with added technical and political risk, at least at present.

These technical and political risks are a third obstacle. Because precise navigation data is militarily useful, and because detailed earth observation via satellite has been a major element in national security strategy, there is substantial government opposition to the commercial development of these services. This opposition, made tangible in the encryptation of Navstar positional data and the prohibition of proprietary earth observation systems such as the now quiescent Sparx proposal, has already chilled investor interest at least somewhat. These domestic constraints are not alleviated by the essentially limbo status of outer space in law, which provides little protection against similar nationally sponsored foreign ventures offering predatory pricing terms. Given examples elsewhere in aerospace of loss leader prestige products, such as the Concorde, investors are likely to remain slow to risk their funds until these concerns are addressed, their legal rights defined, and their ability to earn a

profit tangibly affirmed. This will require additional legislative action, as well as some greater coordination with foreign governments to set some rules of conduct in space development.

Pending resolution of these issues, financial commercial space development is likely to remain a challenge, at least for private investors. The market will develop, but slowly, paced by the success or failure of the few bold ventures that are under way, particularly McDonnell Douglas' electrophoresis in space effort. The development will accelerate as the legal and regulatory environment is gradually clarified, but is unlikely to explode until the availability of the Space Station makes working in space more routinely accessible. To speed up the process, the financial community needs three things from the government, which controls the access to space, to wit: a lower ante, a clear title and agreed on operating rules for U.S. and international players. NASA is effectively addressing the first need with joint endeavor agreements and related easy access packages, but the other two issues remain as yet unresolved. Until they are, space development is likely to remain the preserve of national entities, particularly financially strong, long term oriented ones such as Japan, and of selected large scale investors such as IBM, AT&T, or GM, who can afford the needed long term development effort, and who have the legal clout to defend their investment.

To sum up, we believe that although the current financial climate for space development is good, legal, technical, and market uncertainties are likely to constrain the pace of progress.