



10th SSI-Princeton Space Manufacturing Conference

Introductory Remarks

by Dr. Gerard K. O'Neill
Space Studies Institute Founder and First President



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Space Studies Institute

Thank you very much. Although I work on SSI matters that are referred to me, most SSI work is done by Gregg Maryniak, Executive Vice President, and Bettie Greber, Barbara Faughnan, and Chris Faranetta of the SSI staff, assisted by a small number of volunteers. They are the core of SSI. I'd like to express our collective appreciation for them at this time.

As you know, SSI is a low profile operation. That's by design. We are not a "Gee Whiz" society - we're trying to do serious, worthwhile, permanent things which are going to be valuable and bring us out into space. In that tradition there was a quiet ceremony yesterday at the banquet. It may even have passed some of you by, but I'd like to alert you to it. One of the attendees at our conference is Mr. Shimizu, who travels frequently between Japan and the United States. He is of the family of the Shimizu Construction Company, one of the largest construction companies in the world. There was a modest appearance by Mr. Shimizu, giving what is probably the shortest speech on record, at last evening's banquet, as he handed me an envelope. I opened it a little later and out came cash for SSI in the amount of several thousand dollars. Thank you, Mr. Shimizu, on behalf of SSI, for your generosity. We look forward to working with you in the future as we have in the past.

I'm going to take the liberty to cut in a bit to the time of the morning session, although I realize it's condensed already.

Several people have asked the status of a commercial company, Geostar, on which SSI had a dependence. I have been out of that company, with no chance to influence its management for five years. The bad news is that Geostar has just failed. The potential good news is that several extremely high quality people have joined me in an attempt, based on a new idea that would reduce costs to a very low value, to start a new company providing true Geostar service. Dr. Bernard Oliver, who was for 30 years the Director of Research at Hewlett Packard, winner of the National Medal of Science, member of many Presidential commissions, and for over twenty-five years a member of the Board of Directors of Hewlett Packard, has agreed to be on the Board of the new company. He, and other of that quality, make up our small but stellar Board. Another piece of potential good news is that at a cost to governmental agencies of some twenty million dollars,

the hand-held transceiver development is about 80% complete. It is an Earth station with two-way communication to the satellites in geostationary orbit. That system can provide automatic positioning to about four or five meters with every transmission, using the method which I patented in 1982. It has already been demonstrated in the direction from the hand-held battery operated transceiver up to the satellite twenty-five thousand miles away. So I'm not closing with a downer on that subject, but say rather that several of us are intent on seeing the radio determination system in place, and in a short time; that is roughly twenty-four months. We feel that we have to do that at a very low cost. There are many ways in which the effort could fail, but we have the highest possible quality of people working on it.

I'd like to comment now on the lecture of our dear friend and fine speaker of last night, Joe Allen, former astronaut, and about the Augustine Report which he spoke of. It bears on the general question of where NASA is going. First of all, Joe Allen, who served on the Augustine Commission, is a wonderful person. I said a few things about him last night, and won't repeat them, but he is one of the finest, most intelligent, and most capable individuals whom I've ever met, and is totally honest. He has been a dear friend for many years. He spoke in conservative terms last night, which was appropriate to his responsibility as a member of the Augustine Commission. But we also know that within him there beats the heart of someone who is quite willing to go out on a personal limb. Someone who would jump in his T38 and take off from Houston and fly up to McGuire in 1974 to attend a conference called by an unknown physics professor at Princeton on a subject not as semi-orthodox as space manufacturing, but purely, blatantly and simply, one-hundred percent on space colonies. Now that shows where Joe's heart really is. During the period since the last SSI conference, Joe has joined the Board of Directors of the Space Studies Institute and is a responsible and conscientious Board member.

Here is my personal view about the Augustine report, and about where I see NASA and the federal government going at the present time. Although I served on the President's Commission on Space in the mid 1980's, I, just as Joe did last night, will speak my own mind. The Augustine report, in my judgment, was

written by a fine set of people, including good friends of ours. For example, Dr. Thomas Paine, a member of that commission, is a Director of SSI. He was also the Chairman of the President's Commission on Space which I referred to. Laurel Wilkening, a capable and responsible person, was the second in command on the National Commission on Space. When the rubber met the road, as it always does in commission reports like that, and settled down to who were going to be the three or four people to write the final report, it was Laurel, Tom and I who met in Tucson, Arizona for several days to complete the report. That does not mean that those were the only people who contributed to it. There were extremely important contributions, especially from the head of the Harvard Astrophysical Conservatory, George Field, who was for health reasons unable to be with us in Tucson.

I have not asked Joe Allen, but I'm virtually certain that Joe was one of the three or four, out of the dozen or so members of the Augustine Commission, who carried that same burden. If you read that forty-eight page report, which I recommend that you do, you will find it, I think, one of the most beautifully written documents that has ever come out of the federal government. Many of the things which it recommends, virtually everything that is said, makes a great deal of sense. Nevertheless, it is my belief that the Augustine report, like every other report which has been generated concerning the future of space, including the 1986 report of our National Commission on Space, are all, in my judgment, too timid. They link fundamentally and make dependent the future of the United States space program on a science program. I say that speaking as a scientist. There is nothing more self-serving, there is nothing more conservative, than the scientific establishment. The scientific establishment takes as a high priority the justification of more science, more grants, more funds, more graduate students, and so on, doing basically the same things. We have seen that perpetuated for forty years of hydrogen fusion research without a positive economic result. To be fair, some of NASA's worst blunders, the Shuttle and the Space Station, have nothing to do with science. I think we are seeing a fossilization that has occurred in NASA for many years. As long as NASA always looks to the scientific community to justify NASA's existence, we will always have a very timid though possibly still expensive, space program. It will not tie in with the needs of the ordinary person in this country. I have had an opportunity to observe alternative viewpoints because of some quite unusual changes that have happened in the federal government over the last couple of years since the election of President Bush. Because of work by Gregg and the SSI staff, I met personally with

the Vice President and with Dick Darman the head of the Office of Management and Budget, who is, by the way, very much a space buff. It was in a small group, over several hours. I made the point both to the Vice President and to Dick Darman that there is just one thing that will revitalize the space program, which as Joe says will otherwise become increasingly anachronistic and not a part of the ongoing vital life of the nation. That one thing that can drive a space program to become an essential part of our national life is real, genuine, economic benefit in large quantities brought to the people. Taking cases listed in the Augustine Report, I think that scientific exploration, including the so-called "Mission to Planet Earth" does not constitute such justification. The "Mission to Planet Earth," is a fundamentally passive observational mission. It will simply be overtaken by events. The French Spot Image Spacecraft is already doing a far better job than the long, laborious, expensive U.S. governmental Landsat program has ever done. Landsat fell into all sorts of political difficulties, whereas in France, Spot Image was handled intelligently. That's only one of many examples.

I think that what's going to go on in the U. S. space program is a succession of pointless, duplicative programs. The productive alternative is to bring in ideas like solar power satellites. The best reason for people to be in space is not just because it's hot stuff, but because they're needed to do genuinely economically important tasks. And I made it clear in my discussions with the Vice President, Dick Darman, and others that I see satellite solar power, in whatever variant turns out to be the most cost-effective, to be the big driver; energy is the one unvarying thing that we know is going to be needed throughout the world even fifty years from now. We know from United Nations projections, which have always been on the conservative side, how much energy at a minimum is going to be needed - and it is one heck of a lot.

Presently, NASA alone gets about fifteen billion dollars per year, manna from heaven. That's the standard way (a congressional appropriation) that money comes to a Federal agency: as a pure drain on the taxpayers. Unfortunately, NASA really is doing almost nothing concrete for the economic well-being of this country and for the environment of the world. It is hard to find exceptions to that statement.

Let's contrast that fifteen billion dollar program with the economic potential of satellite solar power. I calculated, on what I believe are conservative assumptions, that satellite solar power as an export product could be from a two trillion dollar per year market to a six trillion dollar per year market fifty years from now. That's revenues from which profits can be

gained. Note that it is about 200 times NASA's current annual budget. And by the way, solar power can clean up the environment of the Earth by displacing fossil and nuclear fuels. It also can make it possible for literally billions of human beings to lift themselves out of poverty. Now that's a space program that, I believe, makes sense.

We really need to change vitally the course of the U.S. national space program, because, as it is now headed, NASA is increasingly irrelevant in the future. One reason is that we are not the only nation with capability in space. The Europeans, the Russians and the Japanese have shown that they are capable of profiting by our mistakes and taking the sensible paths which we strayed from. They have intelligent, well-directed space programs of their own, far more cost-effective than ours. If we continue to ignore satellite power as a

goal of our space program, satellite power is not going to be forgotten. It will simply be picked up and exploited by one or more other nations that see that potential six trillion dollar a year market. The nations that do will become the leading nations of the twenty-first century. I hope very much that the U.S. plays an important role in whatever consortium of nations does develop solar satellite power, but it's currently doubtful that we will, and it will not happen if the U.S. federal space program continues as it's now headed.

I apologize to the speakers this morning for having taken their time, but it seemed to me important to give you these strong beliefs based on more than 30 years of observation of the U.S. and foreign space programs. We have an exciting program for you this morning. I will ask now for the first paper on the fascinating subject of space power.