SPACE SHUTTLE OPERATIONAL PLANNING, POLICY AND LEGAL ISSUES

HEARINGS

BEFORE THE

SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS

OF THE

COMMITTEE ON SCIENCE AND TECHNOLOGY U.S. HOUSE OF REPRESENTATIVES

NINETY-SIXTH CONGRESS

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SPACE SHUTTLE OPERATIONAL PLANNING, POLICY AND LEGAL ISSUES

TUESDAY, SEPTEMBER 25, 1979

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10:05 a.m., in room 2325, Rayburn House Office Building, Hon. Don Fuqua (chairman of the subcommittee) presiding.

Mr. FUQUA. The subcommittee will be in order.

Today the Subcommittee on Space Science and Applications begins 2 days of hearings on Space Shuttle operations planning, policy, and legal issues.

With the first Space Shuttle flights scheduled for next year, NASA must face up to the operational and institutional issues such as how to organize and manage an operational space transportation vehicle as well as legal issues involving user liability, insurance, indemnity and patent and proprietary rights.

The Space Shuttle must serve the needs of NASA, other civilian agencies, the Department of Defense, the private sector as well as foreign users. Realization of full economic benefits will entail extensive planning and execution of Shuttle payload integration, launch mission control, recovery and refurbishment activities. The effectiveness of the space transportation system will depend on establishing broadly based participation from the national and international enterprises.

Government policies and agencies, regulations, user charges, provisions for launch assurance and priorities, user liabilities insurance and indemnity provisions, protection of individual and private property as well as patent and proprietary rights involve questions of legal and business importance which can have a significant effect on the extent to which this new system will promote private venture. It is essential that, while assuring U.S. interests are adequately protected, all reasonable opportunities must be available to encourage full utilization of the Space Shuttle and the space environment.

Our first witness today is Mr. James M. Beggs, the executive vice president of General Dynamics Corp., and chairman of the Panel of the National Academy of Public Administration, which conducted this study on organization alternatives for U.S. Space Transportation in the 1980's.

The witness following Mr. Beggs will be John Yardley, Associate Administrator of NASA Office of Space Transportation Systems.

The last witness will be Dr. Klaus Heiss, president of Econ, Inc. Mr. Beggs, we are happy to have you today and to hear your testimony.

STATEMENT OF JAMES M. BEGGS, CHAIRMAN, PANEL OF THE NATIONAL ACADEMY OF PUBLIC ADMINISTRATION, ACCOMPANIED BY DR. RICHARD CHAPMAN, NATIONAL ACADEMY STAFF

Mr. BEGGS. I have with me Dr. Richard Chapman of the academy staff who assisted this panel, just in case I need my memory refreshed, sir, although I think I have this in hand.

In 1976, at NASA's request, the National Academy of Public Administration convened a panel to address the question of what organizational location and operational relationship was best suited for the Nation's space transportation system in the 1980's and beyond. The panel consisted of, in addition to myself, the following:

Alan L. Dean, Vice President, U.S. Railway Association; Paul G. Dembling, General Counsel, U.S. General Accounting Office; William T. Golden, member of a number of corporate directorships and a trustee; Herbert Roback, Director of Studies, Federal Commission on Paperwork; James P. Romualdi, director, Transportation Research Institute, Carnegie-Mellon University; and Harold Seidman, professor of political science, University of Connecticut.

As the committee I am sure recognizes, all of these members have had extensive experience with a number of different types of government and private organizations. The panel was also very ably assisted by DeWitt C. Armstrong and Dr. Chapman of the National Academy staff.

The possibilities considered included both private or mixed ownership corporations and location within any of several existing Federal departments as well as the potential of a new independent Federal agency and, finally, leaving the program in NASA. With regard to the operational requirements, the key assumption was the projection of space transportation use—a rate of about 60 flights per year by 1992.

NASA, acting for itself, or in a management responsibility for other agencies, would be the user of about one-half the flights while Department of Defense would use about one-fifth. Thus, the Government would be supporting about 60 percent of the capacity of the space transportation system for at least the next decade.

As an aside there, Mr. Chairman, actually that figure is probably closer to 70 percent or 75 percent in the early years.

In the panel's view, at least through the 1980's, economics ruled out private or mixed ownership. To attract private capital sufficient to establish a viable corporation would require user charges much higher than that required to establish a market. In fact, it would probably preclude usage by any except the Government, thus the Government would be fully subsidizing the corporation. However, after suitable experience, and if commercial usage truly flourished, private investment in the system could indeed become financially feasible and should be reconsidered at that time.

Turning to the appropriate place within the Federal structure to locate the space transportation organization, the panel considered the Department of Defense, the Departments of Commerce and

Transportation, and the possibility of a new independent agency. The conclusion was that location within the DOD would be compatible with the U.S. emphasis on open and peaceful use of space and the access to the system of all responsible users. The Department of Commerce was dropped from consideration since it was felt that there was no compatible organizations within Commerce that would lend strength to the space transportation organization.

Therefore, the panel's analysis concentrated on three organization locations—NASA, the Department of Transportation, and an independent agency. A Government corporation to operate the space transportation organization was not considered a distinct alternative since it could be formed within, as well as outside of, existing departments and the corporate form was examined in that context.

The panel then compared the three locations as objectively as possible by testing them against nine criteria. This analysis is contained in our report, copies of which I understand this committee has studied.

In summary, the comparison showed a marked difference in expected performance depending upon whether the space transportation organization and NASA were joined or separated. When joined, they reinforced and complemented one another. When separated, it appeared to the panel that it raised the potential of conflict and competition for both funds and support.

For example, if located in the Department of Transportation, the space transportation organization would be competing both for funds and for management attention and support from the many other DOT elements which, as the committee knows, has urgent problems and large active constituencies. As an independent agency, the organization would have to justify its existence as a relatively small, truncated space agency without the close support and active management attention of NASA which would be the main user of the system.

Likewise, the creation of still another agency devoted primarily to space activities would be a contravention of previous Government studies calling for simplification and greater aggregation of like Federal activities. In short, it is hard to justify detaching the space transportation function from NASA. The panel therefore concluded that NASA was the best organizational location for the system.

The panel then addressed the question of whether the organization should be a component of NASA or a Government corporation within NASA. The corporate form, of course, offers significantly more flexibility than that provided most Government agencies.

However, the 1958 Space Act provides extraordinary flexibility for operating space transportation to NASA. This flexibility has been used over the years in a very wise and effective manner in providing space services to a multitude of users both public and private, foreign and domestic. In addition, as a corporation under the Government Corporation Control Act, the financial reporting requirements would add an undue burden which we believe is unwarranted and perhaps harmful during the initial period of Shuttle operations.

But the day may come when a corporate form would be advantageous and should be studied at a later date if and when commercial use of the Shuttle has developed beyond current projections. In the meantime, the space transportation organization should take the form of a NASA component.

One final comment on the impact of a large operational responsibility within NASA. The panel was concerned that major operational responsibilities tend to divert management attention from research and development activities. Thus the organization within NASA must be carefully considered to minimize the impact of a large operational responsibility on the planning and ongoing programs in research and development. Moreover, NASA management must be consciously and continuously aware of the objectives of NASA as defined in the 1958 act which calls for the advancement of space science and exploration of space for the benefit of the United States and mankind.

In summary, the panel did conclude the best location was a component of NASA and recommended that NASA control be retained. However, that a further look should be taken after sufficient experience and learning have taken place to reevaluate the possibility of whether a Government corporation or a private or mixed ownership form of corporate organization is feasible.

Thank you, Mr. Chairman.

Mr. FUQUA. Thank you very much, Mr. Beggs.

How long, in your opinion, after the Shuttle is operational would a review of this type be appropriate?

Mr. BEGGS. I think certainly enough time for the system to mature, and experience gained on the operation of the Shuttle, which probably means the mideighties or beyond. Certainly during the initial period, when initial operating capability is being established, and the system is being operated more or less in an experimental mode, would be much too early.

I think the question of the testing of the price against the market, that is the use that the market makes of the Shuttle, must be determined before you can really determine whether you have a viable situation for a corporate form.

Mr. FUQUA. Could you elaborate a little bit on the panel's conclusions of keeping the operation within the framework of NASA, rather than as a separate corporation?

Mr. BEGGS. Yes, sir. We looked at a number of specific criteria.

Mr. FUQUA. I still have some questions that I would like to resolve, about making a separate corporation.

Mr. BEGGS. Yes, sir. The criteria that we addressed were primarily related to the model that we were given, which specified through the 1992 time period the usage of the Shuttle, and most of those or a large percentage of those uses relate to specific NASA activities, or to uses that the Department of Defense will make of the Shuttle, as the committee, I am sure, is well aware.

Our view on the separate corporation, or even a separate organization outside of NASA, was that during that period, there would have to be, perforce, a very close relationship between NASA and the corporation; indeed, a very close relationship between that corporation or separate organization and DOD.

The relationships between NASA and DOD already exist. They have been worked out over the years in a very satisfactory and I think effective manner.

Adding the burden of working a new organization into relationships with a number of Federal agencies, a number of potential private users of the system, and perhaps even the necessity to work with foreign users of the system is something that you should not lay upon a new organization to begin with, when you are trying to break in, at the same time, a very complex system.

Mr. WYDLER. I wonder if the gentleman would yield?

Mr. FUQUA. Certainly.

Mr. WYDLER. First, it is good to see you.

Mr. BEGGS. Thank you, sir. It is nice to see you.

Mr. WYDLER. It has been a long time.

Mr. BEGGS. Indeed, it has.

Mr. WYDLER. I am trying to remember. It has been at least 10 years.

Mr. BEGGS. Yes, it has.

Mr. WYDLER. I just cannot help wondering. Was an attempt made to adapt this program to something like Comsat, and get it either into that existing structure or a new structure. Was that considered?

Mr. BEGGS. Yes, it was. As a matter of fact, we looked at the experience with Comsat quite intensively. I think there is a distinction between what you are trying to do here and what you were trying to do there. Comsat was working the communications field. Communications has long been, in this country, an area where private corporations operate within a rather well-defined regulatory structure of the Government, and as a consequence, when the potential for satellite communications became a reality, the logic of proceeding directly from the R. & D. base that existed to a private form of organization was a natural sort of progression.

I might add the financial viability of the space communications system was obvious from the beginning. It was clear that proceeding from what you had in the research and development area to a financially viable corporation was a very logical progression, and the financial community could see an easy way of getting from here to there.

Nevertheless, as you are aware, the Comsat organization is a Government-sponsored corporation, which has public members as well as private. In the case of space transportation, the financial viability of the system has yet to be proved, and indeed the pricing of the system is what we call in this business, flat pricing over a mission model of a number of years.

To ask the financial community to support financially such a system is going to be a very, very difficult thing. In fact, our conclusion was that it would probably be impossible to get private financing in the early years, and therefore we did not believe that, from a financial point of view, you had any chance of organizing a viable corporation.

As I said, after perhaps 5 or 6 or 7 years of operation, when experience indicates that you have proven your pricing model, and it appears that the use of the Shuttle will increase as years go by,

by private users, then you can get the financial community to come in.

Mr. WYDLER. Do you have any numbers? What are we talking about between now and 1992? What kind of money do you feel that this corporation would have to have to operate in that time frame?

Mr. BEGGS. It would be a larger corporation than Comsat.

Mr. WYDLER. If you don't want to stretch it out that far, I mean if you have a shorter period that you know, I would just like some numbers here. I am just wondering what we really are talking about. Can you give me some frame of reference? What were you using as numbers?

Mr. BEGGS. As we conceive the system, the capitalization of such corporation will have to be in the order of several hundred million dollars, and in addition to that, of course, it would draw on a support from the Federal Government to support the pieces and parts that the Federal Government would be flying. That indeed probably would be the larger part of the financial support in the early years, which was still another consideration that we thought militated against the private corporation. You would be asking the private sector to put up several hundred million dollars, which would be needed for operating funds and that, in my view, and in the view of the panel, was probably not in the cards in the early years.

Mr. FLIPPO. Would the gentleman yield?

Mr. FUQUA. Yes.

Mr. FLIPPO. Mr. Beggs, the current traffic forecasts indicate that the NASA payloads will represent approximately 37 percent of all those payloads.

Mr. BEGGS. Yes.

Mr. FLIPPO. DOD will be about 29 percent and everything else about 34 percent, which is somewhat different from the forecast used in your study. Do you feel that these current forecasts alter the conclusions of your study?

Mr. BEGGS. No, sir, I do not. You are still talking about well over half, and when you add to that the usages that will be made by foreign users and other public users, it is still a very large percentage for the initial years. It is my view on the Shuttle that, once you have proved the viability, you are going to get a lot of private usage, but it is going to take a while to bring the commercial user to a realization of the potential profitable opportunities that the Shuttle is going to present. I think a number of years. When that happens, then you will have a different situation, but in the earlier years, the costs associated with it and the large usage of it by the Government I think are going to militate against the heavy usage by the commercial sector.

Mr. FUQUA. In effect what you are saying is that we should look at the Shuttle after it is operating for a while, and then maybe go back and review this issue again?

Mr. BEGGS. Yes, sir, I do indeed.

Mr. FUQUA. You have indicated in your study that with operations by a mixed corporation or totally in the private sector, that the cost might be a little higher. Would that be because of the risk involved, or because of profit, or could that be compensated for by efficiency?

Mr. BEGGS. Primarily risk, which as you know, Mr. Chairman, generally translates into the requirement to make a profit of substantial size, in order to cover that risk, so that the pricing in the early years probably, in a private corporation, would be significantly higher than the kind of flat pricing that the Government is proposing to do, which I believe is right.

It is somewhat comparable to that which one does in the private sector when you launch a new transport, a new commercial transport in the aircraft industry, where you try to flat price over a number of units, in order to make the initial price reasonable enough to attract the customer base that you need to launch that project.

Mr. FUQUA. In the report you pointed out that there should be a distinction made between R. & D. cost and operational cost. Do you think after the Shuttle is operational, that that distinction should continue, or could it all be operational? Would there be a necessity to differentiate between R. & D. and operational cost?

Mr. BEGGS. I think after a period of time, that differentiation will blur, and probably by its own nature be eliminated. In the early years, however, I think it still should be required that those two things be separated, so that you understand the benefits of each, and the costs of each.

Mr. FUQUA. Mr. Wydler.

Mr. WYDLER. Did you ever try to offer—you couldn't offer anything but did you ever talk to anybody in industry about their interest in doing it? You assume, and I think generally your assumptions are about right, but I would also be nervous about making those assumptions without testing them in the real marketplace. I just wonder if you talked to any people in industry that might be interested in getting into this kind of a thing.

Mr. BEGGS. I cannot say that we found anyone that was interested specifically in investing. We did talk to some of the New York financial people as to their opinion about setting up and attracting capital into this kind of thing. Their feeling was that it just was not financially viable, with the mission model that was then in existence. There was not sufficient market, and there was not sufficient interest from a large enough group, unless, of course, you could assume that the Congress would be willing to subsidize heavily in the early years the private corporation as it existed.

Mr. WYDLER. It is not unheard of?

Mr. BEGGS. No, it is not unheard of, but our feeling was that if you were going to do that, why not let the Government operate it, and establish the financial viability of it, and then turn to the private sector.

Mr. WYDLER. I am not necessarily disagreeing with your conclusions, but I am trying to see whether we really have given the other aspects of it a real fair hearing.

Mr. BEGGS. Sure.

Mr. WYDLER. You are really in effect saying, if I understand your conclusions, we will commercialize it somewhere down the road, and that will be whenever it looks like it is commercially feasible?

Mr. BEGGS. If that happens.

Mr. WYDLER. At some period in the future we come to a point where we say it is commercially feasible, then we will let the

private industry into the picture, but I am just wondering if they would not be willing to pick up some of this risk—and there is a lot of risk—earlier, for the potential benefits they might get out of it too. It is obvious that the main customer is going to be the Government, or foreign governments, for a long period of time, and you can use the word "subsidy," but the amount that is charged to the services could be adjusted and worked out and negotiated. Whatever word you want to use, to make the project fairly viable, and possibly let somebody take some risks in the early days when the pay off they realize might not come until somewhere down the line. It does not seem like that is an impossible thing to put together.

It does not seem like that is an impossible thing to put together. It is hard, maybe not much harder than trying to put together a synthetic fuels industry from nothing. It might be just as wild a flyer.

You see, what I am seeing here is an opportunity to demonstrate to the American people, in ways they can understand, the benefits of a space program.

Mr. BEGGS. Sure.

Mr. WYDLER. We have never been able to demonstrate it to them very adequately because most people consider success in dollars and cents, so unless you can show them that you made x dollars on the project, it did not have a payoff, and we cannot do that with the space program. The benefits are more or less intangible types of benefits that people cannot value and weigh properly.

Now, here is a chance, though, to really sell something; to really convince the public that we are giving them a product that had a market value, and I think that might go a long way to reassuring them that the space program was not just a lot of Government subsidies. They look at it as all Government subsidies at the present time.

Anyway, I am just saying I think we should really try to explore it to the extent possible, the possibilities that there are some groups, corporate groups, national groups, even international groups, that might be interested in making a corporation of this type viable even at the present time.

Mr. BEGGS. If I thought that going private, or even quasi public, and and even an international corporation would enhance the image of NASA in the public's mind, I would be 100 percent behind it, because, as you know, I have always been a great supporter of the space program, and I think it is enormously important for the future of this country, and any way you can enhance it in the public mind I think it would be good.

Our feeling was that that wasn't likely to happen though, because in the first 5 or 6 years of the operation of the Shuttle, the usage is going to be so preponderantly by the Government, and the probability of really attracting a financial base from the private sector is so unlikely, and if this situation was forced, it might turn out that what you had on your hands was a corporation that was a little sick, and I have been associated with a couple of those Government corporations that get a little sick, and it really does not help. I think you might hurt the Shuttle by trying to force that too early. That was our concern.

Mr. WYDLER. You are, in other words, convinced in your own mind that you really pushed the possibilities to the uttermost, and still come up with the same answer?

Mr. BEGGS. Well, I guess I would not say quite that, but we pushed as hard as we could, taking into account the political realities, the public policy issues, the questions of how well and how fast do you think this thing might come along, and our view on what was a rather lengthy consideration of those issues was that it was unlikely you were going to get a very healthy private corporation in the early years, and for that reason we rejected it.

Mr. WYDLER. Thank you.

Mr. FUQUA. Mr. Flippo.

Mr. FLIPPO. No questions, thank you, Mr. Chairman.

Mr. FUQUA. Thank you very much.

Mr. BEGGS. Thank you, Mr. Chairman.

Mr. FUQUA. We appreciate you being with us.

Mr. BEGGS. Thank you, sir.

[Additional questions and answers follow:]

COMMITTEE ON SCIENCE AND TECHNOLOGY,
U.S. HOUSE OF REPRESENTATIVES,
Washington, D.C., September 27, 1979.

JAMES M. BEGGS,
Executive Vice President, General Dynamics Corp.,
St. Louis, Mo.

DEAR MR. BEGGS: On behalf of the Subcommittee on Space Science and Applications, I want to thank you for your participation in the hearings on Space Shuttle Operational Planning, Policy and Legal Issues.

The Subcommittee requests that you respond to the enclosed questions and return them with the corrected transcript for inclusion in the record.

Again, thank you for your contribution and valuable insight concerning the issues discussed at these hearings.

Sincerely,

DON FUQUA, *Chairman.*

Enclosure.

SUGGESTED QUESTIONS FOR JAMES BEGGS

(1) Mr. Beggs, the National Academy study concluded that Space Transportation Operations should be a component of NASA rather than a government corporation under NASA.

Could you elaborate on the basis of this conclusion?

(2) In your statement, you suggested that a further look should be taken after sufficient experience and learning have taken place to reevaluate the possibility of whether a government corporation or a private or mixed ownership form of corporate organization is feasible.

What time frame would you consider appropriate for this reevaluation?

(3) Mr. Beggs, what conditions would have to exist to make private operation of the space transportation system viable in the future?

(4) Mr. Beggs, the National Academy Report suggested that NASA clearly separate operational functions from research and development activities.

Could you elaborate on the need for such a separation?

Should the Space Transportation Systems Operations report directly to the NASA Administrator?

(5) Current traffic forecasts indicate that NASA payloads will represent approximately 37 percent of all payloads, DOD about 29 percent, and all other 34 percent which is somewhat different than the forecast used in your study.

Do you feel that this current forecast alters the conclusions of the National Academy study?

(6) You indicate that private or mixed ownership of the Shuttle would require higher user charges. Is this because private owners would require a profit?

Do you believe private operations could provide any compensating efficiencies?

(7) You indicate that under the Government Corporation Control Act, the financial reporting requirements placed upon a government corporation would add an undue burden.

Could you explain this and indicate how different such reporting would be for a government corporation as compared to a federal agency such as NASA?

Please respond to questions not covered in the hearing unless you would like to add additional material.

SPACE SCIENCE AND APPLICATIONS SUBCOMMITTEE—QUESTIONS FOR MR. JAMES M. BEGGS FROM MINORITY

(1) In the NAPA report you stated that a key assumption in your SPS study was the flight frequency of shuttle. What are the effects on the decision if that flight frequency is increased or decreased?

(2) The fact that the NASA or government payloads account for approximately 50 percent of the traffic model undoubtedly influenced your decisions substantially. What level of industrial involvement would be required to make an independent shuttle transportation office feasible? i.e., if civil payloads accounted for 50 percent or 60 percent would it be more reasonable to go to an independent office?

(3) In the NAPA study you make the argument that if the shuttle was separated from NASA that it would deprive NASA of its most visible program and as a consequence lessen the strength of NASA within the government.

Can't the opposite argument be made, mainly that the size and visibility of an operational shuttle program may drastically distract NASA from its primary role as an R&D institution?

ANSWERS TO QUESTIONS FROM SPACE SCIENCE AND APPLICATIONS SUBCOMMITTEE

Question 1

The panel believes the initial period of operation of the space transportation system should be made as simple and straightforward as possible. The initial break-in period will have many unforeseen problems and, therefore, the organization should be as flexible as possible and should have direct access to all of the resources of NASA.

While a government corporation would not be in any way inhibited from operating in a very flexible way, there would be additional financial reporting requirements as required under the Government Corporation Control Act and the likelihood of separate reporting on its operations to the Congress. It was felt these added burdens without any commensurate advantage in the corporate form over that already provided to NASA in the 1958 Space Act made a corporate form undesirable.

Question 2

Assuming the present schedule for shuttle operations, the organization for space transportation operations should be reconsidered in the mid-1980's.

Question 3

Private operation of the space transportation system requires financial conditions giving reasonable probability that sufficient non-U.S. government use is generated so as to make the overall operations both profitable and cash generating. In addition, the operational viability of the system should be well established so that risks of unforeseen additional costs can be evaluated and assessed by investors.

Question 4

The panel believed that operational functions should be separated from research and development activities so as to prevent the diversion of management attention from research and development activities. History has shown that organizations with operational activities co-mingled with important research and development tend to emphasize the former at the expense of the latter. Clear separation of research and development from the shuttle operations in an organizational way should prevent the dilution of management effort.

In the panel's view, when space transportation system's operations reach a point where the organization and operating capability is established, it probably should report to the NASA administrator.

Question 5

Answered in testimony.

Question 6

Higher user charges by private owners in the initial phases of operation would probably be required in order to cover off unknown risks in the operating system. This does not relate specifically to the requirement for a profit although such a requirement is certainly present under private or mixed ownership. However, the flat pricing system proposed by NASA over a lengthy mission model would very likely not be possible under private or mixed ownership as the risks of financial return on a flat pricing assumption would be so large as to discourage investment of the required funds by the private sector.

The panel certainly took into account the fact that private operations would very likely offer significant operating efficiencies. However, in view of the necessity to work very closely with the government in launch and recovery operations as well as planning, it would require significant staffing which probably would not be necessary once the viability of the system were established.

Question 7

The use of the word "undue" is perhaps too strong, however, the Government Corporation Control Act does require additional financial and operating reporting which in the early phases of space transportation operations was felt to be a burden which had no compensating advantages in operations.

QUESTIONS FROM MINORITY

Question 1

If flight frequency is increased for space transportation, it should make more viable a corporate form of organization at an earlier date. If decreased, the panel believes it would make it less desirable.

Question 2

If civil payloads were to account for 50 or 60 percent of traffic, the panel would have concluded that industrial involvement was much more viable. However, the basic conclusion of the panel would not have changed in that the recommendation for operation within the government until the system is well established and the risks understood would still be most desirable.

Question 3

The argument that the size and visibility of an operational shuttle program could distract from its primary role as a research and development institution can certainly be made. The panel considered this possibility quite seriously during its deliberations and recommended that diversion of management attention from the basic research and development mission be very carefully considered by NASA and guarded against.

It is felt, however, that the management experience of NASA in space operations, the relationships that NASA had with DOD, the international space community and other space users within the government were vital to the successful operation of the shuttle. While a new organization could establish these relationships, it would undoubtedly take time and divert attention from the primary role of successful operation of the program from the beginning. Moreover, the early operations will undoubtedly encounter many difficulties which will require the full attention and utilization of all of the knowledge and experience of the NASA organization. Therefore, on balance it was concluded that operations should remain within NASA.

Mr. FUQUA. Our next witness is John Yardley.

John, we are happy to have you again before our subcommittee. We have to concern ourselves with the first flight. Do you have that date ready for us?

[Prepared statement of Mr. Yardley follows:]

Hold for Release
Until Presented by
Witness 9/25/79

STATEMENT

of

JOHN F. YARDLEY
ASSOCIATE ADMINISTRATOR FOR
SPACE TRANSPORTATION SYSTEMS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

before the

Subcommittee on Space Science and Applications
Committee on Science and Technology
House of Representatives

SPACE TRANSPORTATION SYSTEMS OPERATIONAL PLANNING

Mr. Chairman and Members of the Subcommittee:

I am here today to brief you on our operational planning and policies for Space Transportation Systems (STS) Operations. With the first manned orbital flight date approaching, preparations for routine operations of the Space Transportation System are being greatly intensified, and we are strengthening our management structure to carry out these preparations effectively. For example, we recently established a new position of Deputy Associate Administrator for Space Transportation Systems (Operations) in my office. I would like to take this opportunity to introduce Mr. Charles R. Gunn, who has been appointed to this position. Mr. Gunn, formerly the Landsat-D Project Manager at the Goddard Space Flight Center, will be responsible for all operational matters within the Space Transportation Systems Office.

The STS Operations Office, which is part of the Office of Space Transportation Systems, has been charged with the responsibility for planning, implementing, and conducting integrated STS operations after conclusion of the Orbital Flight Test program. This responsibility includes transition planning; development of financial plans and pricing structures; coordinating activities with DOD; and providing all necessary services to potential users of the STS. The management concept selected for STS Operations has three interrelated areas:

1. Operations management which involves mission planning, flight planning, payload integration, flight operations, and launch and landing operations.

2. Business and customer service management which encompasses budgeting, cost accounting, pricing, customer relations, launch service agreement preparation, flight assignment determination, and cargo manifesting.

3. Flight hardware management which is concerned with the procurement of external tanks, refurbished solid rocket boosters, and spares for flight and ground equipment, sustaining engineering and logistics support.

Current planning effort is concerned primarily with operations, business and customer service management. I shall, therefore, discuss these two areas in considerable detail.

Operations Management

The Headquarters staff is generally concerned with the overall management and administration of STS Operations, while technical and day-to-day management functions are performed by NASA field centers.

The field centers use Civil Service personnel for technical tasks and for management of prime and support contractors. For example, Johnson Space Center (JSC) is responsible for cargo manifesting and payload integration and for flight operations, while Kennedy Space Center (KSC) is responsible for launch and landing site operations. The Marshall Space Flight Center (MSFC) is responsible for the procurement of external tanks, solid rocket boosters, Inertial Upper Stages (from the USAF), and Spacelab (from the European Space Agency (ESA), while Goddard Space Flight Center (GSFC) is responsible for procuring Spinning Solid Upper Stages. Since these STS elements are still in the development stage, there continues to be a heavy Civil Service involvement in day-to-day operations.

This management concept will be in effect at the beginning of STS Operations, but as the system matures the number of Civil Service personnel involved in Shuttle operations should be reduced as will the number of major contracts. The period between initial operations and mature operations, which is called the transition period, is currently being examined in some detail. Cross utilization of personnel between production and operations, contract structures, labor

relations, Civil Service personnel impacts, skill requirements, and flexibility to deal with uncertainty are all part of this examination.

Our management approach has been chosen as a result of several studies, both contracted and in house. In 1977, NASA commissioned the National Academy of Public Administration (NAPA) to determine the best possible approach for operating the national spaceline. The NAPA study concluded that Space Transportation Systems Operations should remain with NASA, as a component of NASA, rather than as a separate entity. The main factors influencing this recommendation were funding, STS utilization (NASA and DOD being the principal users) and simplified management. NAPA did recommend, however, that NASA clearly separate R&D from operational functions, and that further consideration be given to a possible new management concept after operational experience has been gained.

In 1977 a contract was also awarded to Booz Allen Applied Research, Inc. to study methods for providing launch and landing services at KSC during the STS mature operations era. The study compared four options ranging from intense Civil Service management to a single operations contractor with a greatly diminished Civil Service role. The study showed that significant savings could be realized by reducing the number of contractors and the number of Civil Service personnel monitoring contractor performance. In all four options the transition from the present to mature operations must be carefully planned, and, in the two options, with reduced Civil Service personnel, the study emphasized the need to shift the Civil Service skill mix from technical to management and staff support roles. Subsequent to the study, KSC intiated an in-house effort and concluded that Booz Allen results were feasible and desirable. KSC is now moving methodically and with contingency plans, in the direction of consolidating most of the contracts at KSC into three major contracts: (1) Shuttle Operations; (2) Cargo Processing; and (3) Base Support. As the first step, a Request for Proposals for the cargo processing contract with self sufficiency options is being prepared now and should be released to industry by the end of this year. It is intended to provide this "self-sufficiency" to all contractors to give them clear responsibilities for total performance. This approach should assure optimum performance, particularly if incentives are involved. We will also continue to provide opportunities for small business and minority contractors.

We have also contracted with the McKinsey Corporation to study the most efficient and effective way to organize JSC to fulfill their responsibilities during integrated STS operations. This study is to identify the evolution from development to operations, and to determine the institutional impact of transferring functions from Civil Service to contractor personnel. This study is still in progress. When completed early next year, results will be furnished to the Sub-committee.

The various management approaches are being evaluated and assessed according to STS Operations economic requirements, and NASA institutional requirements and commitments. Since we have no operations experience with the system, we are being careful to allow the Agency flexibility in choosing the management approach best suited to operation of the national Space Transportation System. Positive action is being taken at KSC on what we believe to be a firm and complete analysis, but we are still maintaining options at KSC as well as at JSC, MSFC, and GSFC.

Business Management and Customer Services

Policies and procedures are being developed which will encourage efficient and cost effective operation of the Space Transportation System. These include the promulgation and updating of reimbursement policies, the implementation of user development policies, launch services agreements, definition of standard and optional services, and development of user interface procedures.

One of the most important aspects of preparing for mature STS operations is the development of a pricing structure and pricing policies which will permit maximum use of the STS while meeting our goal of recovering total operational costs over a 12-year period. This effort has been underway for several years and is nearing completion as we approach initial STS operations. These policies are viable and will be updated as experience and needs dictate.

The Shuttle civil reimbursement policies published in 1977 incorporate the fundamental principles upon which user charges for all STS elements are based. These include such concepts as no distinction between international and U. S. commercial pricing, fixed prices for three years, escalation clauses for inflation, reduced prices for exceptional payloads, standby payloads, provisions for cancellation and postponements, small self-contained payloads, etc. We are currently

planning to amend these policies to clarify a number of issues, such as standard orbits, scheduling priorities, cancellation fees, protection of launch dates, etc. Policies are also being developed for user charges involving Spacelabs, small self-contained payloads and Spinning Solid Upper Stages. The Spacelab pricing policy addresses four types of services, two dedicated and two shared, and the pricing structure for each.

The small, self-contained scientific R and D payload policy defines terms and conditions, establishes priorities for various classes of user, and fixes reimbursement charges. It is noteworthy that the NASA Self-Contained Payload Program has attracted approximately 300 payloads from well over two hundred customers, representing educational institutions, industrial firms, government organizations, and individuals.

The Spinning Solid Upper Stage (SSUS) policy is concerned primarily with the procurement and reimbursement of NASA services, since the SSUS is being developed as a commercial venture and, in most instances, STS users will deal directly with the supplier of the SSUS.

Approximately 29% of all Shuttle traffic is currently earmarked for Department of Defense missions. Special arrangements, including agreements on joint operations of the STS and special reimbursement agreements, are being made with the DOD to accommodate this traffic. In accordance with these agreements, DOD will be responsible for launch and recovery operations at Vandenberg Air Force Base (VAFB), for DOD payload integration and planning, for operation of the Air Force Satellite Control Facility, and for Inertial Upper Stage (IUS) procurement. DOD reimbursement principles are embodied in an agreement which stipulates that KSC launch and JSC flight operations services for DOD missions are exchanged for VAFB launch services for all non-DOD missions from VAFB. Launch costs to DOD are fixed for six full fiscal years at $12.2M in 1975 dollars. This price is intended to recover material and service costs and will be adjusted to actual costs annually after the initial six-year period.

Negotiations are currently underway with the DOD to supplement the basic memoranda of agreement concluded in 1977, and to define services not included in the basic charge and associated reimbursement.

To further encourage both space and STS utilization, we are offering special low-cost prices for experimental

or innovative users of space, and for projects which have great public value. Another area that promises considerable payoff is space industrialization and, specifically, materials processing. Materials Processing in Space (MPS) is emerging as a new technological capability for materials research and for materials processes not possible on earth. The application of this technology must occur in the industrial community to satisfy the needs of an ever-expanding market for new and improved goods and services.

At this time, however, the nascent state of MPS technology places it in a long-term, high-cost, high-risk category which is generally beyond the interest and capacity of commercial concerns to pursue on a totally privately funded basis. Recognizing industry's key role in the successful innovation of any technology for commercial purposes, NASA has initiated a program effort to encourage and stimulate U. S. industry's participation in the development of MPS technology to insure that development activities reflect the needs of industry in the future. We have had numerous discussions with industrial and government officials and have undertaken a number of studies to determine how best to proceed. These studies and discussions indicated that a cooperative arrangement would best serve the purposes of NASA and industry. To this end, a joint endeavor approach has been formulated to pursue cooperative arrangements with industry on a case study basis. A NASA statement, "Guidelines Regarding Joint Endeavors with U. S. Domestic Concerns in Materials Processing in Space" was carried in the Federal Register and Commerce Daily on August 14 and 28, 1979, respectively, announcing this activity. In a joint endeavor, NASA and a U. S. commercial firm agree to be responsible for specific portions of a total endeavor. Each party pays for its portion of the work and equitably shares in the risk and return that may accrue. By design, the joint endeavor approach is a developmental activity, wherein the institutional relationships needed to establish effective industry participation and interaction in NASA's space technology efforts can be developed and refined.

In connection with these activities, NASA has received joint offers from three different private firms, which are now being considered according to the above guidelines. In general terms, these offers propose that the firms be responsible for ground-based experimentation and development of experiments for flight investigations and technology demonstrations, and NASA be responsible for STS services and general

purpose support equipment. In consideration of their investment, the firms would expect to retain commercial patent and data rights commensurate with their level of involvement. For its work, NASA would receive scientific and engineering data required to understand and characterize the role of gravity in material processes.

As industry becomes aware of the potentials of MPS technology, we are confident that additional joint endeavor offers will be forthcoming.

In addition to these major financial management policies, we are developing policies and procedures which will accommodate all users, large and small, and facilitate their entry into the system with a minimum of paperwork. We have developed a unique two-tier system, which permits potential users to conduct all business and financial negotiations with STS operations management at NASA Headquarters, while at the same time interfacing with field center technical personnel to resolve issues concerning mission planning, support requirements and payload integration.

The key document governing relations between NASA and the user is the Launch Service Agreement which all users must sign and which describes the services and conditions of the services to be provided by NASA. This agreement is based on published U. S. government policy and regulations. In addition to describing the standard and optional services to be furnished, it contains all financial arrangements, termination clauses, launch schedules, description of proprietary rights, insurance provisions, etc.

Standard services, which are uniform for all civil users, include a basic Shuttle launch for a one-day mission to a standard altitude and azimuth, a crew of three, and standard support services.

Optional services, which must be requested by the user, include special hardware, analysis, testing, use of KSC facilities and services, and special orbital operations. The Launch Services Agreement also includes a Payload Integration Plan (PIP) which contains detailed, technical launch service specifications.

To insure that all contractural obligations for launch services are fulfilled in a timely and cost-effective manner, an integrated STS Operations Scheduling System is being developed. The system establishes launch requirements and translates those requirements into

detailed schedules for hardware procurement, mission planning, payload integration, and pre-launch operations. This system will make it possible to establish a sound basis for STS operations planning at all levels of management. It will also provide the necessary visibility to top management to permit effective management control. Feedback mechanisms are provided for progress reporting and status reporting, to insure that all contractually obligated milestones are achieved on schedule and within authorized resources.

The STS pricing structure is based on the concept of a firm-fixed price, designed to encourage potential users to make an early commitment to fly on the Space Shuttle. The currently quoted price for civil users is 18.0M in 1975 dollars. It was developed from cost data based on an anticipated traffic of 487 flights in the next twelve years, and is predicated on recovery of all operations costs over this period. Commercial and foreign users, except the European Space Agency (ESA) and Canada, will be charged a fee of $4.3M for the use of U. S. government facilities and $271,000 for reflight insurance. The fixed price of $18.0M has been escalated to $25.8 million in FY 79 dollars, in accordance with actual Bureau of Labor Statistics inflation rates (43.5% compounded, from Jan. 1975 to April 1979). Based on an 8 1/2% inflation rate over the next two years, the projected price in FY 1981 dollars will be $30.5 million. Recent studies of Shuttle and associated operational costs indicate that when we revise our fixed price for FY 1985 flights, our user charge will have to be raised 15 to 20%.

We are also developing prices for cetain optional services which will be required by the various types of Shuttle users. Our goal remains to develop a fixed price for STS standard and optional services in advance of performing the services to the maximum extent practical. For optional Shuttle services where a fixed price does not prove practical, the user will be charged actual costs.

Our experience to date for payload related optional services varies according to mission complexity. Generally, however, for a complex first of a kind payload such a TDRSS-A, optional service costs amount to about 11% of total costs. For a repeat complex payload, it is about 3%. For less complex payloads such as a SSUS-A communication mission, the comparative figures are 4% and 3% respectively.

We have identified five principal users for the Space Transportation System: NASA, DOD, other U. S. government agencies, commercial enterprises, and foreign governments and organizations. Current traffic forecasts indicate that, over the next twelve years, NASA paylods will represent approximately 37% of all payloads, DOD about 29%, and all others 34%.

It is our policy to accommodate user requirements as much as possible on a first-come-first-served basis. However, in case of conflicting requirements, missions affecting national security will be given top priority. Missions involving significant science and technology objectives, and reimbursable payloads will also be given preference over routine science and technology experiments.

We have identified a number of problems associated with cargo manifesting, and are in the process of installing sophisticated computerized models which will permit matching of capabilities with requirements. This involves weight, volume, trajectory, multi-deployable payload requirements, carrier hardware turn-around and contingency scheduling. A key element is Shuttle performance limitations. We are planning a phased build-up in Shuttle engine performance which will permit lifting of the loads required for planetary and geosynchronous missions during the early operations period. We are also concentrating on weight reductions in the flight hardware, including later orbiters, external tanks and solid rocket boosters.

Every attempt will be made to minimize configuration changes between flights and to make maximum use of standard mission profiles. Our manifesting is based on holding a 3000 lb. reserve until after some flight experience.

One of the key elements in preparing for STS operations is the selection and training of the flight crew. Equally important is the selection and proper training of the scientific members of the crew, the payload specialists. NASA has recently advertised for additional pilots and mission specialist candidates. Mission plans and operational needs will dictate the number of additional candidates required. Selection may occur during 1980. Selection criteria for the new group remain the same as those for the original group of candidates. If additional candidates are selected, they will undergo a one-year training program.

We have formulated and published in the Federal Register NASA's policy for the selection, responsibilities, duties, and training of payload

specialists for NASA and NASA-related payloads. We are in the process of submitting to the Federal Register a proposed regulation for the selection, duties, and training of payload specialists for non-NASA civil payloads. Discussions are underway for the possible use and training of foreign mission specialists representing those entities that have made a major contribution to the STS program, i.e. the European Space Agency (ESA) and Canada. Other policies being formulated deal with the authority of the flight commander and the many other aspects of [illegible] ivities during an orbital mission.

Mission Planning for the Orbital Flight Test Program and for early operational flights is progressing at an accelerated pace. We have identified payloads to be carried on our orbital flight tests. In addition to test instrumentation scheduled to be flown on the first manned orbital flight, we plan to fly a pallet carrying earth-sensing experiments and a remote manipulator system test article on orbital flight test missions two and three, respectively. Under consideration for the fourth flight are the Spinning Solid Upper Stage (SSUS) for verification of its delivery capability or a pallet for space physics and solar observation experiments.

We have firm commitments for the first 38 operational flights to be flown in the 1981-1984 time period. These flights will accommodate payloads representing 15 different customers (including NASA). These payloads include commercial, foreign, DOD, Civil - US government, and NASA payloads.

We are committed to a rapid, but orderly transition from the use of Atlas Centaur and Delta expendable launch vehicles to use of the Shuttle, and a key policy concern has been the maintenance of continued launch capability for users during the transition period. For early transition users who are willing to design their payloads to be compatible with both the Shuttle and the expendable Atlas Centaur or Delta, we have agreed to provide limited expendable launch vehicle backup capability to protect the users from possible Shuttle development delays. Users must decide within 30 days after the first Shuttle flight if they want to keep the backup. In the event they elect to keep the backup, they must pay for the expendable launch vehicle.

The larger group of expendable launch vehicle-compatible transition payloads are those of the Delta-class transition users. The current Delta-class transition policy provides Delta backup launch

capability to Satellite Business Systems (SBS-A and -B), NOAA (GOES-D and -E), Telesat Canada (Anik C-1 and C-2), Government of India (Insat) and RCA American Communications (RCA Satcom-D), for a firm-fixed price of $22 million per launch.

While the number of DOD and NASA missions is dictated primarily by national security and budgeting considerations, the number and kind of commercial and foreign payloads will be determined largely by policies developed by this nation, and NASA, to attract potential users.

Mr. Chairman this concludes my prepared testimony. If you have any questions, I shall be glad to respond to them.

STATEMENT OF JOHN YARDLEY, ASSOCIATE ADMINISTRATOR, SPACE TRANSPORTATION SYSTEMS, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, ACCOMPANIED BY CHARLES R. GUNN, DEPUTY FOR OPERATIONS

Mr. YARDLEY. We have a range.

Mr. YARDLEY. Before I begin my presentation on the STS operations this morning I would like to introduce Mr. Charles Gunn on my left, who was named my Deputy for Operations beginning on September 17. We have realized that we need to strengthen this area. We are getting more and more STS traffic, and that is good. As I will show you today, we are solidly booked on the Shuttle into 1984, and I just made a rough survey while Mr. Beggs was talking. About 35 percent of the traffic is non-Government in that period.

If I may, Mr. Chairman, I would like to enter my written statement for the record and proceed with the Vugraph presentation.

Mr. YARDLEY. The space transportation system, of course, includes many elements (fig. 1). Some people think the Shuttle and the space transportation system STS are synonymous, and of course the Shuttle is the centerpiece of the system, but it also includes things like Spacelab, various upper stages, control centers, ground support, launch and landing facilities, mission planning, and a number of other things. We will try to touch on the major ones of those today.

First of all, just an overview. We have defined the responsibilities for STS operations as shown on the left chart (fig. 2). Basically it is planning, implementing, and conducting integrated space transportation system operations, including coordinated operations with the Department of Defense since they will be operating portions of the system in cooperation with us.

Now there are a lot of business management activities that must accompany this. NASA has been engaged in these activities on a small scale, with our expendable launch vehicle programs, but the STS involves a much larger activity, and does require a lot of careful policy thinking, legal thinking, and so on. This has been going on, and is, I believe, in fairly mature shape in many areas.

We also have to worry about developing users, and we have been quite active in this for several years as part of the background for our pricing policies, which I will get into later.

Right now we think maybe we have been a little too successful, since the Shuttle schedule is so full that we are unable to meet new launch requests coming in. We have people that are inquiring about flights in 1982 and 1983, but we are full in those years, so it may be that we will have to support these latecomers with additional expendable launch vehicles, which we had hoped not to do.

Mr. FUQUA. Where are they coming from?

Mr. YARDLEY. The communications industry primarily. Well, NOAA also has some more urgent requirements, but there are three or four Delta class payload users that are inquiring about space in 1982 and 1983 that we are just unable to handle, unless somebody else drops out.

Of course, part of our overall responsibility is to provide launch services throughout the transition period for people that we have always provided launch services for and this means backup launch vehicles as well as continuing expendable launch vehicle services in parallel with the Shuttle, if the traffic demands.

If you look at the activities in operations management (fig. 3), there are three basic elements. One is the hardware management, which invovles buying tanks, solids, and refurbishing, checking out, and so on. Then, of course, there is the overall business management and customer service area, which is a very large area. There is the operations support, which includes payload operations, flight operations, launch and landing, and so on. We are working all of these.

The STS operations organization that we are currently operating with, it is shown here (fig. 4), and I want to emphasize the words "currently operating with," because we are trying to evolve an operations organization that is compatible with our R. & D. organization. We have a large number of people that are working on the Shuttle now, but will eventually be working with operations therefore, and we need to make provisions for this organizational transition too.

Right now we have a blend with the Shuttle and Spacelab development the inertial upper stage (IUS) and other projects, which permit us to use a number of people at the centers in a double-duty sense.

For instance, when we are in the throes of buying, external tanks for the operational period, we keep all the funds and the headquarters staff separate, but when we work with the Marshall Space Flight Center (MSFC) we go to the Shuttle tank project office and have them buy the tanks for the operations. In other words, we are not trying to set up duplicate organizations at this time.

The time will come, however, when that R. & D. function is gone and they will become just pure operational elements, but that is the kind of transition I am talking about.

In general, Johnson Space Center (JSC) will supply flight scheduling, flight planning, training, flight operations, payload integration, and sustaining engineering on the orbiter. They will be supported primarily by Rockwell and Hamilton Standard on this. Marshall's main work will be in the procurement of tanks and solids and refurbishment of engines, procurement of replacement engines and flight spares. Kennedy Space Center (KSC) will do the launch and landing operations. They will also provide substantial payload

support, which will be an extra charge for commercial and non-NASA customers. We will rent them space at Kennedy, and provide them services, to do their off-line payload work.

KSC will also handle the integrated logistics for STS operations. They are now in the best position to know what they need in the way of support equipment and spares. They will determine needs, often working with the development centers to do so. When items are bough they will buy them through the centers that already have open contracts for procuring spares and required equipment in the production process.

The Goddard Space Flight Center (GSFC) is in a peripheral role in terms of relation to the other three major centers. They are doing all of the spinning solid upper stages (SSUS) management and procurement; and they are also doing the small self-contained payload activity, including integration with the users.

Now in our evolutionary management concepts, we have put them in this order.

Mr. FUQUA. Put that other slide back up, the one you just took down. You have under Goddard a prime contractor for the upper stage. Why are you doing that at Goddard? Isn't that a new role for them, rather than at Marshall, or at one of the other centers?

Mr. YARDLEY. No; first of all, let me define what we are talking about. The SSUS-A and SSUS-D are commercial developments. Goddard is the manager of our contracts, our NASA contracts to buy those vehicles. The primary reason it was Goddard was because the SSUS-D which is the big element.

Mr. WYDLER. Would you mind speaking in language I can understand.

Mr. WYDLER. I get this whenever I have to deal with the Defense Department. They are off in all their shortened versions of words, but I do not really know what it means.

Mr. YARDLEY. OK, let me explain briefly the upper stage situation. There is an upper stage called the SSUS-D. It is a solid motor, sized to carry a Delta class payload out of the Shuttle. The user can buy that stage, integrate his spacecraft and have a backup Delta vehicle to fly with that same stage on either Shuttle or the Delta.

It is a transition deviced so that the user can go ahead and integrate payloads and everything, and yet have a more or less last-minute change on the transporation. That is a very popular option and most of our commercial satellite people are using it. They buy directly from McDonnell Douglas, who is the manager and commercial developer, and we have no money in the SSUS-D.

We have a signed agreement with McDonnell Douglas that they will develop the SSUS-D, conduct certain testing, to meet reasonable standards. Goddard has a modest monitoring effort to perform that role. The reason we want it at Goddard is that they are familiar with the upper stage integrated payloads for Delta because they manage the Delta vehicle. In fact, the same Delta people are doing this job.

The SSUS-A is a large vehicle that is required for the same purpose, to replace an Atlas Centaur capability, by using an upper stage in the Shuttle. That one, of course, you do not put on the Atlas Centaur. You do not use the SUSS-A with Atlas Centaur,

but it will deliver the same payload to geosync orbit as the Atlas Centaur. That also is being developed by McDonnel Douglas, but only has one user at the present time and that is Intelsat.

Intelsat through Comsat insisted that we buy it for them, and provide it as a launch service. We are doing that, so we do have a contract on the SSUS–A, but it is not a development contract. It is a hardware and services contract.

In the evolution of our management concepts (fig. 5) at the present time and through orbital flight test (OFT) and early operations, the character of our operations will be similar to the Apollo program. It will be heavily oriented toward civil servants, making sure this complex machine operates properly. We will be discovering problems, engineering solutions to those problems, integrating them into the orbiters, tanks, et cetera, and during that period it will appear very similar to our past operations.

We have plans to transition after that into a reduced civil service involvement, going to more of a management mode with most of the hands-on and analytical work to be done by contractors instead of such a heavy civil service involvement. We hope to be able to get fewer prime contractors, consolidate contracts, and to make the contractor self-sufficient.

That is more or less a Kennedy-type situation there which I will get into later, but right now the Kennedy Space Center provides all sorts of services to their prime contractors. For example, in order for Rockwell to get into position, they have to get hold of NASA, who gets in touch with Boeing, who gets a crew schedule, and so on. It just does not seem like an efficient way to run a railroad. It may be OK for one or two launches a year Apollo-style, but I think everybody agrees within NASA that we want to try to get away from that and make the major contractor self-sufficient. We will talk about that in a few moments.

Then, of course, in the long term, there is a possible transition, as Mr. Beggs discussed, into a single contractor operating it for NASA, or maybe another Government agency, or maybe a private contractor.

Mr. WYDLER. Why do you leave that off your list up there?

Mr. YARDLEY. A single operations contractor could be that too.

Mr. FUQUA. What does this do to the expertise that you have developed in the civil service sector?

Mr. YARDLEY. The expertise is primarily research and development oriented.

Mr. FUQUA. Yes.

Mr. YARDLEY. And we would hope to gradually apply those talents to new research and development activities while we have the contractors building up to take over the more routine operations.

Mr. FUQUA. I am not opposed to private contractors.

I am very much in favor of it. I think though sometimes you train people, develop them, motivate them to learn a skill, and then they get chopped off, while somebody else trains new people and brings them on board.

Mr. YARDLEY. Any transition would be evolutionary as opposed to something sudden. For instance, we are currently setting up the cargo processing contract structure at Kennedy. We are going to issue for a requisition for proposal (RFP) which has only one cargo

processing contractor who will begin operations in the normal civil servant-contractor mode. The proposers are being asked to bid on how they will go into a self-sufficiency mode later on, and I do not know how they are going to bid, but probably all the people work for the contractors supporting Kennedy now will either get jobs with this new contractor when that time occurs, or will become subcontractors to him instead of to NASA. We don't see the actual people and skills moving very much. We are talking more about the organization of these people into more efficient management arrangements.

We have completed two studies to date on the operations, and the third one is in process and I will discuss each of those. First, there is the NAPA study which Mr. Beggs discussed (fig. 6). I am not going to add too much to that. Basically, the National Academy of Public Administration (NAPA) recommended that NASA continue to conduct operations. They think we should have a separate component in NASA for operations, and I think that will come. I do not think it is the correct time to do it now, because we are going to be R. & D. and operations in parallel for a number of years.

The Shuttle, when it first flies, is not going to have its full capabilities. We are going to have to improve the engine, take weight out of the tank, the SRB, and out of the orbiters. We will learn a lot of the other things that we will have to complete in order to develop a mature vehicle. So certainly during that period, we don't want to separate the operations and the R. & D. too much.

After that, the appropriate separation should be made but you have to maintain balance, making sure the two separate groups work together, because for the next decade the Shuttle is going to need improvements that the R. & D. organization is going to do, so you have to work out how that is going to happen. Now, if you organize it at the highest level in the agency, it is tougher to do than if you organize it at a lower level.

The next slide, please (fig. 7).

After the NAPA study, we considered how we would then organize within NASA to do the job. The first study we had done was a Booz-Allen study of how Kennedy should be organized to do the operations phase. They studied a number of options, all the way from continuing the R. & D. mode forever, which is characterized by half a dozen prime contractors and a number of support contractors, with Kennedy being in the middle between all these people, to one where there was only one prime contractor, with Kennedy in primarily an overall management role and the prime contractor doing everything.

Actually, Booz-Allen recommended the latter (fig. 8). Kennedy conducted a study. We reviewed it carefully at Headquarters, and agreed that the way Booz-Allen had structured it looked like a good way to go. But, we wanted two major contractors instead of just one, as partly a hedge against future competition, so we have selected as a long-range goal a cargo processing contractor, and Shuttle operations contractor. Ultimately, the only other contractors that would exist at KSC would be base support-type contractors for grass cutting and that kind of thing.

Mr. FLIPPO. Would the gentleman yield? You have got a study by headquarters done by Booz-Allen?

Mr. YARDLEY. No. Kennedy made the study, and we reviewed it and discussed it with them.

Mr. FLIPPO. Did Kennedy make the study or Johnson?

Mr. YARDLEY. I was referring to the Kennedy study. Johnson is coming up in a minute.

Mr. FLIPPO. I see. All right.

Mr. WYDLER. This is the NASA study conclusion at the end. They say option 3, and that is what he has explained to us.

Mr. FLIPPO. Mr. Yardley, you have got a National Academy study. I guess you would call that headquarters. You have got a Booz-Allen study, and that is a KSC. You have got a McKinsey study and that is Johnson. Where is the Marshall study?

Mr. YARDLEY. Marshall does not have the same kind of problem. Their primary operational role in the Shuttle is the production and continued development of engines, the production of solid rocket boosters, and tanks. It is a role that they are currently doing, and the plan there is to evolve into the tightest organization that can manage those production operations. I am sure it will be smaller than the development organization they have now, but I do not see any rearrangement.

At one point we considered having Kennedy buy all the hardware for the Shuttle, but it seems to me for at least the foreseeable future, that the hardware procurement and the continuing R. & D. have to be held closely together. We will have to review that again, maybe in 1984, to see if we want to make a bigger separation between R. & D. and operations. At that point, we might want to change the procurement role at Marshall.

Mr. FLIPPO. It just seems to me that we had a good balance, a good headquarters study, a good Kennedy study, a good Johnson study, and I just thought we might provide a little balance if we had a good Marshall study, Mr. Chairman.

Mr. FUQUA. I can appreciate that.

Mr. YARDLEY. I am not sure the Marshall space flight Center Director would agree because we kind of shoved these studies down Kennedy's and Johnson's throats. As I mentioned, Kennedy did make their own study after the Booz-Allen one, and their interim conclusions are shown here (figs. 9 and 10).

In the mature operations, the civil servants assigned to the STS would be more in a management role rather than a development role.

It would be a broader, higher level of management, with spot audit-type checking instead of one-on-one sort of activity that has characterized the manned space flight activities in the past. It may require a higher level, more mature center people. I think we will have the people who will be mature in their jobs enough to do that, but I guess the message is that the center grade average may go up. However, that depends on whether additional activity is given to Kennedy, and what the character of that activity might be.

The preferred contracting options shown there, include a shuttle processing contractor, a cargo processing contractor, a base support contractor with some several smaller contractors in terms of small and minority business. Self-sufficiency of contractors to the maxi-

mum extent possible is already mentioned. We think it gives contractors a clear responsibility for total performance. He cannot say, "Boeing didn't get the hoister over here today, so I didn't make my schedule." It is really a consolidation of responsibilities and authorities to get things done.

The McKinsey study (fig. 11), has been underway for just a few months. I have no results or recommendations at this time. It is designed to do a similar job at Johnson, which has a multitude of operational roles, as Booz-Allen did for Kennedy. We are trying to identify efficient, effective ways to organize during mature operations, how we evolve from our flight test setup to those mature operations, and what this does to the institution. In the case of Kennedy, their primary business will be the total launch activity, unless there is other activity given to them.

Johnson will have ongoing R. & D. activities. How do you, within the center, arrange those parallel activities? You do not want to duplicate everything, and yet, at least in the early days, there would be a lot of R. & D. and operations personnel going back and forth, so we need to work that out.

Then, of course, there is the question of how do we structure; to determine what civil service does versus what contractors do. In general, I think the answer should be an evolutionary way to reduce the number of civil servants in the actual operating functions similar to Kennedy, but we will have to wait for the study to see how that comes out.

I would like to now address some of the other operational planning activities and issues. In the business management and customer service issues, the reimbursement policies, of course, are the central core of how we do business on the Shuttle and how we motivate customers to use the Shuttle, particularly in the early years. We have five different reimbursement areas (fig. 12). I will talk about them all, and tell you the status on them.

First of all, just a brief review of the Shuttle reimbursement policies (fig. 13). We have formulated the reimbursement policies which were published in the Federal Register 2½ years ago. They have actually changed the attitude of commercial people of not wanting to go on Shuttle to flip-flopping the other way. Now they want to go on the Shuttle and they do not want to take the expendable launch vehicles (ELV's). The answer is fairly simple.

Take the most popular ELV, the Delta. A Shuttle in the 1981–82 time period charges $8 to $10 million for a Delta-class payload and $22 million on a Delta. That is a big difference to satellite business systems or RCA or Western Union. Therefore, NASA, by publishing a fixed price policy, and by establishing other features of the policy, has encouraged commercial customers to the point where something like 35 percent of the first 3 years usage is booked right now by commercial users. They are coming in every day, but we just do not have enough space to accommodate them.

Now we have a few other features of the reimbursement policy.

Mr. WYDLER. Excuse me. What happens if one of these commercial payloads goes up and the whole operation aborts?

Mr. YARDLEY. That is another feature of our pricing policy. If the abort is caused by the Shuttle, or our inability to obtain orbit from which the payload has to be deployed from, we refly them. We

have, as part of our policy, we put in a reflight guarantee and there is a premium that they pay for this. It is not optional, though, with the commercial flyers at the present time. The way our policy is structured, so that if you fly you get this service for which you pay $271,000 in 1975 dollars for reflight insurance. Everybody is happy with it.

We felt that we had to offer that guarantee 3 years ago, because nobody knew whether the insurance companies would insure them or not when they fly on the Shuttle because the Shuttle is an unknown quantity. So, we evaluated what we thought it would cost, and we are assuming we have to make a reflight once every 35 times.

Mr. WYDLER. Suppose you lost their equipment?

Mr. YARDLEY. Once they are out of the Shuttle it is their responsibility. We do not insure the operation of their payload or the upper stage.

Mr. WYDLER. Let's just put it this way. Something goes wrong on launch. Everything is lost. What happens?

Mr. YARDLEY. You mean the whole Shuttle is lost?

Mr. WYDLER. Yes, the Shuttle is lost. I understand the taxpayers pick that up, but I am wondering about what happens to the equipment that they put on board the Shuttle.

Mr. YARDLEY. The users insure themselves for their payload operating in orbit with their upper stage, and, if they want, against the possibility of the whole Shuttle not returning, which is what you are talking about. What we are saying is that we would insure what would otherwise be their cost for the Shuttle portion of a second launch, without extra charge.

Mr. WYDLER. It is their responsibility, is that what you are telling me?

Mr. YARDLEY. It is their responsibility for everything else, plus there is a responsibility which our General Counsel will discuss tomorrow with respect to third-party liability and that sort of thing, so they have an insurance package anyhow.

The main reason we offered this piece of it is because it was an unknown quantity as to what the commercial people would do. Now I suspect the next time we revise our price, which will be for fiscal 1985, we will make that optional, and if somebody wants to buy his own insurance package, he can do so, but at least I think it has served us well in this early traffic development period.

There are a few other things on this list I would like to point out, which are, shall we say, inducements for greater use of space to people in the private sector. We have an exceptional payloads clause in the pricing policy. If somebody thinks he has a new commercial use for space, and he presents a proposal to the Administrator, the Administrator can elect to fly him at about half price because of that exceptional opening of a new commercial area.

Another one we have is standby payloads. In order to maximize the traffic, the Shuttle depends on sharing cargo space. At times we will have nonfull Shuttles, sort of like an airline, so we have a standby payload. If you are willing to put your payload at Kennedy, and hold it for a year, to launch at our option, then you get a 20-percent discount.

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The small self-contained payloads program is another one of our user development opportunities. These are payloads that will nest easily with almost any cargo that is not weight-critical already.

Mr. FUQUA. Is that what had been referred to as the Getaway Special?

Mr. YARDLEY. Yes, sir, the Getaway Special is the nickname, and now it has become so respectable we don't use that nickname any more. We have had an excellent response on this, $10,000 in 1975 dollars, which also escalates with inflation like our other prices, and will buy a 200-pound payload, as long as you keep its interface with the Shuttle down to just three electrical signals. We have over 300 earnest money payments on those right now.

Regarding the Spacelab reimbursement, we have not yet published this policy (figs. 14 and 15). It in the final coordination cycle within NASA; and it has been coordinated with most of our potential users, to determine how they like it. It is similar to the Shuttle policy in that first of all, it is an optional service on the Shuttle. You have to buy a Shuttle ride to get a Spacelab ride, but it permits you to share Spacelab rides or put a piece of a Spacelab in a Shuttle just like you would put any other shared payload in the Shuttle, so you can have a whole Shuttle flight.

You can also have a dedicated element flight, which is a piece of a Spacelab. Let's say it is one pallet. However, when you fly one pallet, you have to fly the igloo that powers one pallet. So you have to pay for the igloo and the pallet in that mode. If you just want to share with other people, non-Spacelab people that is or, if you want a complete pallet flight, but you don't want to pay the cost of the igloo by yourself, because it is designed to support four pallets, then you have to go with a NASA-scheduled Spacelab flight that will provide one pallet space flight for you—that is cheaper than the second service. There is a fourth type, in case you just want to use a piece of a pallet or piece of a rack in the module. We also have a formula for that. It will be a NASA Spacelab flight shared with other users.

Now the hands-on integration of the experiments in the Spacelab hardware is something that we plan to do at Kennedy for everybody's payloads, unless somebody buys a complete Spacelab flight like the Germans have. If they elect to do their own integration and provide their own hardware, pallets and things to integrate, we would work something out with them, but we cannot afford to send our hardware off for a year or two to have them integrate it, because we need to keep turning that around. We do not have that big of an inventory.

If we have a dedicated flight, each person that buys a dedicated flight can send two of his own payload specialists on that flight. If he is sharing a flight but he has more than half of the flight, then he can provide one. We will provide payload specialists for shared flight users as an optional service, and these payload specialists whom we provide would be mission specialists servicing in payload specialist role. Of course, we furnish mission specialists from the NASA astronaut corps for the mission specialist role in these flights anyway.

I think I have covered most of the self-contained payload policy (fig. 16). We have received earnest money for 301 payloads so far.

We have three classes of users. We found out that when people got into this they started buying in blocks of 25, and then some little university would come in and he would be way back in line, so we reorganized the user groups into three queues. There are the educational class lineups, the commercial class, and the U.S. Government class. This way you do not have to get behind a big commercial list if you are in with the universities for example.

The prices, of course, in terms of escalation, are estimated for fiscal 1983. The $10,000 will be $19,000 by that time. We have smaller versions that you can go with, a 100-pound experiment, for example, for cheaper prices. We found that many people want to stay longer than one day in orbit, and so we have seven or more days in orbit as a breakpoint. Otherwise you are either in the one-plus category, which means you go on any flight and are finished when that flight comes home, or if your experiment really needs more time, then we have to wait and manifest you on something that is going to go at least 7 days.

We are encouraging all users to deal directly with the commercial firm that is developing these stages—SSUS—and bring to us a payload which is an integrated satellite and upper stage that we will then take that as a payload and put in low earth orbit (fig. 17).

Everybody is doing that, with the exception of Intelsat V, and we are procuring SSUS-A stages for them. We are currently not buying any SSUS-D's, although NOAA is considering using SSUS-D on some of their satellites. If so, NASA buys everything that NOAA uses including the satellite.

The DOD represents a special problem, because first of all they are a big customer, and second, they are not only a customer, but a participant in the system (fig. 12). They are, as you well know, developing the inertial upper stage, which is the large upper stage that can put 5,000 pounds in a geosynchronous orbit. There is also a planetary version of the IUS that we will use for NASA planetary missions.

They are also developing and will operate the Vandenberg Air Force Base, so they will not only be a contributor to the development, but will actually be part of the operation. Anybody who flies out of Vandenberg will be processed and launched by the DOD, whether they are civilian or military, and vice versa at Kennedy. NASA will launch military and civilian payloads, and operate Kennedy.

Mr. FUQUA. That is for the launch operations only?

Mr. YARDLEY. That is correct, sir.

Mr. FUQUA. Mission directors and so forth would be military?

Mr. YARDLEY. Mission directors will be military for military missions, and our current plan is to have the astronaut complement on military missions also be military detailees to NASA. There may be some nondetailees to NASA who fly as payload specialists for the military missions. There will also be military flight controllers, and that sort of people, at Johnson.

Mr. FUQUA. In the new facility?

Mr. YARDLEY. Let me cover this. First, during the initial operations, they will be training people by actually working as part of the NASA team. They are studying a new second flight operations center. I don't know where that is going to wind up, but if and

when that does become operational, then they will do flight control, mission planning, and training for their own missions, and Johnson will then revert to just the civil missions, but each will have a backup capability for the other.

Mr. FUQUA. I thought they were going to build a double deck to the present mission control center?

Mr. YARDLEY. No. We already have a couple of floors, and we have what we call a controlled mode operation, so we can handle secure missions out at Johnson. They will have a spot there that will be used for those secure missions, but most of the people using those will be NASA civilians who have a proper clearance, and are experienced flight controllers with more and more DOD people coming in to be trained in that activity. I think we have things worked out pretty well to everybody's mutual satisfaction.

Since both NASA and DOD operate parts of this system, and absorb a lot of the operational costs, we made an analysis of DOD traffic out of Kennedy and our traffic out of Vandenberg and our Johnson services. We agreed that it was close enough to be a push if we would not charge them for the services of launching and flight control, and if they would not charge any non-DOD flights out of Vandenberg for those services. Consequently our cost to DOD would be essentially the costs of tanks, solids, and other expendables for each flight. That cuts down on the bookkeeping, and I think will be an acceptable arrangement.

Now we are working on a more detailed plan, which will cover a lot of things, like launch on demand and shared payloads and things like that. There are some problems, for example, in sharing a foreign Spacelab mission with a highly classified military mission, and our initial planning assumed we would not do that. The DOD, however, has been looking at things more carefully, and we are working with them to figure out a way to accomplish that.

I have already mentioned some of the things about user development, and some of them are shown here again (fig. 19). I discussed the experimental payload, and small R. & D. projects provisions. In addition, NASA has initiated an offer for joint endeavors to encourage early use of space for industrial purposes (fig. 20).

I think Dr. Frosch briefed this committee on it and I am sure Dr. Calio, next month, will go into more detail. Basically, there are several proposals. I think there are three offers from industry, and in general the industry would propose the experiment and fund the cost of developing the experiment, the hardware, and data reduction costs. NASA would provide space on a Shuttle flight.

This chart (fig. 21) goes into a little more detail. The real problem here is similar to the one Mr. Beggs discussed about the overall system, namely to industry to put up money on high-risk potential payoff items, and how to get that "chicken-and-egg" cycle started. Of course, this offer of a joint venture is based on the premise that NASA thinks it is worthwhile and it is also something industry is willing to put some money into. The three commercial offers that have been received are from McDonnell Douglas, Accupart Labs, and Microgravity Research, I am sure Dr. Calio will talk a little bit more about those.

Part of our business management activities is the basic contractual instrument, the launch services agreement (fig. 22). These are

about an inch thick, and we have not yet got one signed. We have some 50-odd payloads paying progress payments, and we are trying to sign the first launch services agreement, but the lawyers are back and forth on the first one and it is a tough one. We hope to get one signed in the next few months. Intelsat would like to get one signed in another month or two, and we would too. Whether we make it or not is a function of the lawyers, but we will keep trying.

Anyhow, the agreements detail all the terms and conditions for launch and associated services. They are based on published Government policy, regulations, et cetera.

The price we talk about in flying the Shuttle is what we call the standard service. To characterize the standard service (fig. 23), it is a one-day mission of the STS to any one of two standard orbits using the basic flight and ground systems, and some payload compatibility verification activity, primarily aimed at Shuttle safety. We do not accept the responsibility that the payload works when it rides on the Shuttle. That is a responsibility of the payload organizations.

Regarding optional services, we provide upon request hardware, analyses, tests, operations, extra time, EVA activity, Spacelab use. We will provide whatever the user wants, but he pays extra for it.

So far the optional services cost have averaged about 11 percent of the total flight price for our more complicated payloads. Then they decrease on the second, third, and fourth payload on the same vehicle down to maybe 3 or 4 percent.

The figure 24 shows sort of the document hierarchy, if you will. The launch services agreement is the top document. Then we have a payload integration plan, which is a technical document, a technical specification, if you will, between the user and the STS detailing what the user wants done, and how much it is going to cost him to do those extra things.

Then we have payload-orbiter interface control document, and if it happens to be a standard STS carrier that is being used, like the Spacelab, then we would have an interface control document there also.

There are also a number of annexes, and some of them are listed here: Payload data package, flight planning, flight operations support, use of the orbiter crew compartment, if they want to put things in there, training of their payload specialists, what they need at the launch site in terms of buildings and services, and then verification of their payload, if it is an extra verification. Most of these people want us to run special thermal analyses and special loads analyses for their payload design purposes, not for our safety purposes. We will provide that service, but it is considered an extra service.

Now the scheduling system (fig. 25) is very important, because the whole system keys to it. We have to mesh or orchestrate, if you will, all sorts of things, like delivery of tanks, refurbishing of solids, and bringing replacement solid cases onboard, incorporating Shuttle performance improvements, scheduling new Shuttle production deliveries. All of these have to be meshed to a schedule, and this we generally talk about in terms of our manifests. I will show you our current manifest in a few minutes, but what the scheduling

system does for us is shown in figure 25. Basically, it insures that everything in the system is on time, but not too far ahead.

A little flow diagram on the right (fig. 26) shows that we start with a headquarters assignment of a flight of a tentative flight assignment based on preliminary manifesting. Then that has to go to the design centers for evaluation of the compatibility on the various payloads, the compatibility of orbits, other factors, to see if we can match those requirements.

Then we produce a master schedule to which development and operations centers schedule their development, their production hardware, their tank deliveries, et cetera, in sync with that master schedule.

Now a few words on cost for flights. These are the prices that our current fixed price stipulates for the dedicated Shuttle standard launch service. You understand that you do not have to buy a dedicated Shuttle. As I mentioned before, the Delta does not take up more than 25 percent of the Shuttle, and in 1979 dollars, that is approximately $6.5 million. I said 8 to 10, because they also have to buy a SSUS upper stage and things like that. Right now our price is $25.8 million in 1981, with a projected inflation rate of 8½ percent. The price in fiscal year 1981 dollars is estimated to be $30.5 million. The difference between $18 and $25.8 million or a growth of $7.8 million in 4 years, is in accordance with Bureau of Labor Statistics inflation rates, which is written into our pricing policy.

In addition to these prices, commercial or foreign customers are charged a use fee which is $4.3 million for use of Government facilities and $271,000 for reflight insurance. The GAO requested this to allow for some recovery on investments, not R. & D. but on investments in facilities and equipment. U.S. Federal Government users, ESA, and Canada are not charged these fees because they made substantial financial contributions to the Shuttle or the STS system itself.

We, of course, are continuing to study these prices. Those numbers were based on a 1976 cost analysis, and we are continuing to evaluate what it costs to operate the system. Of course, we have never flown a Shuttle, so that is still a tentative thing, but as you know the Shuttle development program itself has gone up 15 to 20 percent in the years since 1976. Recent studies indicate that operational costs will go up something on the same order. That price will not affect users until 1985.

This (fig. 28) shows a little detail on what different payloads have to pay for their Shuttle space. The largest one up there is the planetary mission, and these charges are all in terms of commercial prices. We do not charge a commercial price, but in any event they have a big optional service because they are buying an IUS, which is an expensive upper stage. On the right, the open symbols are the special analyses we have to do. Contrast that with the SSUS-D class over here, you can see their Shuttle piece is on the order of $5 million, and they have very little extra service. Now this does not show their costs for a SSUS-D because they buy it, and that is on the order of $2 million to $3 million.

If you just look at the optional services part of it (fig. 29) and plot that in terms of percent of their total flight cost, you will see here

that some of the very complex missions, take TDRS–A and Galileo run 20 to 25 percent of the flight price. However, the TDRS–B drops to the 10 or 15 percent class. The smaller ones run about 10 percent, and some of them decrease further like Spacelab II, where we are talking about 3 percent.

Now let's talk a little bit about who the users are, and how the traffic estimations are expected to go (figs. 30 and 31). Of course, NASA and DOD are the major users. Among the other U.S. Government users at the present time, NOAA is the only real hard customer we can point to at the present time. Then, of course, we have the commercial and foreign users. If you look at the current estimate of the percentage distribution by user, NASA is 37, DOD is 29, and the others are 34, not too far off from what Mr. Beggs said they were using 2 years ago, when they made their study, and not too far off from what our experience is in the first 3 years of appropriation.

At launch site there is about 74 percent out of Kennedy and 26 percent out of Vandenberg. In terms of the mission modes, 31 percent are Spacelab, 25 percent are free flyers, and 41 percent are upper stages, which is a form of free flyer.

One thing of course that becomes very important in this particular time period of saturated capability, during the first several years (fig. 32) is how we prioritize missions and how we are fair to everybody, without giving anybody favored treatment. Our general policy has been to accommodate user requirements as close as possible on a first-come, first-served basis.

Now every user, including NASA, has a date firmly committed to a mission, and that date for anybody but Government users is when we received his check for the earnest money. That date establishes the launch priority. Obviously, for example, we cannot accommodate SBS, who happens to be high on the list, if they don't want to fly both of their payloads on the same flight. They want some spacing between their flights, and so we take all this into account and work up a manifest. But, if they come in and say, "I need to go another 3 months earlier," we cannot do that because that displaces somebody else who also wants to go early, so we are pretty hard and fast on that.

We have a couple of ground rules that will permit us to preempt other things, and they are shown here. A space program requiring urgent support for national security is one that the Secretary of the Air Force or the Secretary of Defense has to certify to the NASA Administrator. DOD has not exercised that priority in our current tight manifesting situation.

Then come significant science and technology missions and missions with critical launch window constraints. The planetary options for example, are very few and far between, so we give them priority when we make up a manifest, because their window, usually provides for one or two flights a year at the most. In terms of significant science and technology missions, the only one that we put in this category right now is the first Spacelab. This is because of our agreements with the Europeans, and incidentally, it has the highest rank anyhow just based on the date of our agreement to fly the first operational mission. It has the highest priority right now.

We have a lot of problems with manifesting (fig. 33). We are plowing new ground here, because the Shuttle's basic forte is to carry big payloads, and that means combining payloads, and that means making diverse customers happy with the same service. This has a multitude of facets to it, and I am sure we have not found them all yet.

The performance and capability of the Shuttle, as you know, is not up to full specifications when we begin operating. We have plans which I will show you in a moment on how it is going to evolve, but that does give us some headaches in the early missions because of we cannot put as many payloads on each mission as we had planned earlier.

Spacelab payloads are getting to be a problem. I think this is a normal thing. They are hard to keep under the landing weight that we specify, and Spacelab I is approaching the limit right now. We may find that we have to take some things off just to make that landing weight.

Another one which gives us a little problem is when we launch say three or four geosyncronous payloads together. Sometime they have such design requirements on the payload that you cannot launch them on the same 1 or 2 days.

We have a satellite for India, for example, that after we had scheduled them with some other similar satellites we found out that their designer had chosen a different design route, and he needed a different sun angle. As a result, we had to wait 7 days in orbit. We launch the first users, then waited until the orbit preset enough to provide the right sun angle for the Indian satellite. We really ought to change the policy, so when he comes in with that kind of requirement, we can charge him for the extra time. We are making changes, but this is an evolutionary process which will uncover all these problems.

In the carrier hardware turnaround, the IUS and the SSUS get expended, but the cradles on which they are mounted on in the Shuttle and the GSE do not get expended. Right now we have a limitation on IUS. We cannot launch two IUS's in 60 days without additional equipment. SSUS is in better shape since they can launch probably three satellites in one flight and do that every 2 months.

Of course, in our scheduling, we need to put in some contingency for aborts and reflights. DOD is planning on a lot of their launches, as their needs dictate and that can wreak havoc with your manifest. Other commercial users have backup payloads. It is a continual problem to try to allow enough cushion so we can juggle flights but not bump the whole manifest.

In Shuttle performance limitations, basically weight and engine performance are the two major items (fig. 34). When we begin operations the middle of next year, we will begin flying, with what we call 100–100 percent engines, which means we will run them at 100 percent normally, and if we abort, we will also keep them at 100 percent. I believe that engine has a chance of also being able to go to 109 percent abort. We have not proven this yet, and as soon as we can certify it for the 100 percent, we are going to try that. In any event, we have some simple changes we think will permit that engine or variant thereof to make 109 percent for a couple of times.

That is all we really need to be able to fly 100 percent with the capability to go to 109 percent in an abort. The probability of needing that is not very high, but the fact that you have that capability allows you to put about 6,000 pounds more payload on board the Shuttle. We will start that in September 1981 which is our schedule for having that capability (fig. 35). The lightweight tank we plan to have in time to fly in January 1982, and that will give us another 6,000 pounds capability.

We show having our 109 percent engine at that same time, in January of 1982. We feel that that is somewhat optimistic, and we would feel more comfortable with a 109–109 percent engine in July of that year. You will note Galileo is scheduled for launch in January of 1982, and, if in fact, the administration decides to go ahead and try for that, we will try to pull the engine up. There has not been a final announcement on that, but it is leaning heavily toward slipping from Galileo 1982.

Of course, crew selection and training is another part of the STS operations family of activities (fig. 36). We have already made the first new astronaut selection a year or so ago. Incidentally, I would like to announce, in case you have not heard, that all of those 35 astronaut candidates that were selected are now full-fledged astronauts. The "candidate" has been taken off of their names, and Chris Kraft tells me they are 100 percent true blue, good kind of people. I am very happy to hear that.

We have decided to set up a continuing recruitment activity on the astronauts, and to develop sort of a register similar to civil service, where people put in their applications each year. We have all this information which we will presort, and then decide along about the middle of each year how many we need that year, and call them up. Otherwise, we have to make a decision how many we need a year and a half before we can get them, and that means a lot more guesswork, so we have put the register into effect. We have announced the selection of additional candidates, or let's say we have announced the opportunity. Their applications have to be in between the first of October and the 31st of December at which time we will be in a position to either take more on, or at least decide how many we are going to take on next June or July. We hope to do that each year.

Now the manifest, and these are my last two charts (figs. 37 and 38). On the left chart are the four planned OFT flights. I won't go into any details. These are all planned to land at Dryden, and they all have NASA test payloads of one sort or another except for STS 1. We have no payload plan for that other than the flight instrumentation, which in itself weighs 10,000 or 12,000 pounds. The reason for that is we want to design and fly the most benign trajectory, the lowest dynamic pressure, the easiest reentry, and keep something like 20 to 25 percent margin on everything on the first flight.

We think it is only prudent to do that. From then on we do build it up. We have two pallets which are European-supplied pallets, and they were supplied with just the structutre. We have, however outfitted them with simple instrumentation. Dr. Calico's office is managing one and Dr. Mutch's office the other.

On STS 3 we have a test article that simulates the payload against which we can test the Canadian manipulator for both deployment and retrieval. Beyond that, flights 5 through 42 are shown here. This manifest is a first cousin to one we showed our users about a month ago, and we asked them for comments. We received some comments, and we tried to update the manifest. It is not quite ready for final publication yet, but I am giving you the earliest snapshot.

The solid red symbols are DOD payloads, and you can see in this first several years eight of them. The NASA's are blue, and if you come down the list you see the first two flights are not NASA. The third one is NASA. That is Galileo, which if we drop it from the manifest, it will enable us to advance the others these and maybe stretch out the time a little. We go on to DOD. Then we have got the half European-half NASA, another commercial, DOD, and so on, so it is pretty full for the first 42 flights. We have a few flights we have blocked out in 1983 or 1984 for planetary operations that we have not filled yet. That may be where Galileo will be scheduled if it moves. We also have blocked out a couple of reflight opportunities through here.

Mr. Chairman, that concludes my testimony.

[Figures 1 through 38 follow:]

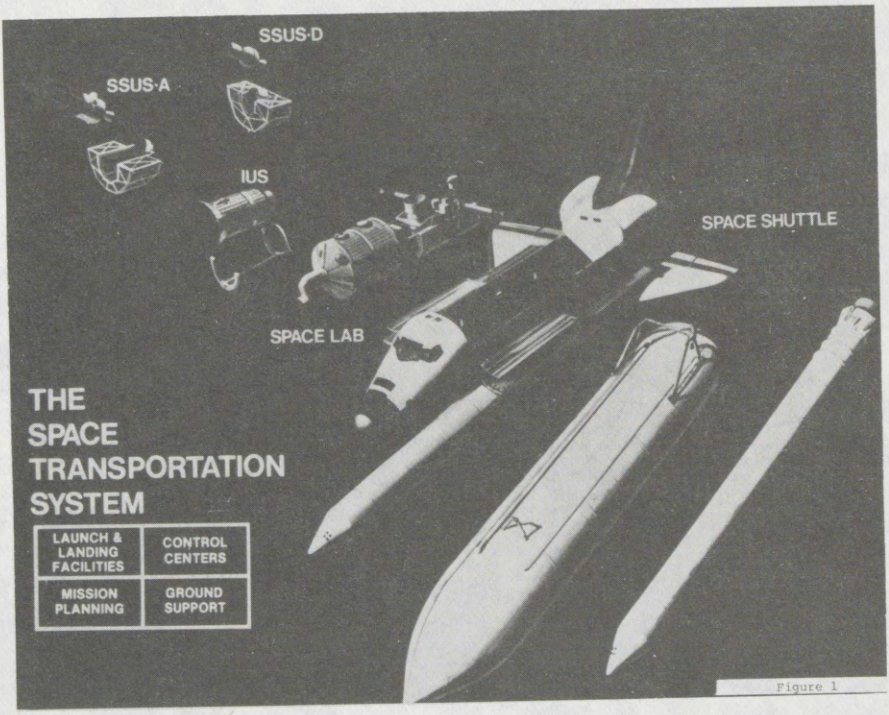


Figure 1

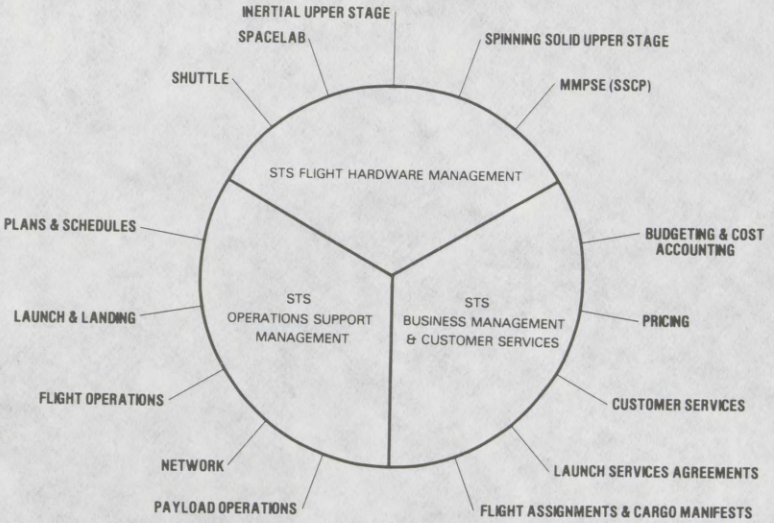
STS OPERATIONS RESPONSIBILITIES

- PLAN FOR, IMPLEMENT AND CONDUCT INTEGRATED SPACE TRANSPORTATION SYSTEMS OPERATIONS INCLUDING COORDINATED OPERATIONS WITH THE DEPARTMENT OF DEFENSE
- DEVELOP BUSINESS MANAGEMENT POLICIES AND PROCEDURES, INCLUDING USER CHARGES AND COST ACCOUNTING
- IMPLEMENT POLICIES FOR USER DEVELOPMENT, AND PROVIDE INFORMATION AND SERVICES TO USERS OF THE SPACE TRANSPORTATION SYSTEM
- PROVIDE REASONABLE TRANSITION MEANS FROM ELV TO SHUTTLE

MO-1122
9/19/79

Figure 2

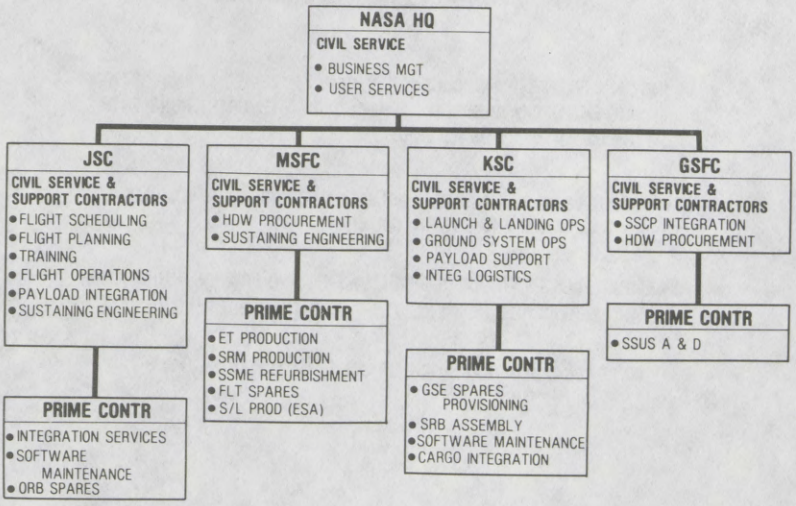
OPERATIONS MANAGEMENT



MO-1115
9/13/79

Figure 3

FUNCTIONAL RESPONSIBILITIES



MO-0014
9/21/79

Figure 4

MANAGEMENT CONCEPTS

NEAR TERM

- SIMILAR TO APOLLO PROGRAM:
  - HEAVY CIVIL SERVICE INVOLVEMENT
  - PRIME & SUPPORT CONTRACTORS

TRANSITION

- TREND TOWARD:
  - REDUCED CIVIL SERVICE INVOLVEMENT
  - FEWER SEPARATE PRIME CONTRACTORS
  - PRIME CONTRACTORS SELF-SUFFICIENT

LONG TERM

- POSSIBLE TRANSITION TO:
  - A SINGLE OPERATIONS CONTRACTOR
  - ANOTHER GOVERNMENT AGENCY

STUDIES TO DATE:

- NATIONAL ACADEMY OF PUBLIC ADMINISTRATION (NAPA)
- BOOZ-ALLEN APPLIED RESEARCH
- McKINSEY — NOT COMPLETED

MO-0035
5/19/79

Figure 5

NAPA STUDY

- **MAIN CONCLUSIONS**
  - STS OPERATIONS SHOULD BE WITHIN NASA FOR FORESEEABLE FUTURE
  - STS OPERATIONS SHOULD BE A COMPONENT OF NASA: NOT A CORPORATE STRUCTURE WITHIN NASA
- **MAIN FACTORS**
  - FEDERAL FUNDING ESSENTIAL
  - PRIMARY USERS ARE NASA AND DOD; FEDERAL CONTROL NECESSARY
  - MOST VISIBLE PROGRAM OF NASA TO ATTRACT FUNDING AND SUPPORT
  - NOT CREATE ANOTHER SPACE ENTERPRISE OR COMPETITION
- **RECOMMENDATIONS**
  - NASA CONTINUE TO CONDUCT STS OPERATIONS
  - ORGANIZE SEPARATE COMPONENT IN NASA FOR STS OPERATIONS
  - NASA TAKE LEAD IN MAKING SPACE PURPOSES EXPLICIT
  - KEEP R & D AND STS OPERATIONS SEPARATE
  - CONTINUAL REVIEW OF DEVELOPMENTS SINCE FUTURE EVENTS MAY INDICATE A DIFFERENT ORGANIZATIONAL STRUCTURE MORE APPROPRIATE

Figure 6

BOOZ-ALLEN MANAGEMENT STUDY

OPTION 0
- **CONTINUATION OF DDT & E MODE OF OPERATION**
  - RETAIN DEVELOPMENT CONTRACTORS FOR LAUNCH PROCESSING
  - CIVIL SERVICE AND SUPPORT CONTRACTORS SUPPLY CENTRAL SERVICES

OPTION 1
- **SAME AS OPTION 0 EXCEPT:**
  - REDUCE NO. OF LAUNCH PROCESSING CONTRACTORS TO TWO
    - **SHUTTLE OPERATIONS CONTRACTOR**
    - **CARGO PROCESSING CONTRACTOR**

OPTION 2
- **REPLACE HARDWARE DEVELOPMENT CONTRACTORS WITH A SINGLE LAUNCH SUPPORT CONTRACTOR**
- **CIVIL SERVICE WOULD MANAGE ALL PROCESSING OPERATIONS AND PROVIDE CENTRAL SUPPORT**

MO-1123
9/19/79

Figure 7

BOOZ-ALLEN MANAGEMENT STUDY
(CONTINUED)

OPTION 3
- **REPLACE HARDWARE DEVELOPMENT CONTRACTORS WITH A SINGLE LAUNCH CONTRACTOR WHO IS SELF-SUFFICIENT**
- **REDUCE CIVIL SERVICE ROLES TO MANAGEMENT & SURVEILLANCE**

NASA STUDY CONCLUSION:

- **FAVOR OPTION 3 BUT WITH TWO SELF-SUFFICIENT CONTRACTORS**
  - SHUTTLE OPERATIONS
  - CARGO PROCESSING

Figure 8

KSC STUDY

SUMMARY INTERIM CONCLUSIONS

- **MOST CIVIL SERVANTS ASSIGNED TO STS MUST MANAGE DIFFERENTLY COMPARED TO OUR CURRENT DDT&E MANAGEMENT STYLE.**
  - MUST PROVIDE MANAGEMENT AT A BROADER/HIGHER LEVEL
  - MUST USE SPOT CHECK/AUDIT TO EVALUATE CONTRACTOR PERFORMANCE
  - MAY REQUIRE A HIGHER CENTER GRADE AVERAGE
- **FURTHER IN-DEPTH STUDY IS UNDERWAY**

MO - 1129
9/19/79

Figure 9

KSC STUDY

SUMMARY INTERIM CONCLUSIONS (CONTINUED)

- **PREFERRED CONTRACTING OPTION IS:**
  - SHUTTLE PROCESSING CONTRACTOR
  - CARGO PROCESSING CONTRACTOR (RFP RELEASE PLANNED LATE 1979)
  - BASE SUPPORT CONTRACTOR
  - SEVERAL SMALLER GOVERNMENT-MANAGED CONTRACTORS
- **"SELF-SUFFICIENCY" OF CONTRACTORS TO THE MAXIMUM EXTENT POSSIBLE**
  - GIVES CONTRACTORS CLEAR RESPONSIBILITY FOR TOTAL PERFORMANCE
  - MOTIVATES BEST PERFORMANCE (PARTICULARLY IF INCENTIVES ARE INVOLVED)

MO - 1128
9/19/79

Figure 10

McKINSEY STUDY
STUDY SYNOPSIS

A STUDY OF THE ORGANIZATION AND PROCEDURES REQUIRED AT THE JOHNSON SPACE CENTER (JSC) FOR THE OPERATION OF THE SPACE TRANSPORTATION SYSTEM (STS)

- **OBJECTIVES**
  - IDENTIFY THE MOST EFFICIENT AND EFFECTIVE WAY TO ORGANIZE JSC FOR MATURE OPERATIONS
  - IDENTIFY PRACTICAL EVOLUTION FROM FLIGHT TEST OPERATIONS TO MATURE OPERATIONS
  - IDENTIFY THE JSC INSTITUTIONAL ORGANIZATION FOR STS OPS WHILE PRESERVING OTHER CENTER R&D CAPABILITIES
  - EVALUATE CRITERIA FOR ALLOCATING FUNCTIONS BETWEEN CIVIL SERVICE AND CONTRACTOR
- **OUTPUTS**
  - RECOMMENDED PLAN FOR MATURE JSC STS OPERATIONS
  - IMPLEMENTATION PLAN FOR EVOLVING TO MATURE STS OPERATIONS
  - ORGANIZATION AND STAFFING PLAN
  - REPORTS & PRESENTATIONS
- **McKINSEY & CO SELECTED FOR NINE—MONTH STUDY (STARTED 3/79)**

MO - 1103
9/19/79

Figure 11

BUSINESS MANAGEMENT AND CUSTOMER SERVICES ISSUES

- **REIMBURSEMENT POLICIES**
  - SHUTTLE
  - SPACELAB
  - SMALL SELF-CONTAINED PAYLOADS
  - SPINNING SOLID UPPER STAGES
  - DOD

MO - 1116
9/19/79

Figure 12

SHUTTLE REIMBURSEMENT POLICY PRINCIPLES

- NO RECOVERY OF STS DEVELOPMENT COST
- FULL RECOVERY OF OPERATIONS COST OVER A 12 YEAR PERIOD
- NO DISTINCTION BETWEEN INTERNATIONAL AND U. S. COMMERCIAL PRICING
- FIXED PRICE FOR THE FIRST THREE YEARS; ADJUSTED ANNUALLY THEREAFTER
- ESCALATION PER OFFICIAL BLS PUBLICATION
- "EXCEPTIONAL PAYLOADS" AT REDUCED PRICE
- POSTPONEMENT/CANCELLATION PROVISIONS
- REFLIGHT GUARANTEES
- STANDBY PAYLOADS AT A 20 PERCENT DISCOUNT
- ONE POLICY FOR COMMERCIAL/FOREIGN USERS AND ANOTHER FOR CIVIL U. S. GOVERNMENT AND CERTAIN FOREIGN USERS (ESA/CANADA)
- SMALL SELF-CONTAINED PAYLOAD OPPORTUNITIES AT LOW COST

MO 1126
9/19/79

Figure 13

SPACELAB REIMBURSEMENT POLICY HIGHLIGHTS

- USED IN CONJUNCTION WITH SHUTTLE POLICIES
- FOUR TYPES OF SPACELAB FLIGHTS OFFERED TO USERS
  - **DEDICATED—SHUTTLE SPACELAB FLIGHT** — FULL SHUTTLE FLOWN FOR A SINGLE SPACELAB USER
  - **DEDICATED ELEMENT FLIGHT** — A PARTIAL SPACELAB FLOWN FOR A SINGLE USER AND WHICH INCLUDES ALL SPACELAB HARDWARE FOR AUTONOMY
  - **COMPLETE PALLET FLIGHT** — A COMPLETE PALLET FLOWN FOR A SINGLE USER BUT FLIES WITH OTHER SPACELAB ELEMENTS ON A NASA SPACELAB FLIGHT AND SHARES COMMON SERVICES
  - **SHARED ELEMENT FLIGHT** — A PALLET OR PRESSURIZED MODULE WHICH IS SHARED BY TWO OR MORE USERS ON A NASA SPACELAB FLIGHT AND WHICH SHARES SERVICES WITH OTHER SPACELAB ELEMENTS ON THE SAME FLIGHT

MO-1082
9/19/79

Figure 14

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SPACELAB REIMBURSEMENT POLICY HIGHLIGHTS (CONT.)

- HANDS-ON LEVEL FOUR INTEGRATION TO BE DONE BY NASA AT KSC AND PAID BY USER AS AN ADDED CHARGE (ACTUAL COST BASIS).
- PAYLOAD SPECIALISTS
  - DEDICATED FLIGHT USERS MAY PROVIDE TWO
  - SHARED FLIGHT USERS WITH A LOAD FACTOR OF 0.5 OR MORE MAY PROVIDE ONE
  - NASA PROVIDES PAYLOAD SPECIALISTS FOR SHARED FLIGHT USERS WITH A LOAD FACTOR LESS THAN 0.5, IF REQUIRED, AS AN OPTIONAL SERVICE
- DETAILED COMPUTATION OF SHARING AND PRICING PARAMETERS IN FINAL REVIEW

9 21 79

Figure 15

POLICY HIGHLIGHTS FOR USE OF SMALL SELF-CONTAINED PAYLOADS

- ESTABLISHES CONDITIONS OF USE, REIMBURSEMENT PROCEDURES, AND FLIGHT SCHEDULING MECHANISMS
- DEFINES THE SSCP AS A SCIENTIFIC RESEARCH AND DEVELOPMENT PAYLOAD OF 200 POUNDS OR LESS AND 5 CUBIC FEET OR LESS
- PROVIDES SEPARATE QUEUE FOR THREE USER GROUPS
  - EDUCATIONAL (CLASS I)
  - COMMERCIAL (CLASS II)
  - U. S. GOVERNMENT (CLASS III)
- 3 YEAR FIXED PRICE REIMBURSEMENT PRICE FOR STANDARD SERVICES (ESTFY 83$)

PAYLOAD WT (LBS)	PAYLOAD VOL (FT^3)	1 TO 6 DAY FLT	7 OR MORE DAYS FLT
• 200	5.0	$19,000	$25,000
• 100	2.5	$9,500	$12,500
• 60	2.5	$6,000	$7,500

- EARNEST MONEY RECEIVED FOR 301 PAYLOADS

MO - 1094
9/17/79

Figure 16

POLICY HIGHLIGHTS FOR PROCURMENT OF SPINNING SOLID UPPER STAGES

- ENCOURAGES USERS TO DEAL DIRECTLY WITH COMMERCIAL SUPPLIERS OF SSUS
- SETS CRITERIA FOR NASA PROCUREMENT FOR THE USER
  - U.S. GOVERNMENT USER REQUEST UNDER TERMS OF INTERAGENCY AGREEMENT
  - NON U.S. GOVERNMENT USER REQUEST WHEN THE USER CANNOT MANAGE A PROCUREMENT
  - SPECIAL SITUATIONS AT NASA DISCRETION
- SPECIFIES NASA AS THE SUPPLIER OF LAUNCH SITE INTEGRATION SERVICES IN PREPARING SSUS AS PART OF A SHUTTLE PAYLOAD
- PROVIDES GUIDELINES ON REIMBURSEMENT FOR SSUS HARDWARE/SERVICES
  - USER REIMBURSES SSUS SUPPLIER FOR HARDWARE/SERVICES PROCURED DIRECTLY
  - USER REIMBURSES NASA FOR SSUS LAUNCH SITE SERVICES
  - USER REIMBURSES NASA FOR NASA PROCUREMENT, AS APPLICABLE

MO 1119
9/19/79

Figure 17

DOD REIMBURSEMENT POLICIES

- PRESENT MEMORANDUM OF AGREEMENT (7 MARCH 1977)
  - KSC AND JSC LAUNCH AND FLIGHT SERVICES EXCHANGED FOR VAFB LAUNCH SERVICES
  - PRICE TO RECOVER ESTIMATED MATERIALS AND SERVICES
  - PRICE FIXED FOR SIX FULL YEARS ($12.2M IN FY 75 DOLLARS);
- MEMORANDUM OF AGREEMENT FOR NASA REIMBURSEMENT TO DOD FOR IUS NOT YET COMPLETE

MO 1143
9/21/79

Figure 18

USER DEVELOPMENT

- **NASA OFFERS A SPECIAL PRICE FOR AN STS LAUNCH TO USERS WITH AN EXPERIMENTAL, NEW USE OF SPACE OR A FIRST TIME USE OF SPACE OF GREAT PUBLIC VALUE**

- **NASA OFFERS JOINT ENDEAVORS TO ENCOURAGE EARLY USE OF SPACE FOR INDUSTRIAL PURPOSES**
  - PROVIDE FLIGHT TIME ON THE STS AT LITTLE OR NO COST
  - PROVIDE TECHNICAL ADVICE, EQUIPMENT AND FACILITIES AT LITTLE OR NO COST

- **NASA OFFERS INEXPENSIVE MEANS FOR SMALL R & D PROJECTS (SSCP)**

MO - 1117
9/19/79

Figure 19

MATERIALS PROCESSING IN SPACE (MPS)

BACKGROUND

- NEW TECHNOLOGY WITH PRIMARY APPLICATION IN INDUSTRIAL COMMUNITY
- CURRENTLY BEYOND CAPACITY OR NEAR TERM INTEREST OF COMMERCIAL PURSUIT
- NASA INITIATED JOINT (NASA/INDUSTRY) ENDEAVOR APPROACH TO STIMULATE INDUSTRY PARTICIPATION
- GUIDELINES HAVE BEEN PUBLISHED IN FEDERAL REGISTER AND COMMERCE BUSINESS DAILY.
- THREE COMMERCIAL OFFERS RECEIVED;
  - **MCDONNELL DOUGLAS (ASTRONAUTICS DIVISION)**
  - **ACCUPART LABORATORIES, INC**
  - **MICROGRAVITY RESEARCH ASSOCIATES**

MO - 1124
9/14/79

Figure 20

MATERIALS PROCESSING IN SPACE (MPS)

GENERALLY, OFFERS RECOMMEND:

- PRIVATE RESPONSIBILITY FOR GROUND-BASED RESEARCH AND DEVELOPMENT OF GROUND AND FLIGHT HARDWARE FOR EXPERIMENTS AND TECHNOLOGY DEMONSTRATIONS
- PRIVATE FIRMS WOULD RETAIN COMMERCIAL PATENT AND DATA RIGHTS COMMENSURATE WITH PARTICIPATION
- NASA RESPONSIBILITY FOR STS SERVICES AND GENERAL PURPOSE SUPPORT EQUIPMENT
- NASA WOULD RECEIVE SCIENTIFIC AND ENGINEERING DATA RELATING TO ROLE OF GRAVITY IN MPS

MO - 1125
9/14/79

Figure 21

LAUNCH SERVICES AGREEMENT

- **PRIMARY CONTRACTUAL DOCUMENT**
- **DETAILED TERMS AND CONDITIONS FOR LAUNCH AND ASSOCIATED SERVICES**
- **BASED ON PUBLISHED U. S. GOVERNMENT POLICY AND REGULATIONS**
  - APPROPRIATE NASA MANAGEMENT INSTRUCTIONS
  - U. S. GOVERNMENT CONTRACTING REGULATIONS
  - OCTOBER 1972 PRESIDENTIAL POLICY STATEMENT ON LAUNCH ASSISTANCE

MO - 1106
9/19/79

Figure 22

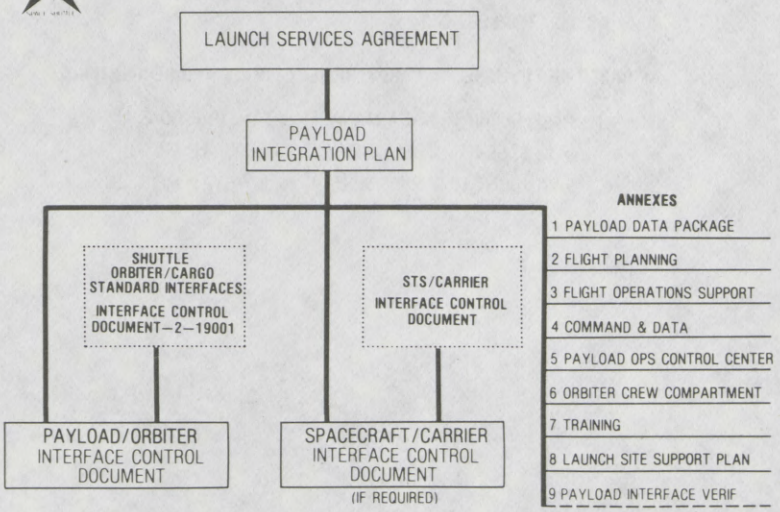
STANDARD AND OPTIONAL STS SERVICES

- **STANDARD SERVICES — UNIFORM FOR ALL USERS**
  - LAUNCH OF STS; ONE DAY MISSION; 28.5° OR 57° INCLINATION, 160 NM ALTITUDE; TRAINED CREW OF 3
  - USE OF BASIC STS FLIGHT AND GROUND SYSTEMS
  - PAYLOAD/STS COMPATIBILITY VERIFICATION
- **OPTIONAL SERVICES — REQUESTED BY USER**
  - AVERAGES ABOUT 11% OF TOTAL FLIGHT PRICE
  - INCLUDES ALL UNIQUE USER REQUIREMENTS SUCH AS;
    - **HARDWARE**
    - **ANALYSES**
    - **TESTING**
    - **OPERATIONS**
    - **TIME ON ORBIT**
    - **EVA ACTIVITIES**
    - **SPACELAB USE**

MO - 1112
9/12/79

Figure 23

STS/PAYLOAD REQUIREMENTS DEFINITION DOCUMENTATION



MO - 1036
4/1 A.

Figure 24

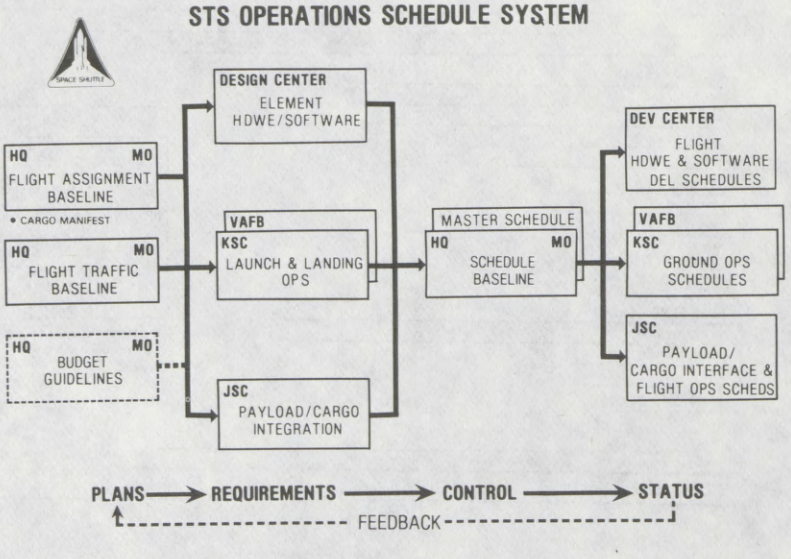
SCHEDULING SYSTEM

- PROVIDES A SOUND BASIS FOR STS OPERATIONS PLANNING
- PROVIDES INTEGRATED SCHEDULES VISIBILITY INTO STS MANAGEMENT
- INSURES COMPATIBILITY OF SCHEDULES WITH BUDGETARY PLANNING AND REQUIREMENTS
- UTILIZES AVAILABLE SCHEDULING SYSTEMS
- PERMITS IMPACT ASSESSMENT OF REPROGRAMMING ACTIONS
- ESTABLISHES EFFECTIVE MANAGEMENT CONTROL

MO – 1085
9/21/79

Figure 25

STS OPERATIONS SCHEDULE SYSTEM



MO – 1034
9/21/79

Figure 26

TOTAL PRICE TO NON-NASA CIVIL U.S. GOVERNMENT USERS
(IN MILLIONS)

	75$	APRIL 79$ (ACTUAL)	APRIL 81$ (PROJECTION)
PRICE BASED ON JUNE 1976 COST TO OPERATE CALCULATION	18.0	25.8	30.5

1. FOR COMMERCIAL AND FOREIGN CUSTOMERS ADD USE FEE (4.298), REFLIGHT INSURANCE (.271 IN 75$)

2. ESCALATION IS BASED ON MID-POINT OF FISCAL YEAR

MO-1118
9/21/79

Figure 27

PRICE PER FLIGHT
(FY 79$ IN MILLIONS)

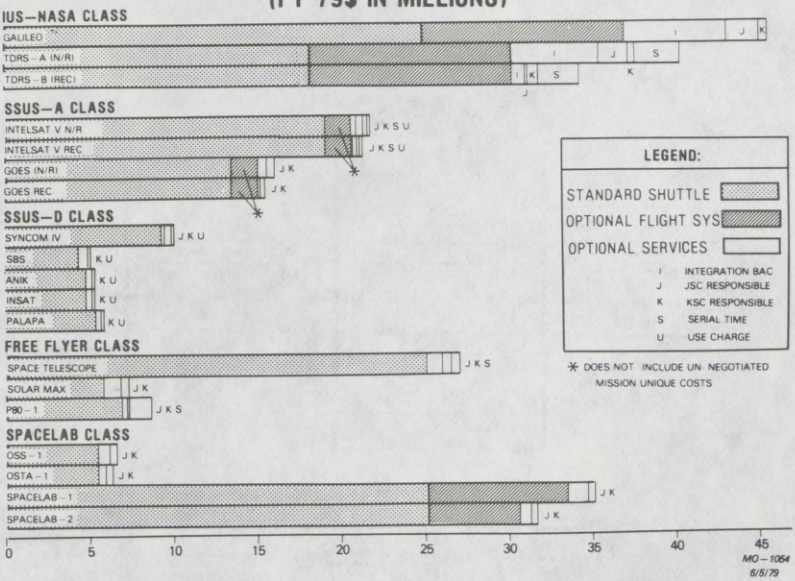


Figure 28

OPTIONAL SERVICES PERCENT OF FLIGHT PRICE

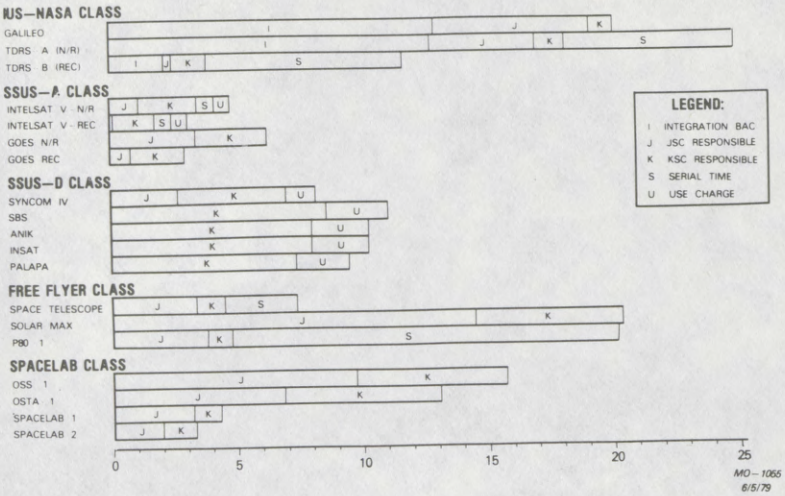


Figure 29

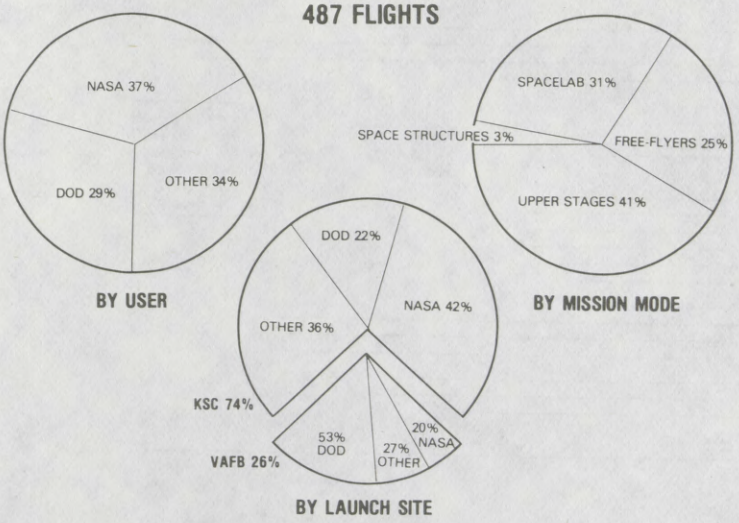
PRINCIPAL STS USERS

- NASA
- DOD
- OTHER U. S. GOVERNMENT
- COMMERCIAL
- FOREIGN

MO—0083
9/13/79

Figure 30

STS TRAFFIC SUMMARY
(DISTRIBUTION)
487 FLIGHTS



MO-0046
7/26/79

Figure 31

MISSION PRIORITIES

GENERAL POLICY

- ACCOMMODATE USER REQUIREMENTS AS CLOSE AS POSSIBLE ON A FIRST COME, FIRST SERVED BASIS

IN THE EVENT OF CONFLICTING REQUIREMENTS, THE PRIORITIES TO BE FOLLOWED ARE:

- SPACE PROGRAMS REQUIRING URGENT SUPPORT FOR NATIONAL SECURITY
- SIGNIFICANT SCIENCE AND TECHNOLOGY MISSIONS AND/OR MISSIONS WITH CRITICAL LAUNCH WINDOW CONSTRAINTS

MO-1078
9 21 79

Figure 32

PROBLEMS ASSOCIATED WITH MANIFESTING

- **SHUTTLE PERFORMANCE CAPABILITY**
  - REDUCED ENGINE PERFORMANCE FOR EARLY MISSIONS
  - IUS PAYLOADS (TDRS, PLANETARY)
  - HI INCLINATION ATTACHED PAYLOADS
- **SPACELAB PAYLOADS**
  - DOWNWEIGHT
  - ENERGY
- **MULTI-DEPLOYABLE PAYLOAD REQUIREMENTS**
  - UNIQUE LAUNCH WINDOW CONSTRAINTS
- **CARRIER HARDWARE TURNAROUND**
  - SPACELAB
  - IUS
  - SSUS
- **CONTINGENCY SCHEDULING**
  - ABORTS
  - LAUNCH ON DEMAND (DOD)
  - BACK-UP PAYLOADS

MO-1031
9 21 79

Figure 33

SHUTTLE PERFORMANCE LIMITATIONS

BASIC GROUNDRULES

- SHUTTLE CAPABILITY BASED ON LATEST SHUTTLE SYSTEM WEIGHT, PERFORMANCE IMPROVEMENTS, AND WEIGHT REDUCTION DATA
- PHASED BUILD UP IN SHUTTLE ENGINE PERFORMANCE
  - **100—100% OFT FLIGHTS**
  - **100—109% FIRST 6 OPERATIONAL FLIGHTS**
  - **109—109% THEREAFTER**
- LIGHT WEIGHT ET & SRB AVAILABLE FOR JAN 82 FIRST LAUNCH (6,700 LBS PERFORMANCE IMPROVEMENTS)
- MINIMUM ORBITER CONFIGURATION CHANGE BETWEEN FLIGHTS
- MAINTAIN 3,000 LBS STS RESERVE

MO-1044
9 12 79

Figure 34

SPACE SHUTTLE CAPABILITY EVOLUTION

- INCLUDES +3,000 LB MARGIN
- NO MISSION MANIFESTING

Sept 20, 1979

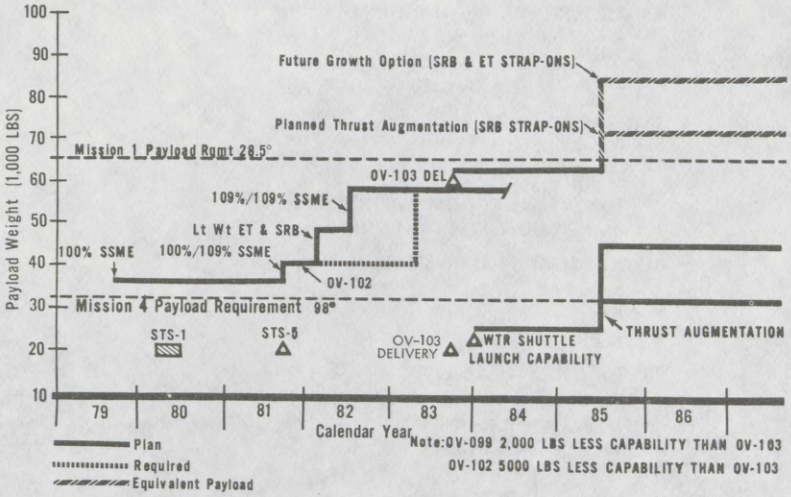


Figure 35

STS OPERATIONS

CREW SELECTION AND TRAINING

- NASA HAS ANNOUNCED PLANS FOR THE SELECTION OF ADDITIONAL PILOTS AND MISSION SPECIALISTS
  - CANDIDATES MAY BE SELECTED DURING 1980
  - MISSION PLANS AND OPERATIONAL NEEDS WILL DICTATE THE NUMBERS OF CANDIDATES
  - ONE YEAR TRAINING PROGRAM
- FEDERAL REGISTER ANNOUNCEMENTS MADE:
  - PAYLOAD SPECIALIST SELECTION FOR NASA/NASA-RELATED PAYLOADS
  - AUTHORITY OF COMMANDER AND PILOT ASTRONAUTS
  - ARTICLES AUTHORIZED TO BE CARRIED ON FLIGHTS BY CREW MEMBERS
- FEDERAL REGISTER ANNOUNCEMENTS TO BE MADE:
  - PAYLOAD SPECIALIST SELECTION FOR NON-NASA CIVIL PAYLOADS
- POLICY BEING ESTABLISHED FOR USE OF FOREIGN MISSION SPECIALISTS

MO - 1130
9.21.79

Figure 36

OFT PAYLOADS PLANNING BASELINE

FLIGHT		STS–1	STS–2	STS–3	STS–4
DATE		MAR–JUN 80	AUG–NOV 80	NOV 80– FEB 81	FEB–MAY 81
INCLINATION		40.3°	40.3°	38°	TBD
ALTITUDE		150 NM	150 NM	150 NM	160 NM
LANDING SITE		DFRC	DFRC	DFRC	DFRC
PAYLOAD		NONE	OSTA–1 PALLET	PDRS TEST ARTICLE	OSS–1 PALLET
PAYLOAD WEIGHT (POUNDS)	UP	0	5600 LBS	10,000 LBS	9100 LBS
	DOWN	0	5600 LBS	10,000 LBS	9100 LBS
TEST INSTRUMENTATION		DFI IECM ACIP	DFI IECM ACIP	DFI IECM ACIP	DFI IECM ACIP
REMARKS		NO PAYLOAD	EARTH SENSING PAYLOAD	LOADED RMS TESTING	SPACE PHYSICS PAYLOAD

MO–1001
9/21/79

Figure 37

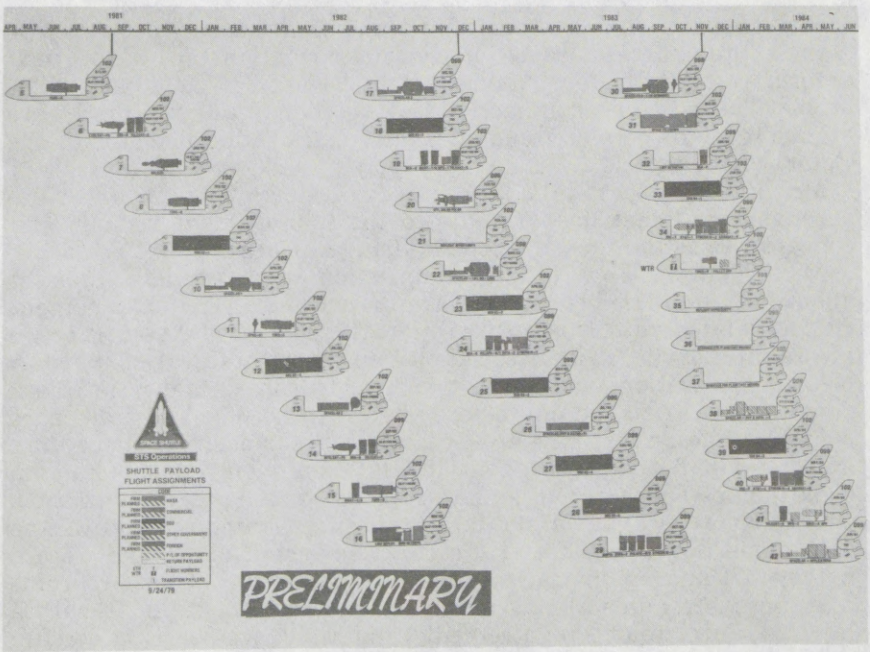


Figure 38

Mr. FUQUA. Thank you, John.

The NASA management review team recently addressed the operational needs and stated, "Top NASA management should address the overall organization, external interfaces, institutional and other management aspects of the operational phase." What has been done or is being done in response to this recommendation?

Mr. YARDLEY. Top NASA management is still studying all those recommendations, and I have not received any instructions on that one, but in conjunction with Al Lovelace, we did bring Charley Gunn on board and are going to start to focus a little more attention on STS operations. We have not planned any revolutionary changes right now, and I guess I would have to comment that we have extensive activity underway. I am not sure this committee had enough time to get into that to really know it. We really gave them no briefings that I am aware of on operations at all. It was not in their charter, but anyhow we accepted their advice and will respond.

Mr. FUQUA. You discussed the Booz-Allen report about this study at Kennedy, and consolidation of the contracts into three contractors. Is there any identified cost savings associated with that?

Mr. YARDLEY. Booz-Allen made some rough estimates, and my recollection—Ed, you may have to help me here—was something like $25 to $35 million a year, you might say.

Mr. ANDREWS. Yes, it is on that order.

Mr. FUQUA. The National Academy study recommended that the STS function report directly to the NASA Administrator. Are there any plans in that regard?

Mr. YARDLEY. As I said earlier, I think that kind of thing may be a little premature, because of the close relationship in the next several years with development, production of orbiters, and operations. There has been no activity along that line that I am aware of, but it might be a suitable question for the Administrator in the October hearings.

Mr. FUQUA. Back to the Kennedy Center. The proposed rearrangement, what does that do to the management risk in that concept versus the present mode of doing business?

Mr. YARDLEY. That is a good question, and we have thought about that, and tried to analyze it as best we can. The management risk associated with it is not really in the contractual structure we are talking about. It is in the evolutionary withdrawal of in-depth NASA penetration, and those two can, to some extent, be segregated. You can do the one before you do the other, and I am sure we will. I guess I just have to say that we are concerned about that, and we will be cautious about it, and would only proceed in an evolutionary manner, and make sure it is working as we withdraw.

In other words, you cannot make a positive statement you will be able to get down to a center director and a staff of 10, and we are not even thinking in those terms, but there are other programs like those Air Force manages at Vandenberg that are done with a lot less Government involvement, and they are very successful.

Mr. FUQUA. You mentioned payload committed to one contractor.

Mr. YARDLEY. Cargo—you mean the cargo integration contract?

Mr. FUQUA. No, I am not talking about contracts. The payload, say it was a commercial payload, where they could send two people as mission specialists.

Mr. YARDLEY. Payload specialists.

Mr. FUQUA. Payload specialists. What requirement would those payload specialists have? What would be the liability of the Government? Would you have final say so over who it was and that they were properly trained?

Mr. YARDLEY. Let me deal with those. I am not going to talk about the liability. I am going to let Neil Hosenball do that tomorrow. They would select candidates.

Mr. FUQUA. Train them?

Mr. YARDLEY. No, we would train them, but first of all we would review them to see if we felt they would meet the medical requirements, and then we give them a medical, and a screening. We have to also be satisfied that they were psychologically compatible, if you will, but if one wasn't, then they would have another one, so they would finally wind up with a couple that were satisfactory to us. Then we would train them as an optional service, for an extra charge, that minor amount of training that they really need on the Shuttle in terms of, for example, what do you do when a fire occurs, and all this kind of safety-type training.

They are not intended to be able to operate the Shuttle or know anything about the system. The training, specific training, that they require on the experiments is up to the sponsor of the experiment. We will have some Spacelab training capability, which will train them in the use of the Spacelab subsystems to get into and out of their experiments. They will pay an additional fee for that.

Mr. FUQUA. John, we may have some more questions, but in the interest of time we will submit them to you, and you can answer them for the record.

Mr. YARDLEY. Fine. I am sorry I went a little over the schedule.

[Answers to questions submitted to NASA follow:]

QUESTION #1:

Mr. Yardley, the National Academy study recommended that NASA clearly separate operational functions from research and development activities.

Could you elaborate on what steps are being taken to accomplish this separation?

ANSWER:

A new Headquarters program office has been established to be responsible for operations of the Space Transportation System. The new office will have charge of Space Transportation System operations and functions including scheduling, manifesting, pricing and launch service agreements, the Spacelab program, and NASA's expendable launch vehicles, except for development of Space Shuttle upper stages. The new office will be the principal interface with all STS users.

QUESTION #2:

Mr. Yardley, the National Academy study recommended that the space transportation system function report directly to the NASA Administrator.

What are NASA's plans in this regard?

ANSWER:

The space transportation system function today reports directly to the Administrator. NASA plans to maintain this arrangement.

QUESTION #3:

a. How are STS Operations functions being accomplished at the field centers?

ANSWER:

NASA published a Management Instruction (NMI 8040.3 - Management of the Space Transportation System) on June 23, 1978, which clearly delineates the responsibilities and functions of NASA field centers during the Space Transportation System's operations era. While operational activities will not start until after completion of the orbital flight test program, the organizational structure for integrated STS operations has been established. Implementing policies and procedures are being developed, which will describe in great detail how center operational components will perform their assigned responsibilities and functions. This includes identification of interfaces

with NASA Headquarters, DOD and the user community; definition of documentation requirements: establishment of resources requirements, both with respect to funding and manpower; and implementation of operating procedures, particularly with respect to scheduling and progress reporting. The inhouse and contractor studies reported to the Subcommittee are currently being assessed and will, to a large degree, influence NASA management decisions as to how STS operations functions will be accomplished during mature STS operations.

b. Are these functions being managed separately from research and development activities?

ANSWER:

A distinction must be made between STS element operation and payload support operations, which include cargo/STS integration activities. While management of STS elements at JSC, KSC, and MSFC, both for DDT&E and Operations, management of all payload support and cargo integration operations assigned to separate organizational elements of JSC, KSC, MSFC, and GSFC, report directly to their respective center directors.

c. How do these functions report to the Center Directors at the various centers?

ANSWER:

The field center organizational elements at the various field centers report directly to their center directors.

QUESTION #4:

With the current Shuttle development problems, what steps are being taken to assure that operational system needs are being fully addressed both at Headquarters and at field centers?

ANSWER:

Formal management arrangements at the field centers and at Headquarters have been established and are continuing to work to assure that operational system needs are fully addressed by the development organizations. Periodic checks and reaffirmation of requirements are employed to maintain the effectiveness of this system.

QUESTION #5:

The Shuttle management review team recently addressed operational system needs and states that "top NASA management should address the overall organization, external

QUESTION #5: (Continued)

interfaces, institutional and other management aspects of the operational phase."

What is being done in response to this recommendation?

ANSWER:

NASA has recently reorganized in Headquarters to make STS Operations a separate program office as the first step. This new organization will in turn study further actions to be taken.

QUESTION #6:

Mr. Yardley, in your statement you stated that Kennedy Space Center is moving in the direction of consolidating most of the contracts into three major contracts: 1) Shuttle Operations, 2) Cargo Processing, and 3) Base Support.

a. Has NASA identified what cost savings, if any, might accrue from this approach?

b. How do these projected savings compare with the errors associated with the cost estimating techniques?

ANSWER:

We are not in a position to project precise cost savings at this time. What we have been doing is looking at areas where effort can be reduced or eliminated. The Booz-Allen study projected some cost savings on the order of $25-30 million, but it was more useful for identifying how contractor-to-contractor and contractor-to-government interfaces could be reduced without increasing risk. Since we are in the posture of projecting costs for operations that have not commenced with either the current management approach or with one of the approaches under consideration, we feel that cost estimating errors would apply to either. We believe that structuring to reduce and eliminate effort is the only sure way to reduce costs to operate at KSC.

QUESTION #7:

a. It is our understanding that NASA plans to compete the cargo processing contract with self-sufficiency options in the near future even though self-sufficiency is not planned until late 1983.

b. It would appear that NASA would be in a better position to truly understand the requirements for a "self-sufficient" cargo processing contractor in later years after some experience is gained. Would you care to comment?

QUESTION #7: (Continued)

ANSWER:

A draft statement of work for a cargo processing contract (CPC) was distributed for industry comment on September 24, 1979, and NASA expects to release a formal Request for Proposals (RFP) near the beginning of 1980. Self-sufficiency requirements are currently planned for the RFP against which the contractors will be evaluated. Self-sufficiency will not be in the basic contract, but will be an option that NASA may exercise. In the draft statement of work released to industry for the CPC, the contractors were told with respect to self-sufficiency that: "It is emphasized that this is an 'optional' concept that will not be implemented until the Space Transportation System has become 'mature' in operations estimated to take place after some 20-25 flights."

QUESTION #8:

Under the current procurement approach, will NASA maintain the option to recompete the cargo processing contract at a later time (1982 or 1983)?

ANSWER:

NASA will maintain the option to recompete the cargo processing contract at a later time. In all likelihood a recompetition will not occur as early as 1982 or 1983, but no firm recompetition date has been established.

QUESTION #9:

a. With the planned approach of consolidating into three major contracts, how can NASA assure future competition in contracting for STS operational activities?

   ANSWER:

   NASA intends to maintain capability within the KSC civil service personnel that will enable these personnel to define requirements for future competitive STS operations contracts. Nothing has been done, or is intended to be done, that would prohibit future competition of STS operational contracts. NASA believes that several aerospace contractors would be capable of competing, especially since the operations will be mature at the time of recompetition.

b. With this approach, are you not indeed locking yourself into a single source contract for any future procurements?

   ANSWER:

   NASA does not intend to put itself in a position that none of the contracts at KSC can be competed in the

future. There is no commitment on the part of NASA to extend any of the STS operational contracts beyond the basic contracted period. NASA will maintain capability within the KSC civil service personnel to define requirements for future competitive STS operations contracts.

QUESTION #10:

a. When do you expect the Johnson Space Center organization study to be completed?

ANSWER:

Early CY 1980.

b. What guidelines have been established for the direction of this study?

ANSWER:

The McKinsey Co. is performing a study of the organization and procedures required at the Johnson Space Center (JSC) for the operation of the Space Transportation System (STS).

The objectives of the study are:

- Identify the most efficient and effective way to organize JSC for mature operations
- Identify practical evolution from flight test operations to mature operations
- Identify the JSC institutional organization for STS Ops while preserving other center R&D capabilities
- Evaluate criteria for allocating functions between Civil Service and Contractor

The study will develop several alternative organizational arrangements of both the Civil Service staff and support contractors and assess these alternatives against selected criteria.

QUESTION #11:

a. What steps are being taken to assure that the division of responsibilities between Headquarters and field centers with regard to operational functions are clearly delineated to avoid confusion and misunderstanding with the user community?

ANSWER:

As mentioned in the response to question 3a, a NASA Management Instruction (NMI 8040.3) was published in

1978 which clearly defines Headquarters and center responsibilities with respect to STS operational functions. NASA Headquarters is primarily concerned with the business aspects of STS operations, such as user development, mission planning and launch service agreement negotiations with users. Headquarters also has overall management responsibility for long-range requirements (i.e., resources, manpower, facilities, etc.). Field centers, on the other hand, are primarily concerned with, and interface directly with users in all technical matters concerned with mission planning and flight operations. Specifically, JSC is responsible for all payload integration and flight planning activities, including crew training. Payload integration at JSC involves primarily analytical engineering such as loads and thermal analyses, compatibility analysis, and design of STS/payload interface hardware (cable harness, attach brackets, etc.). KSC is responsible for all aspects of launch and landing operations, including physical integration, checkout and assembly of individual payloads and cargos.

To avoid duplication of effort and to insure that users can enter the system with a minimum of paperwork, Headquarters and center personnel will work in close cooperation on all matters where user interfaces are involved. This is particularly important with respect to estimating pricing implementation of optional services and mission-unique activities.

To aid in this effort, users are encouraged to appoint mission managers who can identify all user requirements and are authorized to negotiate with appropriate NASA representatives, both at Headquarters and at field centers. NASA, in turn, will designate a focal point or project manager for each mission and/or payload. This project manager will be responsible for insuring that all user requirements are met promptly, and at the lowest possible cost.

b. With how many places within NASA does a comercial customer have to interface?

ANSWER:

Three principal organizations within NASA are points of contact: NASA Headquarters (STS Operations), Johnson Space Center (Shuttle Payload Integration and Development Program Office), and Kennedy Space Center (STS Projects Office). Specific responsibilities within these organizations are:

NASA HQ - Interface for price structure, progress payments, Launch Support Agreement, policy issues, preliminary payload manifesting

JSC - Lead for payload integration, technical requirements definition, payload integration tasks and schedule, finalization of payload manifest

KSC - Support to JSC to define launch site support requirements, payload utilization of specific facilities and schedules and host for payload operations at the launch site

Generally, there is one principal contact identified at each of the three organizations for the customer to interface with. Additionally, the organizations will call upon discipline oriented personnel to aid the customer in specific areas of concern, e.g., safety, thermal environment, dynamic loads, payload data management, testing at the launch site, payload handling mechanism, optional services costs, etc.

Ordinarily, official communications are directed at only the three principal contacts but customer appeal privileges are available up to the NASA Administrator level in the case of an irreconcilable conflict at the lower levels.

QUESTION #12:

A recent Wall Street Journal article reported that France is establishing a private corporation to take over the production and marketing of Ariane.

Do you consider such an approach viable for the Space Shuttle in the future?

ANSWER:

Ownership of the STS by private enterprise in the future cannot be discounted. However, a study performed in 1977 by the National Academy of Public Administration (NAPA) on "US Space Transportaion in the 1980's: Organizational Alternatives," indicates such ownership is probably not viable because of both financial and public policy considerations, as discussed in the testimony.

QUESTION #13:

What is the potential long-term effect of the planned contractor structure on NASA capabilities at Kennedy Space Center?

ANSWER:

We have recognized that KSC, perhaps more than any other NASA center, will need to undergo changes as it transitions from the Shuttle development program to STS operations. Our planning has emphasized the operational role that KSC must play in the future. In a sense, the capability at KSC will be enhanced because the management expertise required for operations will be an addition to, rather than a replacement of, current capabilities.

QUESTION #14:

Will subcontracting be permitted under the proposed contractor structure? Will subcontracting be encouraged?

ANSWER:

Subcontracting will be encouraged. In addition to the small business and minority contracts that will probably be awarded directly by NASA, we will evaluate the proposers on their use of small business and minority contracts as we do in all competitions for major contracts. We are encouraging proposers to organize in the most cost-effective manner. Depending on the capabilities of a particular contractor, subcontracting may or may not be cost effective. Our intent is to allow the proposers the maximum flexibility to achieve cost-effectiveness operations.

QUESTION #15:

NASA appears to be heading toward reducing civil servants' management responsibilities.

Will this adversely affect the motivation of the civil service work force?

ANSWER:

Our plan does not envisage reduced management responsibilities in the broad sense. It does reduce lower level, day to day management of routine tasks which is not essential to the discharge of the overall government responsibilities.

QUESTION #16:

Does NASA expect union problems to result from the major changes in government contractor structure?

ANSWER:

Labor relations have been considered during the operations planning at KSC, but none of the decisions to date have been made based on potential union impact--either pro or con. We held a briefing for representatives of all the unions currently in place at KSC and apprised them of our operations planning. Although some union representatives

expressed concern about being "swallowed up" by other unions, the general response was that they appreciated being informed during the planning process rather than after all the management decisions had been made. We would anticipate that most of the normal labor-management problems that might occur as a result of procurement consolidations and/or competitions, will be resolved between the private sector firms and labor union organzations involved. As in past procurement actions of similar nature at KSC, NASA may have some union unrest until new contracts are in place.

QUESTION #17:

Given the essentially fixed cost of the material resources in the STS program, the cost of manpower resources and the ability to control the use of manpower become the primary economic considerations. What portion of the Shuttle Operations Cost Estimates are allotted to manpower resources?

Can NASA's civil service organization be realigned to achieve the desired economics during the operational phase of the STS program?

ANSWER:

During the period FY 79 - FY 85, approximately 28 percent of the Shuttle Operation Cost Estimates are allotted to R & D manpower resources. This assumes that all manpower associated with hardware, such as External Tank, Main Engine and Solid Rocket Booster are considered part of the material resources in the STS program.

We believe that NASA's civil service organization will be equal to the task of achieving the desired economies during STS Operations.

QUESTION #18:

Does the proposed Kennedy Space Center contractor approach represent an increased management risk as compared to the current method of doing business?

ANSWER:

Managing risk, whether it be risk of a catastrophic failure or the risk of high cost, is a significant element of our planning. We are not planning on a different management approach for the current development situation, but are examining approaches for a different situation--the operations era.

QUESTION #19:

Under the proposed management approach at Kennedy, the civil service will gradually lose its technical and

management expertise.

How can this expertise be regained for future programs?

ANSWER:

None of the management approaches under consideration for KSC have been determined to cause a loss of management or technical expertise. On the contrary, every study to date has emphasized the need to improve existing management skills. The same technical skills will be required to monitor the contractors. If the monitoring is less frequent than during the development program, as we anticipate, then the number of people possessing the technical skills will likely decrease but the expertise will remain at KSC.

QUESTION #20:

How different would the three-contractors approach to KSC operations be to current expendable launch vehicle operation?--I understand NASA has accepted this approach.

What would be the relative level of civil service employment in the two cases?

ANSWER:

The three contractors approach, which is not yet baselined, would be different from the current expendable launch vehicle operation. The expendable launch vehicle contractors are responsible for the manufacture, as well as launch, of their vehicles. None of the three contractors would have manufacturing responsibility as part of their KSC contracts. The expendable contractors are not self-sufficient. They receive technical support from both NASA and USAF support contractors. The expendable vehicle contracts are managed by NASA centers other than KSC, although KSC has some technical direction responsibility, so there are civil servants other than KSC personnel involved in the contract management. Because of the different nature of the contracts, i.e., manufacturing and operations vs. just operations, and multicenter management vs. KSC management, a true comparison of civil service levels is not possible. Generally speaking though, there is less direct civil service involvement in expendable vehicle contracts than there is in manned development vehicle contracts such as Apollo. All of the studies to date have postured toward less direct civil service involvement for operations than for the current development phase. Both expendable vehicle contracts and most of our planning have less direct civil service involvement than past and current manned development vehicle contract but the comparison is not valid beyond that point.

QUESTION #21:

a. With the Shuttle schedule slippage, NASA has unveiled a slow-down flight schedule.

a) What impact has this had on commercial customers,? DOD,? NASA missions?

ANSWER:

In general, there has been about a seven(7) to ten(10) month slip in the ability to accommodate user requirements with the exception of the DOD and NASA planetary programs. The NASA planetary programs, by virtue of the sensitive launch windows, has been held on schedule to the maximum extent. The DOD payload launches have experienced only minor impacts of one (1) to two (2) months slips. Other customers, NASA and foreign/commercial, have been scheduled around these special considerations which led to the seven (7) to ten (10) month impact.

b. With the Shuttle schedule slippage, NASA has unveiled a slow-down flight schedule.

b) Has NASA revised the expendable launch vehicle "backup" policy as a result of these slippages?

ANSWER:

As a result of the slip in the operational date of the Shuttle, NASA has reevaluated the expendable launch vehicle backup policy. It was determined that the most equitable arrangement would be an extension of the backup privileges to the end of calendar year 1982 (December 31, 1982). Customers firmly scheduled on Shuttle through that date would be offered a backup on a Delta 3910 expendable launch vehicle. The offer would not be extended to customers advancing into flights vacated by users exercising the backup option.

QUESTION #22:

a. NASA has announced a cutback in plans for Orbital Flight Test missions from six in 17 months to four in 15 months.

a) What was the primary motivation behind the change?

ANSWER:

The primary motivation was to plan the accomplishment of most major test objectives with the smallest possible number of flights. Four test flights, if all are successful, will provide enough data to permit the initiation of operational flights. If additional test flights are needed, they will be flown.

b. b) What Orbital Flight Test objectives have been sacrificed as a result?

ANSWER:

No required objectives will be sacrificed. Some residual testing will remain to be completed in parallel with operational flights. The necessity for this testing is being considered in the planning of the early operational flights, and we have baselined the necessary flight instrumentation. Some parallel development testing would have been necessary with the previously planned six Orbital Flight Tests.

QUESTION #23:

The Subcommittee understands that NASA's revisions of flight assignments reflecting a seven-month slip and the resulting reassessment of expendable launch vehicle requirements is complicated by incentives against candor on the part of payload sponsors who intend to take their satellites off the Shuttle and fly them on expendables. The problem is that once a customer lets NASA know it will use an expendable, it must start making progress payments on it, at a greater cost.

ANSWER:

NASA has realized that the customer would tend to remain silent concerning the intent to exercise a backup expendable launch vehicle so long as his progress payments would be increased at the time of his commitment to the ELV. As a result, NASA has offered the customers the opportunity to declare his intentions at the earliest date with no progress payment increases until the same period as was previously stated, i.e., the First Manned Orbital Flight (FMOF).

In this manner, both the customer and NASA can proceed with payload/launch planning and integration earlier than had been the case under the old policy.

QUESTION #25:

What operational activities offer the best opportunity for achieving greater operational economy?

(a) Does the Shuttle pricing policy consider the additional costs associated with Thrust Augmentation?

(b) Is Thrust Augmentation considered part of the basic service or as an optional service which will have to be paid for by commercial customers?

ANSWER:

a & b. Yes. Thrust Augmentation will be treated as an optional service and all users requiring this added performance will be charged.

QUESTION #26:

How do the additional costs associated with thrust augmentation impact DOD launch costs?

ANSWER:

Preliminary estimates of the incremental costs per flight associated with Thrust Augmentation are in the $7 to $11 million range (1979 $). When the costs to the STS Operational Program for thrust augmentation become better defined, a special cost per flight impact analysis will be performed for DOD missions.

QUESTION #27:

In your statement for the record, you state that negotiations are currently underway with the DOD to supplement the basic memoranda of agreement concluded in 1977.

a) What kinds of services are involved in these negotiations?

b) When should we expect these negotiations to be complete?

ANSWER:

a) The current negotiations are not to supplement the basic memoranda, but instead to revise it where changes in events have caused such revisions to be appropriate. The Memorandum of Understanding establishes the broad policies and principles that govern the relationship between the DOD and NASA relative to the Space Transportation System, and delineates the roles and responsibilities of the respective agencies for development acquisition, and operation of the elements of the Space Transportation System.

b) We expect to have an approved revision by the end of the year.

QUESTION #28:

a) How many flights are carried in the current Shuttle traffic model?

b) What is the sensitivity of the pricing policy to the number of flights in the traffic model?

ANSWER:

a) 487 flights

b) The pricing policy is based upon total recovery of the STS Operational costs. The cost per flight is sensitive to the total number of flights in the model (e,g. the more flights, the less cost/flight).

QUESTION #29:

a. What would be the costs associated with maintaining the Delta launch vehicle capability until NASA has two orbiters in operation?

ANSWER:

The operational phase of the second Shuttle orbiter is currently planned for September 1982. This is approximately six months beyond the currently planned launch of the last Delta vehicle in launching the Landsat-D[1] spacecraft. We had planned to keep the Delta capability at WTR for the launch of Landsat-D[1], with allowance to September 1982, for rephasing with the success of Landsat-D.

The cost of keeping additional Delta capability beyond this would vary significantly depending on production and launch rates.

Our current Delta production rate is at a four (4) per year rate and our launch capability is approximately 6-8 launches per year through FY 1981.

In our Delta transition planning, we are proceeding on fabrication and hardware assembly to meet our transition policy commitment. This consists of:

a) Four vehicles fabricated and assembled on a phased basis during FY 1979.

b) Four vehicles planned for fabrication and assembly on a 1 per quarter go-ahead during FY 1980.

c) Long lead for an additional five vehicles authorized in FY 1979.

This production will continue up to FMOF and will then be terminated or continued at user(s) options. If FMOF should slip from the March/July 1980 time frame to beyond September 1980, more users will likely opt for backup Delta launch vehicles and these reimbursable funds will be used to continue production. It is estimated that 2.4M per month will be required to continue production into FY 1981 if FMOF slips and no reimbursable users opt for these vehicles. In addition, $15-20 million per year would be required to continue an ETR launch capability to FY 1982.

b. Would such costs have to be incurred by the government or might they be shared by the user community?

ANSWER:

NASA is incurring costs of the transition program until FMOF; after FMOF, NASA will be reimbursed, not only for the continuing costs, but those costs incurred prior to FMOF. from each user who opts for a Delta launch vehicle.

QUESTION #30:

Do the delays in the Shuttle schedule impact the requirements for an Atlas Centaur backup capability?

ANSWER:

We are proceeding on fabrication and assembly of a single backup Atlas Centaur vehicle which was initiated after commitment by Intelsat for launches on the Shuttle. At FMOF, we plan to terminate production of this Atlas Centaur vehicle or continue at Intelsat's option. If FMOF slips past July 1980, users funds will be required to continue this backup capability or effort will be terminated. No other "Atlas Centaur" class payloads have been planned for STS or Atlas Centaur by any users.

QUESTION #1 (MINORITY):

Does NASA agree with the view expressed in the NAPA study?

ANSWER:

Yes.

QUESTION #2:

Does NASA intend to hire additional astronauts in FY '80 or FY '81? How many astronauts and astronaut candidates does NASA currently employ? What function do they currently perform?

ANSWER:

Currently we are in the process of establishing a roster of qualified individuals for both pilot and mission specialists astronaut positions. The period for applying for the roster is October 1, 1979 to December 1, 1979. After the roster is established, the NASA Mission Model will be evaluated, as well as current astronaut attrition rates, to determine whether or not additional pilots and mission specialists are required.

There are 63 astronauts in the Corps at this time and no astronauts in the "candidate status." These astronauts are presently supporting the Space Shuttle Program or the

Payload Programs which are to fly onboard the Shuttle. The astronauts supporting the Space Shuttle Program are involved in developing mission rules, flight profiles, flight data files, EVA time lines, and supporting crew activities, etc.

QUESTION #3:

According to your statement, the additional candidates will undergo a one-year training period. Why has this changed from the previous two-year program?

ANSWER:

The two-year Candidacy Program was defined when the last crew selection was made. The candidacy period provides an opportunity for not only NASA to perform a more detailed evaluation of the personnel involved but also provides the individuals an opportunity to decide whether they would like to remain in the Astronaut Corps. NASA always planned to assess the astronaut candidates as they progressed through the candidacy period. The two-year period was an estimated time frame and not a hard and fast rule. This was the first procedure of this type that NASA has undertaken.

Based on our experience with this group of candidates, it has been determined that the screening process requires only one year rather than two years. The first six months of the period is a formal training program and the second six months the individuals are assigned specific tasks to support ongoing programs. At this point we feel 12 months is an adequate time to perform the detailed evaluation required for final astronaut selection.

Mr. FUQUA. We do have another witness. We are going to have to get on. We thank you very much for your testimony.

The next witness will be Dr. Klaus Heiss, president of Econ. Dr. Heiss, we are happy to have you back again before the committee. You may proceed.

[The prepared statement of Dr. Heiss follows:]

STATEMENT OF DR. KLAUS P. HEISS, PRESIDENT, ECON, INC.

SPACE: OPPORTUNITY AND CHALLENGE FOR FREE ENTERPRISE IN THE NEXT DECADES

1.0 The Uncertainty of the Current U.S. Space Program

Only those quantities that can be measured have any real meaning in physics. However, Heisenberg showed in 1927 that it is fundamentally impossible to make such observations on electron motions due to the interactions between the observer and the observed. To "see" the electron by reflecting light, or other particles, on it the electron recoils when the light bounces from it, thereby altering the electron's motion.

Now this is I believe a good description of the current issues facing this U.S. space program.

I feel myself in the same situation when discussing issues concerning the space program and space activities: The opportunities perceived are shaped by the past and ongoing programs of the United States as well as other nations. At the same time certainly what private industry and U.S. aerospace companies in particular, will do will affect the opportunities that will exist in the 1980s and 1990s for private and public use of space.

The space program and the space opportunities of the 1980s and 1990s are not a "naturally occurring" event that "rains" onto United States society by some ab-

stract process of nature or history. Rather, the opportunitites and the technology in the 1980s and 1990s are created by the actions we will take today, and in the coming years, in government and in industry. While today in some cases the space program of the United States seems to drift, without direction and without the pursuit of clear and present opportunities, I cannot but believe that active, forceful, forward-looking new goals will be given to the space program of the United States.

Within this whatever industry sets forth to pursue for the 1980s and 1990s will change and actively influence what space technology and space opportunities in fact will exist. The most damaging course would be not to create and pursue these opportunities. I cannot but help to reduce some of the difficulties of today's space program in the United States—the hesitancy, as well as the low funding levels—to the difficulty to deal with these interactions: by the very choices we make today we change the future while in most other pursuits of government and private enterprise we try to forecast the future so as to adjust and choose our actions today. It seems to me that often human pursuits as well as government pursuits seem to rely in deciding today on those actions that would most comfortably fit into the future as we preceive it for 1990 or the year 2000. No such comfort and certainty exists, however. Rather, the choices we make today shape the future of 1990 and 2000. What awaits us in space is a world of uncertainty: there is no certainty as to the future, there is no opportunity to "forecast" that future, and reduce current actions and decisions nicely to that forecasted future. What we do in space today will change that very world we try to forecast.

Rather than to forecast, what we have to do today is take those actions that will advance United States interests, the United States economic and technology position as well as United States industry interests in the broadest beneficial sense of that word. Such a course will be well founded on 200 years and more of free enterprise in a free market economy. If we accept these basic observations as the underlying basic factor in today's space program policy issues, we will have gained at least a common basis of understanding on the issues, opportunities and choices for space investment activities, be they by the government or by industry.

There is no reason why, in the context of U.S. space program opportunitites, private enterprise cannot take substantial initiatives in the areas of space transporation and space applications. Annual investment funds needed for some important private initiatives such as discussed later on in this testimony are in the neighborhood of a few hundred million dollars, with total project costs in the neighborhood of—at most—one half to one billion dollars.

By comparision, some major energy projects such as the Alaskan oil and gas pipelines require each financing of $7 billion to possibly as high as $15 billion. In communications (see below) investments of that magnitude are made each year by but one company!

To put the ability of private vs. public financing into context with expenditures and financing requirements of space in the 1980s and 1990s, the estimated net funds raised in the U.S. credit and capital markets are listed in Table 1: government raises annually between 80 to 90 billion dollars (to finance deficits), consumers an foreign entities raise (net) another $140 to $160 billion, and private industry between $100 and $170 billion, annually, in the 1977 to 1982 period. Surely, a few hundred million dollars can be raised for private initiatives in space, if government and Congress create the climate to do so. This was done in space communications—with great success. Yet ever since then we seem to have lost the vision and courage to do likewise in other areas of space enterprise.

To understand this better a brief review of the current situation of the U.S. space program is necessary.

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TABLE 1 NET FUNDS RAISED IN THE U.S. CREDIT AND CAPITAL MARKETS (BILLIONS OF CURRENT DOLLARS)

	ESTIMATE		FORECAST				
	1976	1977	1978	1979	1980	1981	1982
GOVERNMENT MARKETS							
U.S. GOVERNMENT SECURITIES	69	58	65	72	65	55	50
STATE & LOCAL SECURITIES	15	27	24	25	27	29	31
TOTAL GOVERNMENT CAPITAL	84	85	89	97	92	84	81
TOTAL CONSUMER AND FOREIGN CAPITAL MARKETS							
HOME MORTGAGES	64	90	95	93	100	108	115
CONSUMER CREDIT	24	36	29	25	27	30	32
FOREIGN LOANS & SECURITIES	20	12	13	14	16	18	19
TOTAL CONSUMER & FOREIGN CAPITAL	108	138	137	132	143	156	166
BUSINESS CAPITAL MARKETS							
CORPORATE STOCKS	11	9	8	9	10	12	12
CORPORATE BONDS	23	19	18	23	26	29	32
BUSINESS MORTGAGES	21	37	37	39	44	50	55
OTHER BUSINESS CREDIT	22	50	50	50	61	65	75
TOTAL BUSINESS CAPITAL	77	115	113	121	141	156	174
TOTAL CREDIT & CAPITAL MARKETS	269	338	339	350	376	396	421

SOURCE: BANKERS TRUST COMPANY, "U.S. ENERGY AND CAPITAL: A FORECAST 1978-1982", 1978.

This program is currently in a phase of transition: with the successful completion of the Space Shuttle system some of the deferred answers that face the United States space program in the late 1960 now will have to be tackled. What I mean by this is that after the United States space program met with the given goals in the 60s of landing Man on the Moon in the rather complex and heated discussions of the late 60s the Space Shuttle system was chosen as the main development effort of the United States space program for the 1970s. This development program is coming to a completion and the question looms large as to what the pursuits of the United States space program shall be in the 1980s and 1990s.

The recurring concept of the "Space Shuttle dividend" develops from some conception that the space budget in the 80s shall stay "level" along the lines of the 1970s. If this indeed were the case then the reduced funding needs of the Space Shuttle program would open up a "budget opportunity" of between $500 million to $1 billion to be directed toward new space applications, space sciences and space technology efforts. Yet, is it reasonable to expect that such funding will be provided to NASA? Secondly, to what extent indeed is the funding level of the 70s for the space effort of the United States adequate, too large, or in fact substantially underfunded when faced with opportunities perceived, or real, offered by space? Finally, will indeed the low cost space transportation system as offered by the Space Shuttle revolutionize space payload technology, space applications, space sciences?

These are but a few questions that over the next one to two years will have to be addressed by the formulation of a new space program for the 1980s and into the 1990s. There are more serious questions underlying these issues among them and prominent among them the relation of government initiatives vs. private initiatives, investment of corporate funds vs. the continuation and expansion of NASA activities into "operations".

Indeed, the very problems faced by government in the space program today are somewhat novel. For the first time among a multitude of opportunities a few goals will have to be selected for the 1980s and 90s. In addition to the choice among a multiplicity of goals none of the individual goals selected will have the attributes so comfortable for the space goals of the 1960s: the certainty that "landing Man on the Moon" had brought public acceptance and was a unifying theme of the space effort of the United States in the 60s. Whatever goals are selected for the 1980s and 1990s will be subject to constant doubts, uncertainties, a rapidly changing technological world not only in space but also on the ground. Among these uncertainties I perceive a unique challenge as well as opportunity for private enterprise now to reenter space activites on a substantially expanded scale. Private enterprise historically has been fulfilling these functions for the United States and its economy, and it is time that private enterprise accept and be given the challenge and opportunity to enter space activities individually and company by company on a larger expanded scale where their own judgments are excercised and backed up by their own investments.

2.0 The Workings of Free Enterprise and the Economic System

Underlying this deep belief that free enterprise has to fulfill major functions in the space program in the 1980s and 90s, is all the evidence of economic history, economic development of western industrial societies and free market economies.

In essence, free market systems, capitalism and the need to invest capital resources on a diversity of individually perceived opportunities, rests on the constant need for innovation. While in the economic community difficulties exist to trace back innovation to industrial changes, and economic growth, nevertheless the underlying mechanism of today's U.S. economy as well as any other major industrial economy—whether free market or centrally planned—is the need for and the capability to innovate. It was Joseph Schumpeter who in the most concise way traced back innovation, the role of the entrepreneur, the commitment of (private) funds to new ideas and challenges to the basic issues and changes underlying the workings of economic systems. Without innovation there is no profit, without profit there is no ability to grow and expand and for capital markets to support interest payments. Without innovation growth will be reduced to zero, profits will be reduced to zero, and interest will be reduced to zero. Society will stagnate. Innovation in this sense is the foundation of growth economies, and of the financial as well as investment banking opportunities that go with it.

Looking back historically it was precisely this ability to innovate and to finance innovation in the 19th and 20th century that made the United States the predominant worldwide system of today: the financing of railroads, the construction of railroads, the construction of pipelines, the development of aviation industry, the development of computer industry, communication systems and trading systems on

a national and worldwide basis essentially can be traced back to private enterprise and innovation.

If any demonstration of the "superiority" of the decentralized, capitalist decision and risk taking process was necessary it was the visit of the Chinese premiere to the United States just a few months back: the centers visited were the Air and Space Museum in Washington, the Johnson Space Center Space Shuttle Simulation program and enterprises such as Boeing, McDonnell Douglas and Lockheed. Yes, here and there other industrial, technologically advanced industries were part of that visit. But the main theme was aerospace industry. If any further proof of the role of innovation, technological advance and private enterprise was needed I believe that was the ultimate demonstration of the strengths of our system.

Lately, some doubt has been expressed—and indeed is noticeable—in the U.S. economy as to the further opportunities and challenges in innovation: for one Wiesner of M.I.T. has expressed over the past few years great concerns as to the ability and capability of science and technology to maintain the rate of innovation shown so dramatically over the past one hundred or more years. The same Joseph Schumpeter as early as 1942 in his work on Capitalism, Socialism and Democracy expressed the same feelings and pessimisms as to the ability for innovation, the further progress of science to create new ideas which then can be implemented in sometimes revolutionary ways in the market system. Schumpeter could not have been more wrong: four to five years after the publication of his works—and in fact right during the publication of his work—major enterprises of technological innovation were underway: the creation of nuclear energy (contained and explosive), the advent of solid state electronics, the revolution toward low cost calculations brought vast changes to America and worldwide societies, right up to the current ongoing revolutions in telecommunciations industry, in aviation, in transportation, as well as agriculture and food production: After World War II the industrial revolution in many ways has accelerated in a hitherto unknown force with a wealth of innovative ideas which have been implemented over the past two to three decades by free market systems. The systems that lacked in this process again and again, are centrally planned, government studies.

However, over the past ten years several noticeable, negative developments have taken place in the United States.

(1) The expenditures in research and development both as a percentage of gross national product as well as in absolute constant dollars have substantially decreased. From a level of about 3 percent of gross national product in the mid 1960s today the United States has receded to roughly a 2 percent to 2.2 percent funding of research and funding out of total activities of the economic system. The culprit in this major recession has not been private industry: in the mid 60s, as well as every year since then private industry has invested and sunk about 1 percent of gross national product as its share into research and development activities. These R&D efforts are concentrated not only in aerospace but strongly and foremost also in other transportation industries, telecommunication, electronics, energy and agriculture industries. It is on the federal side that funding of R&D activities, and particularly development activities in the sense of applied research, prototype and demonstration programs ("Phase B" funding of R&D) has dramatically decreased. From a high of about 2 percent in the mid 60s this has been reduced to about 1 percent of gross national product by 1978–1979. The total funding of R&D expenditures by the federal government today amount to about $30 billion (1979). If the federal government were to spend the same relative amounts as those in the mid 1960s indeed those funds today would be about $45 billion a year: the gap of $15 billion of funding per year has to have severe effects—direct and indirect—on the economic system, the rate of innovation in the United States, as well as the long term competitiveness of the United States in the 1980s and 1990s. For the past ten years we find, indeed, that productivity increases in the U.S. economy have slowed to a meager 1 percent or so, vs. 3 percent in earlier decades.

If one were to analyze further the cutback in federal R&D activities, the main reduction have occurred (1) in the funding of national defense R&D, a reduction of about 10 to 20 percent in absolute effort and in relative effort an even larger reduction, and (2) first and foremost a reduction in the space effort: from the high funding levels of the mid 1960s the relative cutback of space expenditures as part of total federal funding amounts to a factor of three. In part this reduction of the defense R&D effort has been offset by an expansion of funding of other civilian R&D. Yet, overall the federal funding of R&D reflects what I said at the beginning: from a relative effort of 2 percent of GNP this cutback today to about 1.2 percent amounts to a sizeable, substantial reduction which cannot but have negative effects on the U.S. economy in the 1980s and 1990s.

As to aerospace industry two observations have to be made. First, aerospace industry throughout the past twenty years was the leading R&D industry in the United States by any measure: in terms of percentage of sales aerospace industry over the past twenty years constantly spent betwen 20 to 25 percent of total sales on R&D activities. Any of the other R&D intensive industries in the United States lags substantially behind this very advanced performance of aerospace industry: Those industries are electronics, transportation, communications, as well as energy; they average between 5 percent to at most 6 percent of sales vs. the 20–25 percent figure just mentioned for aerospace. These data are compared in Figure 1: on the horizontal axis, the net trade as a percentage of total sales is shown, and on the vertical axis R&D, again as a percentage of the total sales is shown for each industry—for the 1958 to 1975 period.

Secondly, it is the R&D intensive industries of the United States which over the past twenty years have constantly shown a positive trade position for the United States in worldwide competition: foremost among these, again aerospace industry, were from 10 to 15 percent to total sales of the industry, were transacted worldwide.

To understand the magnitude of the aerospace market worldwide: the opportunities of the 1980s in civilian aircraft sales are from between $70 to $100 billion for the next decade; in military aerospace sales, worldwide, the market opportunity again is at least $100 billion. Of these the past performance of the United States industry has been an 80 to 90 percent share in either one of these markets, the civilian as well as the military markets. The performance of U.S. aerospace industry has been equally impressive in any one of the major subcategories of aerospace sales within civilian as well as military aerospace categories: helicopter sales, fixed wing aircraft sales, wide-body sales as well as conventional aerospace product sales and services.

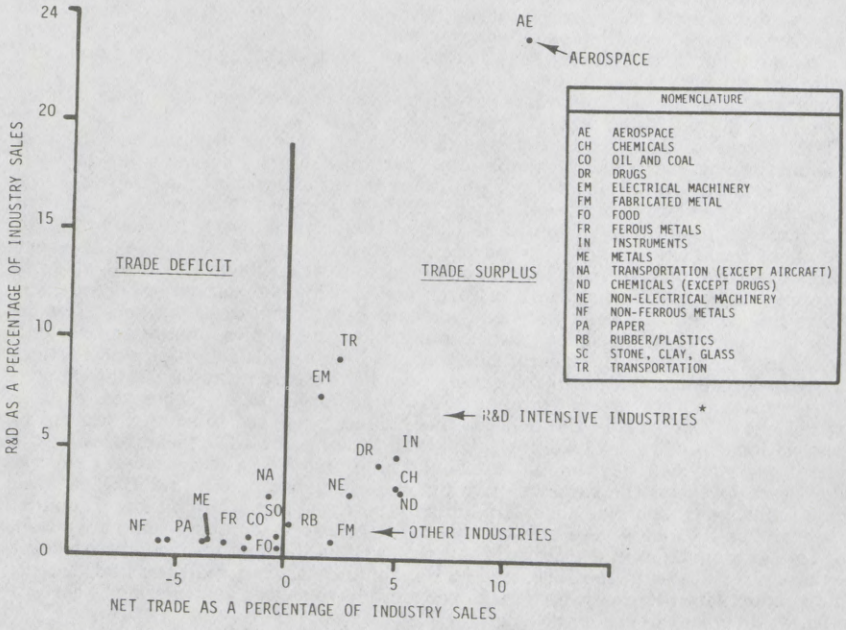

FIGURE 1 R&D AND NET TRADE PERFORMANCE AS PERCENTAGE OF INDUSTRY SALES (1958-1975 AVERAGES)

This preeminence of aerospace industry in the worldwide world trade performance of the United States economy is unequalled by any other sector of the United States, including agriculture: whereas agriculture in total export sales comes close to the performance of aerospace industry (depending on the specific year), we should not forget that these exports are offset in agriculture by nearly equally large imports year by year such as sugar, rice, cocoa, coffee, as well as other products.

The net trade performance of aerospace industry excels that of any other sector of U.S. industry, including electronics, computers, machine building or telecommunications. This preeminence of U.S. aerospace industry can only be maintained in the 80s and 90s with continued innovation, continued exploration of new frontiers, the continued pursuit of risky but potentially also profitable investments. It is within this world that I perceive new challenges and new opportunities to U.S. aerospace industry in space. These opportunities for private enterprise and initiative become all the more important given the current state of the U.S. government funded space program where uncertainty, non-direction, and hesitation have been dominant for the last decade.

The space program of the United States in the 1970s has been one of hesitation, non-decision: it was at the end of the 1960s that the basic decisions as to the future of the United States space program had to be made. Among those choices were (1) an expanded manned program envisioning space stations in Earth orbit as well as possibly on the Moon, (2) large, extended space applications, and (3) an expanded effort in space transportation. The decision then, correct, within a limited world of resources, was to lower the cost of transportation through the Space Shuttle development. This program has been the foremost primary technology program of the United States in the 70s and by next year, hopefully, it will see its foremost achievement with the launch of the Space Shuttle into space. However we should not delude ourselves: the primary, and most difficult questions of the space program have been deferred for at least a decade through this reduced space effort of the 1970s. As noticed above, one cannot expect the same payback, the same rate of innovation, the same opportunities to be created by a program that essentially has been cut in half if not reduced by a factor of three. The consequences of this are that today we will have the means of low cost space transportation in the 1980s and 90s, however, with no specific goals outlined as to the investment and opportunities in space application, science and technology for the next decade. It is in this where I see a partnership developing between private industry and government, for joint decisions and projects with sizeable private enterprise investments into space opportunities.

3.0 Key Opportunities in Space

The key space activities that seem to be offered to the United States, as well as to pursuits of private enterprise seem to be the following:

3.1 Telecommunications

Space investment opportunities will exist in the middle to late 1980s in entirely new telecommunications systems. Several private efforts in space communications have been a characteristic of the United States space program as early as the mid 1960s and, domestically at least, certainly in the 1970s, with a policy of competition and wide open access to such investment opportunities by all companies that desire to take such risks. However throughout the 1960s and 70s space communications have fulfilled subsidiary functions to the existing telecommunications network and investments in the United States. Total investments by and into space communications amount by now to about $1 billion and total revenues from space communications a year amount to $500 million. These are sizeable and impressive numbers. Yet, when compared to total investment activities in the United States by but one company, AT&T, one also realizes how small, if not significant, these achievements are within the capabilities of private enterprise to meet investments, opportunities and risks: as of 1978 AT&T had a net asset value of over $100 billion, performed investments in new plant and equipment in but one year of $12 billion, and had revenues in excess of $36 billion; over the next decade this one single company will invest from between $120 to $150 billion in new plant and equipment.

These investments are not unique, and not relegated to telecommunications industry only: in energy related systems the investment requirements over the next six years, that is to 1985, amount to between $400 to $600 billion, financed by and through private enterprise. Telecommunications and energy industries are the major investment areas of private enterprise in the next decade. These investments and pursuits are one or two orders of magnitude larger than what currently is being spent in investments on space activities, space technology, space science as well as space applications. Any notion that private enterprise and private investment cannot pursue sizeable investments in space—amounting to billions of dollars if necessary—is clearly false. Rather the difficulties seem to be to identify what opportunities exist for space investments, what the risks of such space investments are, and last but not least whether or not indeed private enterprise has full and open access to pursuing space investments just as private enterprise has such opportunities on the ground. The notion indeed is widespread that for one reason or another govern-

ment involvement, government regulation and government restrictions and government initiatives are required first and foremost in order to bring about space activities. This notion has to be destroyed, this notion has to be proven false.

In space communications indeed large investment opportunities exist. With the advent of increased power supplies in space, switching capabilities in space (rather than on the ground) with the advent of beam (point to point) space communications technology from extremely small areas to other small areas, from business complex to business complex, from village to village, from house to house, without the intervening intercession of a complex ground system, a vast expansion of space communications capabilities and investments seems in the offing. Recent studies indicate a market of easily $5 billion if not $10 billion to $20 billion in required investments over one decade. While these numbers seem large when compared to current ongoing space investment efforts they are well in line with efforts expanded by private industry in ventures in telecommunications itself, today, on the ground.

With these capabilities an expansion of space investments in telecommunications to levels of several billions a year, are possible. Space enterprise will then have taken a significant leap forward to establishing itself on a viable basis in the United States and a worldwide basis: space communications systems with point to point communications capabilities similar to those of the telephone system today in the United States will be readily available at low incremental costs for ground terminals and equipment to any and all nations worldwide. The revolution this can bring to developing countries in itself may prove of enough incentive to private enterprise and industry that even without any government participation these investment steps can be taken in the 1980s and 90s just as multi-national firms to date, worldwide, have created more job opportunities, more development, more creation of human skills than all government aid projects in combination. It is the IT&Ts, the Boeings, the electronic industry, the television industry and many many subsidiary industries of multi-national corporations in all economic fields. These investments have proliferated today to make developing regions serious competitors in world trade with advanced industrial economies. These are good pressures, these are good developments; but they also highlight the need of the United States and other advanced nations to explore new frontiers be they here on Earth, or in space. Space-based communications well can provide such advanced new frontiers with a unique current competitive advantage of the United States. Let us exploit this advantage. Let us push these opportunities.

3.2 Observations

The telecommunications revolution, domestic and worldwide, aside the other key component of space enterprise and space investment seems to be in the area of worldwide observations. Already existing systems have seen an application and expansion of space observations to the exploration of natural resources, the improvement of a variety of human activities in better weather forecasting capabilities on a regional as well as local scale etc. However, further important accomplishments in space observations are yet to come in the 1980s and 1990s. Again, to mention but one area, food crop information. While today food and food production problems are typically perceived as one of supply, as in so many other economic matters, the key opportunities and challenges seem to lie in the distribution of existing crops through world trade. Here again the vast differences and fluctuations commodity prices for food crops, feed crops, as well as other natural resources are but a sign of incomplete information systems regionally and worldwide. They are a reflection of ignorance as to developing shortages and the ability to overcome these shortages through trade inventory holding and transportation. Early warning systems on food crops in the northern as well as southern hemisphere can have and will have large, stabilizing integrating effects on world food trade, and the ability of the United States to meet food shortages on a worldwide basis, without the negative side effects that in the late 60s and early 70s seem to have plagued U.S. trade: Information monopolies that still exist today by some regions, noticeably the Soviet Union will then have been replaced by open public, accurate information. The benefits of such improved information will have a stabilizing, equalizing effect taking out some of the fears haunting mankind today, having led even to such mistaken notions as using food as a weapon in worldwide trade.

Other areas of observation from space will be equally important. The use and the effect of fossil fuels on the environment may limit the ability of fossil fuel resources to meet the expanded need for energy of industrialized as well as developing countries. Observations from space on a global basis will help us understand and maybe resolve that issue. The heat balance and its accurate measurement from observations from space, the monitoring of forest resources, of land use patterns, of natural resource deposits, of urban development, the ability to measure and monitor

population growth and human activity from space all will have their contribution and effect.

Information today plays a much larger basic function in the workings of economic systems than is normally perceived. The total information related activities in economic systems have been estimated from between 20 to 30 percent of economic activities in advanced industrial societies. Observations from space will see a substantially expanded role of such information, and again there is no reason why private enterprise cannot fund such systems, see to the evaluation and the distribution of such information. However, compared to the opportunities in telecommunications, observations systems in space will be limited to the opportunities space communications offered industry in the 1960s and 70s. That is, it probably will be limited to a few hundred million dollars in investments per year, probably between $1 to $2 billion over a decade. However, as these developments are pursued and undertaken in the 1980s and 1990s indeed major new opportunities may be offered to both private as well as government funded activities for a substantial expansion of these systems later on.

3.3 Energy from Space

Finally, the third major opportunity of space enterprise clearly will be in providing energy from space for space based systems and for Earth. Industry has spent considerable activity on the analysis of solar power systems. The current evaluation of SPS has to be that energy from space and for space based uses will be a significant prospect in the space program of the United States over the next twenty years. However, a substantial commitment by the government to SPS development has been deferred for a least another five years, if not more. In the interim a low level federal effort is likely on SPS, say of not more than $25 to $30 million per year over the next five years. Substantial private initiatives at this time are unlikely to be very profitable in the short and medium term, meaning the next five years. Private enterprise can pursue opportunities that have been created technologically through advances fostered by commitments at a national sometimes international basis. Private enterprise in the meantime will pursue opportunities at less risk and larger profit with established energy technologies. It is unreasonable that private enterprise on its own invest from $40 to $50 to $60 billion in the exploration of a risky new technology. Private enterprise can pursue opportunities that have been created technologically through advances fostered by commitments at a national sometimes international basis. Private enterprise in the meantime will pursue opportunities at less risk and larger profit with established energy technologies. It is unreasonable that private enterprises on its own can invest from $40 to $50 to $60 billion in the exploration of a risky new technology. Private enterprise will be the ideal entity to implement opportunities created by such R&D once they have been proven and demonstrated. That is the mutual role of government and private enterprise that has proven so effective since 1945.

This brings me to one basic noticeable shortcomming of the United States space program as well as of all federal funding of R&D over the past decade: the substantial decrease and cutback of so-called "Phase B" programs in the RDT&E cycle. It is not enough to claim that basic research funding has increased, as is done and has been done in the past two years in the analysis of the federal budget. Basic R&D by itself created nothing. Ideas have to be translated into first prototype systems and later on into proven, relatively low risk application investments. It was a characteristic of the 1960s R&D program to emphasize Phase B funding. This today I perceive as the major shortcoming of not just the space effort of the United States but the basic federal policy in R&D funding.

The SPS may be too large scale a system to commit substantial development money—federal or private—today. However, other stepping stones on the way from here to future space-based energy system for use on the Earth exist: they are the 25 kw module and, later on the 250 kw module to provide energy in space for space-based systems, as well as low thrust solar propulsion systems.

The power modules seem to be critical steps for a truly expanded activity of space applications for beneficial uses on Earth. Just as energy it is the limiting factor in the expansion of industrial as well as developing societies here on Earth, energy supplies will be a limiting factor to the true and full expansion of space technology and space applications. The funding of energy systems in space such as the 25 kw module and the 250 kw module, seem to be cornerstones on the road to substantial expansion of these opportunities in the 1980s and 1990s. Should and could private enterprises proceed with the development of these initial systems? What would be the rules for such pursuit? If done with private initiative would that mean a cessation by the federal government to fund at taxpayers expense other competing schemes which would invalidate the original private investment? Could indeed the

government rely on private development efforts of systems that might also have significant national defense implication, if not met on time? And, as to the uses of this technology once developed, to what extent are current rules and regulations applicable to the best, and most rapid expansion of the rules of this technology for the benefit of the United States? The commitment of private funds in the development along the lines of the TDRSS procurement or the SSUS (with abstention by the government to fund competing concepts) should be considered seriously. Yet such an initiative involves substantial risks that are difficult to quantify.

There exists other space technology options: waste disposal in space (including) space manufacturing and many other advanced ideas as to the uses of the space environment: low gravity, vacuum, and cryogenic temperatures. It is not up to me to speculate on these new opportunities which essentially will have to wait for an expanded and active R&D program making use of the Spacelab in the 1980s.

4.0 Space Shuttle System and Operation: A New Opportunity for Private Enterprise

Any discussion of space opportunities in the 1980s and 1990 would be incomplete if one were not to consider the significant opportunities for private enterprise in the area of space transportation. While to date all lanch services to space have been provided through government organizations—be it the United States or elsewhere—considerations of economic accountability and efficiency do indicate the need for change in the 1980s to private or semi-private forms of STS operations. Steps in that direction are being explored in Europe and the United States. These initiatives may prove to be a decisive next step in the opening of space to the benefit of mankind. Increasingly, opportunities may get delayed—or be lost entirely—if left to the "insights" of government alone.

One prime example is the Space Shuttle fleet itself: As of today the Space Shuttle system is budgeted to operate out of two launch sites (ETR and WTR) with only four Space Shuttle orbiters. Any serious analysis of the likely space markets in the next decades, the uncertainties and the difficulties in Space Shuttle operations, the likelihood or need for substantial overhauls of individual orbiters, and a full allowance for risks and other uncertainties in payload operations all indicate the clear need for at least five vehicles. By the time other potential space applications are added, indeed, more than five orbiters may be required in the 1980s.

Why not explore the possibility of private financing of these additional vehicles? Of course, such initiatives cannot happen overnight. The initiative may even come from the government and Congress, if only to create the environment to make such initiatives possible. To date, in the United States, exactly the opposite seems to be happening, if not in spirit, certainly in fact.

This hesitancy and lack of initiative is in striking contrast with European moves in the area of space and space transportation. Whereas we hestitate, Europe is moving forcefully to set up a private corporation, Transpace, to take over production, marketing and perhaps even launching of space transportation systems (Ariane). I submit that the same opportunities exist with regard to Space Shuttle systems questions, whether these concern (1) the funding of additional Space Shuttle orbiters, (2) the operation of the Space Shuttle systems, (3) the marketing, domestic and worldwide, of the users of the Space Shuttle system, and (4) efficiency improvement in STS operations. All can come about with one overriding, important condition also met: the maintenance of the current Space Shuttle pricing policy principles as regards commercial, government, and foreign users.

Such ventures in private enterprise in space transportation will not be set up overnight, nor can they be undertaken without the active and positive cooperation of the U.S. Executive and Congress. Some of the most important ventures in space transportation, such as the funding of the fifth and additional Space Shuttle orbiters, or private or semi-private operations of one or two of the launch sites (ETR and WTR) can probably only be done by legislation.

The total market for private initiatives and innovations certainly seems to be there: The total revenues expected in the 1980s for STS operations are about $10.5 billion over the currently planned 12-year horizon of Space Shuttle operations for the current mission model of 487 Space Shuttle flights (May 1979 dollars). The pricing policy based on those expected costs is consistent with the currently announced NASA pricing of commercial, foreign, U.S., civilian, government, and Department of Defense Space Shuttle services. This activity level assumes a Space Shuttle fleet of five orbiters. The resulting surplus or deficit by fiscal year is shown as well as the cumulative surplus and deficits for the 12-year horizon.

Assuming that the Space Shuttle will continue to be the major space transportation vehicle of the United States over the next few decades, the total market for space transportation related items will be about $21 billion along rather conserva-

tive assessments of space activities. In other words, the revenue streams shown in Table 2 do not include any new capability type Space Shuttle missions and applications in the form of, for example, large space structures or new services such as nuclear waste disposal in space or other opportunities discussed elsewhere. Any of these new capability options would substantially add to the space transportation market.

The immediate areas for private initiatives in STS investments and operations for the next two decades certainly include the following opportunities:

(1) Funding of Space Shuttle orbiters by private investment.

(2) Efficient improvements of the Space Shuttle through private initiatives in areas such as the thermal protection system, alternatives to the solid rocket motors and boosters, add-on capabilities of the Space Shuttle.

(3) Power supply systems for extended Space Shuttle operations in orbit.

(4) Ventures in upper state development such as interim OTVs, OTVs, and advanced OTVs (Orbit Transfer Vehicles).

(5) Private and semi-private Space Shuttle operations, with or without ownership of the Space Shuttle fleet.

The advantages of private or semi-private initiatives in STS issues seem to be the following:

TABLE 2 Total Space Transportation

Revenue vs. Cost by Fiscal Year
(All Amounts in Millions of May 1979 Dollars)

Fiscal Year	Total Revenue	Total Costs	Surplus/Deficit	Cumulative Surplus/Deficit
1977	4	0	4	4
1978	38	12	27	29
1979	115	93	22	51
1980	258	382	-122	- 73
1981	463	765	-302	-375
1982	719	867	-148	-523
1983	849	950	-100	-623
1984	1194	1036	159	-464
1985	1086	1032	55	-409
1986	1099	993	106	-303
1987	1159	982	178	-125
1988	1066	966	101	- 26
1989	1059	919	139	114
1990	858	778	81	196
1991	414	526	-111	84
1992	82	198	-115	- 32
Total	10463	10499	- 26	0
to 2000	21000	21000	0	0

(1) Accountability. Private initiatives, and the risking of private funds, can be a critical proof of whether the improvements or additions to the Space Shuttle fleet indeed are warranted. If, with private funding of the fifth Space Shuttle orbiter, the investment funds and the return on that investment can be recovered—without changing current user charges to commercial and foreign users—combined with a simple quid pro quo arrangement with the government as to market responsibilities, understandings on operations and reimbursements for any costs to the government, then indeed the question of whether a fifth or even sixth or seventh Space Shuttle orbiter is needed can be left to the market. Despite the most extensive economic and accounting scrutiny of the Space Shuttle program over the past decade, no study, however well done, can be a substitute for the commitment of private funds in the pursuit of private (and implied public) gain. This proof can be had.

(2) Effective marketing of commercial and foreign users of STS. With private funding of Space Shuttle orbiters, or private operations of the STS fleet the function of marketing the uses of that system by commercial and foreign users of space will find forceful new and efficient advocates in any such venture group. The movement by France and other European nations toward a private space corporation to market transportation services for their rocket systems was undertaken principally with

setting up efficient marketing structures. Given the multiplicity of user interests, their worldwide distribution, and the variety of space uses, I cannot see any one existing U.S. government agency to effectively fulfill all the marketing functions, in all areas of space transportation services. In addition, contracts signed by government agencies have, in some context, less credibility than contracts signed by private entities: private contracts are subject to all the rules of international trade law, as well as any domestic laws that pertain to such signed agreements. Backing up such contracts is the equity of that corporation and its good will. Contracts signed by government in similar matters always are open to questions as to further budgetary commitments and agreements, changes in government, changes in the management of agencies, changes in program content decided either by the Executive or by Congress or both. Last but not least, there is no equity backing up contracts signed by government agencies, nor can recourse be taken easily and efficiently in courts.

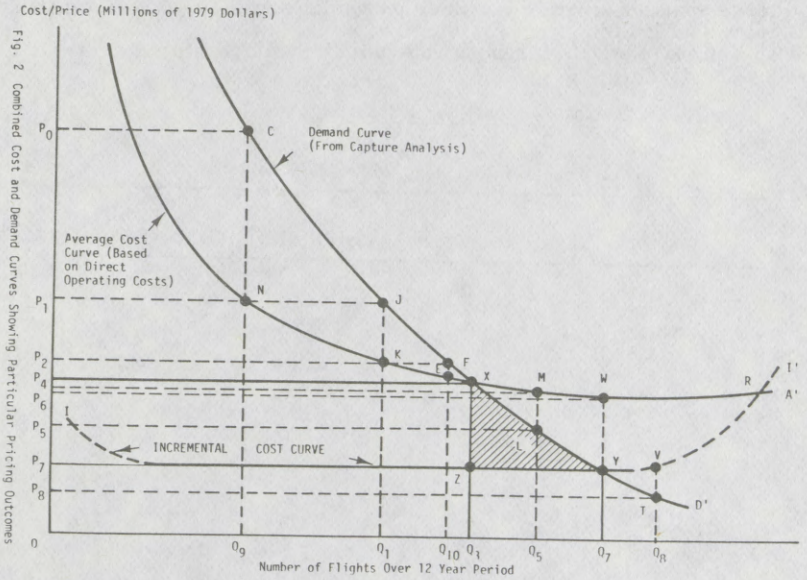

Fig. 2 Combined Cost and Demand Curves Showing Particular Pricing Outcomes

(3) STS Advantages in International Competition. With other nations moving toward effective space transportation capabilities, and direct interest in marketing those capabilities in competition against the United States, the United States has to set up effective means to meet that competition and market STS transportation services effectively against such challenges in international markets. A crucial question concerning the STS is how additional space markets can be captured and brought about, either for entirely new uses of such systems or in competition with expendable systems. A private enterprise in STS would have considerable pricing flexibility of Space Shuttle services ranging from average cost pricing to incremental cost pricing, and possibly intermediate levels. This is the most crucial attribute of Space Shuttle pricing policy, that expendable systems cannot match on economic grounds, and that government operations of STS services are hindered in pursuing fully due to existing, intricate and sometimes contradictory government rules and regulations. This flexibility results from the peculiar cost structure of STS as against expendable systems.

As shown in Figure 2 the average cost price category will contain the payloads representing approximately 80 percent of the flights (i.e., Q_3 of the Q_7 flights). Furthermore, these should be the payloads willing (if the price were so established) to pay the average cost price (P_3), or more; if the wrong payloads are included in the P_3 category they will use expendable launch vehicles in place of the STS, or forego the use of space. It is interesting to note that most (but not all) government uses and a few commercial uses are included in the average cost (P_3) category.

Incremental cost prices down to P_7 can be charged wherever:

(a) a loss to expendables would otherwise occur, or

(b) a clear experimental or developmental purpose is shown that could create later traffic.

This flexible pricing policy also requires that the Space Shuttle operator be administratively prepared to make case by case determinations of pricing category and policy. The burden of doing so should be reduced by the presumption that P_3 (the average cost price) applies unless a persuasive case is presented to apply P_7 (the incremental cost price) or some intermediate price.

In terms of explaining or justifying any Space Shuttle policy the operator of the system will be asked to show:

(1) The cost recovery is consistent with user charge statutes and guidelines. In free market competition, be it within nations or among nations, this principle has to be upheld. Any outright subsidization of space transportation services, be they expendable or reusable, is an undesirable (and possibly illegal) policy, if the long term best interests of space development and space application are kept in mind.

(2) That the government is not paying a higher price than private users. This can still be defended as long as the government sometimes qualifies for the lower price, and commercial users sometimes pay the higher price as suggested in Figure 2. However, in as much as the government payloads that are able to pay the higher price level, it is unavoidable that the government payloads must usually pay the average cost price. By excluding a lower price level, the government would only hurt the outside users as well as itself—because the government payloads will sometimes qualify for the lower price, and because the lower price users can partially offset the fixed costs that would otherwise be exclusively divided among the higher price users.

(3) That the policy is rational based on economic principles—rather than arbitrary or subsidized.

This flexibility in pricing will add a powerful economic tool to bringing about the most widespread and advanced uses of space in several application areas in civilian and government sectors. This policy is best and most efficiently pursued by a private entity, to assure accountability and flexibility.

How the initiative of private ventures in STS systems acquisition and operations in fact will come about have to be left to substantial additional study and consideration by industry and government. However, some critical components of the above issues, I believe, can be combined into a meaningful transition to current exclusive government monopolies in this area to, first, a mixture of government and private activities and, ultimately, a very strong if not exclusive private presence in space, as is the case in all other sectors of U.S. industry. The message I would like to leave with this committee is that such initiatives have to be seen favorably and with positive actions on the part of the U.S. Congress and Executive. If these hearings lead to such a framework of understanding they will have accomplished a very important milestone in the U.S. space program.

5.0 Proposed: A Space Bank

Given all these claimed opportunities, listed above, how is it that private industry and enterprise have not developed more forcefully to date in space matters?

In addition to (1) extensive real and perceived government regulations and "rights", (2) the difficulty of pin-pointing on who indeed can make decisions on behalf of the government when private initiative in space develops in any one particular area—such as Stereo-Sat—and (3) the early stage and high risk of space projects, a key stumbling block for the full development of these opportunities is the weak capital base of U.S. aerospace industry. This clearly is the sector who has to propose and pursue the opportunities outlined above, yet it is the very sector that historically has been all too dependent on government programs (up to 70 percent) and government regulations subject in such programs. As a consequence the capital base, and the spirit of venture by private initiative that characterized so strongly the early part of aerospace industry have been eroded in the past several decades.

While the aerospace industry is thought, by some, to be a capital intensive industry, an examination of the typical aerospace firm in comparison to nine other key sectors of U.S. industry reveals that by the mid-1970s aerospace ranked ninth, just ahead of the retail sector, in the amount of fixed capital used per dollar of sales. The results of an extensive analysis of data for over 500 firms is listed in Table 3 for the years 1974 and 1975. In the mid 1970s aerospace industry had 15 cents of fixed capital invested for every dollars of sales, as compared to 99 cents in transportation, 2.17 dollars in communications and 2.30 dollars to 2.50 dollars per dollar of sales for electric utilities.

Conversely, aerospace ranked second behind the retail sector in fixed capital turnover. The typical aerospace firm's fixed capital was two times smaller than in rubber industry, six times smaller than in transportation and almost 15 times

smaller than in the communications and utility sectors. Similarly, in 1975 the aerospace sector ranked ninth in its ratio of fixed assets or net plant to total assets, with 25 percent; utility and communications sectors ranked first and second, both with almost 86 percent.

The question must be asked whether this is a natural phenomenon of the production process in the aerospace industry, where clearly large human capital expenditure in engineering and research and development must be incurred if high technology products and processes are to be used; or whether this low capital intensity of aerospace is due to government procedurement and tax regulations that make it nearly mandatory to minimize the use of real capital, particularly when doing business with government. [For example exclusion of the possibility to make up inadequate depreciation allowances through higher, forward pricing principles in government contracts.]

TABLE 3 FIXED CAPITAL/SALES RATIO BY SECTOR OF TYPICAL FIRM

	1974	1975
1. UTILITY	2.56	2.30
2. COMMUNICATIONS	2.19	2.17
3. TRANSPORTATION	.99	.99
4. RUBBER	.31	.31
5. BUILDING	.19	.22
6. ELECTRICAL AND ELECTRONIC	.20	.20
7. MOTOR VEHICLE	.19	.18
8. INDUSTRIAL MACHINERY	.17	.17
9. AEROSPACE	.15	.15
10. RETAIL	.14	.14

SOURCE: ECON, INC.

Whatever the reasons of the capital weakness and shortage of the aerospace sector, clearly aerospace industry is in no position today to initiate vast ventures such as those seen in the energy sectors, the communications sectors and the utilities sector of U.S. industry. In addition, the typical aerospace venture as listed above involves risky, and typically longer term projects which makes the raising of capital funds all the more difficult.

The situation in space enterprise and the opportunities offered to the United States, are not dissimilar to the type of project typically funded by the World Bank in developing nations: While standards of accountability are strictly enforced by the World Bank, nevertheless long term, high risk and relatively favorable financing conditions have led by now to a record of success and achievement in the areas for which the World Bank was founded. Similarly, in space, given the opportunities on one side and the dire lack of capital in the industrial sector most affected by and most knowledgeable of these opportunities, the formation of a Space Bank seems to have great merit. While the concept of a Space Bank is not developed in this

testimony, I would like to leave the idea with this committee for further exploration.

The creation of a Space Bank could give rise to a variety of interesting, challenging and constructive questions such as: (1) Should some of the funding that now goes outright to bringing about space applications be channeled to industry through the institution of the Space Bank rather than through government agencies? (2) Should projects in space applications be held to the same accountability as projects in the rest of the economy, meaning that given their purported usefulness the funds sunk therein should be recovered, with interest? (3) Would the institution of a Space Bank lead to substantially reduced lines of communications, with clear decision authority, if any one of these private ventures speculated about above were to be proposed? (4) Could, after initial build-up of such a bank over five or ten years, this activity be self-financing? (5) Would the Board of the Space Bank be able to develop an adequate portfolio of space applications and space venture projects including high risk but also high potential return? (6) Could the Space Bank supplement the World Bank in financing space technology application projects in developing countries e.g., rural communications, land use, water resource management?

Last but not least, would the institution of a Space Bank allow NASA to be again redirected toward its RDT&E role, rather than increasingly costly ventures in space applications with little understanding of the user community, its needs and how to provide and market services?

Many of the issues mentioned before would fall into much clearer focus, and could be brought about in a more timely fashion, helping the uses of the STS and its operations, if the institution of a Space Bank existed today. While this concept is not critical to bringing about private ventures in space in some of the key areas listed, nevertheless many other potential initiatives today go totally unrecognized because private funding can clearly not be obtained and government does not recognize the need nor the opportunity for the many myriad applications of space domestic and worldwide.

6.0 Concluding Remarks

Clearly, more questions are raised in this presentation than can be answered. The purpose of my remarks is to outline to this Committee that private initiative and private ventures, which at the beginning of the space program were part and parcel of U.S. space policy (in the early 1960s), have been neglected ever since. Proposals along this line are being all too quickly dismissed in industry as well as government and Congress. In industry, because it has by now become accustomed to government funding of most space activities; in government, because it would reduce its role and all pervasive power.

Economic principles of accountability and efficiency clearly call for the beginning of private initiatives in space transportation.

In space applications, private initiatives, when joined with the idea of a Space Bank, could increasingly become an instrument of greatly expanded uses of space and space technology in the United States and in other countries, foremost developing countries. Steps in that direction should be taken even if it were to reduce responsibility now held by government.

Private initiative and ventures in the STS area also may be called for to bring about the effective and full use of the Space Shuttle system developed at such great costs by the United States. The marketing of these services, domestic and internationally, is a critical item that, in my opinion, best would be pursued in the form of private or semi-private, corporate institutions. This finding in particular will need a great deal of further work and thought before it can be and should be effectively implemented. But the time to start initiatives in this direction is now if the Shuttle is indeed to become an efficient and useful part of the U.S. and worldwide space programs.

STATEMENT OF DR. KLAUS HEISS, PRESIDENT, ECON, INC.

Dr. HEISS. Thank you very much, Mr. Chairman and members of this committee.

My testimony today in sections 4 and 5 specifically deals with issues on organizational choices on Space Shuttle and Space Shuttle operations, but the lead-in and the answer to these issues I believe has to be seen in the broader context that this committee also dealt with earlier—namely space industrialization. Within this again the thrust of my testimony is that, as of now, a major

opportunity as well as challenge exists to have free enterprise truly enter space and space activities in the next decades, along the examples set early in the U.S. program by Comsat and space communciations, an example we have failed to follow since then over the past 15 if not 20 years.

Why I feel so strongly about such an increased role for free enterprise—in the sense of individuals who are willing to commit funds—in cooperation with, or along with the Government, essentially boils down to the uncertainties that I see in the current U.S. space program itself.

The first part of my presentation deals with some broad issues that I feel today challenge the U.S. space program, a situation that in the early part of the U.S. space program was alleviated by the setting of firm goals which then NASA was very capable and very successful in executing. Such goals are difficult to set in the 1980's and 1990's, particularly since some of them try to address economic opportunities, opportunities for direct use of space and space technology; it is my position that in these areas in particular forecasting is, if not impossible, at least very difficult to do. Also, there is great danger in setting economic goals over time frames of 10, 15, or 20 years. Great harm could be done if the wrong goals were set.

In this situation, one should call upon the community that, for centuries, has dealt with precisely these questions of uncertainty and economic gain: The venture capital community, the investment banking community, in fact the free enterprise system. There is no better accountability to space activities and space projects than the commitment of funds that somebody risks to lose, as against commitment of taxpayer funds. There is no substitute for that process, and no economic study, however brilliantly done—and let me say I am in the business of performing such studies—can be a substitute for that.

This uncertainty I believe importantly calls upon some steps by Congress and the Executive to really have free enterprise enter space activities, not all at once, but in a gradual form which I outline later on in my testimony.

The first objection to such a venture is, at least in the public mind, that maybe space is too expensive. Nothing could be further from the truth in terms of total investment funds required. It may be true that it is not economic to do so, even to commit limited funds to space activities, but the size of the investment is not a bottleneck to bring about either private operations of the Space Shuttle, or acquisition of Space Shuttle orbiters, or several other significant steps for a true, full STS capability to geosyncronous orbit.

To make the point, I have included table 1, where I show for the years 1976 to 1982 how much private capital, net capital, is being raised in the U.S. economy. Net means that these amounts do not include depreciation funds. As shown in table 1, these funds annually range anywhere from $300 to $400 billion. The major users of those funds, which can be looked upon as sort of an asset pie to be distributed each year, is first and foremost the Government: Federal Government and State and local governments, to the extent of about $90 to $100 billion.

Another significant chunk of these investment funds are raised by consumers and foreign capital markets in the United States. They range from about $100 billion a year to about $150 billion a year.

The source of investment funds that go directly to the private market for business investments is roughly one-third of the total funds available, again in the neighborhood of $100 to $150 billion.

Now this compares to what later in the testimony I estimate to be an upper limit to the net funds to be committed by some private venture in space transportation of maybe $1 billion, over a 3- to 4-year period. Later on offsetting revenues will come in, to limit total capital exposure, so certainly the scale of the investment is not a deterrent to seriously consider private, semiprivate, or corporate government organization of space operations sometime in the 1980's.

To consider this option now is important, in the sense that if one is serious to bring such an organization about in the mideighties, steps have to be taken now, during the maturing period, to make that option possible.

The second part of my testimony deals with the question why indeed the market system or the free enterprise system and the economic system interact so successfully, and assures accountability to the economic activities that the Nation engages in. This accountability is very difficult to assure in congressional hearings, when Government funds are committed. All types of projections are being made as part of congressional hearings, as are cost estimates and traffic estimates and benefit estimates, and other social effects. Yet once projects are completed, very seldom does it happen that Congress calls upon the project managers in Government to give an after-the-fact accountability, whatever the results would be. Certainly economic accountability is not automatically assured in Government-funded projects whereas any private enterprise certainly has to make sure that revenues exceed costs. Otherwise a private enterprise will automatically go under. There is no such process at work in Government, and I am not just talking about NASA.

For this reason, if space is to be beneficial and successful, and get a momentum of its own, a private or corporate organization of these activities is very, very important, even if it means in the early phase that the space transportation system does not look as favorable as it would with hidden subsidization. The costs of space transportation should be made fully visible. I do not think the costs are such that they would deter the full use of space; on the contrary.

In discussing the free enterprise system in my testimony I include one figure that in this context is of some importance to answering the organizational question of Space Shuttle operations, and more broadly of space industrialization, and its role in the U.S. economy. It is figure 1 on page 9A. Shown in that figure are the results of the position of different sectors of the U.S. economy in worldwide competition; the net trade position of each of these sectors as a function for the R. & D. and innovative activities of each of these sectors.

The figure is nearly embarrassing, to the extent that aerospace industry: (1) Is by far the most trade-intensive sector of the U.S. economy in terms of net trade; that is, exports minus imports; and (2) is the most R. & D. and innovative intensive U.S. industry. Often agriculture comes to mind, but we also import a lot of foodstuffs in addition to exporting commodities. By the time you look at net trade, aerospace industry is by far the outstanding performer, with electronics, special transportation equipment, chemical industry, and instrumentation being poor seconds. Yet those sectors again—being research-intensive—all show a positive net trade performance, while sectors which are to the lower left side, that is who do not engage in R. & D. and innovative activities, are: (1) Poor performers in net trade; and (2) in fact contribute substantially to the current weak position of the United States in international trade, the U.S. economy, and hence the U.S. dollar.

The figure is relevant in the following sense: Can we find a way to let loose this sector of the U.S. economy, aerospace, in trying to bring, with enterprise, innovations about in the few sectors we seem to be leading in, namely aeronautics, space, and related activities?

We should not depend on Government judgments in each case on such matters, and yet how do we bring about company judgments and initiatives in space? How do we bring about risk taking by that same sector that historically has fulfilled these functions? This is the question before this committee on space transportation and also on space industrialization.

In section 3 I do outline what I consider the key opportunities in space to be for which space transportation would be used. Since you are quite familiar with these opportunities, I will not spend my testimony today on repeating them.

Just a few remarks. First, one single company in the United States, A.T. & T., spends each year between $10 to $12 billion for net investments in communications. The total assets committed to communications by that company, again net, exceed $100 billion. The same company will make, over the next 6 years, a total investment of funds in excess of $100 billion.

What I want to point out is that space and space communication has only but scratched the surface of the market that awaits space applications.

Today space communications is only a subsidiary function to domestic communications. It does grow dramatically, internationally at a growth rate of 25 percent per year ever since the creation of Comsat, and yet it still amounts to very little, most is communication among a few industrial countries. The world that still awaits space enterprise is: (1) Communication in developing countries; and (2) an extension of communications functions that today are being performed on the ground. This expansion of space communications demands space structures, power requirements, switching capabilities and many other requirements that you are familiar with. With these advances in space communications, from building to building, from household to household without the necessary ground system investments, such ground investments have not yet been made. In the case of the United States, at least the incremental investment will increasingly be put into space.

Second, similar challenges exist in observations. Currently the Senate is considering the Earth Data Informtion Services (EDIS) question, which I believe can easily be done in a private or semiprivate mode.

Finally, a question that was extensively dealt with by this committee, and certainly far in the future, is energy from space. A substantial, large opportunity that, if economic, awaits investments on a scale that the space program never has historically dealt with, and will have to deal with in the 1980's, amounting to hundreds of billions of dollars.

The question is, how does one bring about the same principles of the market economy and free enterprise into space which has been dominated by the Government, and where some witnesses before this committee find it so difficult to visualize private enterprise activities.

The first concrete step on a large scale that would make visible to the U.S. public that indeed such opportunities exists, other than communications, is the organization of the Space Shuttle system, and its operations. This is dealt with in part 4 of my testimony.

One prime example of where private initiative could develop in the Space Shuttle program concerns the fifth Space Shuttle orbiter. As of today, the Space Shuttle system is budgeted to operate out of one launch site, ETR, and hopefully a second launch site, WTR, and the budgeted Space Shuttle orbiter fleet consists of four orbiters only.

Any serious analysis of the likely space markets in the next decades, the uncertainties and the difficulties in Space Shuttle operations, the likelihood of the need for substantial overhauls of individual orbiters, and a full allowance for risks and other uncertainties in payload operations all indicate the clear need for at least five vehicles. By the time other potential space applications are added, indeed more than five orbiters may be required in the 1980's. Why not explore the possibility of private funding of these additional vehicles?

Of course, such initiatives cannot happen overnight. The initiatives may even have to come from the Government and Congress, if only to create the environment to make such initiatives possible. To date in the United States exactly the opposite seems to happen, if not in spirit certainly in fact.

This hesitancy and lack of initiative is in striking contrast with European moves in the area of space and space transportation. Whereas we hesitate, Europe is moving with a much smaller technological base forcefully to set up a private corporation, around Ariane, to take over production, marketing, and perhaps even launching of space transportation systems. I submit that the same opportunities exist with regard to the Space Shuttle system, whether these concern: (1) Funding of additional Space Shuttle orbiters; (2) the operation of the Space Shuttle system; (3) the marketing, domestic and worldwide, of the uses of the Space Shuttle system; and (4) efficiency improvemtns in STS operations.

All can come about with one overriding, important condition also met: The maintenance of the current Space Shuttle pricing policy principles as regards commercial, Government, and foreign users, as was just explained by John Yardley; that is, no subsidization

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from users should be asked for just to bring about private initiative. They should fit into a generally acceptable and generally applicable framework of costing.

Such ventures in private enterprise and space transportation will not be set up overnight, as I already mentioned, nor can they be undertaken without the active and positive cooperation of the U.S. Executive and Congress.

The total market for private initiatives and innovations certainly seems to be there. The total revenues expected in the 1980's for STS operations are about $10 billion over the currently planned horizon of 487 Space Shuttle flights.

Table 2 of my testimony projects the revenues as well as the associated costs and the surplus and deficits year by year, as well as the cumulative net budget of Space Shuttle operations. Over the planning horizon to 1992, revenues and costs are equal, to the extent that these can be estimated.

The annual deficit or surplus in Space Shuttle operations may, on the deficit side, be as high as $300 million in the early phase of Space Shuttle operations, and the cumulative deficit will peak maybe around 1983–84, to the extent of $600 million.

In total, after 12 years, all the costs of operations will be recovered through the current NASA pricing policy. To the year 2000 the total revenues may amount to as much as $21 billion, just for Space Shuttle operations, a sizable market that can be handled by private operations, semiprivate operations, certainly in a corporate form, within Government.

Mr. FUQUA. Why do you have the revenue dropping off after 1989?

Dr. HEISS. Because the model used here included only launches for the 12 years, and with the current NASA prepayment schedule, payments in the year of launch in fact will be very small. The payments needed for 1992 launch are made earlier. Similarly, you find revenues catching up long before the first launch of the first Space Shuttle. This projection I believe assumed an early 1980 first launch.

The key points of why certain corporate, semiprivate or private, operations of the Shuttle are important are:

1. ACCOUNTABILITY

Private initiatives and the risking of private funds can be critical proof of whether the improvements or additions to the Space Shuttle fleet indeed are warranted. If with private funding of the fifth Space Shuttle orbiter the investment funds, and return on that investment, can be recovered without changing current user charges to commercial and foreign users, combined with a simple quid pro quo arrangement with the Government, as to market responsibilities, understanding on operations and reimbursements of any cost to the Government, then indeed the question of whether the fifth or even sixth or seventh Space Shuttle orbiters are needed can be left to the market.

Despite the most extensive economic and accounting scrutiny of the Space Shuttle program over the past decades, and I was in-

volved in some of that, no study however well done can be a substitute for such a test and commitment. This proof can be had.

2. EFFECTIVE MARKETING OF COMMERCIAL AND FOREIGN USERS OF STS

With private funding of Space Shuttle orbiters, or private operations of the STS fleet, and these are two different questions, the function of marketing the use of that system to commercial and foreign users of space will find forceful, and efficient advocates in any such venture group. The movement by France and other European nations toward a private space corporation to market transportation services for their rocket systems was undertaken principally with the aim of setting up efficient marketing structures.

Given the multiplicity of user interests, their worldwide distribution, and the variety of space use, I cannot see any one existing U.S. Government agency to effectively fulfill all the marketing functions, in all areas of space transportation services, worldwide.

In addition, contracts signed by Government agencies have, in some context, less credibility than contracts signed by private entities. Private contracts are subject to all the rules of international trade law, as well as any domestic laws that pertain to such signed agreements. Backing up such contracts is the equity of that corportion and its good will. Contracts signed by Government in similar matters always are open to questions as to further budgetary commitments and agreements, changes in Government, changes in the managements of agencies, changes in program content decided by the Executive, by Congress, or both. Last but not least, there is no equity backing up contracts signed by the Government or Government agencies, nor can recourse be taken easily and efficiently in courts.

3. STS PRICING ADVANTAGES IN INTERNATIONAL COMPETITION

With other nations moving toward effective space transportation capabilities and direct interest in marketing those capabilities in competition against the United States, the United States has to set up effective means to meet that competition in marketing STS transportation services effectively against such challenges in international markets.

The crucial question concerning the STS is how additional space markets can be captured and brought about, either for entirely new uses of such systems or in competition with expendable systems. A private enterprise STS would have considerable pricing flexibility of Space Shuttle services ranging from value based pricing to average cost pricing to incremental cost pricing, and possibly intermediate levels. This is the most crucial attribute of Space Shuttle pricing policy, that expendable systems cannot match on economic grounds, and that Government operations of STS services are hindered in pursuing fully due to existing, intricate and sometimes contradictory Government rules and regulations.

This flexibility results from the peculiar cost structure of STS as against expendable systems, which is shown in figure 2 of my presentation.

In the fifth part of my testimony I deal with a related issue that underlies some of the doubts about private initiatives and private enterprise in space. I would like to leave with this committee just an idea. It is not worked out, but the idea of creating, possibly, a space bank.

Given all the claimed opportunities listed above and elsewhere, how is it that private industry and enterprise have not developed more forcefully to date in space matters? In addition to: (1) Extensive real or perceived Government regulations and rights; (2) the difficulty of pinpointing on who indeed can make decisions on behalf of the Government when private initiative in space develops in any particular area, such as Stereo-Sat; and (3) the early stage and high risk of space projects, a further key stumbling block for the full development of these opportunities is the weak capital base of U.S. aerospace industry. This clearly is the sector who has to propose and pursue opportunities outlined above. Yet, it is the very sector that historically has been all too dependent on Government programs—up to 70 percent—and Government regulations that come with such programs.

As a consequence, the capital base and the spirit of venture by private initiatives that characterized so strongly the early part of U.S. aerospace industry have been eroded in the past several decades.

While the aerospace industry is thought by some to be a capital-intensive industry, an examination of the typical aerospace firm in comparison to nine other sectors of U.S. industry reveals that by the mid-1970's aerospace ranked ninth, just ahead of the retail sector, in the amount of fixed capital used per dollar of sales. The results of an extensive analysis of data for over 500 firms for the years 1974 and 1975 are shown in table 3.

In the mid-1970's, aerospace industry had 15 cents of fixed capital invested for every dollar of sales, as compared to 99 cents in transportation, $2.17 in communications, $2.30 to $2.50 per dollar of sales in electric utilities. Conversely, aerospace ranked second behind the retail sector in fixed capital turnover. The typical aerospace firm's fixed capital was 2 times smaller than in the rubber industry, 6 times smaller than in transportation, and almost 15 times smaller than in the communications and utilities sector.

Similarly, in 1975 the aerospace sector ranked ninth in its ratio of fixed assets to net plant or to total assets, with 25 percent. Utility and communications sectors ranked first and second, both with almost 86 percent.

The question must be asked whether this is a natural phenomenon of the production process of the aerospace industry, where clearly large human capital expenditures in engineering research and development must be incurred, if high technology products and processes are to be used; or whether this low capital intensity of aerospace is due to Government procurement and tax regulations that make it nearly mandatory to minimize the use of real capital, particularly when doing business with government. For example, exclusion of the possibility to make up inadequate depreciation allowances through higher forward pricing principles in Government contracts.

The situation in space enterprise and the opportunities offered to the United States is not dissimilar to the type of projects typically funded by the World Bank in developing nations. While standards of accountability are strictly enforced by the World Bank, nevertheless long term, high risk, and relatively fair financing conditions have led by now to a record of success and achievement in the areas for which the World Bank was founded. Similarly, the formation of a space bank seems to have great merit, given the opportunities on the one side and the dire lack of capital in the industrial sector most affected by and most knowledgeable of these opportunities.

While the details of a space bank are not developed in this testimony, I would like to leave the idea with this committee for further exploration, even to the extent of offsetting some of the direct funding of space application programs through taxpayer dollars. Maybe some of that money could be channeled through this institution to industry.

That concludes my testimony.

Mr. FUQUA. Thank you very much. What guarantees by the Government do you think are necessary before private enterprise would assume some responsibility for financing and operating the space transportation system?

Dr. HEISS. The answer will differ depending on what initiative such a private venture would first tackle. If you talk about funding additional Space Shuttle orbiters, I think an understanding, rather than guarantee, would have to concern at what costs and how that fifth orbiter is turned over to the Government as part of the fleet, how much has to be reimbursed to the Government for launch services provided by the operator of the Shuttle, which in this case would not necessarily be the owner of the fifth Shuttle, what the marketing responsibilities would be, and where and how the risk comes in, and the chance to recover the revenue.

In the case of Space Shuttle operations, I think it is a question of seeing how well the Space Shuttle indeed will perform in operations. This will require a learning period of 4 to 5 years. I do not think there are any guarantees needed by the Government, if on the other side the venture also is allowed to make potentially adequate profits to offset the risks taken.

A second option would be to go the public utility route, where the private venture would risk the capital, and in return the Government would guarantee the rate of return through Shuttle prices. Within this broad range any one of a variety of steps can be taken—ranging from no guarantees down to guaranteeing a rate of return to the venture.

Let me parenthetically remark, I do not consider launches by a private entity for the Government and the Government paying for such launches to be a subsidization of a private corporation. It is an atrocious misuse of words that should be excluded from the semantics of these discussions. The Government should pay for what it gets as well as private people; they do so in communciations and in many other service areas, so why single out space transportation suddenly?

Mr. FUQUA. How would you determine what functions should be performed by the Government versus that performed by private enterprise?

Dr. HEISS. I would say it ought to be a stepwise approach, where single elements would be first tried. I think the Space Shuttle orbiter financing indeed is a big question. There are other components of the STS, such as an interim orbit transfer vehicle, improvements in the solid rocket booster systems, in the thermal protection system; these could also be undetaken by private venture rather than Government funding. Which one is feasible and which is not remains to be seen.

In the long run, I think that always—under any circumstances—national security matters are fully dealt with by the Department of Defense. That does not mean at all that the ownership of such systems or the operations can be privately performed. Some of the most sensitive national security issues are being performed by private industry, much more sensitive than space transportation, such as nuclear enrichment.

The transition to full private corporate operation, if that were desired, or Government corporate operations, which I think is mandatory, will gradually evolve in the next 2 or 3 years, as you have a combination of R. & D. functions, development functions, and initial operation functions of the Shuttle. Taking place simultaneously, one should not be dogmatic about this. The end point I think ought to be free private operations with no monopoly granted to anybody, either the Government or that entity, in international competition.

Let me tell you the other side of this coin: If this step were taken, the United States could insist by international trade law and trade agreements that other nations follow the same pricing policies; namely, you have to recover at least the costs of operations. These are serious issues, in areas like steel and textiles, where disagreement exists, but within very well-defined limits, with important, useful precedents for space transportation pricing.

Since the Shuttle promises to be so effective, as against expendable systems, the only way that in the 1980's and 1990's other systems can compete against the Shuttle is by direct subsidization, which if done privately would be a violation of international trade law. Others should be held to the same principles of accountability.

It is very difficult to hold others to such principles, if we do not set up the framework where we can prove that indeed we are following these rules. Under a Government organization it is not possible to do so credibly, I believe.

Mr. FUQUA. Thank you very much, Dr. Heiss. We may have some additional questions we will want to submit to you. We have a series of rollcalls starting now, so thank you very much for your very enlightening testimony.

Whereupon, at 12:20 p.m., the subcommittee adjourned.

[Additional questions and answers follow:]

SPACE SHUTTLE OPERATING PLANNING, POLICY AND LEGAL ISSUES

Dr. Klaus P. Heiss

ANSWERS TO QUESTIONS

Question 1: What do you believe are the major factors affecting private sector investment in space projects?

The positive factors would include the following:

(1) The increased potential for innovation, hence profit, in communications, observations and possibly energy. The "information" sector of the economy is large and expanding, both domestic and worldwide.

(2) Increased reliability of space operations. With reusable space transportation systems total mission reliability may increase from currently 80 to 95 percent to 98 percent and better, an absolute requirement before large systems investments are made for main line commercial operations, rather than subsidiary roles and functions as is the case today.

(3) A stable and expanding space transportation market once Space Shuttle is proven in operations.

(4) Increasing role of military uses of space in areas of national security.

(5) Worldwide market potential with U.S. lead role.

October 4, 1979

The major negative factors would include the following:

(1) The lack of any defined space goals, or space programs, for the 1980s.

(2) The assumption by industry, and the presumption by some government officials that government has a "natural" monopoly in space transportation and in most (all) space applications.

(3) The lack of one decision maker in government when private ventures in space are considered. The "lines of command" go all over government--and Congress.

(4) The weak capital base of aerospace industry.

(5) Government regulations and policy--real or perceived--in key space applications areas such as communications and observations.

(6) Lack of initiative by government and Congress to make private ventures the policy rather than the exception in space activities.

(7) Undue allowance for concerns by other nations that are not used to--or fear the speed and efficiency of free enterprise in world markets. This advantage of the U.S. economic system should be used to the fullest, rather than hindered.

Question 2: If private sector were to assume the responsibility for funding and operating certain aspects of the national space effort, how would research and development be funded and who would be responsible for determining what R&D should be undertaken?

R&D should be, as is now the case, be funded through NASA in consultation with other government agencies, industry, and perceived public needs. R&D should be funded as is now the case and the decision process on determining what R&D should be undertaken again should follow present patterns and procedures. The private enterprise should be free to innovate and improve efficiency of operations. It would however be a mistake to assign also the role of innovation in space transportation to such a private entity. This proved to be somewhat of a mistake in the ComSat initiative--with a reduced and finally negligible role in government in space communications R&D. This mistake should not be repeated.

Question 3: Is the major rationale for private sector assuming responsibility for space systems that private enterprise can operate more efficiently or that certain tax benefits can accrue to private enterprise?

Question 3: continued

Since tax benefits can be a significant motivation to the private sector, why should lost tax revenues not be considered a cost to the government?

Efficiency of operations is but one aspect, and not necessarily the most important one. The major reasons for private sector (or at least government corporate) organization of space operations are:

(1) Economic accountability of program.

(2) Goal (mission, user) orientation of programs, where in government such programs often become but titles for a self perpetuating community of program offices with little or no user orientation.

(3) Marketing orientation of private operations, to raise necessary revenues from users, domestic and worldwide to continue the venture.

(4) Quick decision capability on new opportunities.

(5) Continuity and credibility of enterprise.

As to the second part of the question, tax considerations should play no role--for or against--in the decision on institutional choices for such programs inside or outside government. The issue should be decided based on the substantive merits of the case and not by distortions and misconceptions--introduced by tax issues, or other issues. This is the major fault of NAPA study when rejecting the feasibility of private shuttle operations.

Question 4: What governmental guarantees do you believe are necessary before private enterprises would assume responsibility for financing and operating space systems?

This question is covered in the testimony. To repeat, the form of guarantees needed will strictly depend on how the venture is set up to proceed--with no guarantees and unlimited profit (loss) potential of the venture to guarantees of loans, capital contributions and markets combined with a regulation of profits to "fair" rates of return on the capital invested.

Question 5: What criteria do you believe can be used for determining when functions performed by government should be franchises to private enterprise?

In general the burden of proof should be under government when taking on functions (services): if no imminent reason for government operations exist such operations (services) should be left to the market. Limiting my answer

to issues relating to space activities one might add to this general statement the following:

(1) Whenever private enterprise credibly proposes to fulfill the same functions and services--irrespective of tax and possibly other fictitious accounting considerations, often used to favor government operation roles over private ones.

(2) Any and all functions that do not infringe negatively and imminently on national defense; in the latter case, often private performance under strict national security regulations will be found preferable to government operations.

(3) Any function after "Phase B" demonstration of technology capability.

(4) Projects that are well defined technically and have an assured market in government and/or the economy at large. Examples of the past are the TDRSS system, the SSUS development, the proposed StereoSat venture. Examples in the future are included in my testimony.

The following are also a list of criteria not to be used when deciding such issues:

(1) scale or size of investment needed.

(2) historical precedent of government involvement.

(3) reasoning by "statute or regulation": these can be changed if the case warrants it.

Question 6: What opportunities are the Europeans providing to private enterprise with the Ariane launch vehicle?

Europe is setting up a corporation to produce, market and possibly launch Ariane vehicles. To my understanding the incentives provided, in addition to this far-sighted step, include the following: write-off of all R&D and technology development expenditures; provision of facilities and sunk investment at no cost; full active government cooperation and support in making the venture a success rather than a spirit of confrontation and opposition; delegation of full responsibilities with minimum government supervision; or regulation; lack of concern over "excess profits" or "unfair" use of government developed products and know-how; ready access to credit and capital markets with initial government guarantees.

Question 7: What advantages do you see to the nation for outright membership of space systems by private enterprise as compared to contract operations where the contractor can be on incentive fee?

This question is covered in part in my testimony. To repeat, the key advantages to outright ownership as against contracting for services under incentive fee certainly include the following:

(1) Accountability of program

(2) Marketing of STS services nationally and worldwide.

(3) Flexibility in pricing of STS services.

In addition I would also suggest the following considerations: separating out operations functions from NASA, and for that matter the government, would let NASA concentrate on its R&D and technology role in space, rather than have it bogged down in operational issues in a "constant budget" environment. Furthermore in principle, anything that can be done without government involvement should be done without government involvement; for Space Shuttle operations this clearly will be the case in the mid 1980s. Finally, such outright ownership by private enterprise would be a key demonstration of the viability of the space program, of space transportation and also of space applications in the market; today the perception in the public's mind is still widespread that space without government subsidization is not viable--hence a waste of taxpayer's funds. Nothing, I believe, could be further from the truth; nevertheless this perception will be perpetuated with perpetual government involvement.

In conclusion let me observe that it is always difficult to let go of things that one created, at great expense, over such a long time. Nevertheless the ability to finally separate out these activities and spin them off into the market and the uncertainty as well as the potential of the marketplace in some sense is the ultimate proof that space is here to stay as a viable component of the United States as well as worldwide economy. The Space Shuttle system offers the United States an opportunity to prove this viability. This chance should not be lost.

SPACE SHUTTLE OPERATIONAL PLANNING, POLICY AND LEGAL ISSUES

WEDNESDAY, SEPTEMBER 26, 1979

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND TECHNOLOGY,
SUBCOMMITTEE ON SPACE SCIENCE AND APPLICATIONS,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10:10 a.m., in room 2325, Rayburn House Office Building, Hon. Don Fuqua (chairman of the subcommittee) presiding.

Mr. FUQUA. We continue this morning the hearings on the Space Shuttle operations, planning, policy, and legal issues.

The main focus today will be on the policy and legal aspects of the Space Shuttle operations. The three witnesses before the subcommittee today are highly qualified attorneys, and they have extensive experience in matters relating with space and space applications.

Our first witness is Mr. S. Neil Hosenball, General Counsel, National Aeronautics and Space Administration. The second witness will be Mr. William D. English, vice president of legal and government affairs, Satellite Business Systems. Mr. English is formerly vice president and general counsel for Comsat General Corp. The third witness will be Mr. Paul G. Dembling, who is with a law firm here in Washington. He teaches law at George Washington University, formerly associated with NASA in the General Accounting Office.

Mr. Dembling also worked in the drafting of the bill that chartered the National Aeronautics and Space Administrtion in 1958.

We are very happy to have you here this morning, Neil, and your sidekick there. You may proceed.

[The prepared statement of Mr. Hosenball follows:]

STATEMENT OF

S. Neil Hosenball
General Counsel
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Before

Subcommittee on Space Science and Applications
Committee on Science and Technology
UNITED STATES HOUSE OF REPRESENTATIVES

Mr. Chairman and Members of the Subcommittee:

I appreciate this opportunity to appear before the Subcommittee to report to you on legal issues relating to the Space Transportation System (STS) being developed by the National Aeronautics and Space Administration.

The development and operation by NASA of the Space Transportation System, with its key element, the Space Shuttle, have many legal implications. Some of the legal issues we face are new ones. This is largely because the Space Shuttle era in U.S. space flight will bring about significant changes, one of which is that for the first time individuals other than astronauts employed by the U.S. Government will participate on manned space flights. Payload specialists who will include scientists employed by universities or foreign governments will fly on the Space Shuttle. And, recently, NASA established general guidelines for the participation of foreign astronauts in missions in which their countries have substantial involvement. The implication of all of this is that we must establish jurisdiction and command control over these individuals.

Many of the legal issues inherent in the operation of the Space Shuttle are familiar ones that we confronted in our earlier space programs. Yet, because of the relatively limited number of manned flights in the past, there was no real need to develop formal regulations in many of these areas, particularly since we were dealing with basically an internal NASA program. However, we are now making the transition to a space program that involves and affects other countries and organizations and people outside of NASA. It is for this reason that we find ourselves becoming more formal. We have resolved many of the legal issues, and in doing so, we have issued and are implementing agency regulations. Where necessary, we will be seeking legislation, as we did recently on third-party liability.

My office has the responsibility of identifying legal issues that require resolution in order to prepare for the operation of the Space Shuttle. At my request, the Deputy General Counsel, Mr. Gerald J. Mossinghoff, addressed a number of legal issues inherent in Shuttle operations and reported in a memorandum to me dated August 18, 1977, a copy of which is attached to my statement (Appendix A). Following is a summary of his conclusions on ten of the significant legal issues:

1. Does NASA have authority to operate the Space Transportation System (STS) on a "routine" basis?

The National Aeronautics and Space Act of 1958 (NASA Act) provides adequate statutory authority for NASA to operate the STS on a "routine" basis.

2. Will the STS be a "common carrier"?

The Space Transportation System will not be a "common carrier" because it is not so authorized by Federal statute and because it would conflict with international commitments already entered into by the Federal Government.

3. How is the President's Launch Policy of 1972 related to the selection of missions and payloads for the STS?

Although only expendable boosters were in use at the time the Launch Policy was announced, there is nothing contained in the terms of the policy which would make it inapplicable to the STS, which was being planned when the Launch Policy was announced. In fact, the STS will provide the means for more launch assistance to other countries and international organizations, and hence, will most likely cause a greater use of the Launch Policy. Further, in relation to issue number 2 above, the Launch Policy neither expresses nor implies common carrier status for NASA.

4. What will be the status of the Space Shuttle under the Federal Aviation Act of 1958?

As supported by a March 11, 1977, opinion of the Chief Counsel of the Federal Aviation Administration, the Space Shuttle is not an aircraft within the meaning of the Federal Aviation Act of 1958.

5. What authority will the Shuttle Commander have to enforce order and discipline during Space Shuttle missions?

The Shuttle Commander will have full authority to enforce order and discipline during all phases of any STS mission. This authority extends to any and all persons onboard the Shuttle, including Federal officers and employees and all other persons whether or not they are U.S. nationals. It extends to Spacelab and to personnel engaged in Extravehicular Activity (EVA). Finally, it includes use of physical force if reasonable and necessary under the circumstances without incurring either criminal or civil liability. The NASA Administrator, under existing authority in the NASA Act, can promulgate regulations effective upon publication in the Federal Register, specifying the parameters of the Shuttle Commander's authority.

6. What authority does NASA have to establish medical standards and training requirements for persons flying aboard the Shuttle?

Under the NASA Act, medical, training or similar standards may be established by NASA for payload specialists and other persons flying onboard the Shuttle, including foreign astronauts.

7. What authority does NASA have to control artifacts and mementos brought aboard the Shuttle or found in space by Shuttle personnel?

NASA's basic authority in Section 203(c)(1) of the NASA Act (42 U.S.C. 2473(c)(1)) extends to the establishment of policy, procedures, and responsibilities governing the selection, approval, packing, storage, post-flight disposition and public announcement of articles authorized to be carried on Shuttle flights. Such requirements may be extended to foreign nationals. Enforcement of any policy regarding post-flight disposition by foreign nationals would have to be addressed on a case-by-case basis.

8. What authority exists for the clearing of and/or the warning for Solid Rocket Booster (SRB), External Tank (ET) and sonic boom impact areas on the high seas?

Since the areas under consideration are within the international legal regime of the high seas, the United States cannot legally exclude any vessels or aircraft from these areas except vessels or aircraft of United States nationality. To follow the accepted warning practice for Shuttle operations would not present any new questions of international law. Specific aspects of the impact area designation and warning procedure can be formulated and announced as the first Shuttle orbital flight tests draw nearer.

9. Will an ocean dumping permit be required for the SRB and ET procedures on the high seas?

An ocean dumping permit will not be required to conduct the SRB and ET procedures.

10. Will the United States Federal criminal laws apply to acts during STS space missions?

The current criminal jurisdiction of the United States may not be adequate to cover criminal offenses which may occur during STS space missions.

As Mr. Mossinghoff points out in his memorandum, some other legal issues were addressed separately, specifically, the question of liability and insurance or indemnification, the procedures for selection of payload specialists, and patent and data policies applicable to activities conducted in connection with Shuttle flights on a reimbursable basis.

With regard to the liability and insurance or indemnification issue, we concluded last year that special legislative authority was necessary to assure an orderly and equitable allocation of third-party risks among Shuttle users. Accordingly, as part of our FY 1980 authorization bill, NASA requested an amendment to the National Aeronautics and Space Act. That request was acted favorably upon by the Congress, as you know, and section 6 of Public Law 96-48, NASA's 1980 Authorization Act, enacted August 8, 1979, amends the NASA Act to include a new section 308 authorizing NASA to provide liability insurance and/or indemnification for any user of a space vehicle to compensate claims by third parties for damages resulting from operation of a space vehicle. For the Subcommittee's convenience, I have attached to my statement a copy of this provision (Appendix B).

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Through a notice in the Federal Register, we are requesting comments from all interested persons on how to implement the new authority. At the same time, we are negotiating specific provisions in our launch services agreements with early users of the Space Shuttle to implement the authority. Our objective in these negotiations is to have the user obtain insurance covering itself and the U.S. Government for an amount adequate to protect against any foreseeable "worst-case" accidents. That amount is now projected to be $500 million. In return for that coverage of the Government, NASA will use the new authority to indemnify the user for any possible liability above that amount. We believe our negotiations with our early users will provide us with "real world" experience to complement the comments we will receive as a result of our Federal Register notice.

At this point, I would draw a distinction between what we refer to as "third-party" liability--which involves potential liability for damage to property or injury to persons not involved in the Shuttle use--and "interparty liability"--that is, potential property damage and bodily injury to those flying aboard the Shuttle. With respect to "interparty" liability, we have adopted a no-fault approach where each party is responsible for insuring (or self-insuring) its own property or employees. Thus, if a user damages the Shuttle in some way, we agree not to press a claim or sue the user. Similarly, if NASA or a user were to damage another user's payload, the "damaged" user would not sue NASA or the other user.

In the area of rights to patents and data resulting from reimbursable launches, we have established a policy which is reflected in our formal regulations, that NASA will not acquire rights to inventions, patents or proprietary data privately funded by a Shuttle user or arising out of activities for which a user has reimbursed NASA under our reimbursable policies. However, where the Administrator determines in advance that activities may have a significant impact on the public health, safety or welfare, NASA may obtain assurances from the user that the results of the user's activities will be made available to the public on terms and conditions reasonable under the circumstances.

With respect to joint endeavors undertaken with private concerns, for example, under the Guidelines Regarding Joint Endeavors With U.S. Domestic Concerns in Materials Processing in Space (Appendix C), we have determined that such endeavors are not subject to NASA's statutory patent policies under section 305 of the NASA Act. Attached to my statement

(Appendix D) is a memorandum from the NASA Assistant General Counsel for Patent Matters which sets forth in detail the bases for that conclusion. This means that NASA will be able to tailor patent and data provisions with such private concerns to suit the individual circumstances of the joint endeavor.

I would like to discuss one of the issues addressed in the Deputy General Counsel's memorandum that continues to present a problem, i.e., the applicability of Federal criminal laws to STS missions. The current criminal jurisdiction of the United States may not be adequate to cover criminal offenses which may occur on the Shuttle while in space. The problem involves offenses by civilians. With respect to military personnel detailed to NASA, the Uniform Code of Military Justice will be applicable and provides sufficient jurisdiction. As for criminal offenses committed by civilians while onboard the Shuttle, the status of existing Federal law is such that there is no clear U.S. jurisdiction over criminal acts committed on a space vehicle. Because of this, we have been watching with considerable interest the progress of legislative initiatives in the Congress to reform the Federal criminal code. The Senate bill (S. 1722, 96th Congress, 1st Session; and its predecessors, S. 1497, 95th Congress, 1st Session, which passed the Senate January 30, 1978; and S. 1, 94th Congress, 1st Session) would establish clear U.S. jurisdiction over offenses committed by civilians on Shuttle missions by extending extraterritorial jurisdiction to space vehicles. The Subcommittee on Criminal Justice of the House Committee on the Judiciary recently made available a draft bill that it is holding hearings on this month. It appears that criminal code reform which may resolve the jurisdiction problem, could possibly be enacted in 1980, although its effective date will probably be 2 to 3 years after enactment. We would be satisfied as long as the U.S. jurisdiction over offenses committed in space is clarified in law before individuals other than astronauts employed by the U.S. Government fly on the Shuttle. If it appears that the criminal code reform legislation will not accomplish this in time, NASA will probably seek separate legislation to accomplish the necessary jurisdiction.

To date we have issued many regulations necessary to the operation of the Space Transportation System. We currently are working on others. Because of the level of interest in this area, most of our regulations have been or will be published in the Federal Register, to be included in NASA's portion of the Code of Federal Regulations, Title 14, Chapter V. For the convenience of the Subcommittee, I have attached (Appendix E)

to my prepared statement a list of these regulations, grouped according to whether they are now in effect, published as proposed rules, or still in the internal drafting stage. Also, attached (Appendices F through N) is a copy of the full text of each regulation published to date.

Regulations already in effect include our reimbursement policies for the Shuttle services (Appendices F and G). These include the patent and data policies applicable to activities conducted in connection with Shuttle flights on a reimbursable basis. We published a final regulation last year on selection procedures for payload specialists for NASA and NASA-related payloads (Appendix H). In an area of considerable interest within NASA as well as in Congress, we published in October 1978, final regulations governing the carrying of personal articles on Shuttle flights by the crew as well as any other individuals who participate on a flight (Appendix J). This regulation restricts the number and kind of things that may be carried in what we call the "personal preference kit" and specifies procedures that will enable us to control this practice. We also have added teeth to our ability to enforce these restrictions. The Department of Justice recently advised my office that it believes these new regulations will provide sufficient legal basis for enforcement of the prohibition on commercialization of personal items flown on the Shuttle.

On another subject, on July 6, 1979, we published final regulations on a personal reliability program for individuals who perform duties in connection with the STS (Appendix I). These provide criteria and procedures for assuring the highest standards of reliability in personnel assigned to mission-critical positions. They are part of an overall program to assure the protection of the Space Transportation System by providing special physical security measures, safety precautions, as well as operational standards for mission-critical positions.

On June 20, 1979, we published a final regulation on our astronaut recruitment and selection program (Appendix K). Because we will have a continuing need for new astronauts as the Shuttle becomes fully operational, we have set up a program with an annual announcement and application period after which "registers" or lists of candidates will be established. These annual registers will provide a basis to make final selections as vacancies occur.

Currently, we have three regulations that have been published recently as proposed rules with public comment invited. Based on our earlier conclusion that the NASA Act provides

sufficient legal basis to establish the authority of the STS Commander over all persons on a flight, our proposed regulation on such authority was published August 22, 1979 (Appendix L). The public was given until October 22, to comment on the proposed regulation. The other two proposed regulations concern the procurement of Spinning Solid Upper Stages (Appendix M) and the transition from the Delta launch vehicle to the STS (Appendix N). Both will be published in final form after considering any public comments we receive.

We are now drafting regulations on selection of payload specialists for non-NASA payloads to complement the existing regulation covering NASA payloads. Also, we are drafting our reimbursement policies for Spacelab services and small self-contained payloads, and are in the process of amending our existing reimbursement policies, as Mr. Yardley has mentioned.

Mr. Chairman, this concludes my detailed statement. I would be pleased to provide any additional information you may want or answer any questions you may have.

APPENDICES

A. Memorandum dated August 18, 1977, from the Deputy General Counsel to the General Counsel, NASA, Subject: "Legal Issues Inherent in Space Shuttle Operations."

B. Section 6 of Public Law 96-48, August 8, 1979.

C. Guidelines Regarding Joint Endeavors with U.S. Domestic Concerns in Materials Processing in Space, 44 FR 47650, August 14, 1979.

D. Memorandum dated June 19, 1979 from the Assistant General Counsel for Patent Matters to the General Counsel, NASA, Subject: Applicability of Section 305 of the Space Act to Joint Endeavors

E. Summary of Status of NASA Regulations Relating to Operation of the STS

F. 14 CFR Subpart 1214.1, "Reimbursement for Shuttle Services Provided to Non-U.S. Government Users." (1979 ed., CFR)

G. 14 CFR Subpart 1214.2, "Reimbursement for Shuttle Services Provided to Civil U.S. Government Users and Foreign Users Who Have Made Substantial Investment in the STS Program." (1979 ed., CFR)

H. 14 CFR Subpart 1214.3, "Payload Specialists for NASA or NASA-Related Payloads." (1979 ed., CFR)

I. 14 CFR Subpart 1214.5, "Space Transportation System Personnel Reliability Program" (44 FR 39384, July 6, 1979).

J. 14 CFR Subpart 1214.6, "Articles Authorized to be Carried on Space Transportation System Flights" (1979 ed., CFR)

K. 14 CFR Subpart 1214.11, "NASA Astronaut Candidate Recruitment and Selection Program," (44 FR 36024, June 20, 1979).

L. Notice of Proposed Rulemaking, 14 CFR Subpart 1214.7, "Authority of the Space Transportation System (STS) Commander" (44 FR 49274, August 22, 1979).

M. Notice of Proposed Rulemaking, 14 CFR Subpart 1214.10, "Procurement of Spinning Solid Upper Stages" (44 FR 5085, August 30, 1979).

N. Notice of Proposed Rulemaking, 14 CFR Subpart 1214.20, "Delta Launch Vehicle Class: Transition to the Space Transportation System" (44 FR 37511, June 27, 1979).

APPENDIX A

NASA
National Aeronautics and
Space Administration
Washington, D.C.
20546

Reply to Attn of G

August 18, 1977

MEMORANDUM

TO: G/General Counsel

FROM: G/Deputy General Counsel

SUBJECT: Legal Issues Inherent in Space Shuttle Operations

This responds to your request that I address the legal issues which are inherent in NASA's proceeding into the day-to-day operations of the Space Shuttle and other elements of the overall Space Transportation System. At the outset I wish to acknowledge the indispensable assistance of Mr. George Paul Sloup, who performed much of the research on which my conclusions are based.

In this memorandum I will discuss at some length ten of the more significant issues we considered. The order in which the issues are presented does not reflect a judgment on my part of their relative significance. Based on the work Mr. Sloup and I have done, we have reached the conclusion that there is no immediate need for substantive amendments to the National Aeronautics and Space Act of 1958. I propose that we review that conclusion again at the time of the submission of NASA's FY 1979 legislative program, in the light of our experience at that time.

1. Does NASA have authority to operate the Space Transportation System (STS) on a "routine" basis?

The National Aeronautics and Space Act of 1958 1/ (hereinafter NASAct) provides adequate statutory authority for NASA to operate the STS on a "routine" basis.

The purpose of the NASAct as expressed in section 102(d) is "to carry out and effectuate" the policies stated in section 102, among which are:

> "(1) The expansion of human knowledge of phenomena in the atmosphere and space;
>
> "(2) The improvement of the usefulness, performance, speed, safety, and efficiency of aeronautical and space vehicles;
>
> "(3) The development and operation of vehicles capable of carrying instruments, equipment, supplies, and living organisms through space;
>
> "(4) The establishment of long-range studies of the potential benefits to be gained from, the opportunities for, and the problems involved in the utilization of aeronautical and space activities for peaceful and scientific purposes;
>
> "(5) The preservation of the role of the United States as a leader in aeronautical and space science and technology and in the application thereof to the conduct of peaceful activities within and outside the atmosphere;
>
> * * *
>
> "(7) Cooperation by the United States with other nations and groups of nations in work done pursuant to this Act and in the peaceful application of the results thereof; and
>
> "(8) The most effective utilization of the scientific and engineering resources of the United States, with

close cooperation among all interested agencies of the United States in order to avoid unnecessary duplication of effort, facilities, and equipment."

Section 203(a) of the NASAct provides that NASA, "in order to carry out the purpose of this Act, shall--

"(1) plan, direct, and conduct aeronautical and space activities;

"(2) arrange for participation by the scientific community in planning scientific measurements and observations to be made through use of aeronautical and space vehicles, and conduct or arrange for the conduct of such measurements and observations; and

"(3) provide for the widest practicable and appropriate dissemination of information concerning its activities and the results thereof."

The term "aeronautical and space activities" is defined in section 103(1) as "(A) research into, and the solution of problems of flight within and outside the earth's atmosphere, (B) the development, construction, testing, and operation for research purposes of aeronautical and space vehicles, and (C) such other activities as may be required for the exploration of space." 2/ Section 103(2) defines "aeronautical and space vehicles" as "aircraft, missiles, satellites, and other space vehicles, manned and unmanned, together with related equipment, devices, components, and parts."

In the legislative history of the NASAct, the following was set forth to explain the scope of the term "activities" in the phrase "aeronautical and space activities" in Section 103:

"This section, which defines 'aeronautical and space activities' and 'aeronautical and space vehicles,' embodies the substance of both the House and Senate versions but does so in a way which will ensure that these expressions can be used throughout the act without further question as to their meaning, inclusions, or exclusions.

"The purpose is to make clear that the act is concerned primarily with research, development, and exploration. The use of the word 'activities' is intended to be broad in the area of outer space because no one can predict with certainty what future requirements may be.

"It is not the intention of Congress, however, to construe activities so broadly as to include such things as the operation of commercial airlines, the control of air traffic, the fixing of airworthiness standards, the setting of air fares, or the assigning of certificates of public convenience and necessity. Whether, in time, the new Administration will run a regular transport route to another planet or to the moon is not a matter of current concern. But the term 'activities' should be construed broadly enough to enable the Administration and the Department of Defense, in their respective fields, to carry on a wide spectrum of activities which relate to the successful use of outer space. These activities would include scientific discovery and research not directly related to travel in outer space but utilizing outer space, and the development of resources which may be discovered in outer space." (emphasis supplied) 2/

Thus, while NASA was not intended to be a regulatory agency like the Federal Aviation Administration (FAA) or the Civil Aeronautics Board (CAB), or to be a government-owned commercial transport service such as most non-U.S. flag international airlines (e.g., Air France, Lufthansa, Aeroflot, etc.), there can be no question that the providing of space launch and associated services related not only to the exploration but also to the utilization of outer space for purposes beneficial to humanity was contemplated by the drafters of the NASAct. The reusable Space Transportation System will simply be a more economical, efficient, and versatile way of doing what NASA has been doing for nearly two decades under the authority of the NASAct of 1958.

NASA is authorized to establish and charge fees for launch and associated services and to establish service standards under section 203(c) of the NASAct: "In the performance of its functions the Administration is authorized--

"(1) to make, promulgate, issue, rescind, and amend rules and regulations governing the manner of its operations and the exercise of the powers vested in it by law;

* * *

"(5) . . .to enter into and perform such contracts, leases, cooperative agreements, or other transactions as may be necessary in the conduct of its work and on such terms as it may deem appropriate, with any agency or instrumentality of the United States, or with any State, Territory, or possession, or with any political subdivision thereof, or with any person, firm, association, corporation or educational institution . . .

"(6) to use, with their consent, the services, equipment, personnel, and facilities of Federal and other agencies with or without reimbursement, and on a similar basis to cooperate with other public and private agencies and instrumentalities in the use of services, equipment, and facilities. Each department and agency of the Federal Government shall cooperate fully with the Administration in making its services, equipment, personnel, and facilities available to the Administration, and any such department or agency is authorized, notwithstanding any other provision of law, to transfer to or to receive from the Administration, without reimbursement, aeronautical and space vehicles, and supplies and equipment other than administrative supplies or equipment;" 3/

Finally, the Communications Satellite Act of 1962 (hereinafter the "Comsat Act") provides that NASA "shall--

"(3) assist the corporation [the Communications Satellite Corporation-Comsat] in the conduct of its research and development program by furnishing to the corporation, when requested, on a reimbursable basis, such satellite launching and associated services as the Administration [NASA] deems necessary for the most expeditious and economical development of the communications satellite system;

* * *

> "(5) furnish to the corporation, on request and on a reimbursable basis, satellite launching and associated services required for the establishment, operation, and maintenance of the communications satellite system approved by the Commission [the Federal Communications Commission-FCC];" 4/

The transition from expendable launch vehicles to the Space Transportation System will have no effect upon this statutory authority or responsibility. NASA will continue to have the necessary authority to develop and operate the STS routinely not only for launching its own payloads, but also for launching payloads of other U.S. Government agencies and departments, and for non-U.S. Government users, including users of foreign nationality and international organizations.

NASA has provided launch services on both a cooperative and a reimbursable basis for most of its nearly two-decade history. Many of the reimbursable launches have been among the most important in terms of the use or utilization (as opposed to the exploration) of outer space. On July 10, 1962, Telstar 1 was launched for the American Telephone and Telegraph Company (AT&T) from the Eastern Test Range (ETR) by an expendable Delta launch vehicle; it was the first satellite owned by a private concern. Telstar 2 was launched on May 7 the following year, also from the ETR by a Delta booster. On June 28, 1965, commercial telecommunications satellite service was begun, following the launch on April 6 of that year of Intelsat I, or "Early Bird," for the Communications Satellite Corporation (Comsat), operating as the manager of the global Intelsat system. 5/ Since that time there have been 22 more launches of Comsat/Intelsat communications satellites,6/ plus six communications satellites for domestic United States service and three for maritime service. 7/

Throughout this time NASA has also provided reimbursable launch services to other U.S. Government agencies, such as the Department of Defense, the former Environmental Satellite Services Administration (ESSA), and the National Oceanic and Atmospheric Administration (NOAA). Also, launch services on either a cooperative or a reimbursable basis have been provided to foreign countries and to international organizations.

In recent years the reimbursable launches have begun to outnumber NASA's own launches (including NASA's cooperative launches with other countries or international organizations). In 1975, for example, there were 8 reimbursable launches out of a total of 19; in 1976 there were 12 out of 16. 8/ In 1977 NASA expects to launch 17 out of 23 payloads on a reimbursable basis. 9/

All of NASA's activities, of course, are subject to the Congressional authorization and appropriation process, and Congress has each year specifically approved funds for NASA's launch activities, whether for NASA's own payloads or the payloads of other users, and whether such launches were done on a cooperative or a reimbursable basis. The reimbursable part of NASA's annual program is specifically delineated in the NASA budget and separated from the "direct" part (i.e., that part which is funded by NASA's own appropriations). 10/

The conclusion that NASA's authority under the NASAct is broad enough to cover both cooperative and reimbursable launch and related services is therefore reinforced by the annual Congressional approval of funding for such activities. It is a principle of statutory construction that while legislative acquiescence or inaction following a contemporaneous and practical interpretation of a particular statute may be some evidence that the legislature agrees with such an interpretation, positive action taken by the legislature based upon the interpretation is much more likely to be regarded as presumptive evidence of the correctness. 11/ Furthermore, when such positive action takes the form of continuing annual appropriations based upon the interpretation in question, the probative force likewise increases, even in view of objections to the contrary. 12/ Since the early 1960's Congress has been fully aware of NASA's interpretation of the NASAct as providing sufficient authority for NASA to launch non-NASA payloads on a cooperative or reimbursable basis; the resulting launch activities have been highly visible to the public and have taken place with full Congressional knowledge. Congress' continuing support of those activities through annual appropriations, therefore, has high probative value in establishing the correctness of NASA's interpretation of the NASAct in regard to such activities. Finally, since the

STS will be used to launch all such non-NASA payloads in the future, the annual appropriations for the STS 13/, the purpose of which is and has been well-known to Congress, have high probative value in establishing Congress' agreement with NASA's interpretation of the NASAct as providing adequate statutory authority to operate the STS on a routine basis.

Finally, NASA's authority to provide launch services on a reimbursable basis to others under the NASAct has been recognized by the Department of Justice. 14/

2. Will the STS be a "common carrier"?

The Space Transportation System will not be a "common carrier" because it is not so authorized by Federal statute and because it would conflict with international commitments already entered into by the Federal Government.

The NASAct, while providing NASA with authority sufficient to operate the STS on a "routine" basis, does not go so far as to give NASA authority to operate the STS, or any of the NASA expendable launch vehicle systems, as a common carrier. The legislative history of the NASAct makes this conclusion quite clear. Moreover, the Comsat Act does not in any way make NASA a common carrier. While the Comsat Act does create in section 201(b) a duty of NASA to provide "satellite launching and associated services" to Comsat, this duty relates only to Comsat and not to the General public; a common carrier, on the other hand, is one which holds itself out to the public as engaged in a certain type of transportation or other service which is available to the general public for compensation. 15/ Also, although NASA does receive reimbursement for the costs of providing these launch services, this compensation is not intended to result in a profit for NASA. Lastly, there is no law which compels NASA to provide launch and related services for all who would apply. 16/

NASA is not an "air carrier" under the Federal Aviation Act of 1958 17/ (hereinafter FAAct). First of all, the Shuttle is not an "aircraft" under the FAAct (see Issue 4 below), but even if it were, NASA would not be an "air carrier"

engaging in "air transportation" and thus subject to economic regulation under Title IV of the FAAct ("Air Carrier Economic Regulation"). 18/

That there is no United States statutory law which makes NASA a common carrier or would even allow NASA to operate the STS as a common carrier is consistent with the traditional Governmental role as a regulator of non-U.S. Government entities which are common carriers. 19/ Of course, the U.S. Government has in the past created common carriers, but such entities are specifically not parts of the U.S. Government and are created by statutory authority expressly stating that the newly created entities are to be common carriers. 20/

Some attention should be given at this point as to why NASA should not operate the STS as a common carrier, since it would be possible theoretically to amend the NASAct to provide NASA with such authority and responsibility. The United States has made several international commitments which conflict with the concept that common carriers must not discriminate among customers in offering and providing services, but must serve all members of the public equally. These include the Spacelab Agreement 21/ with the European Space Agency (ESA) and the 1967 Outer Space Treaty 22/, neither of which would allow the United States to operate the STS as a common carrier. [The 1972 President's Launch Policy applicable to foreign countries and international organizations, and why that policy does not express or imply that NASA is a common carrier are discussed in detail in Issue No. 3, infra.]

The Spacelab Agreement, for example, provides in Article 7(A) that the United States "shall, consistent with international agreements and arrangements, make the Space Shuttle available for SL (Spacelab) missions (experiments and applications) of the European Partners and their nationals on either a co-operative or cost-reimbursable basis." Article 7(B) establishes in the following terms that the ESA countries involved in the Spacelab program with NASA shall be given preferential consideration for use of Spacelab:

> "In regard to space missions of the European Partners, the Government of the United States of America shall provide access for use of SLs developed under this cooperative programme for experiments or applications proposed for reimbursable flight by the European Partners, in preference to those of third countries considering, in recognition of the participation of the European Partners in this cooperative programme, that this will be equitable in the event of payload limitation or scheduling conflicts. Experiments or applications proposed for cooperative flight will be selected on the basis of the merit of each proposal in accordance with continuing United States policy; such proposals of the European Partners will be given preference over the proposals of third countries provided their merit is at least equal to the merit of the proposals of third countries. The European Partners will have an opportunity to express their views with respect to the judgement of merit regarding their cooperative proposals." (emphasis added)

Lastly of interest at this point, Article 7(F) states that the United States will provide Spacelab flight crew opportunities to nationals of the ESA countries involved in the Spacelab program with NASA in connection with their space missions involving a Spacelab. Also, "it is contemplated that a European crew member will be included in the flight crew" of the first Spacelab flight. The United States has no such commitment to any other countries. 23/

The Outer Space Treaty provides in the first sentence of Article VI that states parties:

> "shall bear international responsibility for national activities in outer space . . .whether such activities are carried on by governmental agencies or by non-governmental entities, and for assuring that national activities are carried out in conformity with the provisions set forth in the present Treaty."

Under this provision, the United States Government must bear responsibility for the activities of NASA and any other U.S. Governmental agency which conducts space activities, such as NOAA, as well as non-governmental entities, such as the Communications Satellite Corporation (Comsat) and corporations involved in domestic U.S. communications satellite activities, such as Western Union, RCA, and Comsat General. 24/

Sentences two and three of Article VI of the Outer Space Treaty provide that:

> "The activities of nongovernmental entities in outer space. . . shall require authorization and continuing supervision by the appropriate State Party to the Treaty.
>
> "When activities are carried on in outer space . . . by an international organization, responsibility for compliance with this Treaty shall be borne both by the international organization and by the States Parties to the Treaty participating in such organization."

Sentence two requires the United States to insure that the necessary and proper steps are taken to authorize and continuously supervise any activities of U.S. nationals (i.e., "nongovernmental entities" -- persons, partnerships, corporations, etc.) in outer space. Sentence three provides for concurrent responsibility between the United States and any international organization--as well as the other states participating in that organization--for activities in outer space conducted by such organization.

Article VI, in short, "is designed to ensure responsibility for space activities, inherently international in nature, at the governmental level." 25/ If the United States launches a payload for either a U.S. national which is not a U.S. Governmental entity, therefore, or for an international organization in which the U.S. is a participant, the U.S. shall bear responsibility for any subsequent space activities

of such national or organization just as it bears responsibility for space activities of entities which are part of the U.S. Government itself.

Article VII of the Outer Space Treaty provides as follows:

> "Each State Party to the Treaty that launches or procures the launching of an object into outer space. . .and each State Party from whose territory or facility an object is launched, is internationally liable for damage to another State Party to the Treaty or to its natural or juridical persons by such objects or its component parts on the Earth, in air space or in outer space. . . ."

This provision indicates that the concern of the United States in launching any object into outer space extends beyond the successful insertion of such object into the desired orbit, even though the object is launched for a non-governmental U.S. entity (such as Comsat) or a foreign state or international organization. The 1972 Liability Convention elaborates upon this matter. 26/

Moreover, Article IX of the Outer Space Treaty requires the United States to consider the use to which any satellite which it launches is put, even if the United States Government itself will not own or operate the satellite in question. Thus, the United States, or any state providing launch services, has responsibilities beyond the successful launching of a satellite, responsibilities which may last the lifetime of the satellite. 27/

As a technical point, a common carrier's legal responsibilities generally end with the safe delivery of the goods to the final destination, 28/ which for the STS would mean insertion into the proper orbit, but the United States has responsibilities beyond that even if the satellites are actually owned and operated by non-governmental entities of U.S. nationality (such as Comsat) or by foreign countries or international organizations. Since treaties to which the United States is bound are "the supreme law of the land," 29/ the commitments

discussed above take precedence over any conflicting common law principles, such as common carrier status.30/ Therefore, the STS should not be operated as a common carrier in order that the United States be able to carry out most effectively its international commitments relating to activities in outer space.

3. How is the President's Launch Policy of 1972 related to the selection of missions and payloads for the STS?

There are two aspects of this question: (a) the general applicability of the President's Launch Policy of 1972 31/ (hereinafter the "Launch Policy") to the STS and (b) the fact that no common carrier status is expressed or implied for NASA in the Launch Policy.

(a) The general applicability of the Launch Policy to the STS

On October 9, 1972, the President announced a policy whereby the United States would provide, on a nondiscriminatory, cooperative or reimbursable basis, satellite launch assistance to other countries and international organizations. This new policy, in effect, was actually an extension to other countries of the launch policy the United States had publicly announced in regard to the European Space Conference almost a year earlier. 32/ It addressed four main points:

- the availability of launch services vis-a-vis the conditions under which they will be provided;
- the location of launch sites involved;
- the financial conditions; and
- the matters of priority and scheduling.

Under Provision I of the Launch Policy United States launch assistance will be available to interested countries and international organizations for satellite projects which are

for "peaceful purposes" and are "consistent with obligations under relevant international agreements and arrangements." The launch assistance is subject to these additional conditions:

- If the satellites to be launched are intended to provide international public telecommunications services, the United States will inquire of the International Telecommunications Satellite Organization (Intelsat) whether Intelsat makes a favorable recommendation in accordance with Article XIV of the Intelsat definitive arrangements. 33/ If Intelsat does make a favorable recommendation, the United States will provide the launch assistance. If, however, there is no favorable recommendation by Intelsat, the United States will still provide the launch assistance if (1) the United States had supported the proposed system within Intelsat and (2) the country or international entity requesting the assistance "considers in good faith that it has met its relevant obligations under Article XIV of the definitive arrangements." Finally, if there is no favorable Intelsat recommendation and if the United States had not supported the proposed system within Intelsat, the United States will decide whether to provide the requested launch assistance "after taking into account the degree to which the proposed system would be modified in the light of the factors which were the basis for the lack of support within Intelsat."

- If satellites to be launched in the future are operational and are involved in applications "which do not have broad international acceptance," the United States will not favorably consider requests for launch assistance until "broad international acceptance has been obtained." 34/

Although there was no further elaboration of the provisions of the President's Launch Policy, a "Summary of Amplifying Comments" was provided with the text of the September 1, 1971, letter from the State Department to the European Space

Conference when such letter was published on November 1, 1971, outlining the European launch policy. 35/ Since the European launch policy was very similar to the President's Launch Policy announced less than one year later, the "Summary of Amplifying Comments" (hereinafter the "Summary") may be used to elaborate upon the provisions of the President's Launch Policy. 36/

Provision II is addressed to the location of the launch sites involved. United States launch assistance under the Launch Policy will be available, "consistent with U.S. laws," either from U.S. launch sites (through the acquisition of U.S. launch services on a cooperative or reimbursable basis) or from foreign launch sites (by purchase of an appropriate U.S. launch vehicle). In regard to launchings from foreign sites, the United States will require assurance that the launch vehicles will not be made available to third parties without prior agreement of the United States. The Summary's only comment in relation to this provision is that "U.S. laws" are intended to recognize existing treaty obligations, such as the 1967 Outer Space Treaty and domestic legislation such as that affecting exports. The Intelsat agreement is not a treaty and, therefore, constitutes an international undertaking of the United States which is consistent with existing U.S. law but does not create new U.S. law. 37/

Provision III deals with financial conditions for reimbursable launch services from U.S. launch sites and simply states that foreign users will be charged on the same basis as comparable non-U.S. Government domestic users for such services. The Summary had nothing to say in regard to this point, which is quite straightforward, with, perhaps, the only additional comment needing to be made about the word "comparable." This would mean that a foreign government or international organization would be charged on the same basis, all other things being equal, as domestic U.S. (non-governmental) users which have already purchased NASA launch services on a reimbursable basis. 38/

Provision IV, the last of the four main points of the Launch Policy, provides that the priority and scheduling for launching foreign payloads from U.S. launch sites will be dealt with on the same basis as that for U.S. launches. "Each launching will be treated in terms of its own requirements and as an individual case. When it becomes known when a payload will become available and what its launch window requirements will be, the launching will be scheduled for that time. Should a conflict arise, the United States will consult with all interested parties in order to arrive at an equitable solution." The Summary provides no additional comments on this provision.

In summation, regarding the general applicability of Launch Policy to the STS, it can be said that although only expendable boosters were in use at the time the Launch Policy was announced, there is nothing contained in the terms of the policy which would make it inapplicable to the Space Transportation System, which was being planned when the Launch Policy was announced. 39/ In fact, the STS will provide the means for more launch assistance to other countries and international organizations and, hence, will most likely cause a greater use of the Launch Policy. The Shuttle's reusability, versatility, and flexibility will be prime factors in regard to this increased use.

(b) The Launch Policy neither expresses nor implies common carrier status for NASA

As was discussed in Issue No. 2, NASA is not a common carrier and would not be able to operate the STS as a common carrier under existing U.S. statutory law. It should, consequently, be made clear at this point that the President's Launch Policy also neither expresses nor implies that NASA is a common carrier, either in regard to the expendable launch vehicles (which have been used for nearly two decades) or to the new STS.

The President's Launch Policy, although a public statement of policy to all foreign countries and international organizations offering launch services on a generally

nondiscriminatory basis, does require the United States to give certain consideration to the opinions of its Intelsat partners in situations involving proposed international public telecommunications services. The United States must also consider whether any future operational satellite applications have "broad international acceptance" before it "will favorably consider requests for launch assistance" for such satellite projects, namely, that the projects be for "peaceful purposes," that they be "consistent with obligations under relevant international agreements and arrangements," and that the launch assistance be "consistent with U.S. laws." Launchings from foreign sites are subject to the additional requirement that "the United States will require assurance that the launch vehicles will not be made available to third parties without prior agreement of the United States."

All of these conditions expressed in the Launch Policy are inconsistent with the general concept of common carriage, which involves, inter alia, a duty to provide the service in question to all who may apply without discrimination. 40/ Also, these conditions require that NASA have the legal right to inspect the p[illegible]cial Shuttle payloads and obtain some type of assur[illegible] from those requesting the launch services as to the [illegible] nature of the payloads and their true and complete functions in outer space; this, in fact, has been the case since NASA began launching non-NASA payloads and will be the case with the STS. 41/ Generally, common carriers, in absence of a special statute, do not have the right to require knowledge of the character of the goods offered to them for transportation or to inspect such goods for themselves as a condition of receiving and transporting them. 42/

4. What will be the status of the Space Shuttle under the Federal Aviation Act of 1958?

Early in the planning for the Space Shuttle this office advised the Office of Space Flight that it was our considered opinion based upon the Act and relevant space law that the Shuttle would be considered a space vehicle,

and not an aircraft within the meaning of section 101(5) of the FAAct of 1958 43/. However, in its report on the "Status and Issues Relating to the Space Transportation System" (B-183134) the General Accounting Office identified this as an issue that needed to be resolved.

In order to provide a definitive answer to this question we referred it to the Chief Counsel of the Federal Aviation Administration (FAA). In a letter dated March 11, 1977, to you, which letter is attached to this memorandum, the Chief Counsel concluded that:

> "It is the view of this office that for the purposes of the FAAct respecting applicability of the Federal Aviation Regulations (FARs), the Space Shuttle is not an aircraft."

The statutory interpretation leading to and expanding upon their conclusion is set forth in some detail in the attachment. The view of the Chief Counsel of the FAA is, of course, authoritative on this question. 44/

On the question of safety, the Chief Counsel of FAA noted that the FAA regional personnel were "already engaged in establishing the needed restricted air space and other operating conditions" to carry out "the intention of NASA to comply with whatever air traffic and related safety procedures the FAA feels are necessary for the safe operation of this vehicle while in the air space." 45/

- What authority will the Shuttle commander have to enforce order and discipline during Space Shuttle missions?

The Shuttle commander will have full authority to enforce order and discipline during all phases of any STS mission, including the ascent, orbital, and descent phases. This authority extends to any and all persons on board the Shuttle, including Federal officers and employees and all other persons whether or not they are U.S. nationals. 46/ Furthermore, this authority extends to Spacelab, which, when used in an STS mission, will, of course, function only as a part of the Shuttle Orbiter and not as an

independent spacecraft; it will also cover any Shuttle personnel engaged in Extravehicular Activity (EVA), which means any activity outside of the Orbiter cabin and Spacelab areas. Finally, this authority includes the use of physical force if reasonable and necessary under the circumstances without incurring either criminal or civil liability.

This authority is based upon several provisions of the NASAct. Section 203(c) 47/ provides that "(in) the performance of its functions the Administration is authorized--(1) to make, promulgate, issue, rescind, and amend rules and regulations governing the manner of its operations and the exercise of the powers vested in it by law." Section 304(a) 48/ states that the Administrator "shall establish such security requirements, restrictions, and safeguards as he deems necessary in the interest of the national security." Finally, 18 U.S.C. 799 49/ states:

> Violation of regulations of National Aeronautics and Space Administration
>
> "Whoever willfully shall violate, attempt to violate, or conspire to violate any regulation or order promulgated by the Administrator of the National Aeronautics and Space Administration for the protection or security of any laboratory, station, base or other facility, or part thereof, or any aircraft, missile, spacecraft, or similar vehicle, or part thereof, or other property or equipment in the custody of the Administration, or any real or personal property or equipment in the custody of any contractor under any contract with the Administration or any subcontractor of any such contractor, shall be fined not more than $5,000, or imprisoned not more than one year, or both." (emphasis added)

Under the above statutory provisions, the NASA Administrator can promulgate regulations, effective upon publication in the Federal Register, relating to the Shuttle commander's authority. 50/ There can be no question that, aside from

the commander's responsibility for the lives of those people on board the Shuttle, the "protection or security" of the Shuttle and its payload will be one of the commander's primary duties. Since the well-being of the people on board the Shuttle will be directly related to the operational condition of the Shuttle, its payloads (especially Spacelab), and its various parts and systems, the commander's responsibilities both in relation to the people on board and to the Shuttle itself must be considered together.

In regard to the international law, the Shuttle commander will have authority analogous to the authority which commanders of ships and aircraft have traditionally been accorded. International law recognizes that the ship or aircraft commander is the representative of the state of nationality of such ship or aircraft to whom that state's jurisdiction has been delegated to maintain discipline and protect the persons and property on board. 51/ Article VIII of the 1967 Outer Space Treaty logically extends this principle to spacecraft:

> "A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body. . . ." 52/

Any and all persons on board the Shuttle or conducting any EVA activities from the Shuttle, therefore, will be under the direct and complete authority of the Shuttle commander, whether or not he is a civilian employee of NASA or an officer or employee of DoD. The parameters of this authority may be specified in regulations promulgated by the NASA Administrator, if he so desires. 53/

6. What authority does NASA have to establish medical standards and training requirements for persons flying aboard the Shuttle?

From the beginning of the U.S. manned space program, NASA has established physical, physiological and psychological standards (hereinafter referred to as "medical standards")

and training requirements for persons going into outer space aboard NASA spacecraft. So far, these people have all been U.S. nationals and U.S. Government (NASA or DoD) employees. In addition to these same types of people, the Shuttle will carry scientists and certain other persons who may be neither employees of the U.S. Government nor nationals of the United States. NASA will, however, have the same authority to establish personal standards for such new categories of people.

Section 203(c)(1) of the NASAct 54/ already discussed in connection with Issue No. 5 in relation to the authority of the Shuttle commander, gives NASA the authority, in performing its functions, "to make, promulgate, issue, rescind, and amend rules and regulations governing the manner of its operations and the exercise of the powers vested in it by law." NASA's functions include the: (1) planning, directing, and conducting of aeronautical and space activities and (2) the arranging for participation by the scientific community in the planning of scientific measurements and observations to be made through use of aeronautical and space vehicles, as well as the conducting or arranging for the conduct of such measurements and observations. 55/

Under the above statutory authority, NASA has established medical standards and training requirements for scientists and certain other professionals participating in flights aboard NASA research aircraft as part of the Airborne Sciences Program, conducted for many years by the NASA Ames Research Center. These professional people flying aboard NASA aircraft, often an international air space over the high seas, are usually referred to as "experiment operators" or "EOs," and have included non-U.S. Government employees and foreign nationals. For the purpose of this discussion, the EOs are analogous to the payload specialists who will conduct experiments in Spacelab aboard the Space Shuttle. 56/ Examples of training requirements and medical standards which have been established by NASA for persons flying aboard NASA research aircraft are:

(1) high altitude indoctrination training at a suitable low pressure chamber every three years for NASA-Ames Research Center flight crew members; 57/

(2) completion within the preceding two years of a low pressure physiological training course, including a low pressure chamber run for crew members other than regular flight crew personnel who are scheduled to engage in flights above 45,000 feet, or a cabin altitude in excess of 14,000 feet; 58/

(3) freedom from heart disease, diabetes, chronic respiratory ailments, colds or sinus conditions; 59/

(4) a minimum of facial hair, and no beards, mutton-chop sideburns, or large mustaches. 60/

These same or similar standards, and more, may be established by NASA for payload specialists and other persons flying on board the Shuttle. In addition, NASA may establish standards for foreign astronauts who fly in Shuttle missions.

7. What authority does NASA have to control artifacts and mementos brought aboard the Shuttle or found in space by Shuttle personnel?

NASA's basic authority "to make, promulgate, issue, rescind, and amend rules and regulations governing the manner of its operations and the exercise of the powers vested in it by law" 61/ extends to the establishment of policy, procedures, and responsibilities governing the selection, approval, packing, storage, post-flight disposition and public announcement of articles authorized to be carried on Shuttle flights. Such authority covers NASA employees, 62/ as has already been manifested in relation to past missions, 63/ and also non-NASA employees of U.S. nationality. 64/

With regard to foreign nationals participating in STS missions, NASA would have full authority to determine what objects could be brought on board the Shuttle in the first place, as well as

how they must be stowed, etc., since such determinations would involve safety and related considerations. Once NASA had allowed an article to be brought on board the Shuttle and determined how such article should be packed, stowed, etc., enforcement of any policy regarding post-flight disposition, if the article is the property of a foreign person or other entity and no longer in the United States, would have to be addressed on a case-by-case basis.

As far as objects found in outer space are concerned, the United States would need to reach agreement with the foreign states involved in order to establish appropriate policy and rules for its implementation; again, however, any considerations relating to safety on board the Shuttle or otherwise in connection with the Shuttle mission remain within the authority of the Shuttle commander and, ultimately, the United States. 65/

The NASA Artifacts Committee, established by NMI 4310, has been asked to formulate guidelines for the control and disposition of Shuttle-borne artifacts and mementos. Once that is done, I recommend that any guidelines or regulations be published formally and incorporated into Shuttle launch agreements.

8. What authority exists for the clearing of and/or the warning for solid rocket booster, external tank, and sonic boom impact areas on the high seas?

During the ascent-to-orbit phase of every Shuttle mission, the following events will occur on the high seas: the impact of the two Solid Rocket Boosters (SRBs); the impact of pieces of the External Tank (ET); and the creation of a sonic boom footprint. While the exact parameters of these occurrences are still in the process of being determined by NASA, 66/ the legal aspects of these occurrences in relation to the safety of other users of the high seas 67/ within the areas in question are well known, since these occurrences are analogous to booster stage and sonic boom impact resulting from the launch of expendable launch vehicles, which the United States has been doing for nearly two decades. 68/

Basically, since the areas under consideration are within the international legal regime of the high seas, including the subjacent water column and the superjacent air space, the United States cannot legally exclude any vessels (surface ships and submersibles) or aircraft from these areas except vessels or aircraft of United States nationality (i.e., registry). 69/ It has long been the practice for both the United States and the Soviet Union for missile testing and spacecraft launch operations over the high seas to warn vessels and aircraft of the operations planned. To follow that accepted practice for Shuttle operations would not present any new questions of international law. 70/ Specific aspects of the impact area designation and warning procedure can be formulated and announced as the first Shuttle Orbital Flight Tests (in 1979) draw nearer.

9. Will an ocean dumping permit be required for the SRB and ET procedures on the high seas?

An ocean dumping permit will not be required to conduct the SRB and ET procedures. 71/ The statute of concern is the Marine Protection, Research, and Sanctuaries Act of 1972 72/ (hereinafter the "Marine Act"). NASA will not be required to obtain such a permit under the Marine Act for either the temporary placement of the SRBs on the ocean surface off the United States coast or for the disposal of the ET in a remote ocean area during the ascent-to-orbit phase of each Shuttle mission, due to the fact that each such placement of the SRBs and disposal of the ET is incidental to the use and actual purpose of the SRBs and ET; the SRBs are booster stages for the Space Shuttle, and the ET is a fuel tank to contain and supply both fuel (liquid hydrogen) and oxidizer (liquid oxygen) for the Space Shuttle Main Engines (SSMEs) during the ascent phase. The disposal of the ET will be analogous to the ocean disposal after burnout of the rocket booster stages of expendable launch vehicles or the testing over the ocean and impact into the ocean of missiles, both very common practices for over two decades.

The Marine Act predated the entering into force of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, with annexes 73/ (hereinafter the "London Convention") but was then amended to implement the

provisions of the London Convention in the United States.74/ Regulations to implement the permit system defined by the London Convention have also been created.75/

The Marine Act states that:

> "The Congress declares that it is the policy of the United States to regulate the dumping of all types of materials into ocean waters and to prevent or strictly limit the dumping into ocean waters of any material which would adversely affect human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities."76/

The purpose of the Marine Act is to regulate:

> "(1) the transportation by any person of material from the United States and, in the case of United States vessels, aircraft, or agencies, the transportation of material from a location outside of the United States, when in either case the transportation is for the purpose of dumping the material into ocean waters, and (2) the dumping of material transported by any person from a location outside the United States, if the dumping occurs in the territorial sea or the contiguous zone of the United States."77/

The specific provision of interest to Space Shuttle ET procedures is as follows:

> "Except as may be authorized by a permit issued pursuant to section 1412 or section 1413 of this title, and subject to regulations issued pursuant to section 1418 of this title,
>
> (1) no person shall transport from the United States, and
>
> (2) in the case of a vessel or aircraft registered in the United States or flying the United States flag or in the case of a United States department, agency, or instrumentality, no person shall transport from any location,

> any material for the purpose of dumping it into ocean waters." 78/

"Person" includes "any officer, employee, agent, department, agency or instrumentality of the Federal Government" 79/ and would, therefore, include NASA. "Transport. . .refers to the carriage and related handling of any material by a vessel, or by any other vehicle, including aircraft" 80/ and might cover space launch vehicles, such as the Shuttle and the presently used expendable booster rockets; it would not be necessary to define the Shuttle or the expendable boosters as "aircraft" to come within the meaning of "transport." Finally, the definitions of "material" and "ocean waters" might cover the SRBs and ETs and the areas into which NASA intends to place them during the ascent-to-orbit phase of each and every mission. 81/

It is the definition of "dumping" by which the SRB and the ET procedures would definitely be excluded from the proscription of the Marine Act. "Dumping" is defined as:

> ". . .a disposition of material: . . .Provided further, That it does not mean. . .the intentional placement of any device in ocean waters or on or in the submerged land beneath such waters, for a purpose other than disposal, when. . .such placement. . . occurs pursuant to an authorized Federal or State program. . . ." 82/

The dropping of the SRB and ET into "ocean waters" will only be incidental to their actual purposes, respectively, to provide a booster stage and a fuel and oxidizer tank for the Space Shuttle during the launch phase. The Space Shuttle program, of course, is an "authorized Federal program." The same reasoning also applies to the use of expendable launch vehicles and the testing of ballistic missiles over and into the high seas.

The foregoing statutory interpretation is entirely consistent with the legislative history of the Marine Act. In a detailed, section-by-section analysis of the Proposed Marine Protection Act of 1971, one of the bills that led to the enactment of the Marine Act, the Environmental Protection Agency made the

following statement about subsection 3(f), which contained the same basic definition of "dumping" (33 U.S.C. 1402(f)) quoted above:

> "Special note should also be made of the fact that 'dumping' as defined in subsection 3(f) would not include an activity which has as its primary purpose a result other than 'a disposition of material' but which involves the incidental depositing of some debris or other material in the relevant waters. For example, material from missiles and debris from gun projectiles and bombs ultimately come to rest in the protected waters. Such activities are not covered by this Act." 83/

10. Will the United States Federal criminal laws apply to acts during STS space missions?

Based upon the detailed memorandum which Mr. Sloup prepared on this single issue, which you have, I have concluded that the current criminal jurisdiction of the United States may not be adequate to cover all criminal offenses which may occur during STS space missions. However, the enactment into law of the Criminal Code Reform Act of 1977, S. 1437, 95th Cong., 1st Sess., would establish an adequate criminal jurisdictional structure. Since enactment of that bill in this Congress is now a distinct possibility, I recommend that for the time being NASA merely follow its progress closely. With respect to military personnel aboard the Shuttle, the present Uniform Code of Military Justice, as it is now written, would apply to such personnel and their actions in space.

Conclusion

In addition to the ten issues discussed in this memorandum, there are, of course, other legal issues inherent in STS operations. Some of these have already been resolved. For example, patent and data policies applicable to activities conducted in connection with Shuttle flights on a reimbursable basis were addressed and resolved in connection with the issuance of the regulations concerning reimbursable launches.

Also, those regulations were issued only after a careful consideration and resolution of the legal elements of the financial issues.

Other issues are being addressed separately. The whole question of liability, and the availability and requirements for insurance or indemnity provisions, are being handled as a separate matter, as you know. And the procedures to be used for the selection of payload specialists are being considered in the context of how scientific investigations will be selected and procured in the Shuttle era.

While much more work needs to be done, I hope the discussions in this memorandum, and the research done by Mr. Sloup which is reflected in the extensive footnotes, will be helpful as we proceed into the Shuttle era.

Gerald D. Mossinghoff

Attachments

ATTACHMENT 29

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

WASHINGTON, D.C. 20591

March 11, 1977

Neil Hosenball, Esquire
General Counsel
National Aeronautics & Space Admin.
400 Maryland Avenue, S.W.
Washington, D. C. 20546

Dear Mr. Hosenball:

You have raised a question respecting the status of the NASA Space Shuttle under the Federal Aviation Act of 1958 (FAAct). Specifically, you have inquired as to whether we consider the Shuttle to be an "aircraft" within the meaning of section 101(5). It is the view of this office that for the purposes of the FAAct respecting applicability of the Federal Aviation Regulations (FARs), the Space Shuttle is not an aircraft.

That section of the FAAct reads as follows:

> "Aircraft" means any contrivance now known or hereafter invented, used, or designed for navigation of or flight in the air.

While any man-made object moving through the air might arguably be called an aircraft, it is necessary to examine the legislative intent and purpose behind the regulatory scheme in the FAAct. It is undoubtedly clear that a major purpose of the FAAct was to unify control and management of the air space in a single agency. Foremost in the minds of the drafters were military and civilian airplanes. The idea then that rockets or spacecraft would routinely traverse the air space was mere speculation only months after Sputnik I was launched. In fact, the statutory creation of NASA, as you are well aware, was barely one month earlier than the effective date of the FAAct.

To date, the issue of whether a craft is a space vehicle or an aircraft for purposes of the FARs has been largely academic. The operational characteristics of the Space Shuttle and the amount of time it will be in the navigable air space have altered the circumstances somewhat. We understand that the Shuttle will have maneuvering characteristics similar to a glider. It will use

control surfaces to navigate to a landing at a designated landing field. We understand further that its trajectory is far steeper than an aircraft and bears the characteristics one would expect of a vehicle re-entering the atmosphere from orbit. The length of time it will take to go from 42,000 feet to touchdown is only three minutes and eight seconds. The vast majority of its operational time is spent in a space, not air, environment.

We further understand that the NASA Act of 1958 recognized the distinct categories of "aeronautical and space vehicles" in section 103. In that section, we construe "aircraft" to be the aeronautical vehicle, i.e., designed primarily for operation in the air. The other listed vehicles seem to be "space vehicles." The contemporaneous but different drafters of our legislation did not mention space vehicles as a distinct category. From our view of the operational characteristics of the Shuttle, we conclude it is, in fact, a space vehicle rather than an aircraft. This is especially apparent considering that, in general, the operating requirements of Part 91 are inappropriate for application to the Shuttle operation. Many would be unnecessary and even incompatible with the Shuttle mission. You have expressed the intention of NASA to comply with whatever air traffic and related safety procedures the FAA feels are necessary for the safe operation of this vehicle while in the air space. To this end, we understand that our regional personnel are already engaged in establishing the needed restricted use air space and other operational conditions. In these circumstances, it seems entirely consistent with the intent of the FAAct not to apply the full panoply of our FAA regulations so long as we remain assured the safety of the U.S. air space will not be derogated. We acknowledge NASA's firm commitment to cooperate fully to that end.

Sincerely,

for Bruce D. Nelson

BERT Z. GOODWIN
Chief Counsel

FOOTNOTES

1/ 72 Stat. 426; 42 U.S.C. 2451 et seq.

2/ 1958 U.S. Code Congressional and Administrative News 3192, 85th Cong., 2nd Sess.

3/ NASA's Shuttle services reimbursement policy for non-U.S. Government users appears at 14 CFR Subpart 1214.1, 42 Fed. Reg. 3829 (1977); for civil U.S. Government users and certain foreign users appears at 14 CFR Subpart 1214.2, 42 Fed. Reg. 8631 (1977); and for the Department of Defense users is incorporated in a Memorandum of Understanding dated March 7, 1977, NASA NMI 1052.204.

4/ Communications Satellite Act of 1962, §201(b), 76 Stat. 421, 47 U.S.C. 721(b) (1962).

5/ Under the Communications Satellite Act of 1962, Comsat acts as an agent to acquire launch services from NASA on behalf of the International Telecommunications Satellite Organization (Intelsat).

6/ This figure includes the launch of five spacecraft which for one reason or another failed to reach the proper orbit; the remainder were successful and consisted of the second, third, and fourth generations of Intelsat satellites.

7/ These satellites include two for Western Union, two for RCA, and five for Comsat General, a wholly-owned subsidiary of Comsat; two of the five Comsat General satellites are for domestic U.S. service, while the remaining three are for maritime service.

8/ NASA Press Release No. 76-207, December 15, 1976, contains a list of the 1976 launches.

9/ NASA Press Release No. 77-2 January 7, 1977, contains a list of the planned 1977 launches.

10/ See The Budget of the United States Government 1978 - Appendix, at pp. 655, 659-660.

11/ 2A Sutherland Statutory Construction, sec. 49.10 (Sands, ed., 4th ed., 1972) (hereinafter cited as "Sutherland"). This principle was first applied by the U.S. Supreme Court in 1803 in the case of Stuart v. Laird, 1 Cranch (5 U.S.) 299, 309, 2 L.Ed. 115, 118, in which the Court, answering the objection that the act of 1789 (1 Stat. at L. 73, Chap. 20) was unconstitutional insofar as it gave circuit powers to judges of the Supreme Court, stated that:

> "practice and acquiescence under it for a period of several years, commencing with the organization of the judicial system, affords an irrefutable answer, and has indeed fixed the construction. It is a contemporary interpretation of the most forcible nature. This practical exposition is too strong and obstinate to be shaken or controlled. Of course, the question is at rest, and ought not now to be disturbed."

In United States v. Midwest Oil Co., 236 US 459, 472-473, 59 L.Ed. 673, 681, 35 S.Ct. 309 (1915), a certain long-continued practice of the President, with the acquiescence of Congress, relating to the disposition of public lands was at issue:

> "It may be argued that while these facts and rulings prove a usage, they do not establish its validity. But government is a practical affair, intended for practical men. Both officers, lawmakers, and citizens naturally adjust themselves to any long-continued action of the Executive Department, on the presumption that unauthorized acts would not have been allowed to be so often repeated as to crystallize into a regular practice. That presumption is not reasoning in a circle,

> but the basis of a wise and quieting rule that, in determining the meaning of a statute or the existence of a power, weight shall be given to the usage itself--even when the validity of the practice is the subject of investigation."

Subsequent cases have reaffirmed this principle: Apex Hosiery Co. v. Leader, 310 US 469, 84 L.Ed. 1311, 60 S.Ct. 982, 128 ALR 1044 (1940); Sibbach v. Wilson & Co., 312 US 1, and 655, 85 L.Ed. 479, 61 S.Ct. 422 (1941); Federal Trade Commission v. Bunte Bros., Inc. 312 U.S. 349, 85 L.Ed. 881, 61 S.Ct. 580 (1941); National Labor Relations Board v. Seven-Up Bottling Co. of Miami, Inc. 344 US 344, 97 L.Ed. 377, 73 S.Ct. 287 (1953); Alstate Const. Co. v. Durkin, 345 US 13, 97 L.Ed. 745, 73 S.Ct. 565 (1953); Blau v. Lehman, 368 US 403, 7 L.Ed. 2d 403, 82 S.Ct. 451 (1962). See also 73 Am Jur 2d, Statutes, secs. 169, 178, 179; and 82 C.J.S. Statutes secs. 351, 357-360.

12/ In Tennessee Valley Authority v. Kinzer, 142 F.2d 833, 837 (6th Cir. 1944), the court upheld the Retirement System of the Tennessee Valley Authority partly on the basis of the subsequent and regular appropriation of funds by Congress:

> "Moreover, Congress, by regularly appropriating funds to enable the Authority to make its contributions to the System, has demonstrated its intention that the statutory mandate is to be construed and understood in accordance with the settled construction placed upon it by the Authority, as disclosed by the Rules and Regulations setting up the Retirement System. The voting of such appropriations, in the face of the construction placed upon the Act by the Authority, has an effect similar to that resulting from the re-enactment of a statute, the provisions of which had, theretofore,

> been interpreted by regulations; they are deemed to have received legislative ratification and, thereby, to have become embedded in the law; and are to be given the same force and effect as the statute, itself."

The repeated enactment by Congress of appropriations for a TVA project over objections that there was no legal authority to carry out the project supported the interpretation that such authority existed in United States ex rel. Tennessee Valley Authority v. Two Tracts of Land, 456 F2d 264 (6th Cir. 1972), cert. den'd 409 US 887 (1972).

13/ See, e.g., P.L. 94-39 (89 Stat. 218), P.L. 94-116 (89 Stat. 581), P.L. 94-307 (90 Stat. 677), and P.L. 94-378 (90 Stat. 1095). Earlier NASA authorization and appropriations acts are cited in the Staff Report of the Committee on Aeronautical and Space Sciences, United States Senate, 94th Cong., 1st Sess. (Comm. Print March 11, 1975).

14/ In a letter to the Legal Adviser, Department of State, dated April 29, 1969, Mr. William H. Rehnquist, then-Assistant Attorney General, Office of Legal Counsel, responded to a request for a Department of Justice opinion concerning two interrelated questions:

> "(1) 'Under existing domestic law is there any legal obstacle or impediment to the provision of launch services by the National Aeronautics and Space Administration to a foreign government having a foreign operational domestic communications satellite system?
>
> (2) 'If NASA has authority to provide such services under our law may it do so independently of the Communications

> Satellite Corporation, whether acting as an independent United States corporation or as an agent for Intelsat?' "

In his letter Mr. Rehnquist concluded that:

> "Although not specifically so stated in your letter, I understand your questions assume that such launch services would be provided on a 100% reimbursable basis. In these circumstances, it is our opinion that (1) there is no legal impediment to the provision of launch services by NASA if the President should direct such action; and (2) that launch services pursuant to such Presidential directive may be furnished independently of the Communications Satellite Corporation (Comsat)."

15/ As developed extensively in case law, a private carrier is one who undertakes by special agreement in a particular instance to transport property without being bound to serve every person who may apply. 13 C.J.S. Carriers, §4; 13 Am. Jur. 2d Carriers, §8. A common carrier is one who as a regular business transports personal property from place to place for all persons who may wish to employ him and pay his charges. What constitutes common carriage is a question of law; but whether one holds himself out as a common carrier is a question of fact. 13 C.J.S. Carriers, §3(a); 13 Am. Jur. 2d Carriers, §2. See also, note 40, infra.

Furthermore, NASA's statutory launch duty to Comsat under section 201(b) of the Comsat Act, 47 U.S.C. 721(b), applies only to communications satellites which are part of the International Telecommunications Satellite Organization (Intelsat), of which Comsat is the United States' representative. Section 102(a), (b), and (c) of the Comsat Act, 47 U.S.C. 701(a)(b)(c). Domestic communications satellite systems are not covered by this statutory duty, although it should be noted that the Comsat Act does allow the global (Intelsat) system to be used for domestic communications services "where consistent with the provisions of this [the Comsat] Act" and, in addition, allows "the creation of additional

communications satellite systems, if required to meet unique governmental needs or if otherwise required in the national interest." Section 102(d) of the Comsat Act, 47 U.S.C. 701(d).

16/ Where Congress intends that a statutorily created entity is to be a common carrier the statute is typically quite explicit on that point. See note 20, infra. It should be noted that although NASA is not a common carrier under the Comsat Act or any other law, Comsat itself is a "common carrier within the meaning of section 3(h) of the Communications Act of 1934. . . ." Section 401 of the Comsat Act, 47 U.S.C. 741.

17/ 72 Stat. 731, 49 U.S.C. 1301.

18/ Section 401(a) of the FAAct, 49 U.S.C. 1371(a), provides that "[n]o air carrier shall engage in any air transportation unless there is in force a certificate [of public convenience and necessity] issued by the [Civil Aeronautics] Board authorizing such air carrier to engage in such transportation."

An "air carrier" is defined in section 101(3) as "any citizen of the United States who undertakes, whether directly or indirectly or by a lease or any other arrangement, to engage in air transportation . . . ." A "citizen of the United States" is defined in section 101(13) to mean:

> "(a) an individual who is a citizen of the United States or of one of its possessions, or (b) a partnership of which each member is such an individual, or (c) a corporation or association created or organized under the laws of the United States or of any State, Territory, or possession of the United States, of which the president and two-thirds or more of the board of directors and other managing officers thereof are such individuals and in which at least 75 per centum of the

> voting interest is owned or controlled by persons who are citizens of the United States or of one of its possessions."

Thus, a U.S. Government agency cannot be an "air carrier" under the FAAct. This fact is seen even more clearly vis-a-vis the definition of "foreign air carrier," which can include governmental entities of foreign countries:

> ". . .any person, not a citizen of the United States, who undertakes, whether directly or indirectly or by lease or any other arrangement, to engage in foreign air transportation." Section 101(19) of the FAAct.

"Person" is defined in section 101(29) to include a "body politic," so while "air carrier" cannot include agencies of the U.S. Government, "foreign air carrier" can include agencies of foreign governments.

Another aspect of the definition of "air carrier" which would not apply to STS operations is that air carriers engage in "air transportation," defined in section 101(10) of the FAAct as meaning "interstate, overseas, or foreign air transportation or the transportation of mail by aircraft." These terms are further defined in section 101(21):

> " 'Interstate air transportation,' 'overseas air transportation,' and 'foreign air transportation,' respectively, mean the carriage by aircraft of persons or property as a common carrier for compensation or hire or the carriage of mail by aircraft, in commerce between, respectively--
>
> > (a) a place in any State of the United States, or the District of Columbia, and a place in any other State of the United States, or the District of Columbia; or between places in the same State of the United States through the airspace over any place outside thereof; or

between places in the same Territory or possession of the United States, or the District of Columbia;

(b) a place in any State of the United States, or the District of Columbia, and any place in a Territory or possession of the United States; or between a place in a Territory or possession of the United States, and a place in any other Territory or possession of the United States; and

(c) a place in the United States and any place outside thereof;

whether such commerce moves wholly by aircraft or partly by aircraft and partly by other forms of transportation."

The NASA Shuttle, as already mentioned, will be neither a "common carrier" nor an "aircraft." The mode of conveyance in which the STS will engage is best described by the first two words of its name: space transportation, a sui generis method of conveyance.

19/ Exceptions to this may occur during war or other national emergency, such as when the U.S. Government took over the control of certain railroads and other transportation systems under the Federal Control Act of March 21, 1918, Chap. 25, 40 Stat. 451. See Missouri Pac R. Co. v. Ault, 256 U.S. 554, 41 S.Ct. 593, 65 L.Ed. 1087 (1921). See also Virginia Ry. Co. v. Mullens, 271 U.S. 220, 46 S.Ct. 526, 70 L.Ed. 915 (1926).

20/ Comsat and the National Rail Passenger Corporation (Amtrak) are examples. Comsat, created by the Comsat Act (supra note 4), is not "an agency or establishment of the United States Government" but is "deemed to be a common carrier within the meaning of section 3(b) of the Communications Act of 1934." Sections 301 and 401 of the Comsat Act of 1962, 47 U.S.C. 731 and 741. Amtrak, created by the Rail Passenger Service Act of 1970 (84 Stat. 1328, 45 U.S.C. 501), is also not "an agency or establishment of

the United States Government" but is "deemed a common carrier by railroad" subject, with certain exceptions, to the Interstate Commerce Act. Sections 301 and 306(a) of the Rail Passenger Service Act of 1970, 45 U.S.C. 541 and 546(a).

21/ Agreement Between the Government of the United States of America and Certain Governments, Members of the European Space Research Organization, for a Cooperative Programme Concerning the Development, Procurement and Use of a Space Laboratory In Conjunction With the Space Shuttle System, done at Neuilly-sur-Seine August 14, 1973, entered into force for the United States August 14, 1973, 24 UST 2049; TIAS 7722. Since the agreement was concluded, ESRO has been succeeded by the European Space Agency (ESA), which is likewise bound by the Spacelab Agreement.

22/ Treaty on Principles Governing the Activities of States In the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, done at Washington, London, and Moscow, January 27, 1967; entered into force for the United States October 10, 1967. 18 UST 2410; TIAS 6347; 610 UNTS 205.

23/ Under NASA's Shuttle services reimbursement policies, supra note 3, foreign users "who have made substantial investment in the STS program, i.e., European Space Agency (ESA), ESA member or observer nations participating in Spacelab development, and Canada, when conducting experimental science or experimental applications missions with no near-term commercial implications" are treated the same for reimbursement purposes as civil U.S. Government users. Canada's investment in the STS program is made under an Agreement Between the United States of America and Canada concerning Space Cooperation: Remote Manipulator System, entered into force June 23, 1976, TIAS 8400.

24/ See supra note 20 on Comsat's legal status under U.S. municipal law. Internationally, under the Intelsat Agreement (opened for signature at Washington, August 20, 1971, 23 U.S.T. 3813, TIAS 7532), Comsat acts as technical and operational manager of Intelsat until February 12, 1979, six years after the date of entry into force of the Intelsat Agreement, after which a new technical and operational management arrangement must be worked out. See Articles XI and XII of the Intelsat Agreement; and Aviation Week and Space Technology, March 15, 1976, at 77. The satellites used by Intelsat are owned by Intelsat.

Western Union, RCA, and Comsat General (a wholly-owned subsidiary of Comsat) own and operate their own satellites, while a fourth corporation, American Satellite Corporation (owned by Fairchild Industries Inc.), leases capacity from the Western Union satellites. Business Week, May 31, 1976, at 25.

25/ Senate Committee on Aeronautical and Space Sciences, Report on Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Comm. Print, 90th Cong., 1st Sess. 28 (March 1967).

26/ Convention on International Liability for Damage Caused by Space Objects, done at Washington, London, and Moscow, March 29, 1972; entered into force for the United States October 9, 1973. 24 UST 2389; TIAS 7762. In the Liability Convention, the provisions prescribing liability are usually directed at the "launching State," which is defined as a "State which launches or procures the launching of a space object" and a "State from whose territory or facility a space object is launched." Article I(c). Subsequent provisions specify the types of liability which apply in various situations and the apportionment of liability in situations involving more than one launching State.

27/ Article IX of the Outer Space Treaty contains further prescriptions relating to the general matter of state responsibility in outer space. States Parties to the Treaty shall be guided by the principle of cooperation and mutual assistance in the exploration and use of outer space and shall conduct all their outer space activities "with due regard to the corresponding interests of all other States Parties to the Treaty." They "shall pursue studies of outer space, including the Moon and other celestial bodies, and conduct exploration of them so as to avoid their harmful contamination and also adverse changes in the environment of the Earth resulting from the introduction of extraterrestrial matter and, where necessary, shall adopt appropriate measures for this purpose." A State Party which "has reason to believe that an activity or experiment planned by it or its nationals in outer space . . .would cause potentially harmful interference with activities of other States Parties in the peaceful exploration and use of outer space. . .shall undertake appropriate international consultations before proceeding with any such activity or experiment." If a State Party "has reason to believe that an activity or experiment planned by another State Party in outer space. . .would cause potentially harmful interference with activities in the peaceful exploration and use of outer space," it "may request consultation concerning the activity or experiment."

28/ The basic duty of a common carrier to make final delivery before being relieved of its legal responsibilities is very well-established. Gorton, infra note 40, at 101, 114. See Railroad Co. v. Manufacturing Co., 16 Wall. (83 U.S.) 318, 21 L.Ed. 297 (1872); Railroad Co. v. Pratt, 22 Wall. (89 U.S.) 123, 22 L.Ed. 827 (1874); Pratt v. Railway Co., 5 Otto (95 U.S.) 43, 24 L.Ed. 336 (1877); Insurance Co. v. Railroad Co., 14 Otto (104 U.S.) 146, 26 L.Ed. 679 (1881); and North Pennsylvania R. Co. v. Commercial National Bank, 123 U.S. 727, 31 L.Ed. 287, 8 S.Ct. 266 (1887). Further citations to cases discussing this basic rule, as well as its many nuances can be found at 13 Am Jur 2d, Carriers, secs. 395-414; and 13 C.J.S. Carriers, secs. 159-186.

29/ U.S.C.A. Const. Art. 6, cl. 2.

30/ It is true that if the STS were legally able to be operated as common carrier (which, as stated earlier, would require amendment of the NASAct), common law principles would have to "bow" to any conflicting treaty provisions. See e.g., Indemnity Ins. Co. of North America v. Pan American Airways, 58 F. Supp. 338 (S.D.N.Y. 1944) (public policy against contractual limitation of liability by common carriers must bow to the overriding policy of Warsaw Convention); and Block v. Compagnie Nationale Air France, 299 F. Supp. 801 (N.D. Ga. 1964) (Warsaw Convention limitations on liability of common carriers override state public policy).

31/ The Launch Policy can be found in the Department of State Bulletin, November 6, 1972, at 533-534.

32/ The public announcement of the European launch assistance policy was made on November 1, 1971, by the State Department; however, the U.S. policy was first formally presented to the European Space Conference in a letter dated September 1, 1971, from Under Secretary of State for Political Affairs U. Alexis Johnson to Minister Theo Lefevre, Chairman of the European Space Conference. Text of the announcement and letter, as well as of a "summary of amplifying comments" can be found at Department of State Bulletin, November 29, 1971, at 624.

33/ Article XIV of the Intelsat definitive arrangements contains provisions on the rights and obligations of Intelsat members which desire to establish, acquire, or utilize space telecommunications facilities separate from the Intelsat facilities for various purposes, domestic or international in nature. Agreement Relating to the International Telecommunications Satellite Organization (INTELSAT), with annexes, done at Washington, August 20, 1971; entered into force for the United States February 12, 1973. 23 UST 3813; TIAS 7532.

34/ Supra note 31.

35/ Supra note 32.

36/ Supra note 32.

37/ Supra note 32.

38/ Supra note 24.

39/ It should be noted that since no Shuttle missions will, for the foreseeable future, be launched from outside the United States, the language of Provision II relating to launchings under the Launch Policy but from foreign sites is inapplicable.

40/ This principle of the legal status of a common carrier is basic and well-established from seventeenth century England:

> "The common carrier 'is under a public duty to carry for every one, under certain conditions, usually of his own making, so that if he refuses to carry within these limitations he is liable.' He is bound to receive and transport all freight tendered, according to the custom and usage of their business. To carry out his service duty the common carrier at common law is not allowed to refuse transportation for certain persons except in some cases (in other words he cannot freely choose his customers), he is not allowed to charge unreasonable rates (that would in fact be another way to refuse to carry) and he has to provide reasonable facilities (which is true particularly for the railways).
>
> "The common carrier's basic duty is to accept and carry impartially for all who wish to engage his services. Originally the common law courts treated actions for non-feasance and mis-feasance as based on tort which required the assumpsit that the defendant

> had set himself out to perform or to perform with skill, as the case may be, and that assumpsit might be represented by the fact that the defendant was exercising a common calling. But, by the seventeenth century a failure to perform the duties of serving all and sundry and of serving with skill came to be regarded as a breach of contract. Hence a person seeking redress had the opportunity of proceeding by alternative [illegible] He could bring an action on the case sounded in tort or he could allege breach of contract, for the duties of a person in a common calling came to be regarded as terms of an implied contract.'
>
> "Thus a common carrier may not carry for one and refuse to carry for another, but instead he must perform his duty without discrimination, and theoretically, at least, in the order in which the applications are made." (footnotes omitted)

Lars Gorton, The Concept of the Common Carrier in Anglo-American Law 103-105 (Gothenburg Maritime Law Association 1971). Beyond this basic duty, however, there have developed many and often complicated nuances which are beyond the scope of this discussion. See the cases collected in 13 Am Jur 2d, Carriers, secs. 175-224; and 13 C.J.S. Carriers, secs. 348-397. The basic common law duty of a common carrier not to discriminate remains to this day, although the duty in the United States is usually enforced through Federal regulatory agencies applying Federal statutes addressed to common carriage. See e.g. A.L. Mechling Barge Lines, Inc. v. U.S., 376 U.S. 375, 84 S.Ct. 874, 11 L.Ed. 2d 788 (1964), reh. den'd 377 U.S. 960 (1964); and American Trucking Associations, Inc. v. Atchison, Topeka & Santa Fe R. Co., 387 U.S. 397, 87 S.Ct. 1608, 18 L.Ed. 2d 847 (1967), reh. den'd 389 U.S. 889 and 389 U.S. 892 (1967).

41/ Under NASA's reimbursement policies (supra note 3) all users "will be required to furnish NASA with sufficient information to verify peaceful purposes and to insure Shuttle safety and NASA's and the U.S. Government's continued compliance with law and the Government's obligations." 14 CFR 1214.104(b) and 1214.204(b). See also NASA Management Instructions (NMI) 8610.8, paragraph 6(b) (January 21, 1977), and 8610.9, paragraph 6(b) (February 11, 1977).

With respect to commercial users of the Shuttle, NASA's reimbursement policies specifically provide that:

> "NASA will not acquire rights to inventions, patents or proprietary data privately funded by a user, or arising out of activities for which a user has reimbursed NASA under the policies set forth herein. However, in certain instances in which the NASA Administrator has determined that activities may have a significant impact on the public health, safety or welfare, NASA may obtain assurances from the user that the results will be made available to the public on terms and conditions reasonable under the circumstances." 14 CFR 1214.104(a); NMI 8610.8, paragraph 6a.

Thus, any proprietary information to verify peaceful purposes and insure Shuttle safety, in order to be adequately protected, could be supplied to NASA as privileged and confidential under appropriate safeguards.

42/ There are exceptions to this general rule, such as when the common carrier has reasonable ground to suspect that the goods are of a dangerous or illegal character. The Nitroglycerine Case (Parrot v. Wells, Fargo & Co.) 15 Wall. (82 U.S.) 524, 535-536 (1872). See also other cases collected at 13 Am Jur 2d, Carriers, sec. 238; and 13 C.J.S. Carriers, sec. 28.

43/ 72 Stat. 731; 49 U.S.C. 1301

44/ When faced with a problem of statutory construction, the courts show "great deference to the interpretation given the statute by the officers or agency charged with its administration." Udall v. Tallman, 380 U.S. 1, at 16 (1964). See also, Philadelphia Television Broadcasting v. FCC, 359 F. 2d 282 (D.C. Cir. 1965).

It should be noted in passing that even if hypothetically the Shuttle were considered to be an "aircraft" under the FAAct, it would be a "public aircraft" rather than a "civil aircraft" under the Act. A "civil aircraft" is defined as "any aircraft other than a public aircraft" (FAAct, sec. 101(14); 49 U.S.C. 1301(14)). A "public aircraft" is:

> "an aircraft used exclusively in the service of any government or of any political subdivision thereof, including the government of any State, Territory, or possession of the United States, or the District of Columbia, but not including any government-owned aircraft engaged in carrying persons or property for commercial purposes."

FAAct, sec. 101(32); 49 U.S.C. 1301(32). Although aircraft owned by foreign governments are "civil aircraft" if "engaged in carrying persons or property for commercial purposes," a U.S. flag aircraft, even if owned and operated by a private corporation will be a "public aircraft" if it is engaged exclusively in U.S. Government business (e.g., under a contract to perform transportation services solely for the U.S. Government). United States v. Aero Spacelines, Inc., 361 F.2d 916 (9th Cir., 1966). Any NASA aircraft would be a "public aircraft" even if such aircraft is carrying cargo which might eventually have commercial value to a private corporation, since "(t)o come within the definition of 'public aircraft,' the aircraft need only be used exclusively in the service of any government. . . ." Id. at 922. The STS, owned and operated by the U.S. Government and used to fulfill the policies specified in the NASAct will not be "a major enterprise for profit," thus not making NASA

a "commercial operator" under the FARs (14 CFR 1.1 (1976)). Payment to NASA for providing reimbursable launch services are not based upon making a profit but only upon covering NASA's expenses.

45/ The Federal Register, March 31, 1977, Vol. 42, pp. 17139 & 17140, contains the proposed FAA rules for the alteration and establishment of several restricted air space areas (under 14 CFR Parts 71, 73) for Shuttle operations from Kennedy Space Center in Florida. Final rules are published in Federal Register, June 9, 1977, Vol. 42, pp. 29475 & 29476.

46/ This authority would even extend to stowaways on board the Shuttle, although it is highly unlikely that such a situation would ever occur, due to the stringent security which will surround STS operations and the very small amount of room on board the Shuttle.

In regard to DoD personnel detailed to NASA, they will be subject to "all appropriate regulations and directives of NASA. Agreement Between the Departments of Defense, Army, Navy and Air Force and the National Aeronautics and Space Administration Concerning the Detailing of Military Personnel for Service with NASA, approved by the President on April 13, 1959. See NASA Management Instruction (NMI) 1052.11A, sec. IV(a) (April 13, 1959). Memorandum of Understanding (MOU) Between the Department of Defense, the Army, the Navy and the Air Force and the National Aeronautics and Space Administration Concerning the Detailing of Military Personnel for Service as Shuttle Crew Members. See NMI 1052.202, sec. IV(e) (December 17, 1976).

47/ 42 U.S.C. 2473(c).

48/ 42 U.S.C. 2455(a).

49/ This provision, mutatis mutandis, is contained in S. 1437 (95th Cong., 1st Sess.) as §892.

50/ Such as been done for other matters of great importance to NASA. See e.g. 14 CFR 1203a.100 et seq. (establishment of NASA security areas) and 14 CFR 1211.100 et seq. (NASA "quarantine" regulations).

51/ McDougal, Lasswell, and Vlasic, Law and Public Order in Space 670, and 668-674 generally (1963). See also Matte, The International Legal Status of the Aircraft Commander (1975); and Meyers, The Nationality of Ships, 110, 120, and 322 n. 3 (1967).

52/ "A state's 'registry' of spacecraft is a term similar to the 'registry' of ocean-going ships, such records being kept for the purpose of identifying ownership." Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, Including the Moon and Other Celestial Bodies, Staff Report of the Committee on Aeronautical and Space Sciences of the United States Senate 31, 90th Cong., 1st Sess. (Comm. Print, March 1967). Details concerning the registration of space objects are set forth in the Convention on Registration of Objects Launched into Outer Space, opened for signature at New York January 14, 1975; entered into force for the United States September 15, 1976. TIAS 8480. Under Article II(1) the United States will be required to register the Shuttle Orbiter each time it is launched into orbit.

53/ Exercise of that authority, including the use of physical force, set forth in NASA regulations based upon the NASAct, secs. 203(c)(1) and 304(a) as discussed earlier, would not involve a determination of criminal guilt, but only a determination that certain measures are reasonable and necessary to insure the safety of the persons on board the Shuttle (which includes Spacelab) as well as the protection and security of the Shuttle, any payloads, and any parts thereof. Violation of NASA regulations is addressed in 18 U.S.C. 799, but the determination of guilt and punishment for such alleged violations is a matter for the appropriate United States court

back on Earth. The matter of criminal jurisdiction is discussed in Issue No. 10.

54/ 42 U.S.C. 2473(c)(1).

55/ Section 203(a) of the NASAct; 42 U.S.C. 2473(a).

56/ See Mulholland, "A Cost-Effective Approach for Flight Experiments: Application of Airborne Science Aircraft Experience to the Shuttle Sortie Lab," paper presented at the 24th International Astronautical Congress, Baku, U.S.S.R., October 7-13, 1973; and Mulholland, et al., "NASA/ESA CV-990 Airborne Simulation of Spacelab," paper no. AAS 75-237, presented at the 21st Annual Meeting of the American Astronautical Society, Denver, Colorado, August 26-28, 1975.

57/ NASA/Ames Research Center, Flight Operations Manual Memorandum No. 70-2, sec. 302.3 Physiological Training (July 24, 1970).

58/ Id. Crew members other than flight crew personnel who are scheduled for high altitude flights are also required to visit an Ames Research Center approved physician immediately prior to beginning a series of such flights.

59/ NASA Learjet Airborne Observatory Investigator's Handbook, sec. 1.1.

60/ Id.

61/ Section 203(c)(1) of the NASAct; 42 U.S.C. 2473(c)(1).

62/ See supra note 46 regarding DoD personnel detailed to NASA.

63/ See e.g. NMI 8020.19B (September 17, 1974), establishing policy, procedures, and responsibilities regarding articles authorized to be carried on the Apollo-Soyuz Test Project mission.

64/ NASA regulations, published in the Federal Register, would establish artifact policy for non-NASA employees of U.S. nationality, unless the matter were to be controlled by the relevant contractual provisions. Both approaches would seem advisable.

65/ Man-made objects of Earth origin which might be retrieved by the Shuttle, but not belonging to the United States, would most likely be legally the property of the state of registry, according to Article VIII of the 1967 Outer Space Treaty. It would, therefore, be the duty of the United States to return such object to the state of registry on request, pending proper request for and identification of the object:

> "A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body. Ownership of objects launched into outer space, including objects landed or constructed on a celestial body, and of their component parts, is not affected by their presence in outer space or on a celestial body or by their return to the Earth. Such objects or component parts found beyond the limits of the State Party to the Treaty on whose registry they are carried shall be returned to that State Party, which shall, upon request, furnish identifying data prior to their return."

This provision, of course, is binding only upon States Parties to the Treaty, and, furthermore, does not impose a duty on the United States to retrieve the foreign space object in the first place.

66/ The latest details available on the SRB and ET procedures appear in the amended version of the environmental impact statement on the Space Shuttle Program.

67/ It should be noted that although the SRBs will impact within a 200-mile coastal zone, for the purposes of this analysis they will be regarded as impacting on the high seas.

68/ The first United States satellite launched into Earth orbit was Explorer I on January 31, 1958.

69/ The U.S. agencies most directly involved are the FAA and the Coast Guard. See e.g., 14 CFR 91.91, 91.95, and 91.102 (1977), Federal Aviation Regulations, based upon section 307 of the FAAct, and 33 CFR 72.01 (1976), Coast Guard regulations on "Notices to Mariners," to advise mariners on various facts relating to the safety of navigation.

70/ Past United States and Soviet practice regarding missile and launch vehicle booster stage impact can be found in 4 Whiteman, Digest of International Law, 619-631 (1965).

71/ Only the ET will be disposed in the ocean; the SRBs will be recovered on the ocean, towed back to shore, refurbished, and used again.

72/ Act of October 23, 1972; P.L. 92-532; 86 Stat. 1052; 33 U.S.C. 1401 et seq.

73/ Done at London, Mexico City, Moscow, and Washington, December 29, 1972; entered into force for the United States August 20, 1975; TIAS 8165. The text can also be found in 11 International Legal Materials 1294 (November 1972).

74/ 1974 U.S. Code Congressional and Administrative News, pp. 2792-93. The Marine Act's legislative history clearly indicates that the Act was drafted in

anticipation of the London Convention. Id. at 2794. See also 1972 U.S. Code Congressional and Administrative News, pp. 4242-43.

75/ 40 CFR 220 et seq.

76/ 33 U.S.C. 1401(b).

77/ 33 U.S.C. 1401(c).

78/ 33 U.S.C. 1411(a).

79/ 33 U.S.C. 1402(e).

80/ 33 U.S.C. 1402(k).

81/ "Material" includes "matter of any kind or description, including but not limited to, dredged material, solid waste, incinerator residue, garbage, sewage, sewage sludge, munitions, radiological, chemical, and biological warfare agents, radioactive materials, chemicals, biological and laboratory waste, wreck or discarded equipment, rock, sand, excavation debris, and industrial, municipal, agricultural, and other waste. . . ." 33 U.S.C. 1402(c).

"Ocean waters" are defined to mean "those waters of the open seas lying seaward of the base line from which the territorial sea is measured, as provided for in the Convention on the Territorial Sea and the Contiguous Zone (15 UST 1606; TIAS 5639)." 33 U.S.C. 1402(b).

82/ 33 U.S.C. 1402(f).

83/ 1972 U.S. Code Congressional and Administrative News, pp. 4255-56.

Public Law 96-48
96th Congress

An Act

To authorize appropriations to the National Aeronautics and Space Administration for research and development, construction of facilities, and research and program management, and for other purposes.

Aug. 8, 1979
[H.R. 1786]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there is hereby authorized to be appropriated to the National Aeronautics and Space Administration to become available October 1, 1979:

National Aeronautics and Space Administration Authorization Act, 1980.

(a) For "Research and development," for the following programs:
(1) Space Shuttle, $1,586,000,000;
(2) Space flight operations, $463,300,000;
(3) Expendable launch vehicles, $70,700,000;
(4) Physics and astronomy, $337,500,000;
(5) Planetary exploration, $220,200,000;
(6) Life sciences, $43,900,000;
(7) Space applications, $338,300,000;
(8) Technology utilization, $12,100,000;
(9) Aeronautical research and technology, $309,300,000;
(10) Space research and technology, $119,400,000;
(11) Energy technology, $5,000,000; and
(12) Tracking and data acquisition, $332,800,000.

(b) For "Construction of facilities," including land acquisition, as follows:
(1) Modification of static test facility, Ames Research Center, $2,900,000;
(2) Construction of large aircraft maintenance dock, Hugh L. Dryden Flight Research Center, $1,500,000;
(3) Rehabilitation and modification of flight operations facilities, Ellington Air Force Base, $1,760,000;
(4) Modifications to central instrumentation facility, John F. Kennedy Space Center, $1,260,000;
(5) Modifications to operations and checkout building, John F. Kennedy Space Center, $950,000;
(6) Rehabilitation of roof, launch control center, John F. Kennedy Space Center, $600,000;
(7) Modifications of model support system 8-foot high temperature structures tunnel, Langley Research Center, $1,410,000;
(8) Modifications to 8-foot transonic pressure tunnel, Langley Research Center, $2,000,000;
(9) Modification of transonic dynamics tunnel, Langley Research Center, $970,000;
(10) Rehabilitation and modification of gas dynamics laboratory, Langley Research Center, $3,600,000;
(11) Modifications to central air system, various buildings, Lewis Research Center, $5,720,000;
(12) Modifications to various buildings, Marshall Space Flight Center, $2,640,000;
(13) Rehabilitation of roofs, various buildings, Marshall Space Flight Center, $900,000;

(14) Rehabilitation of roof, Phase I, building 103, Michoud Assembly Facility, $3,100,000;

(15) Construction of facilities operations shop building, Wallops Flight Center, $1,100,000;

(16) Large aeronautical facility: construction of national transonic facility, Langley Research Center, $12,000,000;

(17) Large aeronautical facility: modification of 40- by 80-foot subsonic wind tunnel, Ames Research Center, $33,900,000;

(18) Space Shuttle facilities at various locations as follows:

(A) Modifications to launch complex 39, John F. Kennedy Space Center, $17,100,000;

(B) Modifications to crawler transporter maintenance facility, John F. Kennedy Space Center, $1,250,000;

(C) Modification of manufacturing and final assembly facilities for external tanks, Michoud Assembly Facility, $6,900,000;

(D) Minor Shuttle-unique projects, various locations, $2,500,000;

(19) Space Shuttle payload facilities at various locations as follows:

(A) Rehabilitation and modification for payload ground support operations, John F. Kennedy Space Center, $2,610,000;

(B) Modification and addition to materials sciences laboratory, Ames Research Center, $1,640,000;

(20) Repair of facilities at various locations, not in excess of $500,000 per project, $12,000,000;

(21) Rehabilitation and modification of facilities at various locations, not in excess of $500,000 per project, $19,790,000;

(22) Minor construction of new facilities and additions to existing facilities at various locations, not in excess of $250,000 per project, $3,500,000; and

(23) Facility planning and design not otherwise provided for, $14,000,000.

"Research and program management."

(c) For "Research and program management," $964,900,000, and such additional or supplemental amounts as may be necessary for increases in salary, pay, retirement, or other employee benefits authorized by law.

"Research and development."

(d) Notwithstanding the provisions of subsection 1(g), appropriations for "Research and development" may be used (1) for any items of a capital nature (other than acquisition of land) which may be required at locations other than installations of the Administration for the performance of research and development contracts, and (2) for grants to nonprofit institutions of higher education, or to nonprofit organizations whose primary purpose is the conduct of scientific research, for purchase or construction of additional research facilities; and title to such facilities shall be vested in the United States unless the Administrator determines that the national program of aeronautical and space activities will best be served by vesting title in any such grantee institution or organization. Each such grant shall be made under such conditions as the Administrator shall determine to be required to insure that the United States will receive therefrom benefit adequate to justify the making of that grant. None of the funds appropriated for "Research and development" pursuant to this Act may be used in accordance with this subsection for the construction of any major facility, the estimated cost of which, including collateral equipment, exceeds $250,000, unless the Administrator or his designee has notified the Speaker of

the House of Representatives and the President of the Senate and the Committee on Science and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate of the nature, location, and estimated cost of such facility.

(e) When so specified and to the extent provided in an appropriation Act, (1) any amount appropriated for "Research and development" or for "Construction of facilities" may remain available without fiscal year limitation, and (2) maintenance and operation of facilities, and support services contracts may be entered into under the "Research and program management" appropriation for periods not in excess of 12 months beginning at any time during the fiscal year.

Scientific consultations or extraordinary expenses.

(f) Appropriations made pursuant to subsection 1(c) may be used, but not to exceed $25,000, for scientific consultations or extraordinary expenses upon the approval or authority of the Administrator and his determination shall be final and conclusive upon the accounting officers of the Government.

(g) Of the funds appropriated pursuant to subsections 1(a) and 1(c), not in excess of $75,000 for each project, including collateral equipment, may be used for construction of new facilities and additions to existing facilities, and for repair, rehabilitation, or modification of facilities: *Provided,* That, of the funds appropriated pursuant to subsection 1(a), not in excess of $250,000 for each project, including collateral equipment, may be used for any of the foregoing for unforeseen programmatic needs.

SEC. 2. Authorization is hereby granted whereby any of the amounts prescribed in paragraphs (1) through (22), inclusive, of subsection 1(b)—

(1) in the discretion of the Administrator or his designee, may be varied upward 10 percent, or

Report to congressional committees.

(2) following a report by the Administrator or his designee to the Committee on Science and Technology of the House of Representatives and the Committee on Commerce, Science, and Transportation of the Senate on the circumstances of such action, may be varied upward 25 percent,

Limitations.

to meet unusual cost variations, but the total cost of all work authorized under such paragraphs shall not exceed the total of the amounts specified in such paragraphs.

Transfer of funds.

SEC. 3. Not to exceed one-half of 1 percent of the funds appropriated pursuant to subsection 1(a) hereof may be transferred to the "Construction of facilities" appropriation, and, when so transferred, together with $10,000,000 of the funds appropriated pursuant to subsection 1(b) hereof (other than funds appropriated pursuant to paragraph (23) of such subsection) shall be available for expenditure to construct, expand, or modify laboratories and other installations at any location (including locations specified in subsection 1(b)), if (1) the Administrator determines such action to be necessary because of changes in the national program of aeronautical and space activities or new scientific or engineering developments, and (2) he determines that deferral of such action until the enactment of the next authorization Act would be inconsistent with the interest of the Nation in aeronautical and space activities. The funds so made available may be expended to acquire, construct, convert, rehabilitate, or install permanent or temporary public works, including land acquisition, site preparation, appurtenances, utilities, and equipment. No portion of such sums may be obligated for expenditure or expended to construct, expand, or modify laboratories and other installations

unless (A) a period of 30 days has passed after the Administrator or his designee has transmitted to the Speaker of the House of Representatives and to the President of the Senate and to the Committee on Science and Technology of the House of Representatives and to the Committee on Commerce, Science, and Transportation of the Senate a written report containing a full and complete statement concerning (1) the nature of such construction, expansion, or modification, (2) the cost thereof including the cost of any real estate action pertaining thereto, and (3) the reason why such construction, expansion, or modification is necessary in the national interest, or (B) each such committee before the expiration of such period has transmitted to the Administrator written notice to the effect that such committee has no objection to the proposed action.

SEC. 4. Notwithstanding any other provision of this Act—

(1) no amount appropriated pursuant to this Act may be used for any program deleted by the Congress from requests as originally made to either the House Committee on Science and Technology or the Senate Committee on Commerce, Science, and Transportation,

(2) no amount appropriated pursuant to this Act may be used for any program in excess of the amount actually authorized for that particular program by subsections 1(a) and 1(c), and

(3) no amount appropriated pursuant to this Act may be used for any program which has not been presented to or requested of either such committee,

unless (A) a period of 30 days has passed after the receipt by the Speaker of the House of Representatives and the President of the Senate and each such committee of notice given by the Administrator or his designee containing a full and complete statement of the action proposed to be taken and the facts and circumstances relied upon in support of such proposed action, or (B) each such committee before the expiration of such period has transmitted to the Administrator written notice to the effect that such committee has no objection to the proposed action.

Federal research funds, geographical distribution.
42 USC 2459 note.

SEC. 5. It is the sense of the Congress that it is in the national interest that consideration to be given to geographical distribution of Federal research funds whenever feasible, and that the National Aeronautics and Space Administration should explore ways and means of distributing its research and development funds whenever feasible.

SEC. 6. (a) Paragraph 13 of subsection (c) of section 203 of the National Aeronautics and Space Act of 1958, as amended (42 U.S.C. 2473(c)(13)), is amended by striking out "$5,000" where it appears and inserting in lieu thereof "$25,000".

42 USC 2459.

(b) The National Aeronautics and Space Act of 1958, as amended, is amended (1) by redesignating section 308 as section 309 thereof; and (2) by inserting the following new section:

"INSURANCE AND INDEMNIFICATION

Liability insurance.
42 USC 2458b.

"SEC. 308. (a) The Administration is authorized on such terms and to the extent it may deem appropriate to provide liability insurance for any user of a space vehicle to compensate all or a portion of claims by third parties for death, bodily injury, or loss of or damage to property resulting from activities carried on in connection with the launch, operations or recovery of the space vehicle. Appropriations available to the Administration may be used to acquire such insurance, but such appropriations shall be reimbursed to the maximum

extent practicable by the users under reimbursement policies established pursuant to section 203(c) of this Act.

Ante, p. 348.

"(b) Under such regulations in conformity with this section as the Administrator shall prescribe taking into account the availability, cost and terms of liability insurance, any agreement between the Administration and a user of a space vehicle may provide that the United States will indemnify the user against claims (including reasonable expenses of litigation or settlement) by third parties for death, bodily injury, or loss of or damage to property resulting from activities carried on in connection with the launch, operations or recovery of the space vehicle, but only to the extent that such claims are not compensated by liability insurance of the user: *Provided*, That such indemnification may be limited to claims resulting from other than the actual negligence or willful misconduct of the user.

"(c) An agreement made under subsection (b) that provides indemnification must also provide for—

"(1) notice to the United States of any claim or suit against the user for the death, bodily injury, or loss of or damage to the property; and

"(2) control of or assistance in the defense by the United States, at its election, of that suit or claim.

"(d) No payment may be made under subsection (b) unless the Administrator or his designee certifies that the amount is just and reasonable.

"(e) Upon the approval by the Administrator, payments under subsection (b) may be made, at the Administrator's election, either from funds available for research and development not otherwise obligated or from funds appropriated for such payments.

Definitions.

"(f) As used in this section—

"(1) the term 'space vehicle' means an object intended for launch, launched or assembled in outer space, including the Space Shuttle and other components of a space transportation system, together with related equipment, devices, components and parts;

"(2) the term 'user' includes anyone who enters into an agreement with the Administration for use of all or a portion of a space vehicle, who owns or provides property to be flown on a space vehicle, or who employs a person to be flown on a space vehicle; and

"(3) the term 'third party' means any person who may institute a claim against a user for death, bodily injury or loss of or damage to property.".

Effective date.
42 USC 2458b note.

(c) This section shall be effective October 1, 1979.

Short title.

SEC. 7. This Act may be cited as the "National Aeronautics and Space Administration Authorization Act, 1980".

Approved August 8, 1979.

LEGISLATIVE HISTORY:

HOUSE REPORTS: No. 96-52 (Comm. on Science and Technology) and No. 96-371 (Comm. of Conference).

SENATE REPORTS: No. 96-207 (Comm. on Commerce, Science, and Transportation) and No. 96-252 (Comm. of Conference).

CONGRESSIONAL RECORD, Vol. 125 (1979):

Mar. 28, considered and passed House.

June 14, considered and passed Senate, amended.

July 23, Senate agreed to conference report.

July 27, House agreed to conference report.

APPENDIX C

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

[Notice No. 79-70]

Guidelines Regarding Joint Endeavors With U.S. Domestic Concerns In Materials Processing In Space

Background

NASA, by virtue of the National Aeronautics and Space Act of 1958, is directed to conduct its activities so as to contribute to the preservation of the role of the United States as a leader in aeronautical and space science and technology, and their applications. In furtherance of these objectives, the Administrator of NASA on June 25, 1979, promulgated a statement of *NASA Guidelines Regarding Early Usage of Space for Industrial Purposes*. These guidelines recognized that "since substantial portions of the U.S. technological base and motivation reside in the U.S. private sector, NASA will enter into transactions and take necessary and proper actions to achieve the objective of national technological superiority through joint action with United States domestic concerns."

Materials Processing in Space (MPS) is an emerging technology which can potentially provide public benefits through applications in the private sector. However, in the foreseeable future, normal market incentives appear to be inadequate to bring about technological innovation in the private sector based on this technology. Therefore, in accordance with the above referenced Guidelines, NASA contemplates entering into joint endeavors with U.S. industrial concerns. Through these joint endeavors, NASA seeks, within the context of the MPS program objectives, to broaden the base of understanding of MPS technology, particularly with regard to its usefulness in the private sector where economic benefits may result. Present MPS program objective are: a) to understand the pervasive role of gravity in materials processing; b) to develop and demonstrate enhanced control of materials processes in weightless environment; c) to explore the unique nature of space vacuum for materials processing; and, d) to foster commercial applications of MPS technology.

Nature of the Joint Endeavor

Joint endeavors in MPS will generally be for the purpose of: 1) engaging in research programs directed to the development and/or enhancement of U.S. commercial leadership in the field of materials processing in space, and 2) encouraging commercial applications of MPS technology. Joint endeavors may cover ground-based research to create a sound scientific basis for investigations in space; the investigation of materials properties or phenomena and process technology in the unique environment of space; the making in space of exemplary materials to serve as a point of reference for ground-based materials and processes; and the application investigations and feasibility demonstrations of space-made or space-derived materials and processes.

In joint endeavors, NASA and the industrial concern share in the cost and risks of the endeavor. Terms and conditions, including the business arrangements, are negotiable within the limits of prevailing statutes and regulations and will be commensurate with the risks, involvement and investment of all the parties. NASA's intent is to offer as much latitude as practical in joint endeavor arrangements. Due to the experimental nature of the program, both technically and institutionally, each endeavor will be negotiated on a case-by-case basis. Endeavors are expected to vary in size, complexity, and arrangements to

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achieve diversity in the program. The number and/or size of the joint endeavors undertaken will depend upon the nature of the proposals received and resource availability. All joint endeavors will be subject to availability of appropriated funds, as well as NASA procedures regarding flight safety and verification.

NASA Provided Incentives

NASA incentives for these purposes may include in addition to making available the results of NASA research: (1) providing flight time on the space transportation system on appropriate terms and conditions as determined by the Administrator; (2) providing technical advice, consultation, data, equipment and facilities to participating organizations; and (3) entering into joint research and demonstration programs where each party funds its own participation.

Facts to be Considered in Establishing Endeavors

To qualify for joint sponsorship, the offeror must be engaged in business in the U.S. in such a manner that any promising results from the endeavor will contribute principally to the U.S. technological position; the proposed joint endeavor must comport with one or more of the MPS program objectives as stated above; and the technical uncertainties and risk involved must be significant enough to warrant the government's participation.

The factors to be considered by NASA prior to providing incentives may include, but not be limited to, some or all of the following considerations: (1) the public or social need for the expected technology development; (2) the contribution to be made to the maintenance of U.S. technological superiority; (3) possible benefits accruing to the public or the U.S. Government from sharing in results; (4) the enhanced economic exploitation of NASA capabilities such as the space transportation system; (5) the desirability of private sector involvement in NASA programs; (6) the merit of the research, development or application proposed; (7) the degree of risk and financial participation by the commercial concern; (8) the amount of proprietary data or background information to be furnished by the concern; (9) the rights in data to be granted the concern in consideration of its contribution; (10) the ability of the concern to project a potential market; (11) the willingness and ability of the concern to market and sell any resulting new or enhanced products on a reasonable basis; (12) the impact of NASA sponsorship on a given industry; (13) provision for a form of process exclusivity in special cases when needed to promote innovation; (14) recoupment of the NASA contribution under appropriate circumstances; and, (15) support of socioeconomic objectives of the Government.

Administration

The Associate Administrator, Space and Terrestrial Applications, is delegated the authority to enter into negotiations and to approve MPS joint endeavors on behalf of the Agency. Before proceeding into comprehensive evaluation of a joint endeavor, a preliminary assessment will be made of the merits of the offer. (Joint endeavor offers which are too sketchy or ill-defined to establish that the basic idea contained in the offer has merit, is in accord with MPS program objectives, or that the organization is willing to make significant contribution to the endeavor, will not be evaluated in depth and will be handled as correspondence or advertising.) This preliminary assessment will be reviewed by the Associate Administrator, Space and Terrestrial Applications, or his designee, to determine if the proposed endeavor warrants further consideration from NASA's standpoint. If this determination is positive, further evaluation will be made. After such evaluation and discussions with the offeror, if the parties mutually agree to proceed with a joint endeavor, designated representatives of NASA will enter into detailed discussions and negotiations with the offeror regarding the technical and business aspects of the offer in an effort to consummate a mutually satisfactory joint endeavor agreement. Management of the MPS joint endeavor program will be carried out by the Division of Materials Processing in Space of the Office of Space and Terrestrial Applications.

Due to resource limitations and necessity for diversity in the program, normally only one offer will be accepted to apply a particular materials process in a given technical area. If substantially similar offers are received within any 45-day period, they will be evaluated/negotiated together. The one which provides the best total consideration for the Government will be accepted. Special consideration shall be given to small and minority businesses, as appropriate.

August 3, 1979.

Robert A. Frosch,

Administrator.

[FR Doc. 79-24699 Filed 8-13-79; 8:45 am]

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APPENDIX D

National Aeronautics and
Space Administration

Washington, D.C.
20546

June 19, 1979

TO: G/General Counsel

FROM: GP/Assistant General Counsel for Patent Matters

SUBJECT: Applicability of Section 305 of the Space Act to Joint Endeavors

This responds to your request that I address the issue of whether "section 305 of the National Aeronautics and Space Act of 1958, as amended [hereinafter "Space Act"] applies to inventions made in the course of joint endeavors; for example, endeavors undertaken in the Materials Processing in Space Program."

In this memorandum I will review the legislative history of section 305, discuss NASA's interpretation and application of the section over the years, summarize the experience gained, and state the conclusions to be drawn therefrom.

The basic legal issue is whether a "joint endeavor" is a contract of the Administration for the performance of work within the intent of section 305, such that any inventions made in the course of the endeavor are subject to the ownership requirements of subsection 305(a).

For the purposes of this memorandum, a joint endeavor is defined as follows:

> A joint endeavor is an arrangement between NASA and a party or parties in which each undertakes to contribute to or participate in a project of mutual benefit, and which usually involves the use of equipment, facilities, services, personnel or information made available by one or more of the each parties for use by the others. Such endeavors do not involve the transfer of funds or title to property between the parties, and are not considered a procurement or an assistance transaction within the purview of P.L. 95-224. Services which may be involved do not constitute the employment of one of the party's employees by the other.

In answer to the legal issue raised, it is concluded that a joint endeavor is not subject to the legal constraints of section 305. This conclusion is based on the Space Act and the long-standing administrative interpretation of section 305 by NASA that there are many arrangements which NASA may enter into, a joint endeavor being one such arrangement, that are not contracts covered by subsection 305(a).

1. Section 305 of the Space Act

The pertinent language in the Space Act[1] dealing with the allocation of property rights in inventions is as follows (emphasis added):

> o Subsection 305(a) requires that [w]henever any invention is made "--in the performance of any work under any contract of the Administration, and the Administrator determines that -
>
> (1) the person who made the invention was emplyed or assigned to perform research, development, or exploration work and the invention is related to the work he was employed or assigned to perform, or that it was within the scope of his employment duties, whether or not it was made during working hours, or with a contribution by the Government of the use of Government facilities, equipment, materials, allocated funds, information proprietary to the Government, or services of Government employees during working hours; or
>
> (2) the person who made the invention was not employed or assigned to perform research, development, or exploration work, but the invention is nevertheless related to the contract, or to the work or duties he was employed or assigned to perform, or was made during working hours, or with a contribution from the Government of the sort referred to in clause (1)"
>
> such invention becomes the exclusive property of the United States unless the Administrator waives rights thereto in conformity with the provisions of subsection 305(f).
>
> o Subsection 305(b) specifies that "[e]ach contract entered into by the Administrator with any party for the performance of any work" is to contain effective provisions for the reporting of inventions "which may be made in the performance of such work."

o Section 305(j)(2) defines the term contract as meaning "any actual or proposed contract, agreement, understanding, or other arrangement, or subcontract."

It is the meaning, interpretation and application of the phrase "in the performance of any work under any contract of the Administration" when considered in the context of the whole statute, its legislative purpose and intent, and its long standing practical interpretation by NASA, that determines whether a joint endeavor, which meets the literal definition of "contract" as set forth in subsection 305(j)(2), comes under subsection 305(a).

2. Legislative Purpose and Intent Behind Section 305

The legislative purpose and intent underlying section 305 is not set forth in the Space Act;[2] however, the legislative history of section 305 does provide insight in this regard. Although the legislative history of section 305 has been characterized as "extremely thin" and not providing guidance, or as "very scanty," requiring NASA to use "its best judgment as to what Congress had in mind" with regard to the interpretation of such difficult and complicated legislation,[3] a careful review of the report of the House-Senate Conference on the bill,[4] and the transcripts of the floor debate prior to its passage[5], does reveal a consistent thread of legislative purpose and intent underlying section 305.

The report of the conference, for example, after briefly setting forth the previous House and Senate actions that led up to the need for conference on the issue, states:

> "Operating on the theory that the Government's interests must be protected, but with the concomitant purpose of protecting private interests and of keeping private incentive and initiative at a high level, the Committee of Conference adopted entirely new patent provisions."[6]

The report then continues with a very brief explanation of Subsection 305(a), indicating that inventions are to become the property of the United States "according to a specified standard." (Emphasis in report). This standard is set forth in subparagraphs (1) and (2) of subsection 305(a), and is based on a relationship of inventions made to both the duties of the contractor employee performing under the contract and contract requirements.[7]

During floor discussion prior to final passage of the Space Act, Rep. McCormack stated in his opening address:

> "The patent provisions of the House bill is the only part of the bill extensively revised by the conferees. The Senate version carried a patent provision closely similar to the provision of the House bill. This was dropped by floor amendment just before passage in the Senate to allow this section to go to conference. The review and redrafting were wise. The select committee created a special subcommittee to study the matter, and after talking with many experts in and out of Government arrived at a new version, drawing upon Senate and House suggestions. The original patent provision was too closely patterned after the stringent requirements of the Atomic Energy Act which are not fully applicable to the space field. The substitute provision agreed to by the conferees protects both the interests of the Government and affords enough flexibility to the Space Administrator to let him meet needs for preserving inventions of the individuals and companies whose efforts it is public policy to encourage."[8]

Rep. Keating also commented rather extensively on the patent provisions. Included in his summary of section 305 was the statement:

> "The conferees recognized that research and development in aeronautical and space sciences will not be comparable, in most respects, to that in the field of atomic energy, and hence that there is no necessity for a Government monopoly of rights or interests in all inventions and/or discoveries relating to space exploration.
>
> "And the patent provisions in this conference report do not automatically, as I understand the Atomic Energy Act does, give all property rights in inventions to the Government."[9]

The above-noted comments from the conference report and statements made during floor debate, viewed in light of drafting changes that culminated in the final version of section 305, clearly suggest that there was a legislative intent not to follow the restrictive and stringent approach taken in the field of atomic energy, which approach automatically created a "Government-monopoly" on inventions in the entire field based on some rather broad and generalized contractual relationships.[10] To the contrary, the Congres-

sional intent behind the redrafts that became section 305 was to loosen the grip of government ownership of technology resulting from the space program. This was accomplished by incorporating the "standard" of subparagraphs (1) and (2) into subsection 305(a) wherein the Government acquires rights to inventions only in specified situations in which contractors and employees thereof are required to perform work of an inventive nature for the Administration.

Thus, even though the legislative history lacks a detailed analysis of the various provisions of section 305 and their interplay, two key points are evident from the conference report and the floor statements, quoted above. First, there was an underlying legislative purpose to maintain private incentive and initiative; and second, there was a legislative intent that the restrictive provisions of the Atomic Energy Act, which essentially preempt private ownership of patent rights in an entire field of endeavor, were not to be carried over to space activities. Accordingly, NASA has from the onset adopted a liberal administration of section 305 and has made this known to Congress.[11] This is illustrated by the numerous examples discussed below.

3. NASA Interpretation and Application of Section 305

Consistent with the pronouncement to liberally administer section 305, and in harmony with the aforementioned legislative purpose and intent, NASA has over the years taken a more restricted interpretation as to the type of contracts that are subject to the title-taking constraints of subsection 305(a) than is literally suggested by the broadly worded definition of subsection 305(j)(2).[12] Accordingly, it has been the long standing official interpretation and administrative practice of NASA to limit the application of subsection 305(a) to activities performed for NASA that have the potential for making inventions.[13] This is reflected in NASA's regulations and practices over the past two decades, as the following review illustrates. This review covers a number of arrangements that NASA determined were not covered by subsection 305(a), a joint endeavor being one such arrangement. In each instance the determination made by NASA, and relied on by the other party, has had a direct effect on the vesting of property rights to inventions made by that party.[14]

a. Proposals Submitted to NASA

A literal interpretation of subsections 305(a) and 305(j)(2), taken together, would require the Government to take title to any privately funded inventions made in the course of preparing a proposal (i.e., a "proposed con-

tract") for submittal to NASA. Such interpretation, however, is manifestly at odds with the legislative purpose of section 305(a) to protect private interests and to maintain private incentive and initiative. Thus, NASA took a restrictive interpretation of the phrase "any... proposed contract" appearing in subsection 305(j)(2), and limited it to work performed upon an understanding that a contract would be awarded, such as when a written authorization is given to proceed with the work pending formalization and execution of a contract.[15]

b. Contracts for Supplies, Construction and Utility Services

In developing NASA's procurement regulations, interpretations of section 305 were made to determine the types of contracts that were subject to subsection 305(a), and therefore required the inclusion of a provision as specified in subsection 305(b). NASA concluded that the legislative intent was to apply section 305 only to those types of contracts requiring the performance of inventive type work for NASA, and so advised Congress.[16] This interpretation is reflected in the NASA Procurement Regulations, which limit the use of a patent rights clause that would invoke section 305 to specified types of contracts having a prospect of inventive work being performed.[17]

c. Launch Service Agreements

NASA has provided launch services to non-NASA entities during most of its history. Many of the launches have been provided on a reimbursable basis for private domestic concerns, wherein the launched spacecraft has been developed and owned by the concern for whom NASA provided such services. In addition, there have been numerous reimbursable launches for other U.S. Government agencies, foreign countries and international organizations.

(i) The AT&T Launch Agreement

The first launch service agreement was with American Telephone and Telegraph (AT&T) (July, 1961) to launch the experimental Telstar communication satellites. This agreement differed considerably from the typical research and development contract entered into by NASA since the satellites were to be designed, built, funded and owned by AT&T, and AT&T was also to reimburse NASA for its "out of pocket launch costs." Thus, the roles of the parties were reversed from the normal contractual situation in that NASA was being paid to perform work for AT&T.

The agreement was made subject to section 305, and NASA took, and then waived back, title to all inventions made by AT&T in the design and development of the Telstar satellite, but retained a worldwide, royalty free license for governmental purposes. In addition, NASA acquired the right to grant licenses to others for the practice of such inventions throughout the world for any purposes whatsoever upon such terms and conditions as the Administrator may prescribe. This right to license others was unrestricted as to both the parties to be licensed and the purposes for which the inventions may be practiced.

The rationale for acquiring these rights under the AT&T agreement was the existance of exceptional circumstances; that is, the desire to keep options open in an uncertain area until such time as the Congress and the President acted on an approach to be taken in establishing a communication satellite system.[18]

(ii) Subsequent Launch Agreements

The next launch service agreement where the applicability of section 305 was raised was in 1964, when NASA negotiated an agreement with the Communications Satellite Corporation (Comsat) to launch on a reimbursable basis, Comsat's funded and owned satellites. In formulating a patent policy for this agreement note was made, and consideration given, to the position previously taken by NASA with respect to NASA/AT&T Telstar launch agreement. It was concluded, however, the reasons that gave rise to the particular NASA/AT&T patent policy no longer existed.[19] It was observed that while the NASA/Comsat launch agreement was a "contract for the performance of work" and hence could be construed to be covered by section 305, under the specific terms of the agreement NASA was to perform the work for Comsat, as contrasted with the typical situation where the contractor performs work for NASA.[20] In other words the conventional roles were reversed under this type of agreement.

NASA made the interpretation that the launch service agreement with Comsat was not subject to section 305 because no work was to be performed for NASA, and thus there was to be no transfer of NASA funds to Comsat. However, to insure against a later amendment of the agreement calling for the performance of work by the corporation for NASA it was decided to include a section 305 patent clause in the agreement as a precautionary measure. To this end, the clause began with the language "If and to the extent that any work is performed for NASA under this agreement..."[21] Thus, NASA made the further interpretation that, in addition, inventive type work had to be performed for NASA in order for section 305 to apply.[22]

The interpretation that a launch service agreement does not constitute a contract for the performance of work for NASA, and hence not a contract subject to subsection 305(a), has been consistently followed since 1964.[23] In fact, experience has shown over the years that the standard launch service agreements have never required any work to be performed for NASA, and the above-mentioned precautionary section 305 patent rights clause is no longer used.

4. Joint Endeavors

The above review illustrates a number of instances where NASA has made an official interpretation and adopted administrative practices to support the position that not all contracts are subject to subsection 305(a). Joint endeavors represent yet another instance where NASA has made an interpretation that an agreement or arrangement which literally meets the definition of contract under subsection 305(j)(2) is not a contract in the context of subsection 305(a).

With the development of advance facilities, such as wind tunnels, sensing and communications satellites and a space transportation system, and the creation of high technology, such as supercritical wing and ADP systems, NASA found it to be in its interest, both national and international, to enter into arrangements whereunder NASA would contribute the use of its facilities or technology to other parties in return for the other parties agreeing to furnish their products or services to carry out a program or project of mutual interest. The parties then share the results and benefits of the project. Often these activities are carried out as a joint endeavor, as previously defined.

Joint endeavors may vary as to the number of parties involved, the type and amount of contributions made by the parties, as well as the technical nature of the endeavor undertaken. In general these activities and arrangements differ considerably from a formal NASA contract and somewhat from those activities previously discusssd in that they are usually informal in nature, are sometimes bottomed on a best efforts basis, do not involve the reimbursement or exchange of funds betwen the parties, and are not deemed as requiring employment of one party's employees or contractors by the other party in making the contribution of facilities, equipment or services to the joint activity.

NASA's first interpretation as to whether section 305 applied to a joint endeavor occurred in April, 1959, in re-

sponse to an inquiry by a private company regarding an arrangement whereby NASA would contribute one of its facilities for the testing of privately developed equipment, and NASA and the owner of the equipment would share the resulting test data.[24] The position was taken that, while such an arrangement had the appearance of a contract with NASA, the fact that the company contributed equipment to the joint endeavor would not mean the company assumed any obligations to perform any work for NASA in the sense of subsection 305(a). Hence the interpretation was made that subsection 305(a) would not be applicable to any inventions made by the company or its employees during the testing of the company's equipment or any activities incident thereto. The interpretation was also made that should any of the company's employees participate in the testing, and should they as a result make an invention, the invention would not be covered by subsection 305(a) because it would not have resulted from the performance of any work for NASA.[25]

Subsequent to this initial interpretation, NASA has had many occasions to determine whether an arrangement or agreement structured as a joint endeavor was to be considered a contract subject to subsection 305(a). The interpretation has been consistent that, under joint endeavors neither party is assuming any obligations to perform inventive type work for the other, and accordingly each party retains rights to any inventions that may be made in the course of carryng out its activities that are contributed to the effort.[26] This interpretation and the resulting practices are illustrated by the examples set forth below.

(a) Use of NASA Facilities

Where NASA's contribution is the use of a ground-based facility, and the other party furnishes equipment or services, NASA does not apply section 305, but acquires license rights to any inventions resulting from such use through negotiated provisions in the agreement.[27]

NASA has a similar policy where the contribution is the use of its orbiter to carry the other party's payload for testing, demonstration, or performing other operations or analysis in space.[28]

(b) Use of Satellite Data and High Technology

Other joint endeavors in which NASA has not applied section 305, involve activities wherein NASA's contribution is its satellite data[29] or its high technology such as supercritical wing technology in exchange for results of the analysis thereof. When the resulting activities are not of the inventive nature, no patent provisions are included;

when it is anticipated that inventions may be made, a patent provision may be included by negotiation.[30]

(c) Contributions of Technical Interface and Technical Monitoring Assistance

NASA also entered into a joint endeavor with the McDonnell Douglas Corporation (and a similar one with the Boeing Company) whereunder McDonnell Douglas developed at its expense a spin stabilized payload assist module (SUSS/PAM) for launching payloads from the orbiter, and NASA provided technical interface and monitoring assistance and services.[31] Subsection 305(a) was not deemed applicable to this joint endeavor, but under negotiated provisions NASA would acquire rights to inventions made by McDonnell Douglas in developing the SUSS/PAM in event of termination for default.[32]

(d) Cooperative Launch Activities

In addition, NASA has entered into arrangements whereby NASA launches, at no cost to the other party, spacecraft and/or experiments provided at no cost to NASA by the other party, with the understanding that NASA and the other party are to share in the results, usually by exchange and/or publication of the information and data derived from the resulting activity. Again, section 305 has not been deemed applicable to these arrangements, but a provision may be included, by negotiation, to acquire license rights for governmental purposes if it is determined that the resulting activity is of an inventive nature. Other than such license rights, invention rights reside with the respective parties (or their employees or contractors) of the joint endeavor.[33]

(e) Contribution of Major Hardware

Other NASA joint endeavors have involved activities where the various parties have made significant hardware contributions to a common program. As in the previously discussed joint endeavors, subsection 305(a) has not been deemed applicable, and any invention rights involved reside with the party (or its employees or contractors) who contributed the hardware. License rights, for governmental purposes, are acquired if it is determined that the resulting activity is of an inventive nature.[34]

5. Summary and Conclusions

It is clear from the foregoing that during its nearly two decade history NASA has entered into numerous actual or proposed contracts, agreements, understandings or other arrangements, all within the literal definition of "contract" of subsction 305(j)(2), that were not deemed subject to subsection 305(a). In some instances they were for the procurement of goods and services (supply contracts using appropriate funds); in other instances they were for launch services or the use of NASA facilities on either a reimbursable or joint basis; and in still other instances they involved contributions of hardware on a joint basis. The issue does not turn on whether the arrangement between the parties falls within the literal definition of contract as defined in subsection 305(j)(2). Rather, the common basis for the decision not to consider these types of "contracts" under subsection 305(a) was a determination, consistent with the legislative history, purpose and intent, that they did not involve the performance of work of an inventive type for the Administration in the context of subsection 305(a).

This determination is equally valid with respect to joint endeavors, wherein each party performs, or has performed, work on its own behalf in order to make contributions to the common project. To the extent that any inventive activity is performed by a party's employees or contractors, it is performed by or for that party for the purpose of enabling that party to make contributions to the joint endeavor. That is, one party is not performing, or not having performed, work for the other party, but rather, for itself. Neither party is empowered to direct, assign or require work of an inventive nature to be performed by the employees or the contractor employees of the other party. Thus, a joint endeavor is no different than the numerous other arrangements NASA has determined not to be subject to subsection 305(a) in that it does not require the performance of work of an inventive type for NASA.

In addition, there is nothing in the legislative history of section 305, nor of NASA's long-standing interpretation and administrative practices relating thereto, to suggest the determination should be any different because the technology involved may find commercial application, as may be the case for joint endeavors under the Materials Processing in Space Program. If it is determined that the activity does not involve the performance of work of an inventive type for NASA, subsection 305(a) is not applicable notwithstanding the nature of the technology involved or its commercial potential.

Because joint endeavors are not contracts under subsection 305(a), any rights to inventions made in the course of a joint endeavor undertaken in the Materials Processing in Space Program must be acquired by negotiation. It is recommended that at a minimum NASA continue the established practice of acquiring a royalty-free license to practice, for governmental purposes, all inventions made in the course of the resulting activites of a joint endeavor undertaken in the Materials Processing in Space Program. Consideration may be given to acquiring license rights of the same scope to practice any inventions specifically made in the course of any preparatory or background activities, to the extent necessary to practice inventions made in the course of the resulting activities. Beyond this, it will be necessary to consider each proposed joint endeavor case-by-case. However, it is recommended that, consistent with the policy set forth in NMI 8610.8 dealing with reimbursable launches,[35] NASA obtain assurances, by way of directed licensing rights, that the results of any joint endeavor activity which may have a significant impact on the public health, safety or welfare be made available to the public on terms and conditions reasonable under the circumstances.

It is therefore concluded that:

(a) NASA does enter into many types of arrangements falling within the literal definition of contract under subsection 305(j)(2) that are not contracts in the context of subsection 305(a);

(b) a joint endeavor is an example of one type of arrangement that is not a contract in the context of subsection 305(a);

(c) a joint endeavor under the Materials Processing in Space Program is no different regarding the interpretation and application of subsection 305(a) than any other joint endeavor, and therefore is not a contract in the context of subsection 305(a); and

(d) the allocation of property rights in inventions under any joint endeavor is a matter of agreement between the parties that must be specifically set forth in the joint endeavor.

Robert F. Kempf

Enclosure

FOOTNOTES

1. 72 Stat. 426; 42 U.S.C. §2451 et seq.; particularly 42 U.S.C. §2457.

PROPERTY RIGHTS IN INVENTIONS

Sec. 305(a) Whenever any invention is made in the performance of any work under any contract of the Administration, and the Administrator determines that-

(1) the person who made the invention was employed or assigned to perform research, development, or exploration work and the invention is related to the work he was employed or assigned to perform, or that it was within the scope of his employment duties, whether or not it was made during working hours, or with a contribution by the Government of the use of Government facilities, equipment, materials, allocated funds, information proprietary to the Government, or services of Government employees during working hours; or

(2) the person who made the invention was not employed or assigned to perform research, development, or exploration work, but the invention is nevertheless related to the contract, or to the work or duties he was employed or assigned to perform, and was made during working hours, or with a contribution from the Government of the sort referred to in clause (1),

such invention shall be the exclusive property of the United States, and if such invention is patentable a patent therefor shall be issued to the United States upon application made by the Administrator, unless the Administrator waives all or any part of the rights of the United States to such invention in conformity with the provisions of subsection (f) of this section.

(b) Each contract entered into by the Administrator with any party for the performance of any work shall contain effective provisions under which such party shall furnish promptly to the Administrator a written report containing full and complete technical information concerning any invention, discovery, improvement, or innovation which may be made in the performance of any such work.

(c) No patent may be issued to any applicant other than the Administrator for any invention which appears to the Commissioner of Patents to have significant utility in the

conduct of aeronautical and space activities unless the applicant files with the Commissioner, with the application or within thirty days after request therefor by the Commissioner, a written statement executed under oath setting forth the full facts concerning the circumstances under which such invention was made and stating the relationship (if any) of such invention to the performance of any work under any contract of the Adminsitration. Copies of each such statement and the application to which it relates shall be transmitted forthwith by the Commissioner to the Administrator.

(d) Upon any application as to which any such statement has been transmitted to the Administrator, the Commissioner may, if the invention is patentable, issue a patent to the applicant unless the Administrator, within ninety days after receipt of such application and statement, requests that such patent be issued to him on behalf of the United States. If, within such time, the Administrator files such a request with the Commissioner, the Commissioner shall transmit notice thereof to the applicant, and shall issue such patent to the Administrator unless the applicant within thirty days after receipt of such notice requests a hearing before a Board of Patent Interferences on the question whether the Administrator is entitled under this section to receive such patent. The Board may hear and determine, in accordance with rules and procedures established for interference cases, the question so presented, and its determination shall be subject to appeal by the applicant or by the Administrator to the Court of Customs and Patent Appeals in accordance with procedures governing appeals from decisions of the Board of Patent Interferences in other proceedings.

(e) Whenever any patent has been issued to any applicant in conformity with subsection (d), and the Administrator thereafter has reason to believe that the statement filed by the applicant in connection therewith contained any false representation of any material fact, the Administrator within five years after the date of issuance of such patent may file with the Commissioner a request for the transfer to the Adsministrator of title to such patent on the records of the Commissioner. Notice of any such request shall be transmitted by the Commissioner to the owner of record of such patent, and title to such patent shall be so transferred to the Administrator unless within thrity days after receipt of such notice such owner of record requests a hearing before a Board of Patent Interferences on the question whether any such false representation was contained in such statement. Such question shall be heard and determined, and determination thereof shall be subject to

review, in the manner prescribed by subsection (d) for questions arising thereunder. No request made by the Administrator under this subsection for the transfer of title to any patent, and no prosecution for the violation of any criminal statue, shall be barred by any failure of the Administrator to make a request under subsection (d) for the issuance of such patent to him, or by any notice previously given by the Administrator stating that he had no objection to the issuance of such patent to the applicant therefor.

(f) Under such regulations in conformity with this subsection as the Administrator shall prescribe, he may waive all or any part of the rights of the United States under this section with respect to any invention or class of inventions made or which may be made by any person or class of persons in the performance of any work required by any contract of the Administration if the Administrator determines that the interests of the United States will be served thereby. Any such waiver may be made upon such terms and under such conditions as the Administrator shall determine to be required for the protection of the interests of the United States. Each such waiver made with respect to any invention shall be subject to the reservation by the Administrator of an irrevocable, nonexclusive, nontransferable, royalty-free license for the practice of such invention throughout the world by or on behalf of the United States or any foreign government pursuant to any treaty or agreement with the United States. Each proposal for any waiver under this subsection shall be referred to an Inventions and Contributions Board which shall be established by the Administrator within the Administration. Such Board shall accord to each interested party an opportunity for hearing, and shall transmit to the Administrator its findings of fact with respect to such proposal and its recommendations for action to be taken with respect thereto.

(g) The Administrator shall determine, and promulgate regulations specifying the terms and conditions upon which licenses will be granted by the Administration for the practice by any person (other than an agency of the United States) of any invention for which the Administrator holds a patent on behalf of the United States.

(h) The Administrator is authorized to take all suitable and necessary steps to protect any invention or discovery to which he has title, and to require that contractors or persons who retain title to inventions or discoveries under this section protect the inventions or discoveries to which the Administration has or may acquire a license of use.

(i) The Administration shall be considered a defense agency of the United States for the purpose of chapter 17 of title 35 of the United States Code.

(j) As used in this section--

(1) the term "person" means any individual, partnership, corporation, association, institution, or other entity.

(2) the term "contract" means any actual or proposed contract, agreement, understanding, or other arrangement, and includes any assignment, substitution of parties, or subcontract executed or entered into thereunder; and

(3) the term "made," when used in relation to any invention, means the conception or first actual reduction to practice of such invention.

2. The Declaration of Purpose and Policy in section 102 of the Space Act does not address the disposition of rights in inventions covered in section 305. 42 U.S.C. 2451.

3. See, for example, the testimony of John A. Johnson, General Counsel of NASA during Hearings Before a Subcommittee of the Select Committee on Small Business of the United States Senate on The Effect of Federal Patent Policies on Competition, Monopoly, Economic Growth and Small Business, 86th Cong., 1st. Sess., pages 255 and 267; and during Hearings Before the Subcommittee on Patents, Trademarks, and Copyrights, of the Committee of the Judiciary, pursuant to S. Res. 55 on S. 1089 and S. 1176, 87th Cong; 1st Sess., Part 1, page 161.

4. House Rept. No. 2166, 85th Cong., 2nd Sess. (July 15, 1958) at 22-24. An extensive discussion of the events that led up to this conference report can be found in Appendix A of An Evaluation of the Patent Policies of the National Aeronautics and Space Administration, Report of the Committee on Science and Astronautics, U. S. House of Representatives, 89th Cong., 2nd Sess.. Some key events discussed are:

(a) The introduction of the original House and Senate bills (H.R. 1181 and S. 3609, on April 14, 1958) containing no patent provisions.

(b) The subsequent hearings on S. 3609, during which the Deputy Secretary of Defense recommended that no special patent provisions be included in the legislation, based on the expectation that the policies and procedures of NACA (similar to those of DOD) would be applied by regulation.

(c) The reporting of H.R. 12575 (replacing H.R. 1181) out of House committee (May 24, 1958), with a section 407 entitled "Patent Rights," patterned after similar provisions of the Atomic Energy Act.

(d) The unanimous passing H.R. 12575 (June 2, 1958) with no debate or comment on section 407.

(e) The subsequent expressions of displeasure by industry and the private bar over section 407, primarily because of its similarity with what they considered the restrictive and arbitrary provisions of the Atomic Energy Act.

(f) The reporting out by the Senate Committee (June 11, 1958) of amended S. 3609 with a new Section 303, almost identical to section 407 of H.R. 12575.

(g) The successful floor amendment by Sen. Johnson during debate on amended S. 3609 to have section 303 deleted and the matter referred to conference.

(h) The subsequent appointment, by Rep. McCormack (Chairman of the Select Committee on Astronautics and Space Exploration) of a patent subcommittee (chaired by Rep. Natcher) to review the matter prior to any House-Senate conference. This subcommittee recommended an approach which provided, inter alia, that the Administrator would be entitled to ownership to inventions made under contract only when certain findings (based on the relationship of the invention to the duties of the employee of the contractor making the invention) were made; and as a separate matter would be authorized to waive ownership of inventions to which the Administration was entitled in the national interest. Thus the report of the Natcher subcommittee indicated an intent not to automatically vest ownership in the Administration under all contractual situations (no matter how broadly defined), as under the Atomic Energy Act. This report, unpublished, is entitled "Report of The Patent Subcommittee, House Committee on Astronautics and Space Exploration re Section 407, H.R. 12575.

(i) The adoption of the final version of section 305, coupled with favorable floor comment. While worded and structured differently than section 407 appearing in the re-

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port of the Natcher subcommittee, it contained many of the salient features recommended in the report. Thus, when the conference report refers to the adoption of "entirely new patent provisions," it is in reference to the earlier draft of section 407 in H.R. 12575, and not in the rewrite of section 407 by the Natcher subcommittee. This is emphasized by the floor statements of Rep. Keating, which follow the report of the Natcher subcommittee rather closely in explaining the basis for new section 305.

5. 104 Congressional Record 13978 (1958)

6. House Rept. No. 2166, at 22.

7. On this point the report of the Natcher subcommittee (see note 4(h) above) states, by way of explaination of its redraft of section 407(a):

> "The new version is not designed to be applicable to inventors or others directly employed by the Agency as Government employees. The rights of Government employees in such matters are already set forth by Executive Order (E.O. 10096, Jan. 23, 1950)."

The report then continues with an explaination of subsection 407(b) by stating "This spells out two conditions under which the Administrator is entitled to claim ownership in invention." The two conditions described are essentially the same as subparagraphs (1) and (2) of subsection 305(a), and are analogous to the basic policy set forth in paragraph 1. of E.O. 10096. Thus, there appears to be an intent to establish a relationship whereby, for the Administrator to be entitled to claim ownership to invention rights, the contractor employee is to be required to perform work for the Administration, indirectly through contract, in a manner analogous to the direct requirement for employees of the agency to perform such work.

8. 104 Congressional Record 13978 (1958) at 13986-13987. The provision dropped by floor amendment was section 303 (similar to section 407 in H.R. 12575) which was critized as being too much like the restrictive and arbitrary provisions of the Atomic Energy Act. Also, the statement that "--the stringent requirements in the Atomic Energy Act -- are not fully applicable to the space field --" is one of the principal conclusions of the report of the Natcher subcommittee.

9. Supra, note 8, at 13987-13988. Rep. Keating's statements, like those of Rep. McCormack, are markedly con-

sistent with, and supportive of, the conclusions and recommendations of the report of the Natcher subcommittee.

10. The Natcher subcommittee, for example, noted in its report (see note 4(h)) that the original section 407, as it stood, tended to be "arbritrary and restrictive" and might "stifle interest and private endeavors in the space research and development field."

11. Testimony of John A. Johnson, General Counsel of NASA, during Hearings Before the Special Subcommittee on Patents and Scientific Inventions of the Committee on Science and Aeronatuics, U.S. House of Representatives, on H.R. 1934 and H.R. 6030, 87th Cong; 1st Sess., at page 17.

12. There is no question as to the binding effect of a statutory definition of a term. However, as observed by authorities on statutory construction, such as the treatise of Sutherland Statutory Construction, Sec. 4707 [Sands, 4th ed 1973] [hereinafter Southerland]:

> "Definitions are themselves... written in words whose meaning, whether viewed separately or in conjunction with the terms being defined and other language comprising their context, may be determinable only through further practice of the methods of interpretation."
>
> "...words of an act may be restricted by its subject in order to avoid repugnance with other parts of the act (cite omitted)... [and] [t]he application of the words of a single provision may be... restricted to bring the meaning of the clause in question into conformity with the intention of the legislature..."

13. The official interpretation reflected in the regulations and long standing practices of an administrative agency charged with the duty of enforcing a statute has great weight in determining the operation of a statute. Although not binding on a court, it is unlikely that such interpretation would be overturned unless found to be clearly erroneous. Southerland, Sec. 4905 (and cases cited therein); C.D. Stands, 4th ed. 1973; also 82 C.J.S. Statutes, Secs. 358, 359 (and cases cited therein).

14. The courts are particularly reluctant to overule a long-standing administrative interpretation of a statute where to do so would unsettle titles, or prejudice persons who have acquired contract or property rights in reliance on such constuction. 82 C.J.S. Statutes, Sec. 359 (and the cases cited therein). Needless to say, a literal con-

struction of subsection 305(a) and 305(j)(2) at this time would have the effect of unsettling a myriad of rights in any inventions that may have been made in those instances where NASA has exercised reasonable judgment in making practical interpretations consistent with the legislative purpose (e.g., as has been done regarding the preparation of proposals, supply contracts, reimbursable launch service agreements, and numerous joint endeavors).

15. The Assistant General Counsel for Patents memorandum dated June 23, 1959 to the General Counsel on The Applicability of the "Property Rights in Inventions" Section of the National Aeronautics and Space Act of 1958 (Section 305) to inventions made in the performance of research and development work, the cost of which is not charged to NASA.

Two significant points made in the memorandum are:

(a) "It is inconceivable that the Congress would have intended that NASA could establish a relationship with a party whereby all the inventions made by that party or its employees under the circumstances defined in Provisions (1) and (2) of subsection 305(a) would become the exclusive property of the Government merely by NASA proposing to such party that it do work for the Administration"; and

(b) "In order not to work a completely incongrous result, it is recomended that NASA interpret the terms 'proposed contract,' as used in subsection 305(j)(2) in defining 'contracts,' as relating back to work done upon an understanding that a contract would be awarded."

16. That interpretation was made clear in the testimony of John A. Johnson, NASA General Counsel, during Hearings Before The Subcommittee on Patents and Scientific Inventions of the Committee on Science and Astronautics of the U.S. House of Representatives, on Public Law 85-568, 86th Cong. 1st Sess. In answer to a question by Rep. Fulton (pg 14) regarding the distinction between research and development contracts and supply contracts in the field of aeronautics and space, the General Counsel testified:

> "We did make that distinction. We have made it administratively - and we were without any published legislative history on this to help use - because we simply could not believe, in the context of this section, that every time we entered into a contract for the supply of some office supplies or something of that kind it was intended that this kind of patent clause should into it. We have confined our patent clause to

> - we have a rather elaborate formula in our regulations; but, to oversimplify it, it is basically a research and development type contract. We felt, after all, that this was the only reasonable intention we could read into this section of the law; but the language is so broad that some of the initial commentators on this section made it appear more horrible than it actually is in practice."

In his response to the General Counsel's answer Rep. Fulton made the point that the "law is too broad" and went on to --

> "compliment the NASA, the Administrator, and the people who have been advising him on making the distinction as to the type of contract that the patent provisions apply to."

17. The NASA Procurement Regulations (Chapter 18 of Title 41 of the Code of Federal Regulations) requires the use of a section 305 patent rights clause only in contracts which entail technical, scientific or engineering work of a kind performed in a contract having as one of its purposes (1) the conduct of basic or applied research, (2) the design or development, or manufacture for the first time, of any machine, article of manufacture, or composition of matter to satisfy NASA's specifications or special requirements, (3) any process or technique for attaining a NASA objective not readily attainable through the practice of a previously developed process or technique, or (4) the testing or practice of a previously developed process or technique to determine whether the same is suitable or could be made suitable for a NASA objective. This official interpretation was initially taken in 1959 (14 CFR 1201.101-2(a)), and is still followed (see NASA PR 9.107-4, revised Dec. 1976).

18. Statement of Mr. James B. Webb, Administrator, National Aeronautics and Space Administration, Before the Committee on Science and Astronautics, House of Representatives, August 10, 1061. (NASA NEWS RELEASE NO. 61-173). This consideration is seen as reflected in the follwing language taken from Mr. Webb's statement:

> "The significance of the patent provisions agreed to by NASA and AT&T is that whatever form of organization may be determined to be in the public interest and approved by the Federal Communications Commission for providing communication to the public through satellite relays, that organization will be able to use

inventions made by AT&T while in this cooperative relationship with NASA."

The patent provisions of the NASA/AT&T agreement were unique in many respects: (1) inventions "conceived or first actually reduced to practice in the performance of work under or in anticipation of the Agreement on or after May 18, 1961 were, by specific agreements of the parties, to "be regarded as being made in the performance of work under a contract...within the meaning of section 305" of the Space Act; (2) title to such inventions was waived in advance to AT&T but in addition to the usual rights under section 305, NASA also retained the right to sublicense United States business throughout the world in the field of communications satellites; and (3) with respect to inventions made by AT&T during the period of the contract but unrelated to the contract save for being contemporaneously made and of similar use, the Government was to receive a broad royalty-free license together with the right to require sublicenses. For a thorough analysis of the AT&T arrangement, which has not been followed in any other instance, see Allnutt, Patent Policy for Communications Satellites: A Unique Variation, 46 MARQUETTE L. REV. 63 (1962).

19. Assistant General Counsel for Patent Matters memorandum of February 3, 1964 to the General Counsel on Recommended Patent Clause for the Cooperative Agreement Between NASA and the Communications Satellite Corporation.

The memorandum notes that the position recommended therein for the Comsat agreement is quite different from that previously taken in the AT&T agreement. It points out, however, that the rather marked departure (taken in the NASA/AT&T agreement) from standard NASA patent pactices was essentially prompted by two reasons neither of which is "effective today."

As to the first reason, it was pointed out that the need to insure freedom of action in the communication satellite field pending a Congressional decision on a communications satellite system no longer existed in view of the establishment of the Communications Satellite Corporation under the Communication Sateliite Act of 1962. 76 Stat. 421, 47 U.S.C. 721(b)(1062).

The second reason dealt with the practical difficulty of determining whether AT&T inventions relating to Telstar were made under the NASA/AT&T agreement or as a result of AT&T's independent research progams. To avoid this difficulty, the Government under the NASA/AT&T agreement acquired rights to all such inventions.

The memornadum took the position that NASA was not entitled to any rights to inventions made by Comsat or its contractors since "if Congress intended for NASA to attempt to

acquire patent rights in inventions developed in the corporation funded research, either to insure royalty-free use of such inventions by the Government, or as a means of assuring effective competition among the corporation's suppliers, there is no doubt that such a prescription would have been included in the Act.....The view that NASA is not entitled to demand such an interest in the cooperative agreement is reinforced by the fact that the FCC and not NASA is charged under the Act with the responsibility of insuring effective competition among the corporation's contractors."

20. Ibid.

21. Agreement Between the National Aeronautics and Space Administration and Communications Satellite Corporation For Satellite Launching and Associated Services to Be Furnished By NASA In Connection With The Launching of Intelsat II and Certain Intelsat I Satellites, dated July 22, 1966, Article X - Property Rights in Inventions.

22. As a further clarification of this interpretation of section 305, ART II - Par. 1.C. of the NASA/Comsat Agreement (note 21) contained the following language:

> "c. The Corporation represents that it proposes to do the following, which will not, however, constitute work performed under this Agreement.
>
> (1) Provide for the design, development, and testing of all spacecraft.
>
> (2) Perform all spacecraft pre-launch tests at ETR.
>
> (3) -------"

23. The most recent interpretation is found in paragraph 6(a) of NASA Management Instruction (NMI) 8610.8 of January 21, 1977 (14 CFR 1214.104(a)) entitled Reimbursement for Shuttle Services Provided to Non-U.S. Government Users:

> "6. PATENT AND DATA RIGHTS
>
> a. NASA will not acquire rights to inventions, patents or proprietary data privately funded by a user, or arising out of activities for which a user has reimbursed NASA under the policies set forth herein. However, in certain instances in which the NASA Administrator has determined that

activities may have a significiant impact on the public health, safety or welffare, NASA may obtain assurances from the user that the results will be made available to the public on terms and conditions reasonable under the circumstances."

24. Letter of April 6, 1959 from NASA General Counsel to Patent Counsel, General Electric Company, Cincinnati, Ohio.

25. Ibid.

26. This is not to say that NASA does not obtain rights to inventions which may result from joint actvities under an endeavor. However, such rights are obtained by negotiation and agreement, and not by the imposition of subsection 305(a). Typically, when the resulting activities are of an inventive type, NASA acquires at least a royalty-free license to practice, for governmental purposes, any inventions arising from such results. On a case-by-case basis greater rights may be acquired to assure that the results of a joint endeavor are made available to the public upon reasonable circumstances.

27. For example, NASA's policy for the use of its installation research facililties by individual researchers is set forth in the NASA Supplement for the Federal Personnel Manual, Chapter B11, issued September 29, 1977, which provides:

"Rights to any inventions conceived or first reduced to practice during, and resulting from use of Government facilities should be stated in the agreement. Normally NASA should obtain a royalty free license for the U.S. Governmment to practice the invention for governmental purposes.

28. This policy is reflected, for example, in the Announcement of Opportunity for Materials Processing Investigations on Space Shuttle Missions (A.O. No. OA-77-3, Feb. 8, 1977) seeking investigations comprising applied and basic research projects in branches of materials science where the weightlessness and ultra high vacuum obtainable in orbital flight can be exploited to unique advantage. It is stated, in paragraph V.2.:

"For a Cooperative Project, NASA will obtain a royalty free license to practice for U.S. governmental purposes any inventions and patents resulting from the experiment and the right to use and disclose the resulting data for U.S. governmental purposes.

29. Typical arrangements where a significant NASA contribution is its satellite data are:

(a) "Agreement Between National Aeronautics and Space Administration and the GEOSAT Committee, Inc." for the purpose of demonstrating improved remote sensing techniques for mineral and petroleum exploration;

(b) "Cooperative Agreement Between the California Department of Water Resources and the National Aeronautics and Space Administration for an Application Systems Verification and Transfer (ASVT) Project involving Irrigated Land Assesment For Water Management," to evaluate the utility of LANDAT as a source of data for use as input to water management models and decisions;

(c) "Cooperative Agreement Between The Appalachian Regional Commission and The National Aeroanutics and Space Administration For Appalachian Lineament Analysis" to conduct a joint project involving LANDSAT-derived information for certain land use purposes; and

(d) "Memorandum of Understanding Between NASA and the Agency [ESA] for LANDSAT ground stations" wherein NASA provided LANDSAT data and ESA established a system for the reception, pre-processing, archiving and dissemination of such data.

30. Thus for example, in a model "Cooperative Endeavor Agreement" under which NASA made certain of its scientific and technical data available under specified conditions and the recipient provided NASA with reports of the result of applying such data to commercial aircraft, the following patent provision was included:

"5. PATENTS

(a) NASA, acting on behalf of the U.S. Government, has filed application for Letters Patent in the United States and certain foreign countries on an invention made by Richard T. Whitcomb and entitled, Airfoil Shape for Flight at Subsonic Speeds. The supercritical aerodynamic technology furnished by NASA to Lear Avia under this Agreement is based, in large part, upon the novel concepts, theories, formulae, and technology encompassed by this invention. In recognition of these contributions offered by the Government, Lear Avia agrees that should its application of such technology to commercial aircraft, as contemplated under this

Agreement, result in patentable modifications or improvements to the supercritical aerodynamic technology, Lear Avia will provide NASA with the disclosure of such inventions and grant to the U.S. Government a nonexclusive, irrevocable, royalty-free license to practice such inventions throughout the world for government purposes.

Such agreements have been entered into with Lear Avia, Cessna, Beech, and Gates Lear Jet.

31. Agreement of November 24, 1976, between McDonnell Douglas Corporation and NASA concerning the design, manufacture, test and delivery of a spin stabilized payload assist module for launching spacecraft.

32. Supra, note 31. ARTICLE IX - Termination for Default

33. Examples of arrangements of this type are:

(a) "Memorandum of Understanding Between The Federal Minister for Scientific Research of The Federal Republic of Germany and The United States National Aeronautics and Space Administration" for Project HELIOS, having the general objective to provide new understanding of fundemental solar processes and solar terrestrial relationships by the study of phenomena such as solar wind, magnetic and electric fields, cosmic rays, and cosmic dust.

(b) "Memorandum of Understanding Between The United States National Aeronautics and Space Administration and The Netherlands Agency for Aerospace Programs" for the Infrared Astronomical Satellite to perform an all-sky survey of extraplanetary, galactic and extragalactic infrared sources.

(c) "Memorandum of Understanding Between The United States National Aeronautics and Space Administration and The European Space Agency for The International Solar Polar/Out-Of-Ecliptic Mission" to conduct coordinated observations of the interplanetary medium and the Sun simultaneously in the northern and southern hemispheres of the solar system.

(d) Letter agreement between NASA and The Centre National d'Etudes Spartrales, France, selecting a proposal entitled "Multipurpose French Cooperative Environment Tests to be Conducted on NASA LDEF," for participation in the NASA Long Duration Exposure Facility (LDEF) Mission. The proposal was submitted in response to the NASA Announcement of Opportunity AO-OAST-76-1, and has as a scientific ob-

jective the investigation of the effect of long term space exposure on thin metal film and evaporated cathodes, optical coatings, holographic gratings, thermal coatings, structural materials, and fiber optics.

(e) Letter agreement between NASA and the University of Sydney, Australia, selecting a proposal entitled "Aggregation of Human Red Blood Cells," in response to NASA Announcement of Opportunity AO-OA-77-3 (see note 28). The scientific objective of the proposed experiment is to observe the aggregation of human red blood cells under conditions approaching zero gravity.

No patent provisions were included in examples (a) - (c), but examples (d) and (e) included the following:

> "It is further understood that should any inventions and patents result from this project, NASA is granted a royalty-free license to practice such inventions and patents for U.S. Government purposes."

34. Representative examples of joint endeavors involving contributions of major hardware are:

(a) "Memorandum of Understanding Between The National Aeronautics and Space Administration and The European Space Research Organization for a Cooperative Programme Concerning Development, Procurement and Use of a Space Laboratory In Conjunction With the Space Shuttle," wherein ESA and its members developed the Spacelab (some of the subcontract research and development work performed by US companies) to be utilized with the NASA develped orbiter;

(b) "Memorandum of Understanding Between The National Aeronautics and Space Administration and The National Research Council of Canada For a Cooperative Program Concerning the Development and Procurement of a Space Shuttle Attached Remote Manipulator System (RMS)," wherein Canada developed the RMS to be employed on the NASA developed orbiter;

(c) "Memorandum of Understanding Between The European Space Agency and The United States National Aeronautics and Space Administration," under which ESA is to develop major hardware to be incorporated into the NASA developed telescope; and

(d) "Memorandum of Understanding Between The Department of Communications of Canada and The Centre National D'Etudes Spartrales of France and The National Aeronautics and Sapce Administration of The United States of America," wherein Canada is to develop significant hardware (some to be produced in the U.S. under subcontract) to be used in and with a U.S. developed satellite.

No patent provisions were included in examples (a) - (d), above.

35. Supra, note 23.

Summary Status of NASA Regulations
Relating to Operation of the STS

APPENDIX E

I. Published Final Regulations in Title 14, Code of Federal Regulations

Subpart 1214.1	Reimbursement for Shuttle Services Provided to Non-U.S. Government Users (1979 edition, CFR)
Subpart 1214.2	Reimbursement for Shuttle Services Provided to Civil U.S. Government Users and Foreign Users Who Have Made Substantial Investment in the STS Program (1979 edition, CFR)
Subpart 1214.3	Payload Specialists for NASA or NASA-Related Payloads (1979 edition, CFR)
Subpart 1214.5	Space Transportation System Personnel Reliability Program (44 FR 39384, July 6, 1979)
Subpart 1214.6	Articles Authorized to Be Carried on Space Transportation System Flights (1979 edition, CFR)
Subpart 1214.11	NASA Astronaut Candidate Recruitment and Selection Program (44 FR 36024, June 20, 1979*)

II. Pending Rulemaking in Title 14, Code of Federal Regulations

Subpart 1214.7	Authority of the Space Transportation System (STS) Commander Proposed 44 FR 49274, August 22, 1979; public comments until October 22, 1979.
Subpart 1214.10	Procurement of Spinning Solid Upper Stages Proposed 44 FR 50858, August 30, 1979; public comments until October 29, 1979.
Subpart 1214.20	Delta Launch Vehicle Class: Transition to the Space Transportation System Proposed 44 FR 37511, June 27, 1979; public comments until August 27, 1979.

*Public comment was invited until August 20, 1979

III. Regulations Currently Being Developed

1. Payload Specialists for Non-NASA Payloads (Subpart 1214.4 reserved)

2. Reimbursement for Spacelab Services (Subpart 1214.8 reserved)

3. Use of Small Self-Contained Payloads (Subpart 1214.9 reserved; significant regulation)

4. Third Party Liability in Connection with the Space Transportation System (To implement Section 6 of P.L. 96-48, August 8, 1979, NASA Authorization Act, 1980.)

APPENDIX F

(b) Public organizations of the United States that are not part of the Government of the United States.

(c) Foreign governments or private persons and private or public organizations of foreign countries, except for the government of Canada and governments of the European Space Agency (ESA) member nations participating in Spacelab development when conducting experimental science or experimental applications missions, with no near-term commercial implications, undertaken on behalf of government agencies. The NASA Administrator shall determine the missions which qualify for this exception.

(d) International organizations, except the ESA when conducting experimental science or experimental applications missions with no near-term commercial implications.

(e) Other U.S. Government agencies, Canadian government agencies and the ESA, requesting Shuttle services from NASA in connection with launch and other services being performed by such agencies for users listed in paragraphs (a) through (d) of this section.

Subpart 1214.1—Reimbursement for Shuttle Services Provided to Non-U.S. Government Users

SOURCE: 42 FR 3929, Jan. 21, 1977, unless otherwise noted.

§ 1214.100 Scope.

This Subpart 1214.1 sets forth:

(a) The policy on reimbursement for Shuttle services which are provided by NASA to non-U.S. Government users (as defined in § 1214.101) under launch services agreements, and

(b) Responsibilities for putting such policy into effect and carrying it out.

§ 1214.101 Definition.

For the purpose of this subpart, the term "Non-U.S. Government Users" means:

(a) Private persons or private organizations of the United States, including its territories, the District of Columbia, Panama Canal Zone, and Puerto Rico.

§ 1214.102 Reimbursement policy.

(a) *Features of policy.* (1) All users will be charged on a fixed price basis; there will be no post-flight charges, except for prespecified optional services.

(2) The price will be based on estimated costs.

(3) The price will be held constant for flights in the first three years of Space Transportation Systems (STS) operations.

(4) Payments with respect to total operations costs shall be escalated according to the Bureau of Labor Statistics Index for Compensation per hour, Total Private. Payments with respect to the use charge shall not be escalated.

(5) Subsequent to the first three years the price will be adjusted annually to insure that aggregate costs are recovered over a twelve-year period.

(6) Pricing incentives are designed to maximize the proper utilization of the STS.

(b) *Dedicated flight reimbursements.* (1) For the purposes of this policy, a

dedicated flight is one sold to a single customer.

(2) The policy is established for two distinct phases of Shuttle operations. The first phase is through the third full fiscal year of Shuttle operations and the second phase consists of nine full fiscal years subsequent to the first phase.

(i) For a dedicated Shuttle flight during the first phase, NASA shall be reimbursed in an amount which is a pro-rata share of forecast additive costs averaged over the first phase of three years, plus a use charge in lieu of depreciation for the use of facilities, support equipment and the Shuttle fleet; however, the price shall not be less than a pro-rata share of forecast aggregate costs averaged over both the first and second phases of the twelve-year Shuttle operation period.

(ii) For a dedicated Shuttle flight during the second phase, NASA shall be reimbursed a pro-rata share of forecast aggregate costs over both phases to insure that total aggregate costs are recovered over the twelve year period.

(iii) The definition of the costs as specified in this Subpart are set forth in Appendix A to this subpart.

(iv) Subject to NASA approval, a dedicated flight user may apportion and assign STS services to other STS users provided they satisfy STS user requirements. The price of integrating additional payloads will be negotiated.

(v) A summary of standard Shuttle services included in the flight price is set forth in Appendix B to this subpart.

(vi) The prices of optional Shuttle services are being developed and shall be set forth in the Shuttle Price Book which is being developed. A summary of the optional services is set forth in Appendix C to this subpart.

(vii) For the user with an experimental new use of space or first time use of space of great public value, the reimbursement to NASA for the dedicated, standard Shuttle flight in either the first or second phase shall be a pro-rata share of the average twelve-year additive costs as estimated at the time of negotiations. Programs which qualify for this price will be determined by an STS Exceptional Program Selection Process. In all cases, the Administrator will be the selection official.

(viii) For dedicated flight users, NASA and the user will identify a desired launch date within a period of ninety days three years prior to flight. One year prior to the flight a firm launch and payload delivery date will be identified by NASA. The firm launch date will be within the first sixty days of the original ninety-day period. Launch will occur on the firmly scheduled launch date or within a period of thirty days thereafter. The payload must be ready to launch for the duration of that period.

(c) *Shared flight reimbursements.* (1) The price of a shared Shuttle flight will be a fraction of the dedicated Shuttle flight price. The fraction will be based on the length and weight of the payload and the mission destination at the time of contract negotiations. The formula for computing the fraction is set forth in Appendix D to this subpart.

(2) For shared flight users, NASA and the user will identify a desired launch date three years prior to flight. Launch will occur within a period of ninety days, beginning on the desired launch date. One year prior to flight a payload delivery date and a firm launch date will be coordinated among the share flight users. This firm launch date will be within the first thirty days of the original ninety-day period. The launch will occur on the firmly scheduled launch date or within a period of sixty days thereafter. The payloads must be ready to launch for the duration of that period.

(3) A 20 percent discount on the standard flight price will be given to shared flight users who will fly on a space-available (standby) basis. NASA will provide launch services within a prenegotiated period of one year. Shared flight payloads must be flight deliverable to the launch site on the first day of the one-year period and sustain that condition until delivery to the launch site. The user will be notified sixty days prior to the firmly scheduled launch date which has been established by NASA. At that time, NASA will also establish a payload de-

livery date. The payload must be available at the launch site on the assigned delivery date and ready to launch for a period of sixty days after the firmly scheduled launch date.

(d) *Small self-contained payloads.* Packages under 200 pounds and smaller than five cubic feet which require no Shuttle services (power, deployment, etc.), and are for R&D purposes, will be flown on a space-available basis during both phases of Shuttle operation. The price for this service will be negotiated based on size and weight, but will not exceed $10,000 in 1975 dollars. A minimum charge of $3,000 in 1975 dollars will be made. If Shuttle services are required, the price will be individually negotiated. Reimbursement to NASA will be made at the time the package is scheduled for flight.

(e) *Options.* (1) Options for future flights will be made available to STS users already contracting for STS launch services. Fixed price options for flights in a given year beyond the three year fixed price period will be made available. For fixed price options, NASA shall be reimbursed the user's flight price compounded at 8 percent per year for each year beyond the fixed price period. The fee for this option is one million dollars in 1975 dollars. The option fee will be applied to the price of the user's flight. The user will exercise his option by contracting for the flight on the normal 33-month reimbursement schedule or the option fee will be retained by NASA.

(2) In order to insure that space will be available for flights in a given future year, scheduled launch options, where NASA will provide a launch during a ninety-day period, will be given to STS users already contracting for flights at a fee of $100,000 in 1975 dollars. The option fee will be applied to the price of the user's flight. The user will exercise his option by contracting for the flight on the normal 33-month reimbursement schedule or the option fee will be retained by NASA.

(3) In order to allow the user greater flexibility in selecting a launch date, the user may purchase a "floating launch date" option. At the time of contract execution, the user will begin to make payments according to a 33-month reimbursement schedule for this launching. At any time during Phase 1 or 2, the user may exercise this option by informing NASA of his desired launch date for this option which will then be negotiated by NASA and the user. This launch date must be at least 33 months after the date of the first reimbursement payment. If the desired launch date is within one year of the date of declaration, the short term call-up option and associated fee will apply. If the desired launch is to occur in a year for which a new price per flight is in effect, the user will pay the new price. The fee for this option is 10 percent of the user's flight price in effect at the time of contract execution and is payable at that time. This fee will not be applied to the price of the user's flight.

(4) Options must be exercised for a flight by the end of the second phase of operations or the option fee will be retained by NASA.

(f) *Fixed price period and escalation.* (1) The price will remain constant for flights during the first phase of Shuttle operation. For flights during the second phase, the price will be adjusted on a yearly basis, if necessary, to assure recovery of aggregate costs over a twelve year period. These adjusted prices will be applicable only to agreements executed after the adjustment is made.

(2) Shuttle services for both phases will be contracted on a fixed price basis. The payments in the contract will be escalated to the time of the payment using the Bureau of Labor Statistics Index for Compensation per hour. Total Private.

(g) *Earnest money.* Earnest money will be paid to NASA prior to contract negotiations. The earnest money required per contract shall be $100,000 in 1975 dollars; however, if the payload is a small self-contained payload, the earnest money shall be $500.00. The earnest money will be applied to the first payment made by the customer or will be retained by NASA.

(h) *Reimbursement schedule.* (1) Reimbursement shall be made in accord-

ance with the reimbursement schedule contained in this subsection. No charges shall be made after the flight, except as negotiated in the contract for prespecified extra services. Those users who contract for Shuttle services less than three years before the desired launch date will be accommodated and will pay on an accelerated basis according to the reimbursement schedule.

(2) Standby payloads.

(i) Before the establishment of a firmly scheduled launch date, the number of months before launch will be computed assuming a launch date at the mid-point of the designated one-year period.

(ii) Once the firmly scheduled launch date is established, the user shall reimburse NASA to make his payments current according to the reimbursement schedule.

(3) Reimbursement schedule.

Number of months before launch flight is scheduled	Percent of price Months prior to scheduled launch date					
	33	27	21	15	9	3
33 or more	10	10	17	17	23	23
27-32	.....	21	17	17	23	23
21-26	.....	.....	40	17	23	23
15-20	.....	.....	.....	61	23	23
9-14	.....	.....	.....	.....	90	23
3-8	.....	.....	.....	.....	.....	122

This schedule holds unless there are offsetting advantages to the U.S. Government of an accelerated launch schedule.

(4) Contracts for Shuttle services made one year or less before a flight and up to three months before a flight will be made on a space-available basis unless the short term call-up option is elected.

(i) *Short term call-up option.* (1) For flights contracted one year or less before launch, but not less than three months before launch, short term call-up will be provided to dedicated flight users at the dedicated flight price according to the reimbursement schedule.

(2) For dedicated flight users requiring short term call-up flights less than three months before launch, NASA will provide STS launch services on a space-availalble basis. NASA shall be reimbursed the dedicated flight price according to the reimbursement schedule plus short term call-up additional costs. The additional costs will be based on estimated costs to be incurred.

(3) For shared flights contracted one year or less before launch, but more than six months before launch, users may elect to short term call-up option. The user shall reimburse NASA the standard shared flight price according to the reimbursement schedule plus a load factor-recovery fee. The load factory-recovery fee is half the difference between a dedicated flight price and the user's shared flight price or the difference between a dedicated flight price and the total adjusted reimbursements from all shared users, whichever is less.

(4) For shared flights contracted six months or less before launch, but more than three months before launch, users may elect the short term call-up option. The user shall reimburse NASA the standard shared flight price according to the reimbursement schedule plus a load factor-recovery fee which is the difference between a dedicated flight price and the total adjusted reimbursement from all shared flight users.

(5) Shared flights contracted three months or less before launch will be flown on a space-available basis. NASA shall be reimbursed the shared flight price according to the reimbursement schedule plus short term call-up additional costs. These additional charges

will be based on estimated costs to be incurred.

(6) For the purposes of this paragraph, "adjusted reimbursements" is defined to be reimbursements assuming all shared users are non-U.S. Government.

(7) The load factor-recovery fee will never be less than zero.

(8) The load factor-recovery fee is payable upon receipt of NASA's billing therefor.

(j) *Accelerated launches.* For users who reschedule a launch so that it occurs earlier than the planned launch, the user will pay on an accelerated reimbursement schedule. The user will reimburse NASA to make his payments current on the new accelerated reimbursement schedule. If the time from notification of acceleration is less than one year from the new launch date, short term call-up reimbursements will also apply.

(k) *Postponements.* (1) Non-standby payloads. (i) A user can postpone a flight of his payload one time with no additional charge if postponement occurs more than one year before launch. For subsequent postponed flights more than one year before launch, the user shall reimburse NASA a postponement fee of 5 percent of the user's flight price. For postponements one year or less before launch, the user shall reimburse NASA 5 percent of the user's flight price plus an occupancy fee according to the occupancy fee schedule in Appendix E to this subpart.

(ii) If the postponement of a flight causes the payload to be launched in a year for which a different price per flight has been established, the new price shall apply if it is higher than the originally contracted price.

(2) Standby payloads.

(i) For flights postponed more than six months prior to the beginning of the negotiated one-year period, NASA shall renegotiate a new one-year period during which launch will occur. No additional fee will be imposed.

(ii) For flights postponed six months or less prior to the beginning of the negotiated one-year period, the user shall reimburse NASA 5 percent of the user's flight price plus an occupancy fee according to the occupancy fee schedule set forth in Appendix E to this subpart.

(3) Postponement fees are payable upon receipt of NASA's billing therefor.

(4) Flights postponed will henceforth be treated as newly scheduled launches according to the reimbursement schedule. The number of months prior to launch will be taken as the total number of months between the date postponement is elected and the new launch date. Short-term call-up options and associated fees shall apply.

(5) Minor delays (up to three days) caused by the users will not constitute a postponement. No fee will be charged for a minor delay.

(l) *Cancellations.* (1) Non-standby payloads. Users who cancel a flight more than one year before launch shall reimburse NASA 10 percent of the user's flight price. For a cancelled flight one year or less before launch, the user shall reimburse NASA 10 percent of the user's flight price plus an occupancy fee as set forth in Appendix E to this subpart.

(2) Standby payloads.

(i) Users who cancel a flight more than six months prior to the beginning of the negotiated one-year period shall reimburse NASA 10 percent of the user's flight price.

(ii) For a flight cancelled six months or less prior to the beginning of the negotiated one-year period, the user shall reimburse NASA 10 percent of the user's flight price plus an occupancy fee as set forth in Appendix E to this subpart.

(3) Cancellation fees are payable upon receipt of NASA's billing therefor.

§ 1214.103 Reflight guarantee.

(a) A fee for a reflight guarantee is included in the price charged the user. In consideration of that fee, NASA guarantees one reflight of:

(1) The launch and deployment of a free flying payload into a Shuttle compatible mission orbit if, through no fault of the user, the first launch and deployment attempt is unsuccessful and if the payload returns safely to

earth or a second payload is provided by the user.

(2) The launch of an attached payload into its mission orbit if the first launch attempt is unsuccessful through no fault of the user, and if the payload returns safely to earth or a second payload is provided by the user.

(3) A launch of a Shuttle into a payload mission orbit for the purpose of retrieving a payload if the first retrieval attempt is unsuccessful through no fault of the user. This guarantee only applies if the payload is in a safe retrievable condition as determined by NASA.

(b) This reflight guarantee will not be applicable to payloads or upper stages placed into orbits other than the Shuttle mission orbit.

§ 1214.104 Patent and data rights.

(a) NASA will not acquire rights to inventions, patents or proprietary data privately funded by a user, or arising out of activities for which a user has reimbursed NASA under the policies set forth herein. However, in certain instances in which the NASA Administration has determined that activities may have a significant impact on the public health, safety or welfare, NASA may obtain assurances from the user that the results will be made available to the public on terms and conditions reasonable under the circumstances.

(b) The user will be required to furnish NASA with sufficient information to verify peaceful purposes and to insure Shuttle safety and NASA's and the U.S. Government's continued compliance with law and the Government's obligations.

§ 1214.105 Revisit and/or retrieval services.

These services will be priced on the basis of estimated costs. If a special dedicated Shuttle flight is required, the full dedicated price will be charged. If the user's retrieval requirement is such that it can be accomplished on a scheduled Shuttle flight, he will only pay for added mission planning, unique hardware or software, time on orbit, and other extra costs incurred by the revisit.

§ 1214.106 Damage to payload.

The price does not include a contingency or premium for damage that may be caused to a payload through the fault of the U.S. Government or its contractors. The U.S. Government, therefore, will assume no risk for damage or loss to the user's payload. The users will assume that risk or obtain insurance protecting themselves against that risk.

§ 1214.107 Responsibilities.

(a) *Headquarters officials.* (1) The NASA Comptroller, in coordination with the Associate Administrator for Space Flight will:

(i) Prescribe guidelines, procedures, and other instructions which are necessary for estimating costs and setting prices and purlishing them in the NASA Issuance System, and

(ii) Review and arrange for the billing of users.

(2) The Associate Administrator for Space Flight will arrange for:

(i) Developing estimates for costs and establishing prices in sufficient detail to reveal their basis and rationale.

(ii) Obtaining approval of the NASA Comptroller of such estimates and related information prior to the execution of any agreement, and

(iii) Reviewing of final billings to users prior to submission to the NASA Comptroller.

(b) *Field installation officials.* The Directors of Field Installations responsible for the STS operations will:

(1) Maintain and/or establish agency systems which are needed to identify costs in the manner prescribed by the NASA Comptroller.

(2) Compile financial records, reports, and related information, and

(3) Provide assistance to other NASA officials concerned with costs and related information.

APPENDIX A—COSTS FOR WHICH NASA SHALL BE REIMBURSED

Additive Costs. All additional costs, both direct and indirect, that the NASA has to incur above those it would otherwise have incurred had it not undertaken to meet non-NASA user requirements.

Total Operations Costs. Total Operations Costs include all direct and indirect costs,

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excluding costs composing the use charge. Such costs include direct program charges for manpower, expended hardware, refurbishment of hardware, spares, propellants, provisions, consumables and launch and recovery services. They also include a charge for program support, center overhead, and contract administration.

Use Charge. A charge in lieu of depreciation for use of facilities, support equipment and the Shuttle fleet.

Aggregate Costs. Aggregate costs are all reasonable costs which include the sum of the use charge and total operations costs.

Appendix B—Standard Shuttle Services

Two standard mission destinations:
(1) 160 NM Altitude; 28.5° Inclination.
(2) 160 NM Altitude; 56.0° Inclination.
One day mission operations
Orbiter flight planning services
Transmission of payload data to compatible receiving stations
A three-man flight crew
On-orbit payload handling
Deployment of a free flyer
NASA support of payload design reviews
Prelaunch payload installation, verification and orbiter compatibility testing
NASA payload safety review

Appendix C—Optional Shuttle Services

Revisit and retrieval
Use of Spacelab or other special equipment
Use of Mission Kits to extend basic orbiter capability
Use of Upper Stages
EVA services
Unique payload/orbiter integration and test
Payload mission planning services, other than for launch, deployment and entry phases
Additional time on-orbit
Payload data processing
Launch from Western Test Range
Two standard mission destinations are available from the Western Test Range site:
(1) 160 NM Altitude; 90.0° Inclination.
(2) 160 NM Altitude; 104.0°Inclination.

Appendix D—Shared Flight Charge

To calculate the cost of individual payloads transported on a flight shared with other payloads:

(1) Find the load factor for the payload by dividing the payload weight by the Shuttle capability for the desired inclination (Table in Figure 1).

(2) Find the load factor for the payload by dividing the payload length by 60 feet.

(3) Enter the curve (Figure 1) at the higher value obtained from steps 1 and 2 and read the Charge Factor (C_f)from the curve.

(4) Multiply the C_f value times the quoted price per dedicated flight. This will result in the price for the payload flight.

The price for each payload flight (Step 4) entitles the user to be provided a pro-rata share of the facilities available on board the standard Shuttle flight. For example, if the payload factor is 0.5, then the payload is entitled to 50% of power, cooling, and other services provided on the standard flight. Standard services required that exceed the pro-rata share will be an additional charge to the user based on the cost of the service provided.

For purposes of this attachment, payload weight includes a pro-rata share of all special equipment (e.g., spin tables and their controls) needed for the user's mission. Payload length includes a pro-rata share of the clearance length necessary to operate or deploy the payload, including the length of deployment mechanisms.

DETERMINATION OF CHARGE FACTOR (C_f) FOR 160 N.MI

PRICE = C_f × DEDICATED PRICE

LOAD FACTOR = { PAYLOAD WEIGHT, LBS / SHUTTLE CAPABILITY ; PAYLOAD LENGTH, FT / 60 } WHICHEVER IS GREATER

SHUTTLE CAPABILITY	
INCLINATION IN DEGREES	WEIGHT IN THOUSANDS OF POUNDS
28 5	65
56	57
90	37
104	30

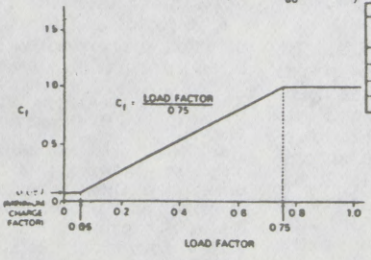

FIG 1

APPENDIX G

APPENDIX E—OCCUPANCY FEE SCHEDULE

For a postponed or cancelled dedicated flight, the occupancy fee will be zero.

For a postponed or cancelled shared flight, the occupancy fee will be computed according to the computation instructions set forth below. If the computation results in an occupancy fee which is less than zero, the occupancy fee will be reset to zero.

For a postponed or cancelled shared flight one year or less, but more than six months before launch, the user shall reimburse NASA an occupancy fee of half the user's flight price less any adjusted reimbursements from other users who contract for the same flight subsequent to the postponement or cancellation date.

For a postponed or cancelled shared flight six months or less before launch, the user shall reimburse NASA an occupancy fee of 90% of the user's flight price less any adjusted reimbursements from other users who contract for the same flight subsequent to the postponement or cancellation date.

For a given shared flight, if the occupancy fee so computed would result in total adjusted reimbursements (exclusive of the 5% (10%) postponement (cancellation) fee) in excess of the price of a dedicated flight, the occupancy fee will be reduced in order to recover the price of a dedicated flight.

In the event that, as a result of the postponement or cancellation, the Shuttle is not launched at all for the intended flight, the occupancy fee will be zero.

(For purposes of this attachment, "adjusted reimbursements" is defined to be reimbursements assuming all users are non-U.S. Government.)

Subpart 1214.2—Reimbursement for Shuttle Services Provided to Civil U.S. Government Users and Foreign Users Who Have Made Substantial Investment in the STS Program

SOURCE: 42 FR 8631, Feb. 11, 1977, unless otherwise noted.

§ 1214.200 Scope.

This Subpart 1214.2 sets forth:

(a) The policy on reimbursement for Shuttle services which are provided by NASA to users (as defined in § 1214.201) under launch services agreements, and

(b) Responsibilities for putting such policy into effect and carrying it out.

§ 1214.201 Definition.

For the purpose of this subpart, the term "users" means:

(a) For all civil U.S. Government agencies who request Shuttle services from NASA, and

(b) Foreign users who have made substantial investment in the STS program, i.e., European Space Agency (ESA), ESA member or observer nations participating in Spacelab development, and Canada, when conducting experimental science or experimental applications missions with no near-term commercial implications.

§ 1214.202 Reimbursement policy.

(a) *Features of policy.* (1) All users will be charged on a fixed price basis; there will be no post-flight charges, except for prespecified optional services.

(2) The price will be based on estimated costs.

(3) The price will be held constant for flights in the first three years of Space Transportation System (STS) operations.

(4) Payments shall be escalated according to the Bureau of Labor Statistics Index for Compensation per hour, Total Private.

(5) Subsequent to the first three years, the price will be adjusted annually to insure that total operating costs are recovered over a twelve-year period.

(6) Pricing incentives are designed to maximize the proper utilization of the STS.

(b) *Dedicated flight reimbursements.* (1) For the purposes of this policy, a dedicated flight is one sold to a single user.

(2) The policy is established for two distinct phases of Shuttle operations.

The first phase is through the third full fiscal year of Shuttle operations and the second phase consists of nine full fiscal years subsequent to the first phase.

(i) For a dedicated Shuttle flight during the first phase, NASA shall be reimbursed in an amount which is a pro-rata share of forecast additive costs averaged over the first phase of three years; however, the price shall not be less than a pro-rata share of forecast total operating costs averaged over both the first and second phases of the twelve year Shuttle operation period.

(ii) For a dedicated Shuttle flight during the second phase, NASA shall be reimbursed a pro-rata share of forecast total operating costs over both phases to insure that total operating costs are recovered over the twelve year period.

(iii) The definition of the costs are specified in this subpart are set forth in Appendix A to this subpart.

(iv) Subject to NASA approval, a dedicated flight user may apportion and assign STS services to other STS users provided they satisfy STS user requirements. The price of integrating additional payloads will be negotiated.

(v) A summary of standard Shuttle services included in the flight price is set forth in Appendix B to Subpart 1214.1.

(vi) The prices of optional Shuttle services are being developed and shall be set forth in the Shuttle Price Book which is being developed. A summary of the optional services is set forth in Appendix C to Subpart 1214.1.

(vii) For the user with an experimental, new use of space or first time use of space of great public value, the reimbursement to NASA for the dedicated, standard Shuttle flight in either the first or second phase shall be a pro-rata share of the average twelve year additive costs as estimated at the time of negotiations. Programs which qualify for this price will be determined by an STS Exceptional Program Selection Process. In all cases, the Administrator will be the selection official.

(viii) For dedicated flight users, NASA and the user will identify a desired launch date within a period of ninety days three years prior to flight. One year prior to the flight, a firm launch and payload delivery date will be identified by NASA. The firm launch date will be within the first sixty days of the original ninety day period. Launch will occur on the firmly scheduled launch date or within a period of thirty days thereafter. The payload must be ready to launch for the duration of that period.

(c) *Shared flight reimbursements.* (1) The price of a shared Shuttle flight will be a fraction of the dedicated Shuttle flight price. The fraction will be based on the length and weight of the payload and the mission destination at the time of contract negotiations. The formula for computing the fraction is set forth in Appendix D to Subpart 1214.1.

(2) For shared flight users, NASA and the user will identify a desired launch date three years prior to flight. Launch will occur within a period of ninety days, beginning on the desired launch date. One year prior to flight, a payload delivery date and a firm launch date will be coordinated among the shared flight users. This firm launch date will be within the first thirty days of the original ninety day period. The launch will occur on the firmly scheduled launch date or within a perod of sixty days thereafter. The payloads must be ready to launch for the duration of that period.

(3) A 20 percent discount on the standard flight price will be given to shared flight users who will fly on a space-available (standby) basis. NASA will provide launch services within a prenegotiated period of one year. Shared flight payloads must be flight deliverable to the launch site on the first day of the one year period and sustain that condition until delivery to the launch site. The user will be noti-

fied sixty days prior to the firmly scheduled launch date which has been established by NASA. At that time, NASA will also establish a payload delivery date. The payload must be available at the launch site on the assigned delivery date and ready to launch for a period of sixty days after the firmly scheduled launch date.

(d) *Small self-contained payloads.* Packages under 200 pounds and smaller than five cubic feet which require no Shuttle services (power, deployment, etc.), and are for R&D purposes, will be flown on a space-available basis during both phases of Shuttle operation. The price for this service will be negotiated based on size and weight, but will not exceed $10,000 in 1975 dollars. A minimum charge of $3,000 in 1975 dollars will be made. If Shuttle services are required, the price will be individually negotiated. Reimbursement to NASA will be made at the time the package is scheduled for flight.

(e) *Options.* (1) In order to allow the user greater flexibility in selecting a launch date, the user may purchase a "floating launch date" option. At the time of contract execution, the user will begin to make payments according to a 33 month reimbursement schedule for this launching. At any time during Phase 1 or 2, the user may exercise this option by informing NASA of his desired launch date for this option which will then be negotiated by NASA and the user. This launch date must be at least 33 months after the date of the first reimbursement payment. If the desired launch date is within one year of the date of declaration, the short term call-up option and associated fee will apply. If the desired launch is to occur in a year for which a new price per flight is in effect, the user will pay the new price. The fee for this option is 10 percent of the user's flight price in effect at the time of contract execution and is payable at that time. This fee will not be applied to the price of the user's flight.

(2) Options must be exercised for a flight by the end of the second phase of operations or the option fee will be retained by NASA.

(f) *Fixed price period and escalation.* (1) The price will remain constant for flights during the first phase of Shuttle operations. For flights during the second phase, the price wil be adjusted on a yearly basis, if necessary, to assure revovery of total operating costs over a twelve-year period. These adjusted prices will be applicable only to agreements executed after the adjustment is made.

(2) Shuttle services for both phases will be contracted on a fixed price basis. The payments in the contract will be escalated to the time of the payment using the Bureau of Labor Statistics Index for Compensation per hour, Total Private.

(g) *Earnest money.* Earnest money will be paid to NASA by ESA and ESA member nations paticipating in Spacelab development, and government agencies of Canada prior to contract negotiations. The earnest money required per contract shall be $100,000 in 1975 dollars; however, if the payload is a small self-contained payload, the earnest money shall be $500.00. The earnest money will be applied to the first payment made by the customer or will be retained by NASA.

(h) *Reimbursement schedule.* (1) Reimbursement shall be made in accordance with the reimbursement schedule contained in this subsection. No charges shall be made after the flight, except as negotiated in the contract for prespecified extra services. Those users who contract for Shuttle services less than three years before the desired launch date will be accommodated and will pay on an accelerated basis according to the reimbursement schedule.

(2) Standby payloads. (i) Before the establishment of a firmly scheduled launch date, the number of months before launch will be computed assuming a launch date at the mid-point of the designated one-year period.

(ii) Once the firmly scheduled launch date is established, the user shall reimburse NASA to make his payments current according to the reimbursement schedule.

(3) Rembursement schedule.

Number of months before launch flight is scheduled	Percent of price Months prior to scheduled launch date					
	33	27	21	15	9	3
33 months or more	10	10	17	17	23	23
27 to 32 months	.....	21	17	17	23	23
21 to 26 months	.....	.....	40	17	23	23
15 to 20 months	.....	.....	.....	61	23	23
9 to 14 months	.....	.....	.....	.....	90	23
3 to 8 months	.....	.....	.....	.....	.....	.....

This schedule holds unless there are offsetting advantages to the U.S. Government of an accelerated launch schedule.

(4) Contracts for Shuttle services made one year or less before a flight and up to three months before a flight will be made on a space-available basis unless short term call-up option is elected.

(i) *Short term Call-up option.* (1) For flights contracted on year or less before launch, but not less than three months before launch, short term call-up will be provided to dedicated flight users at the dedicated flight prices according to the reimbursement schedule.

(2) For dedicated flight users requiring short term call-up flights less than three months before launch, NASA will provide STS launch services on a space-available basis. NASA shall be reimbursed the dedication flight price according to the reimbursement schedule plus short term call-up additional costs. The additional costs will be based on estimated costs to be incurred.

(3) For shared flights contracted one year or less before launch, but more than six months before launch, users may elect the short term call-up option. The user shall reimburse NASA the standard shared flight price according to the reimbursement schedule plus a load factor-recovery fee. The load factor-recovery fee is half the difference between a dedicated flight price and the user's shared flight price or the difference between a dedicated flight price and the total adjusted reimbursements from all shared users, whichever is less.

(4) For shared flights contracted six months or less before launch, but more than three months before launch, users may elect the short term call-up option. The user shall reimburse NASA the standard share flight price according to the reimbursement schedule plus a load factor-recovery fee which is the difference between a dedicated flight price and the total adjusted reimbursement from all shared flight users.

(5) Shared flights contracted three months or less before launch will be flown on a space-available basis. NASA shall be reimbursed the shared flight price according to the reimbursement schedule plus short term call-up additional costs. These additional charges will be based on estimated costs to be incurred.

(6) For the purposes of this paragraph, "adjusted reimbursements" is defined to be reimbursements assuming all shared users are among those defined in § 1214.201.

(7) The load factor-recovery fee will never be less than zero.

(8) The load factor-recovery fee is payable upon receipt of NASA's billing therefor.

(j) *Accelerated launches.* For users who reschedule a launch so that it occurs earlier than the planned launch, the user will pay on an accelerated reimbursement schedule. The user will reimburse NASA to make his payments current on the new accelerated reimbursement schedule. If the time from notification of acceleration is less than one year from the new launch date, short term call-up reimbursements will also apply.

(k) *Postponements.* (1) Non-standby payloads.

(i) A user can postpone a flight of his payload one time with no additional charge if postponement occurs more

than one year before launch. For subsequent postponed flights more than one year before launch, the user shall reimburse NASA a postonement fee of 5 percent of the user's flight price. For postponements one year or less before launch, the user shall reimburse NASA 5 percent of the user's flight price plus an occupancy fee according to the occupancy fee schedule in Appendix B.

(ii) If the postponement of a flight causes the payload to be launched in a year for which a different price per flight has been established, the new price shall apply if it is higher than the originally contracted price.

(2) Standby payloads. (i) For flights postponed more than six months prior to the beginning of the negotiated one-year period, NASA shall renegotiate a new one-year period during which launch will occur. No additional fee will be imposed.

(ii) For flights postponed six months or less prior to the beginning of the negotiated one-year period, the user shall reimburse NASA 5 percent of the user's flight price plus an occupancy fee according to the occupancy fee schedule set forth in Appendix B.

(3) Postponement fees are payable upon receipt of NASA's billing therefor.

(4) Flights postponed will henceforth be treated as newly scheduled launches according to the reimbursement schedule. The number of months prior to launch will be taken as the total number or months between the date postponement is elected and the new launch date. Short term call-up options and associated fees shall apply.

(5) Minor delays (up to three days) caused by the users will not constitute a postponement. No fee will be charged for a minor delay.

(l) *Cancellations.* (1) Non-standby payloads. Users who cancel a flight more than one year before launch shall reimburse NASA 10 percent of the user's flight price. For a cancelled flight one year or less before launch, the user shall reimburse NASA 10 percent of the user's flight price plus an occupancy fee as set forth in Appendix B.

(2) Standby payloads. (i) Users who cancel a flight more than six months prior to the beginning of the negotiated one-year period shall reimburse NASA 10 percent of the user's flight price.

(ii) For a flight cancelled six months or less prior to the beginning of the negotiated one-year period, the user shall reimburse NASA 10 percent of the user's flight price plus an occupancy fee as set forth in Appendix B.

(3) Cancellation fees are payable upon receipt of NASA's billing therefor.

§ 1214.203 Optional reflight guarantee.

(a) If reflight insurance is purchased from NASA, NASA guarantees one reflight of:

(1) The launch and development of a free flying payload into a Shuttle compatible mission orbit if, through no fault of the user, the first launch and deployment attempt is unsuccessful and if the payload returns safely to earth or a second payload is provided by the user.

(2) The launch of an attached payload into its mission orbit if the first launch attempt is unsuccessful through no fault of the user, and if the payload returns safely to earth or a second payload is provided by the user.

(3) A launch of a Shuttle into a payload mission orbit for the purpose of retrieving a payload if the first retrieval attempt is unsuccessful through no fault of the user. This guarantee only applies if the payload is in a safe retrievable condition as determined by NASA.

(b) Reflight insurance is not applicable to payloads or upper stages placed into orbits other than the Shuttle mission orbit.

§ 1214.204 Patent and data rights.

(a) When accommodating missions under this Subpart, i.e., experimental science or experimental applications missions for ESA, ESA member states or Canada with no near-term commercial implications, NASA will obtain for U.S. Governmental purposes rights to inventions, patents and data resulting from such missions, subject to the

user's retention of the rights to first publication of the data for a specified period of time.

(b) The user will be required to furnish NASA with sufficient information to verify peaceful purposes and to insure Shuttle safety and NASA's and the U.S. Government's continued compliance with law and the Government's obligations.

§ 1214.205 Revisit and/or retrieval services.

These services will be priced on the basis of estimated costs. If a special dedicated Shuttle flight is required, the full dedicated price will be charged. If the user's retrieval requirement is such that it can be accomplished on a scheduled Shuttle flight, he will only pay for added mission planning, unique hardware or software, time on orbit, and other extra costs incurred by the revisit.

§ 1214.206 Damage to payload.

The price does not include a contingency or premium for damage that may be caused to a payload through the fault of the U.S. Government or its contractors. The U.S. Government, therefore, will assume no risk for damage or loss to the user's payload. The users will assume that risk or obtain insurance protecting themselves against that risk.

§ 1214.207 Responsibilities.

(a) *Headquarters officials.* (1) The NASA Comptroller, in coordination with the Associate Administrator for Space Flight will:

(i) Prescribe guidelines, procedures, and other instructions which are necessary for estimating costs and setting prices and publishing them in the NASA Issuance System, and

(ii) Review and arrange for the billing of users.

(2) The Associate Administrator for Space Flight will arrange for:

(i) Developing estimates for costs and establishing prices in sufficient detail to reveal their basis and rationale.

(ii) Obtaining approval of the NASA Comptroller of such estimates and related information prior to the execution of any agreement, and

(iii) Reviewing of final billings to users prior to submission to the NASA Comptroller.

(b) *Field installation officials.* The Directors of Field Installations responsible for the STS operations will:

(1) Maintain and/or establish agency systems which are needed to identify costs in the manner prescribed by the NASA Comptroller,

(2) Compile financial records, reports, and related information, and

(3) Provide assistance to other NASA officials concerned with costs and related information.

APPENDIX A—COSTS FOR WHICH NASA SHALL BE REIMBURSED

Total Operating Costs. Total Operating Costs include all direct and indirect costs, excluding costs of composing the use charge. Such costs include direct program charges for manpower, expended hardware, refurbishment of hardware, spares, propellants, provisions, consumables and launch and recovery services. They also include a charge for program support, center overhead and contract administration.

APPENDIX B—OCCUPANCY FEE SCHEDULE

For a postponed or cancelled dedicated flight, the occupancy fee will be zero.

For a postponed or cancelled shared flight, the occupancy fee will be computed according to the computation instructions set forth below. If the computation results in an occupancy fee which is less than zero, the occupancy fee will be reset to zero.

For a postponed or cancelled shared flight one year or less, but more than six months before launch, the user shall reimburse NASA an occupancy fee of half the user's flight price less any adjusted reimbursements from other users who contract for the same flight subsequent to the postponement or cancellation date.

For a postponed or cancelled shared flight six months or less before launch, the user shall reimburse NASA an occupancy fee of 90% of the user's flight price less any adjusted reimbursements from other users who contract for the same flight subsequent to the postponement or cancellation date.

For a given shared flight, if the occupancy fee so computed would result in total adjusted reimbursements (exclusive of the 5% (10%) postponement (cancellation) fee) in excess of the price of a dedicated flight, the occupancy fee will be reduced in order to recover the price of a dedicated flight.

In the event that, as a result of the postponement or cancellation, the Shuttle is not launched at all for the intended flight, the occupancy fee will be zero.

For purposes of this attachment, "adjusted reimbursements" is defined to be reimbursements assuming all users are among those defined in § 1214.201.

APPENDIX H

Subpart 1214.3—Payload Specialists for NASA or NASA-Related Payloads

AUTHORITY: 42 U.S.C. 2473.

SOURCE: 43 FR 9790, Mar. 10, 1978, unless otherwise noted.

§ 1214.300 Scope.

This Subpart 1214.3 sets forth NASA's policy on and process for the acquisition and utilization of payload specialists who operate NASA or NASA-related payloads aboard Space Transportation System (STS) flights.

§ 1214.301 Definitions.

(a) *Payload specialist.* A payload specialist is an individual selected to operate assigned payload elements on a specific STS flight or mission.

(b) *NASA or NASA-related payload.* A NASA or NASA-related payload is a specific complement of instruments, space equipment and support hardware, developed by a NASA Program Office or by another party with which NASA has a shared interest, and carried into space to accomplish a mission or discrete activity in space.

(c) *Mission.* The performance of a coherent set of investigations or operations in space to achieve program goals. A single mission might require more than one flight, or more than one mission might be accomplished on a single flight.

(d) *Mission manager.* The mission manager is a NASA official responsible for the implementation of the NASA or NASA-related payload portion of an STS flight(s). The mission manager is designated by the field installation selected to execute the payload portion of the flight(s).

(e) *Mission specialist.* A mission specialist is a career NASA Astronaut skilled in the operation of STS systems related to payload operations and thoroughly familiar with the operational requirements and objectives of the payloads with which the mission specialist will fly. The mission specialist, when designated for a flight, will participate in the planning of the mission and will be responsible for the coordination of overall payload/STS interaction. The mission specialist will direct the allocation of STS and crew resources to the accomplishment of the combined payload objectives during the payload operations phase of the flight in accordance with the approved flight plan.

(f) *Investigator working group (IWG).* An investigator working group (IWG) is a group, generally composed of the investigators, or their representatives, established in accordance with NASA Management Instruction 1150.1, whose primary purpose is facilitating or coordinating the development and execution of the operational plans of an approved NASA program or reporting the progress thereof. The IWG's work is primarily operational in nature; its advisory function, if any, is only incidental.

§ 1214.302 Background.

The Space Transportation System (STS) has been developed to expand the Nation's capabilities to utilize beneficially the space environment in a cost-effective way. It provides opportunity for onboard participation of investigators, their associates or other representatives of the payload community. Such participation by individuals associated with the investigations should enhance the probability of successful achievement of the payload objectives. Therefore, the concept of a payload specialist has been introduced in order to permit the utilization of various specialists as payload operators. The STS will provide these payload specialists with a habitable working environment and support services in such a way as to require a minimum of dedicated space flight training, allowing them to concentrate their efforts on the accomplishment of their scientific or technical objectives.

§ 1214.303 Policy.

NASA policy is to provide individuals associated with space investigations the opportunity to perform as

payload specialists aboard STS flights to conduct measurements and observations in pursuance of mission objectives.

§ 1214.304 Process.

(a) *Determining the need for payload specialist(s).* The Official-in-Charge of the sponsoring Program Office determines the need for a payload specialist(s) to serve aboard an STS flight with the NASA or NASA-related payload. This determination may be made at the time of selection of investigations resulting from an Announcement of Opportunity issued in accordance with NASA Handbook 8030.6, or when the need becomes known during payload/mission development. The policy contained in NASA Management Instruction 3713.2C will be considered.

(b) *Selection of payload specialists.* (1) Except as provided in paragraph (b)(5) of this section, when the Official-in-Charge of the sponsoring Program Office has approved a payload for a mission and/or has otherwise determined a need for a payload specialist(s), the IWG will then commence the selection process.

(2) The IWG will examine the requirements for the selected investigations to determine the number and qualifications of payload specialists and backups that are necessary to support the investigations. Any support which can be provided by the flight crew will be included in these considerations by the IWG.

(3) The IWG members will solicit candidiate payload specialists. The solicitation will require as a minimum that a summary of professional qualifications, a medical history, and the results of the physical examination described in paragraph (b)(3)(iii) of this section be submitted. The IWG will be responsible for:

(i) Establishing professional and operational criteria for payload specialists for specific payloads.

(ii) Screening all candidates against the criteria established.

(iii) Selecting payload specialists from those candidates deemed professionally qualified and who meet the NASA Class III Space Flight Medical Selection Standards. The preselection phases of the medical examiniation will be conducted at various locations by certified examiners approved by the Director, Life Sciences Division, NASA Headquarters.

(4) The Official-in-Charge of the sponsoring Program Office will request that the Director of the Johnson Space Center supply the names and qualifications of appropriate mission specialists who are available to serve as payload specialists for the flight under consideration. These candidates will be considered by the IWG along with all other candidates.

(5) The Official-in-Charge of a sponsoring Program Office is authorized to select a payload specialist(s) as a part of or incident to the acquisition or selection of an investigation(s) for flight. Generally, this authority will be exercised when an IWG has not been convened for this purpose, the investigation(s) is unrelated by nature of its source or objective to the IWG's principal efforts, or other circumstance warrants such approach. In making such selection, the Official-in-Charge of the sponsoring Program Office is to consider the availability of mission specialists as required in paragraph (b)(4) of this section.

(c) *Approval of payload specialists.* The IWG will submit its payload specialist selections through the mission manager to the Official-in-Charge of the sponsoring Program Office for approval. The Official-in-Charge of the sponsoring Program Office will assure appropriate arrangements are made for the assignment of Government employees.

(d) *Preflight activities.* (1)(i) The payload specialist(s) in each assigned position will undergo training required to support the payload elements assigned to that position.

(ii) The IWG is responsible for defining the training necessary for payload elements within its cognizance. The mission manager will assist as necessary in carrying out these IWG defined activities and is responsible for the total integrated payload operations training.

(iii) The Office of Space Transportation Systems (STS) is responsible for

training the payload specialists on those Orbiter, Spacelab, Interim Upper Stage, and/or payload support systems which do not vary with the payload being flown; the Office of STS will provide certification to the mission manager of the payload specialists' readiness for flight.

(iv) The mission manager is responsible for verifying that the payload specialists are properly trained for flight including payload and STS requirements.

(2) The medical program for payload specialists will be continued during the preflight period in accordance with the NASA Class III Space Flight Medical Selection Standards.

(3) If during the preflight period the number of payload specialists is reduced to fewer than that desired by the IWG, the IWG will initiate the necessary reprocessing to provide replacements.

(e) *Designation of primary and backup payload specialists (when required).* At an appropriate time designated by the mission manager, the IWG will determine which payload specialists are primary and which are backup. The designations will be forwarded through the mission manager to the Official-in-Charge of the sponsoring Program Office for approval. Consideration will be given to proficiency in both payload operations and STS operations as demonstrated during the training period.

§ 1214.305 Payload specialist responsibilities.

(a) *Operation of payload elements.* The payload specialist will be responsible for the operation of the assigned payload elements. The payload specialist is responsible to the authority of the mission specialist and operates in compliance with mission rules and Payload Operation Control Center directives. Onboard decisions concerning assigned payload operations will be made by the payload specialist. A payload specialist may be designated to resolve conflicts between payload elements and approve such deviations from the flight plan as may arise from equipment failures or STS factors. In the instance of STS factors, the mission specialist will present the available options for decisions by the payload specialist.

(b) *Operation of STS equipment.* The payload specialist will be responsible for knowing how to operate certain Orbiter systems, such as hatches, food and hygiene systems, and for proficiency in those normal and emergency procedures which are required for safe crew operations.

(c) *Relationship with flight crew.* The responsibility for on-orbit management of Orbiter systems and attached payload support systems and for extravehicular activity and payload manipulation with the Remote Manipulator System will rest with the flight crew since extensive training is required for safe and efficient operation of these systems. In general, the flight crew will operate Orbiter systems and standard payload support systems, such as Spacelab and Interim Upper Stage systems; the mission specialist and/or payload specialists will operate payload support systems which have an extensive interface with the payload.

§ 1214.306 Payload specialist relationship with sponsoring institutions.

A payload specialist who is not a U.S. Government employee must have entered into a contractual or other arrangement establishing an obligatory relationship with an institution participating in the payload prior to entering into training at a NASA installation or NASA designated location. It is not the intention of NASA to enter into any direct contractual or other arrangement with payload specialists. Any exception must be approved by the Official-in-Charge of the sponsoring Program Office with the concurrence of the NASA General Counsel and the Director of Procurement.

 APPENDIX I

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

14 CFR Part 1214

Space Transportation System; Personnel Reliability Program

AGENCY: National Aeronautics and Space Administration.

ACTION: Final Regulation.

SUMMARY: NASA currently does not have a prescribed regulation to establish criteria and procedures for assuring the highest standards of reliability in personnel assigned to mission-critical positions in connection with the Space Transportation System. This regulation is part of an overall program to assure the protection of the Space Transportation System by providing special physical security measures, safety precautions and operational standards for mission-critical positions.

DATE: July 6, 1979.

ADDRESS: Director, Reliability, Quality and Safety, Code MR-4, Office of Space Transportation Systems, National Aeronautics and Space Administration, Washington, D.C. 20546.

FOR FURTHER INFORMATION CONTACT: Haggai Cohen, telephone 202-755-3155.

SUPPLEMENTARY INFORMATION: On March 16, 1979, NASA published proposed regulation (44 FR 16020-16021) to establish criteria and procedures for assuring the highest standards of reliability in personnel assigned to mission-critical positions in connection with the Space Transportation System. Interested parties were given until April 16, 1979, to submit comments or suggestions. Although there were no substantive comments on the proposed regulation, there was one request for additional information which was provided by letter. The proposed regulation is hereby adopted without change and is set forth below.

Robert A. Frosch,

Administrator.

14 CFR Part 1214 is amended by adding a new Subpart 1214.5 reading as follows:

Subpart 1214.5—Space Transportation System Personnel Reliability Program

Sec.

Authority: The National Aeronautics and Space Act of 1958, as amended, 72 Stat. 426, 42 U.S.C. 2451 *et seq.*

Subpart 1214.5—Space Transportation System Personnel Reliability Program

§ 1214.500 Scope.

This Subpart 1214.5 establishes a program designed to ensure that personnel assigned to mission-critical positions in connection with the Space Transportation System meet established screening requirements. This program supplements the DOD and NASA program requirements for security clearances.

§ 1214.501 Applicability.

(a) This regulation applies to NASA Headquarters and field installations whose personnel are engaged in activities that are critical to the success of Space Transportation missions.

(b) The provisions of the regulation apply to all personnel assigned to mission-critical positions in connection with the Space Transportation System.

(c) This regulation does *not* include flight crew or payload specialists when covered by other NASA Management Instructions which have equivalent screening requirements.

§ 1214.502 Definitions.

(a) *Mission-Critical Position.* Any position requiring physical access to the vehicle, or command capability through the Launch Processing System or the Mission Control Center as well as any other positions wherein the concerned NASA installation determines that faulty, negligent or malicious actions could result in a program contingency.

(b) *Two-Person Concept.* The practice of requiring the presence of two authorized persons, each capable of detecting incorrect or unauthorized procedures, during the performance of tasks or operations vital to the Space Shuttle.

(c) *Medical Authority.* A NASA civil service or contract physician responsible for reviewing medical records, providing results of medical evaluations and interpreting evaluations as they relate to reliable performance of mission-critical duties.

(d) *Program Contingency.* Any program-related failure, accident or incident that significantly delays or jeopardizes the program or a mission, prevents accomplishment of a major mission objective or terminates a mission prematurely.

§ 1214.503 Policy.

(a) The Space Transportation System is a national resource providing a capability to support a wide range of scientific, applications, commercial, defense and international uses. Since it will contribute significantly to ensuring a scientifically, technologically and economically strong and secure nation, the interest of the national security, as well as program reliability, operational and safety considerations require that extraordinary measures be taken to provide for the protection of the system.

(b) Measures to ensure this protection are:

(1) Special physical security provisions,

(2) Two-person concept of operations in connection with selected, most vital pre-launch and post-launch tasks, and

(3) Procedures to ensure that personnel assigned to perform mission-critical duties meet specified screening requirements.

§ 1214.504 Screening requirements.

(a) Only those persons shall be assigned to, employed in, or retained in mission-critical positions who have been determined to be competent and reliable in the performance of their assigned duties pursuant to the screening requirements of this section, and whose assignment, employment or retention is clearly consistent with optimum Space Transportation System safety and security.

(b) Determinations of acceptability for assignments to mission-critical positions shall be made on the basis of the following criteria:

(1) Ability to perform mission-critical duties as evidenced by performance during training, simulations and on the job.

(2) An initial medical evaluation of the individual and as necessary thereafter, but not less than every two years, to ensure health is adequate for reliable performance of mission-critical duties. The medical evaluation by competent medical authority may be made by: (i) Medical history and records which are sufficiently comprehensive and current for the purpose; or (ii) an appropriate medical examination.

(3) Verification of the existence of a current personnel security clearance at the level commensurate with the classification of the information required in the position.

(4) A review of the results of a National Agency Check (including a name check of the FBI fingerprint records) completed within the past five years. When the National Agency Check indicates that a more extensive investigation has been completed, the results of that investigation will also be reviewed.

(5) Local agency checks as appropriate.

§ 1214.505 Program implementation.

(a) Each NASA installation to which this regulation is applicable will identify positions occupied by personnel assigned to mission-critical duties. The number of positions so identified must be the absolute minimum necessary to meet operational requirements. The unnecessary designation of such positions not only increases the costs required to administer the program, but also reduces its total effectiveness.

(b) Each NASA installation to which this regulation is applicable will establish:

(1) A *certification system* acceptable to the Associate Administrator for Space Transportation Systems to ensure that the screening requirements of this instruction are met for designated mission-critical positions. The certification system is to provide for the issuance of a NASA identification for each authorized individual who passes the prescribed requirements; and

(2) A *management review process* to validate the objectivity of individual certification determinations and ensure that reassignments or other personnel actions taken pursuant to this regulation are duly processed under the appropriate personnel policies and procedures applicable to each individual: and

(3) Appropriate procedures for review of certification determinations which shall be provided to affected individuals.

(c) The launch centers, in conjunction with other involved NASA centers, contractors or agencies, will identify the vital pre-launch and post-launch tasks where the two-person concept of operations should be used.

(d) The full intent of the provisions of this regulation will be incorporated in any contract under which contractor employees will be assigned to mission-critical positions. An appropriate procurement provision is being separately prepared for this area.

(e) NASA Headquarters (OSTS) will periodically review the program to assure reasonable uniformity in implementation procedures and the identification of mission-critical positions.

[FR Doc. 79-20946 Filed 7-5-79; 8:45 am]

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APPENDIX J

Subpart 1214.6—Articles Authorized To Be Carried on Space Transportation System Flights

AUTHORITY: Pub. L. 85-568, 72 Stat. 426, 42 U.S.C. 2473(c).

SOURCE: 43 FR 49979, Oct. 26, 1978, unless otherwise noted.

§ 1214.600 Scope.

This subpart established policy, procedures, and responsibilities governing the selection, approval, packing, storage, post-flight disposition, and public announcement of articles authorized to be carried on space transportation system flights.

§ 1214.601 Definitions.

(a) The official flight kit contains selected items such as flags, patches, medallions, and other memorabilia to be presented to Government officials, Members of the Congress, and others who receive such awards as a result of individual contributions to the space program, as determined by the Administrator.

(b) The personal preference kit contains individual items of a personal nature selected by each individual who participates on a space transportation system flight.

(c) The flight crew consists of the commander, pilot, and mission specialist(s).

(d) A payload specialist is an individual selected to operate assigned payload elements on a specific space transportation system flight.

§ 1214.602 Policy.

Articles authorized to be carried on a space transportation system flight, other than articles related to the execution of a mission, are limited to those items approved by the Administrator for carrying in the official flight kit or a personal preference kit, in accordance with the requirements of this subpart.

§ 1214.603 Approval and disposition of contents of the official flight kit.

(a) *Proposed contents.* Both the Director, Johnson Space Center, and the program Associate Administrator responsible for payload mission management for a given flight shall suggest items for inclusion in the official flight kit to the associate administrator for space transportation systems.

(b) *Recommendation by Associate Administrator for Space Transportation Systems.* The Associate Administrator for Space Transportation Systems shall recommend to the Administrator a final list to be included in the official flight kit.

(c) *Disposition of kit.* Once the flight is completed the contents of the official flight kit shall be forwarded by the Director, Johnson Space Center, through the Associate Administrator for Space Transportation Systems, to the Administrator.

(d) *Approval authority.* The Administrator shall make all decisions concerning the contents and disposition of the official flight kit.

§ 1214.604 Policy on personal preference kits.

(a) *Purpose.* Each individual who participates on a flight, including flight crew members and payload specialists, shall be permitted to carry certain items of a personal nature in his/her personal preference kit on each space transportation system flight for use by him/her as personal gifts for immediate family and relatives (spouses, children, parents, in-laws, siblings) or close friends. No more than one article may be given to one individual.

(b) *Limit on number of items.* No more than 20 items will be included in the personal preference kit.

(c) *Weight limitations.* Each personal preference kit will be limited to 1.5 pounds which limitation may be reduced on a given flight because of overall weight considerations, if approved by the Associate Administrator for Space Transportation Systems upon the recommendation of the Director, Flight Operations, Johnson Space Center. Under no circumstances will an increase in the limitation be authorized.

(d) *Sale or commercial use prohibited.* Items carried in the personal preference kit shall not be sold or transferred for sale, or used, or transferred for economic gain or for any commercial or fund-raising purpose. Items will not be approved for carrying that by their nature may lend themselves to exploitation by the recipients, create problems with respect to good taste, or have a known or suspected commercial value, such as philatelic covers and coins.

§ 1214.600 Scope.

This subpart established policy, procedures, and responsibilities governing the selection, approval, packing, storage, post-flight disposition, and public announcement of articles authorized to be carried on space transportation system flights.

§ 1214.601 Definitions.

(a) The official flight kit contains selected items such as flags, patches, medallions, and other memorabilia to be presented to Government officials, Members of the Congress, and others who receive such awards as a result of individual contributions to the space program, as determined by the Administrator.

(b) The personal preference kit contains individual items of a personal nature selected by each individual who participates on a space transportation system flight.

(c) The flight crew consists of the commander, pilot, and mission specialist(s).

(d) A payload specialist is an individual selected to operate assigned payload elements on a specific space transportation system flight.

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Articles authorized to be carried on a space transportation system flight, other than articles related to the execution of a mission, are limited to those items approved by the Administrator for carrying in the official flight kit or a personal preference kit, in accordance with the requirements of this subpart.

§ 1214.603 Approval and disposition of contents of the official flight kit.

(a) *Proposed contents.* Both the Director, Johnson Space Center, and the program Associate Administrator responsible for payload mission management for a given flight shall suggest items for inclusion in the official flight kit to the associate administrator for space transportation systems.

(b) *Recommendation by Associate Administrator for Space Transportation Systems.* The Associate Administrator for Space Transportation Systems shall recommend to the Administrator a final list to be included in the official flight kit.

(c) *Disposition of kit.* Once the flight is completed the contents of the official flight kit shall be forwarded by the Director, Johnson Space Center, through the Associate Administrator for Space Transportation Systems, to the Administrator.

(d) *Approval authority.* The Administrator shall make all decisions concerning the contents and disposition of the official flight kit.

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(b) *Limit on number of items.* No more than 20 items will be included in the personal preference kit.

(c) *Weight limitations.* Each personal preference kit will be limited to 1.5 pounds which limitation may be reduced on a given flight because of overall weight considerations, if approved by the Associate Administrator for Space Transportation Systems upon the recommendation of the Director, Flight Operations, Johnson Space Center. Under no circumstances will an increase in the limitation be authorized.

(d) *Sale or commercial use prohibited.* Items carried in the personal preference kit shall not be sold or transferred for sale, or used, or transferred for economic gain or for any commercial or fund-raising purpose. Items will not be approved for carrying that by their nature may lend themselves to exploitation by the recipients, create problems with respect to good taste, or have a known or suspected commercial value, such as philatelic covers and coins.

(e) *Certification required.* At the time a list of proposed contents is submitted, each individual desiring to carry a personal preference kit shall make the following written agreement:

In compliance with the requirements of 14 CFR 1214.6—Articles Authorized to be Carried on Space Transportation System Flights—I submit this certification along with my proposed list of items to be carried in my Personal Preference Kit on _____ (applicable flight).

1. I have read and understand the requirements of 14 CFR 1214.6 and agree to comply with those requirements.

2. My proposed list of items to be carried in my personal preference kit complies with the requirements.

3. Other than items approved by the Administrator for inclusion in my personal preference kit, I will carry no other items for use by myself or anyone else.

4. The items carried in my personal preference kit will be used as personal gifts. I will present no more than one item to an individual. The items will not be sold or transferred for sale, or used, or transferred for economic gain or for any commercial or fund-raising purpose.

5. I understand and agree that if I carry an item in violation of the requirements of 14 CFR 1214.6, that item will become the property of the U.S. Government, and that I may be subject to disciplinary or appropriate legal action.

6. I understand and agree that I assume the risk of loss for items carried in my kit, no matter what the cause.

_____

(Signature)

(f) *Violations.* Any item carried in violation of the requirements of this subpart shall become the property of the U.S. Government subject to applicable Federal laws and regulations.

(g) *Exceptions.* The Administrator may make exceptions to the policy of this section on personal preference kits by not permitting an individual to carry a preference kit. Flight crew members and payload specialists will not receive any U.S. Government or other property carried on the flight unless it is property contained in a personal preference kit.

§ 1214.605 Safety requirements.

Items included in the official flight-kit and personal preference kits shall meet the safety requirements of the NASA Headquarters document "Safety Policy and Requirements for Payloads Using the STS."

§ 1214.606 Procedures for approval of contents of personal preference kits.

(a) *Individual submits list.* At least 60 days before the scheduled launch date an individual desiring to carry a personal preference kit shall provide the Director, Flight Operations, Johnson Space Center, a list with the following information:

(1) A description of each item proposed to be included;

(2) The intended recipient of each item and his/her relationship;

(3) The certification required by § 1214.604(e).

In the case of a payload specialist, the list shall first be approved by the program Associate Administrator responsible for the payload mission management.

(b) *Action by Johnson Space Center.* The Director, Flight Operations, Johnson Space Center, shall review the lists for compliance with this subpart, and will submit them with weight data through the Director, Johnson Space Center, to the Associate Administrator for Space Transportation Systems, not later than 45 days before the scheduled launch date.

(c) *Action by headquarters.* The Associate Administrator for Space Transportation Systems shall submit the lists with his/her recommendation to the Administrator for approval. A final decision will be made not later than 30 days before the scheduled launch date.

(d) *Approved list.* A copy of each approved list, including the required certification, shall be provided to the individual requesting, as well as the Associate Administrator for External Relations, the Associate Administrator for Space Transportation Systems, the General Counsel and the Director, Johnson Space Center.

§ 1214.607 Preflight packaging and storage of kits.

The Director, Flight Operations, Johnson Space Center, shall;

(a) Insure that the official flight kit and the personal preference kits are packaged and sealed in the Director's presence and that the contents of each kit correspond with the lists approved by the Administrator;

(b) Verify that each kit meets the weight requirements of § 1214.604(c);

(c) Place the packed kits in bonded storage not less than 21 days before the scheduled launch date; and

(d) Certify in writing to the Associate Administrator for Space Transportation Systems, through the Director, Johnson Space Center, that the above actions have taken place.

§ 1214.608 Public announcements of contents of kits.

(a) *Officicl flight kit.* The contents of the official flight kit shall be announced in a NASA press release no later than 30 days after the flight has been completed.

(b) *Personal preference kits.* The contents of each personal preference kit shall be announced in a NASA press release no later than 30 days after the flight has been completed. At the request of the individual the contents of his/her kit may be announced sooner by NASA, but only after the contents of the kit have been approved by the Administrator.

(c) *Responsibility.* The Associate Administrator for External Relations is responsible for insuring that the required press releases are issued.

(d) *Inquiries before announcements.* The Director, Flight Operations, Johnson Space Center, will respond to all inquiries concerning the contents of the kits prior to the required press releases being issued.

§ 1214.609 Disposition of kits after flight.

The Director, Flight Operations, Johnson Space Center, shall:

(a) Insure the removal and safekeeping of the kits following the flight;

(b) Return the personal preference kits to the individuals to whom they belong; and

(c) Forward the official flight kit as required by § 1214.603(c).

§ 1214.610 Loss or theft.

(a) *Responsibility.* Each individual who carries a personal preference kit assumes the risk of loss for that kit or any item in it, regardless of the cause. The National Aeronautics and Space Administration shall not be responsible for the loss, theft of, or damage to a personal preference kit.

(b) *Report of loss of theft.* Any NASA employee who becomes aware that an item contained in a personal preference kit or the official flight kit has been lost or is missing shall immediately notify the Inspections Division and the Installation Security Office.

§1214.611 Applicability of this subpart.

(a) *Acknowledgement of requirements.* (1)When this subpart goes into effect, or upon his/her selection each individual shall sign an acknowledgement that he/she has read the subpart and will comply with its requirements, and provide the acknowledgement to the Director, Johnson Space Center.

(2) The acknowledgement required by this section shall be updated upon the assignment of an individual to a flight.

(3) Acknowledgements required by this section and made by individuals who are NASA employees, shall be retained in the individual's official personnel folder.

(4) Acknowledgements made by individuals who are not NASA employees shall be retained by the program Associate Administrator sponsoring their activities, or by the Associate Administrator for Space Transportation Systems, as appropriate.

(b) *Procedures required to bring non-NASA employees under this subpart.* (1) The requirements of this subpart will be made applicable to individuals who participate on a flight who are not NASA employees.

(2) The Associate Administrator for External Relations, the Associate Administrator for Space Transportation Systems, or the Director, Procurement Office, is responsible for insuring that individuals not employed by NASA are made subject to these requirements through the terms of the applicable interagency agreement, contract, or other agreement.

53-649 O - 80 - 16

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

14 CFR Part 1214

NASA Astronaut Candidate Recruitment and Selection Program

AGENCY: National Aeronautics and Space Administration.

ACTION: Final rule with comments requested.

SUMMARY: The National Aeronautics and Space Administration will have a continuing need for Astronauts to support Space Shuttle mission operations. This regulation establishes an annual process for soliciting and evaluating applications, and for selecting individuals for the Astronauts Candidate Program at the Lyndon B. Johnson Space Center.

EFFECTIVE DATE: June 20, 1979. Comments must be received on or before August 20, 1979.

ADDRESS: Submit written comments to the Office of the Associate Administrator for Space Transportation Systems, Headquarters, National Aeronautics and Space Administration, Mail Code: M, Room 468, Washington, D.C. 20546. All written comments received will be available for public inspection at this address.

FOR FURTHER INFORMATION CONTACT: Daniel M. Germany, Office of the Associate Administrator for Space Transportation Systems, telephone 202/755–3678.

SUPPLEMENTARY INFORMATION: These procedures concern agency management and personnel and are therefore exempt under 5 U.S.C. 553(a)(2) from notice and public comment requirements. NASA has decided to invite public comment notwithstanding this exemption, due to the considerable interest in this subject. These procedures, however, become effective on publication. These procedures have been coordinated with the Department of Defense and the Office of Personnel Management.

14 CFR Part 1214 is amended by adding a new Subpart 1214.11 reading as follows:

Subpart 1214.11—NASA Astronaut Candidate Recruitment and Selection Program

Sec.

Authority: 42 U.S.C. 2473.

Subpart 1214.11—NASA Astronaut Candidate Recruitment and Selection Program

§ 1214.1100 Scope.

This Subpart 1214.11 sets forth NASA procedures and assigns responsibilities for recruitment and selection of astronaut candidates. It applies to all pilot and mission specialist astronaut candidate selection activities conducted by the National Aeronautics and Space Administration.

§ 1214.1101 Announcement.

(a) Astronaut candidate opportunities will be announced by the Johnson Space Center (JSC) on a nationwide basis and reannounced annually as required.

(b) Announcements will be open to the general public for a two-month period and to the military services for a longer period as necessary for the DOD screening process and will cover all positions to be filled for one year following the establishment of rosters of qualified applicants. To be considered, civilian applicants must apply prior to the end of the specified period. Military personnel on active duty must apply through and be nominated by the military service with which they are affiliated.

(c) Notification will be sent to the Department of Defense as early as possible with a request for their nominations.

(d) The Director of Equal Opportunity Programs, NASA Headquarters, will be notified as early as possible and requested to provide assistance in the recruiting process.

§ 1214.1102 Evaluation of applications.

(a) All incoming applications will be reviewed by the JSC personnel office to determine whether or not applicants meet basic qualifications. Those not meeting the basic qualification requirements will be so notified in writing and will not be eligible for further consideration. Those meeting the basic qualification requirements will have their applications retained for review by designated rating panels.

(b) Rating panels of at least three members each will be appointed by the Director of JSC and will include discipline specialists, current astronauts, and management officials as appropriate.

(c) Each member of a rating panel will initially review each incoming application from qualified applicants. The overall initial score will be determined by the rating panel. This initial score may be determined through averaging of individual ratings or consensus of the rating panel meeting as a group.

(d) To assure consistency across the rating panels, a review panel appointed by the Director of JSC will monitor the rating process. The JSC Personnel Officer will assure adherence to applicable rules and regulations.

(e) The Director of JSC will make every reasonable effort to assure that minorities and females are included among the members of the rating panels and the review panel.

(f) Based on the numerical scores, the JSC personnel officer will establish rosters of qualified applicants. Separate rosters will be established for civilian applicants and for active duty military applicants nominated by the DOD.

(g) Based on requirements approved by NASA Headquarters, the Director of JSC will decide the number of astronaut candidates to be selected. A decision on the number of applicants to be selected from the roster established for civilian applicants and from that established for active duty military applicants, will be made by the JSC Director based upon program needs. The Director of Flight Operations and the JSC Personnel Officer will determine the number of highest scoring applicants from the rosters to receive final consideration (at least twenty times the number of vacancies). Reference forms and physical examination forms will be obtained from these applicants.

(h) Upon receipt of physical examination forms (completed by personal physicians or appropriate public health or military medical authorities), the JSC medical staff will identify those applicants who appear to meet the physical requirements.

(i) For those applicants appearing to have met the physical requirements, the respective rating panels will review and rate the references received. The score for references will be incorporated into the initial score and the rosters adjusted accordingly.

§ 1214.1103 Selection committee activities.

(a) The Director, JSC, will appoint a separate selection committee for each discipline, which will include appropriate discipline specialists, and will make evey reasonable effort to assure that minorities and females are included among selection committee members.

(b) The JSC Personnel Officer will issue to the selection committee appropriate certificates of the highest scoring applicants in the disciplines in which selections will be made. Normally at least four applicants will be listed for each vacancy.

§ 1214.1104 Interviews and medical evaluation.

Applicants included on the certificates will be interviewed by the selection committee and will be given detailed medical evalution by the JSC medical staff. The interview process will result in a numerical score based on scoring criteria previously established by the selection committee.

§ 1214.1105 Final score.

The composite scores, based on the adjusted initial rating and interview score, will be transmuted to a 0 to 100 range with 70 being the minimum passing score. Points for veteran preference will be applied to total scores and the roster adjusted accordingly.

1214.1106 Committee recommendations.

The committee will recommend to the JSC Director, the selection of specific candidates from among those having the highest final scores, and who are found to be medically qualified by the JSC medical staff.

§ 1214.1107 Selection of astronaut candidates.

The JSC Director will review the selection committee's recommendations and will make final selections subject to review and approval by the Administrator.

§ 1214.1108 Notification.

Selectees and appropriate military services will be notified and the public informed. Unsuccessful applicants will be notified of nonselection.

Robert A. Frosch,

Administrator.

[FR Doc. 79-19108 Filed 6-19-79; 8:45 am]

BILLING CODE 7510-01-M

APPENDIX L

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

[14 CFR Part 1214]

Authority of the Space Transportation System (STS) Commander

AGENCY: National Aeronautics and Space Administration.

ACTION: Proposed rule.

SUMMARY: The proposed regulations would set forth the authority of the Space Transportation System commander. The commander is ultimately responsible for maintaining order and discipline and for the safety of all personnel aboard a Space Shuttle flight, as well as for the safety of the Space Shuttle itself, STS elements and payloads. Under this regulation, the commander's authority applies to all persons aboard the Space Shuttle, including those persons engaged in extravehicular activity (EVA), and it includes the right to use any reasonable and necessary means, including the use of physical force, to ensure that such responsibility is fulfilled.

DATE: Written comments should be received not later than 60 days following publication in the Federal Register.

ADDRESS: Office of Space Transportation Systems, Mail Code MSP-2, NASA Headquarters, Washington, DC 20546.

FOR FURTHER INFORMATION CONTACT: Robert T. O'Neil, 202/755-2424.

SUPPLEMENTARY INFORMATION: In the past, all persons who have launched into outer space aboard United States spacecraft have been both nationals of the United States and employees of the United States Government.

On STS flights it is expected that some persons will be flown who will be neither United States nationals nor employees of the United States Government. The purpose of the proposed regulation is to make clear the fact that all persons aboard the Space Shuttle, including those participating in extravehicular activities (EVA), will be subject to the authority of the STS commander or a flight crew member who succeeds to the commander's authority. These proposed regulations will affect persons outside of NASA and, because of this, public comment is being invited on this proposal.

14 CFR Part 1214 is amended by adding a new Subpart 1214.7 reading as follows:

Subpart 1214.7—The Authority of the Space Transportation System (STS) Commander

Sec.

Authority: Pub. L. 85-568; 72 Stat. 426; 42 USC 2473, 2455; 18 USC 799; Art. VIII, TIAS 6347 (18 UST 2410).

Subpart 1214.7—The Authority of the Space Transportation System Commander

§ 1214.700 Scope.

This Subpart establishes the authority of the STS commander to enforce order and discipline during all flight phases of an STS flight to take whatever action in his/her judgment is necessary for the protection, safety, and well-being of all personnel and on-board equipment, including the STS elements and payloads. During the final launch countdown, following crew ingress, the STS commander has the authority to enforce order and discipline among all on-board personnel. During emergency situations prior to liftoff, the STS commander has the authority to take whatever action in his/her judgment is necessary for the protection or security, safety, and well-being of all personnel on board.

§ 1214.701 Definitions.

(a) *STS Elements* consists of the Orbiter, an External Tank, two Solid Rocket Boosters, Spacelab, Upper Stage Boosters (Solid Spinning Upper Stage and Interim Upper Stages) and others as specified in NASA Management Instruction 8040.3.

(b) The *Flight Crew* consists of the commander, pilot, and mission specialist(s).

(c) A *Flight* is the period from launch to landing of a Space Shuttle—a single round trip. (In the case of a forced landing the STS commander's authority continues until a competent authority takes over the responsibility for the Orbiter and for the persons and property aboard.)

(d) The *Flight-Phases* consist of launch, in orbit, deorbit, entry, landing, and postlanding.

(e) A *Payload* is a specific complement of instruments, space equipment, and support hardware/software carried into space to accomplish a scientific mission or discrete activity.

(f) *Personnel On Board* refers to those astronauts or other persons actually in the Orbiter or Spacelab during any flight phase of an STS flight (including any persons who may have transferred from another vehicle) and including any persons performing extra-vehicular activity associated with the mission.

§ 1214.702 Authority and responsibility of the STS commander.

(a) During all flight phases of an STS flight, the STS commander shall have the absolute authority to take whatever action is in his/her discretion necessary to (1) enforce order and discipline, (2) provide for the safety and well being of all personnel on board, and (3) provide for the protection of the STS elements and any payload carried or serviced by the STS. The commander shall have authority throughout the flight to use any reasonable and necessary means, including the use of physical force, to achieve this end.

(b) The authority of the commander extends to any and all personnel on board the Orbiter including Federal officers and employees and all other persons whether or not they are U.S. nationals.

(c) The authority of the commander extends to all STS elements and payloads.

(d) The commander may, when he/she deems such action to be necessary for the safety of the STS elements and personnel on board, subject any of the personnel on board to such restraint as the circumstances require until such time as delivery of such individual or individuals to the proper authorities is possible.

§ 1214.703 Chain of command.

(a) The *Commander* is a career NASA astronaut who has been designated to serve as commander on a particular flight, and who shall have the authority and responsibility described in section 1214.702 of this Subpart. Under normal flight conditions (other than emergencies) the STS commander is responsible to the Flight Director, Johnson Space Center, Houston, TX.

(b) The *Pilot* is a career NASA astronaut who has been designated to serve as the pilot on a particular flight and is second in command of the flight. If the commander is unable to carry out the requirements of this Subpart, then the pilot shall succeed to the duties and authority of the commander.

(c) Before each flight, the other flight crew members (Mission Specialists) will be designated by the Director of Flight Operations, Johnson Space Center, Houston, TX, in the order in which they will assume the responsibilities and

authority of the commander under this Subpart in the event that the commander and pilot are both not able to carry out their duties.

§ 1214.704 Violations.

(a) All personnel on board an STS flight are subject to the authority of the commander and shall conform to his/her orders and direction as authorized by this Subpart.

(b) This regulation is a regulation within the meaning of 18 U.S.C. 799, and whoever willfully violates, attempts to violate, or conspires to violate any provision of this Subpart or any order or direction issued under this Subpart shall be fined not more than $5,000 or imprisoned not more than 1 year, or both.

Robert A. Frosch,

Administrator.

August 13, 1979.

[FR Doc. 79-25906 Filed 8-21-79; 8:45 am]

BILLING CODE 7510-01-M

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

[14 CFR Part 1214]

Space Transportation System; Procurement of Spinning Solid Upper Stages

AGENCY: National Aeronautics and Space Administration.

ACTION: Proposed rule.

SUMMARY: NASA proposes to issue a policy defining general guidelines for user procurement of Spinning Solid Upper Stages (SSUS). This policy applies only to the procurement of those Spinning Solid upper Stages developed under the provisions of commercial development agreements established between NASA and SSUS supplier(s). Because commercial source(s) of SSUS are available, it is NASA policy that users should procure from these source(s) without NASA involvement. However, NASA will in certain limited circumstances act as the procurement agent for SSUS users.

DATE: Comments or suggestions regarding the proposed policy should be submittted in writing not later than October 29, 1979.

ADDRESS: STS Operations, Office of Space Transportation Systems, National Aeronautics and Space Administration, Washington, DC 20546.

FOR FURTHER INFORMATION CONTACT: George D. Ojalehto, STS Operations, National Aeronautics and Space Administration, Washington, DC 20546 (202-755-2344).

PART 1214—SPACE TRANSPORTATION SYSTEM

1. 14 CFR Part 1214 is amended by adding a new Subpart 1214.10 reading as follows:

Subpart 1214.10—Procurement of Spinning Solid Upper Stages

Sec.
1214.1000 Scope.
1214.1001 Definitions.
1214.1002 Procurement process.
1214.1003 Reimbursement procedures.

Authority: Sect. 203, Pub. L. 85-568, 72 Stat. 429, as amended (42 U.S.C. 2473).

Subpart 1214.10—Procurement of Spinning Solid Upper Stages

§ 1214.1000 Scope.

This Subpart 1214.10 sets forth the NASA policy on procurement of Spinning Solid Upper Stages (SSUS). It does not cover Shuttle launch services defined in Subpart 1214.1 and Subpart 1214.2.

§ 1214.1001 Definitions.

(a) *SSUS.* A generic acronym for a Spinning Solid Upper Stage developed commercially under NASA-SSUS supplier agreements to be used as a perigee stage for certain Shuttle payloads. This generic definition encompasses upper stages for Delta-class (SSUS-D) and Atlas-Centaur-class (SSUS-A) payloads.

(b) *SSUS Supplier.* A commercial organization providing SSUS hardware and related services.

(c) *NASA-SSUS Supplier Agreement.* An agreement between NASA and a SSUS supplier delineating technical and operational requirements and financial conditions regarding the commercial development and supplying of SSUS and related services to a user.

(d) *SSUS Launch Site Services.* Those launch site services provided by NASA to the SSUS supplier for the SSUS suppliers use in preparing a SSUS as a part of a Shuttle Payload for a user.

§ 1214.1002 Procurement policy.

(a) NASA has entered into agreement(s) with commercial source(s) for the commercial development and supply of Spinning Solid Upper Stages (SSUS) for both Delta-class and Atlas-Centaur-class payloads. SSUS services, therefore, are available to the STS user community at large and their availability is not contingent upon, nor does it require, a NASA involvement for their procurement. Accordingly, NASA's general policy is not to act as a procuring agent for the user community, but to encourage the user community to procure required SSUS and related services from the commercial source(s).

(b) Normally, users requiring a SSUS shall procure the SSUS hardware and related services from a SSUS supplier.

(c) Within its discretion and capability, NASA will undertake SSUS procurement in circumstances where:

(1) NASA is acting upon the request of a U.S. Government user under the terms of an interagency agreement in behalf of the Federal Government, or

(2) A non-U.S. Government user does not have and cannot reasonably obtain the expertise needed to manage a SSUS procurement and requests NASA to perform this function as a procurement agent for the user, or

(3) A non-U.S: Government user does have or can reasonably obtain the expertise needed to manage a SSUS procurement but still explicitly requests and NASA agrees to perform this function as a procurement agent for the user.

(d) Users utilizing NASA as their procurement agent for SSUS procurement shall contract directly with NASA for such procurement services.

(e) All users shall enter into a Launch Service Agreement with NASA for SSUS launch site services.

(f) The United States shall not be liable for costs or damages directly or indirectly arising from a delayed mission, or an unsuccessful performance of the SSUS.

§ 1214.1003 Reimbursement procedure.

(a) Within the guidelines of the NASA-SSUS supplier agreements, a user procuring a SSUS from a SSUS supplier shall:

(1) Reimburse the SSUS supplier for the SSUS and related services.

(2) Reimburse NASA for all SSUS launch site services provided to the SSUS supplier.

(b) A user who has entered into a Launch Services Agreement with NASA which calls for NASA to act as a procurement agent for SSUS and related services shall reimburse NASA an amount which is the sum of:

(1) The contract price of the SSUS and related services.

(2) A fee for NASA activities associated with a SSUS procurement.

(3) The price for all NASA-provided SSUS launch site services.

August 20, 1979.

Robert A. Frosch,

Administrator.

[FR Doc 79-27011 Filed 8-29-79; 8:45 am]

BILLING CODE 7510-01-M

Proposed Rules

Federal Register

Vol. 44, No. 125

Wednesday, June 27, 1979

This section of the FEDERAL REGISTER contains notices to the public of the proposed issuance of rules and regulations. The purpose of these notices is to give interested persons an opportunity to participate in the rule making prior to the adoption of the final rules.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

[14 CFR Part 1214]

Delta Launch Vehicle Class; Transition to the Space Transportation System

AGENCY: National Aeronautics and Space Administration.

ACTION: Proposed rule.

SUMMARY: NASA proposes to issue a policy which is related to the existing Space Transportation System (STS) policies (Subparts 1214.1 and 1214.2) and which identifies the general means for transition of Delta launch vehicle class users to the STS. This policy is necessary to execute a rapid but orderly transition from use of expendable launch vehicles to use of the STS while maintaining a reasonable Delta-class backup launch capability during the early transition period.

DATE: Comments or suggestions should be submitted in writing on or before August 27, 1979.

ADDRESS: STS Operations, Office of Space Transportation Systems, National Aeronautics and Space Administration, Washington, DC 20546.

FOR FURTHER INFORMATION CONTACT: George D. Baker, STS Operations, National Aeronautics and Space Administration, Washington, DC 20546 202–755–7152.

SUPPLEMENTARY INFORMATION: The policy describes the Delta backup capabilities which NASA will provide during the transition period and the specific mechanism by which a user must commit to the use of a Shuttle or Delta launch vehicle. The policy further describes the general methods for selection of Delta backup launches by a user and user reimbursement. This policy provides the user with the necessary information for overall planning purposes and provides a normal schedule in which NASA can accommodate user requests during the transition period.

1. 14 CFR Part 1214 is amended by adding a new Subpart 1214.20 reading as follows:

PART 1214—SPACE TRANSPORTATION SYSTEM

Subpart 1214.20—Transition from Use of the Delta Launch Vehicle to Use of the Space Transportation System

Sec.

Authority: Pub. L. 85–568, 72 Stat. 426, 42 U.S.C. 2473(c).

Subpart 1214.20—Transition from Use of the Delta Launch Vehicle to Use of the Space Transportation System

§ 1214.2000 Scope.

This Subpart 1214.20 provides policy for transition from use of the Delta launch vehicle to use of the Space Transportation System.

Policy

§ 1214.2001 Transition planning.

With the advent of the Space Transportation System (STS), which is built around the Space Shuttle, NASA plans for a rapid but orderly transition from use of expendable launch vehicles, including the Delta launch vehicle, to use of the STS and phase-out of expendable launch vehicles. Phase-out of the Delta launch vehicle operations at the Kennedy Space Center/Eastern Test Range (KSC/ETR) will occur once the STS becomes operational at KSC/ETR. During the Delta launch vehicle to STS transition period, defined as June 1, 1980 through June 30, 1981, NASA plans to maintain continuous launch capability from KSC/ETR for Delta-class spacecraft by using the Shuttle or by providing backup launches utilizing Delta 3910 launch vehicles. All Delta-class spacecraft that are to be launched from KSC/ETR during the transition period shall be initially scheduled for launch on the Shuttle and must be dual compatible if Delta backup launch capability is desired.

§ 1214.2002 Provision of Delta backup launch capability.

(a) For those Delta-class payloads for which, as of June 30, 1978, NASA was planning Shuttle launches during the defined transition period and which have not subsequently been rescheduled out of the defined transition period at the respective user's request, NASA will provide at no cost to the user, Delta backup launch capability—

(1) Until 30 days after completion of the first manned orbital flight of the Shuttle, or

(2) Until nine months prior to the Delta backup launch date established pursuant to § 1214.2004 for each use payload, or

(3) Until the user selects use of the Delta backup launch mode for a particular payload launch, whichever occurs first. This no cost provision will apply to those NASA services normally associated with a Delta launch. The user will reimburse NASA for any nonstandard Delta launch services provided at the user's request.

(b) Unless the user has previously made a commitment to the specific launch mode desired, at the time of completion of first manned orbital flight of the Shuttle or 10 months before the Delta backup launch date for a particular payload, whichever occurs first, the user will be formally notified by NASA and required to make a commitment within 30 calendar days—

(1) Solely to a Shuttle launch, or

(2) Solely to a Delta backup launch, or

(3) If NASA agrees, to continued preparations (at the user's expense) for both a Shuttle launch and a Delta backup launch with the final selection of launch mode to be made by the user at a later date. [The date on which the user either makes such previous commitment to a specific launch mode or makes the commitment required by this paragraph (b) shall hereinafter be called the "decision date."]

§ 1214.2003 Charges to be paid by users.

(a) NASA Policy Directive 8610.5 sets forth the "all reasonable costs" charging principle under which Delta launch services are provided to non-United States Government users. To date, this charging principle has been implemented by charging such users "all reasonable costs actually incurred" by NASA, with final cost determination after each launch. However, as an

alternative charging method during the defined transition period. NASA will offer Delta backup launches to non-United States Government users for a fixed price of $22 million [real year dollars] each based on "proposed all reasonable costs," plus all reasonable costs incurred for any nonstandard Delta services provided at the request of the user. This fixed price is exclusive of the Delta "3900 series" launch vehicle development cost amortization charge associated with the use of the Delta 3910 launch vehicle for which the user must enter into a contract directly with the launch vehicle contractor. The fixed price, however, will provide for all NASA services normally associated with manufacture, preparation and launch of the Delta launch vehicle.

(b) Users pay NASA for launch services usually through a series of progress payments. Those users who avail themselves of Delta backup launch capability according to this policy will initially make progress payments toward a Shuttle launch of each of their respective payloads pursuant to the normal Shuttle progress payments schedule and toward any nonstandard Delta service that is to be provided according to a progress payments schedule to be defined by NASA at the time NASA agrees to provide such service. At the decision date (and again at such later date that the final launch mode may be selected by the user as provided for in § 1214.2002(b)(3), NASA will revise the user's progress payments schedule consistent with the user's decision and the charging principles set forth in this section. The initial progress payment for a Delta backup launch will be the cumulative percentage of the total charges (fixed price or estimated actual incurred cost) due from the user under a normal Delta progress payments schedule.

(c) Each user will be charged for whichever launch mode is actually utilized for their payload launches plus—

(1) If the Shuttle launch mode is utilized, all costs incurred by NASA in providing:

(i) User requested nonstandard Delta launch services on or before the decision date, including any costs associated with the termination of such services; or

(ii) Standard and nonstandard Delta launch services, including any costs associated with the termination of such services, should the Delta launch backup preparations be continued beyond the decision date at the user's request; or

(2) If the Delta backup launch mode is utilized:

(i) The portion of charges/estimated costs incurred by NASA in providing optional Shuttle services on or before the decision date, including any costs associated with the termination of such services; or

(ii) The STS cancellation fee plus the portion of charges/estimated costs incurred by NASA in providing optional Shuttle services, including any costs associated with the termination of such services, should the Shuttle launch preparations be continued beyond the decision date at the user's request.

(d) For a user who selects solely the Delta backup launch mode on or before the decision date, whether the Delta backup launch mode is subsequently utilized or terminated for that particular payload, there will be no Shuttle cancellation fee charged the user. The user, however, will be charged the portion of the charges/estimated costs incurred for optional Shuttle services provided at the user's request (including any costs associated with the termination of such services).

(e) For a user who selects the "fixed price" charging method for the Delta backup launch of a particular payload and subsequently terminates the request for all NASA launch services for that particular payload, the user will be required to pay termination charges consisting of—

(1) The Shuttle cancellation fee and the portion of the charges/estimated costs incurred for optional Shuttle services provided at the request of the user (including any costs associated with the termination of such services); *plus*

(2) All Delta backup launch related costs incurred on or before the time of or as a result of termination *except that*—

(3) If the user commits solely to the Delta backup launch mode on or before the decision date for a particular payload and subsequently terminates the request for all NASA launch services for the payload, the user will be required to pay only the Delta backup termination charges defined in paragraph (e)(2) of this section.

(f) For a user who selects the "actually incurred costs" charging method for the Delta backup launch of a particular payload and subsequently terminates the request for all NASA launch services for that particular payload, the user will be required to pay termination charges consisting of—

(1) The Shuttle termination charges defined in paragraph (e)(1) of this section; *except that*—

(2) If the user commits solely to either the Shuttle launch mode or the Delta backup launch mode on or before the decision date for a particular payload and subsequently terminates the request for all NASA launch services for the payload, the user will be required to pay only the termination charges, as defined in paragraph (e)(1) and (2) of this section, applicable to the launch mode to which the user committed solely; and

(3) If the user requests, and NASA agrees, to continuation of both Shuttle and Delta backup launch preparations for a particular payload beyond the decision date and the user subsequently terminates the request for all NASA launch services for the payload, the user will be required to pay the termination charges, as defined in paragraph (e)(1) and (2) of this section, applicable to both launch modes.

§ 1214.2004 Delta backup launch scheduling.

(a) Delta launch schedule capability is expressed in terms of launch slots, which reflect the nominal spacing between Delta launches. The last day of the launch slot is the nominal launch date. Delta backup launch slots will be initially assigned by NASA at the outset of transition planning consistent with—

(1) The relative sequence of user requested launch dates as June 30, 1978, and

(2) The Delta backup charging method selected by the user.

(b) In making the initial launch slot assignments, scheduling priority will be given to those users selecting the "fixed price" Delta backup charging method. Each user in the defined transition period as of December 15, 1978, was notified and given 60 days in which to select the Delta backup charging method prior to establishment of the initial Delta backup launch schedule. Where multiple users have requested Shuttle launch dates that are in conflict or exceed Delta backup launch capability, the date (or dates) NASA received each user's earnest money payment and formal launch date request will be among the factors considered in determining the initial schedule sequence. Except as otherwise mutually agreed by NASA and a user, the initial Delta backup launch slot assignment for each payload will provide for a launch on the same or later date as user's requested Shuttle launch date.

(c) If a transition user requests to change the date of the user's Delta backup launch for a particular payload, or if additional payloads are to be scheduled for Delta launch in the defined transition period, the user's payload will be scheduled into the vacant Delta backup launch slot which most nearly satisfies the user's request at the time written notification is received by NASA of the desired launch date or launch date change.

Robert A. Frosch,

Administrator.

June 18, 1979.

[FR Doc. 79-19852 Filed 6-26-79; 8:45 am]

BILLING CODE 7510-01-M

STATEMENT OF S. NEIL HOSENBALL, GENERAL COUNSEL, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, ACCOMPANIED BY GERALD MOSSINGHOFF, DEPUTY GENERAL COUNSEL, NASA

Mr. HOSENBALL. Thank you, Mr. Chairman. I appreciate this opportunity to appear before the subcommittee to report to you on legal issues relating to the Space Transportation System—STS—being developed by the National Aeronautics and Space Administration.

As you noted, I have with me Mr. Gerald Mossinghoff, who is Deputy General Counsel of NASA, and to whom I assigned the job of doing a systematic review of potential legal issues that might be associated with shuttle operations.

The development and operation by NASA of the Space Transportation System, with its key element, the Space Shuttle, have many legal implications. Some of the legal issues we face are new ones. This is largely because the Space Shuttle era in U.S. space flight will bring about significant changes, one of which is that for the first time individuals other than astronauts employed by the U.S. Government will participate on manned space flights. Payload specialists who will include scientists employed by universities or foreign governments will fly in the Space Shuttle. And, recently, NASA established general guidelines for the participation of foreign astronauts in missions in which their countries have substantial involvement. The implication of all of this is that we must establish jurisdiction and command control over these individuals.

Many of the legal issues inherent in the operation of the Space Shuttle are familiar ones that we confronted in our earlier space programs.

Yet, because of the relatively limited number of manned flights in the past, there was no real need to develop formal regulations in many of these areas, particularly since we were dealing with basically an internal NASA program. However, we are now making the transition to a space program that involves and affects other countries and organizations and people outside of NASA.

It is for this reason that we find ourselves becoming more formal. We have resolved many of the legal issues, and in doing so, we have issued and are implementing agency regulations. Where necessary, we will be seeking legislation, as we did recently on third-party liability.

My office has the responsibility of identifying legal issues that require resolution in order to prepare for the operation of the Space Shuttle. At my request, the Deputy General Counsel, Mr. Gerald J. Mossinghoff, addressed a number of legal issues inherent in Shuttle operations and reported in a memorandum to me dated August 18, 1977, a copy of which is attached to my statement—appendix A. Following is a summary of his conclusions on 10 of the significant legal issues:

One, does NASA have authority to operate the Space Transportation System (STS) on a routine basis?

The National Aeronautics and Space Act of 1958—NASA Act—provides adequate statutory authority for NASA to operate the STS on a routine basis.

Two, will the STS be a common carrier?

The Space Transportation System will not be a common carrier because it is not so authorized by Federal statute and because that would conflict with international commitments already entered into by the Federal Government.

Three, how is the President's launch policy of 1972 related to the selection of missions and payloads for the STS?

Although only expendable boosters were in use at the time the launch policy was announced, there is nothing contained in the terms of the policy which would make it inapplicable to the STS, which was being planned when the launch policy was announced.

In fact, the STS will provide the means for more launch assistance to other countries and international organizations, and hence, will most likely cause a greater use of the launch policy. Further, in relation to issue No. 2 above, the launch policy neither expresses nor implies common carrier status for NASA.

Four, what will be the status of the Space Shuttle under the Federal Aviation Act of 1958?

As supported by a March 11, 1977, opinion of the Chief Counsel of the Federal Aviation Administration, the Space Shuttle is not an aircraft within the meaning of the Federal Aviation Act of 1958.

Five, what authority will the Shuttle commander have to enforce order and discipline during Space Shuttle missions?

The Shuttle commander will have full authority to enforce order and discipline during all phases of any STS mission. This authority extends to any and all persons onboard the Shuttle, including Federal offices and employees and all other persons whether or not they are U.S. nationals. It extends to Spacelab and to personnel engaged in Extravehicular Activity (EVA). Finally, it includes use of physical force if reasonable and necessary under the circumstances without incurring either criminal or civil liability. The NASA Administrator, under existing authority in the NASA Act, can promulgate regulations effective upon publication in the Federal Register, specifying the parameters of the Shuttle commander's authority.

Six, what authority does NASA have to establish medical standards and training requirements for persons flying aboard the Shuttle?

Under the NASA Act, medical, training or similar standards may be established by NASA for payload specialists and other persons flying onboard the Shuttle, including foreign astronauts.

Seven, what authority does NASA have to control artifacts and momentoes brought aboard the Shuttle or found in space by Shuttle personnel?

NASA's basic authority in section 203(c)(1) of the NASA Act (42 U.S.C. 2473(c)(1) extends to the establishment of policy, procedures, and responsibilities governing the selection, approval, packing, storage, postflight disposition and public announcement of articles authorized to be carried on Shuttle flights. Such requirement of any policy regarding postflight disposition by foreign nationals would have to be addressed on a case-by-case basis.

Eight, what authority exists for the clearing of and/or the warning for solid rocket booster (SRB), external tank (ET) and sonic boom impact areas on the high seas?

Since the areas under consideration are within the international legal regime of the high seas, the United States cannot legally exclude any vessels or aircraft from these areas except vessels or aircraft of U.S. nationality. To follow the accepted warning practice for Shuttle operations would not present any new questions of international law. Specific aspects of the impact area designation and warning procedure can be formulated and announced as the first Shuttle orbital flight tests draw nearer.

Nine, will an ocean dumping permit be required for the SRB and ET procedures on the high seas?

An ocean dumping permit will not be required to conduct the SRB and ET procedures.

Ten, will the U.S. Federal criminal laws apply to acts during STS space missions?

The current criminal jurisdiction of the United States may not be adequate to cover criminal offenses which may occur during STS space missions.

As Mr. Mossinghoff points out in his memorandum, some other legal issues were addressed separately; specifically, the question of liability and insurance or indemnification, the procedures for selection of payload specialists, and patent and data policies applicable to activities conducted in connection with Shuttle flights on a reimbursable basis.

With regard to the liability and insurance or indemnification issue, we concluded last year that special legislative authority was necessary to assure an orderly and equitable allocation of third-party risks among Shuttle users. Accordingly, as part of our fiscal year 1980 authorization bill, NASA requested an amendment to the National Aeronautics and Space Act. That request was acted favorably upon by the Congress, as you know, and section 6 of Public Law 96-48, NASA's 1980 Authorization Act, enacted August 8, 1979, amends the NASA Act to include a new section 308 authorizing NASA to provide liability insurance and/or indemnification for any user of a space vehicle to compensate claims by third parties for damages resulting from operation of a space vehicle.

For the subcommittee's convenience, I have attached to my statement a copy of this provision—appendix B.

Through a notice in the Federal Register, we are requesting comments from all interested persons on how to implement the new authority. At the same time, we are negotiating specific provisions in our launch services agreements with early users of the Space Shuttle to implement the authority. Our objective in these negotiations is to have the user obtain insurance covering itself and the U.S. Government for an amount adequate to protect against any foreseeable worst-case accidents. That amount is now projected to be $500 million.

In return for that coverage of the Government, NASA will use the new authority to indemnify the user for any possible liability above that amount. We believe our negotiations with our early users will provide us with real world experience to complement the comments we will receive as a result of our Federal Register notice.

At this point, I would draw a distinction between what we refer to as third-party liability—which involves potential liability for

damage to property or injury to persons not involved in the Shuttle use—and interparty liability—that is, potential property damage and bodily injury to those flying aboard the Shuttle. With respect to interparty liability, we have adopted a no-fault approach where each party is responsible for insuring—or self-insuring—its own property or employees. Thus, if a user damages the Shuttle in some way, we agree not to press a claim or sue the user. Similarly, if NASA or a user were to damage another user's payload, the damaged user would not sue NASA or the other user.

I might interject here, Mr. Chairman, that yesterday I had a visit by one of the leading brokers in the United States, and in discussing the question of the capacity of the market to provide the limits which I have set out, he indicated to us that it appeared most likely that there would be at least 500 million dollars' worth of third-party liability coverage, which would be available to individual users, if they so desired.

He further indicated to me that he believed that the market would also be able to provide coverage for the cargo, to the point where he seemed to be very hopeful that he could get sufficient coverage, even if three commercial communications satellites were to fly aboard a single Shuttle flight. We think that development will assist greatly in increasing commercial use, and solve a great deal of the problems that, looking back, we thought were going to be serious problems with the insurance market.

In the area of rights to patents and data resulting from reimbursable launches, we have established a policy which is reflected in our formal regulations, that NASA will not acquire rights to inventions, patents, or proprietary data privately funded by a Shuttle user or arising out of activities for which a user has reimbursed NASA under our reimbursable policies.

However, where the Administrator determines in advance that activities may have a significant impact on the public health, safety, or welfare, NASA may obtain assurances from the user that the results of the user's activities will be made available to the public on terms and conditions reasonable under the circumstance.

With respect to joint endeavors undertaken with private concerns, for example, under the Guidelines Regarding Joint Endeavors With U.S. Domestic Concerns in Materials Processing in Space—Appendix C—we have determined that such endeavors are not subject to NASA's statutory patent policies under section 305 of the NASA Act. Attached to my statement—appendix D—is a memorandum from the NASA Assistant General Counsel for Patent Matters which sets forth in detail the bases for that conclusion. This means that NASA will be able to tailor patent and data provisions with such private concerns to suit the individual circumstances of the joint endeavor.

I would like to discuss one of the issues addressed in the Deputy General Counsel's memorandum that continues to present a problem, that is, the applicability of Federal criminal laws to STS missions. The current criminal jurisdiction of the United States may not be adequate to cover criminal offenses which may occur on the Shuttle while in space. The problem involves offenses by civilians.

With respect to military personnel detailed to NASA, the Uniform Code of Military Justice will be applicable and provides sufficient jurisdiction.

As for criminal offenses committed by civilians while onboard the Shuttle, the status of existing Federal law is such that there is no clear U.S. jurisdiction over criminal acts committed on a space vehicle while in space.

Because of this, we have been watching with considerable interest the progress of legislative initiatives in the Congress to reform the Federal criminal code. The Senate bill—S. 1722, 96th Congress, 1st session; and its predecessors, S. 1497, 95th Congress, 1st session, which passed the Senate January 30, 1978; and S. 1, 94th Congress, 1st session—would establish clear U.S. jurisdiction over offenses committed by civilians on Shuttle missions by extending extraterritorial jurisdiction to space vehicles.

The Subcommittee on Criminal Justice of the House Committee on the Judiciary recently made available a draft bill that it is holding hearings on this month. It appears that criminal code reform which may resolve the jurisdiction problem, could possibly be enacted in 1980, although its effective date will probably be 2 to 3 years after enactment. We would be satisfied as long as the U.S. jurisdiction over offenses committed in space is clarified in law before individuals other than astronauts employed by the U.S. Government fly on the Shuttle. If it appears that the criminal code reform legislation will not be accomplished in time, NASA will probably seek separate legislation to accomplish the necessary jurisdiction.

To date we have issued many regulations neessary to the operation of the Space Transportation System. We currently are working on others. Because of the level of interest in this area, most of our regulations have been or will be published in the Federal Register, to be included in NASA's portion of the Code of Federal Regulations, title 14, chapter V.

Mr. FUQUA. We have a quorum call. I think it would be appropriate at this point to take a short break while we answer the quorum call. We will be right back.

[Recess.]

Mr. FUQUA. The subcommittee will resume.

Neil, you may pick up where you left off.

Mr. HOSENBALL. Thank you, Mr. Chairman. I was about to discuss the regulations that have been issued or in process. What we have done is for the convenience of the subcommittee, is to have attached—appendix E—to my prepared statement a list of these regulations, grouped according to whether they are now in effect, published as proposed rules, or still in the internal drafting stage. Also, attached—appendixes F through N—is a copy of the full text of each regulation published to date.

Regulations already in effect include our reimbursement policies for the Shuttle services—appendixes F and G. These include the patent and data policies applicable to activities conducted in connection with Shuttle flights on a reimbursable basis. We published a final regulation last year on selection procedures for payload specialists for NASA and NASA—related payloads—appendix H.

In an area of considerable interest within NASA as well as in Congress, we published in October 1978, final regulations governing the carrying of personal articles on Shuttle flights by the crew as well as any other individuals who participate on a flight—appendix J. This regulation restricts the number and kind of things that may be carried in what we call the personal preference kit and specifies procedures that will enable us to control this practice. We also have added teeth to our ability to enforce these restrictions.

The Department of Justice recently advised my office that it believes these new regulations will provide sufficient legal basis for enforcement of the prohibition on commercialization of personal items flown on the Shuttle.

On July 6, 1979, we published final regulations on a personal reliability program for individuals who perform duties in connection with the STS—appendix I. These provide criteria and procedures for assuring the highest standards of reliability in personnel assigned to mission-critical positions. They are part of an overall program to assure the protection of the Space Transportation System by providing special physical security measures, safety precautions, as well as operational standards for mission-critical positions.

On June 20, 1979, we published a final regulation on our astronaut recruitment and selection program—appendix K. Because we will have a continuing need for new astronauts as the Shuttle becomes fully operational, we have set up a program with an annual announcement and application period after which registers or lists of candidates will be established. These annual registers will provide a basis to make final selections as vacancies occur.

Currently, we have three regulations that have been published recently as proposed rules with public comment invited. Based on our earlier conclusion that the NASA Act provides sufficient legal basis to establish the authority of the STS commander over all persons on a flight, our proposed regulation on such authority was published August 22, 1979—appendix L.

The public was given until October 22, to comment on the proposed regulation. The other two proposed regulations concern the procurement of spinning solid upper stages—appendix M and the transition from the Delta launch vehicle to the STS—Appendix N. Both will be published in final form after considering any public comments we receive.

We are now drafting regulations on selection of payload specialists for non-NASA payloads to complement the existing regulation covering NASA payloads. Also, we are drafting our reimbursement policies for Spacelab services and small self-contained payloads, and are in the process of amending our existing reimbursement policies, as Mr. Yardley mentioned yesterday.

Mr. Chairman, this concludes my detailed statement. I would be pleased to provide any additional information you may want and to answer any questions you may have.

Mr. FUQUA. Thank you very much, Neil, for a very fine and comprehensive statement, and for the progress that NASA appears to be making in resolving some of the legal issues and policy questions regarding operation of the Space Transportation System.

You mentioned in your statement the lack of criminal laws covering the Space Transportation System, I assume once it is in

space. I hope that crew selections are such that that is not a real problem, and I assume you were mentioning coverage of civilian versus military personnel.

How about non-U.S. citizens?

Mr. HOSENBALL. That is where we see that we ought to have some coverage. We are not basically concerned about those who we select to fly on the Shuttle, either military or civilian astronauts that are U.S. Government employees.

It is a careful selection process which I know you are familiar with, and they have been very carefully selected. Based on our experience through Apollo, we have not had any occasion whatsoever to really worry about the problem, but with non-Government people being flown on the Space Shuttle, with payload specialists not receiving the extensive training that a mission specialist or a pilot would receive, we do think it is prudent to make sure that we have the necessary criminal coverage.

The regulation we have issued does give us command and control, so that the commander could throw the offender into the space brig, if you will. We think that was absolutely necessary to make sure that he had that command and control, and we think a second logical step is to make sure that our criminal jurisdiction does apply to extraterritorial activities in space.

It is not a new problem. It first came up in an aircraft setting, where the question was raised in a criminal case, and the court held that there was no criminal jurisdiction over international waters aboard an aircraft.

It also subsequently came up in an Antarctic context as a result of which 18 U.S.C. did have an amended extraterritorial provision enacted, which now includes aircraft, as well as ships and other areas, and what we propose doing is just adding to that United States Code section spacecraft or similar words to cover our Shuttle operations.

Mr. FUQUA. I realize you can't anticipate everything that may happen, but what type of criminal acts are you most concerned about?

Mr. HOSENBALL. Oh, you could have an assault of some kind.

Mr. FUQUA. Incompatibility?

Mr. HOSENBALL. That is right. The likelihood of that happening is minimal, but I think going through the experience of the aircraft and Antarctica, I think we ought to be prudent and make sure the jurisdiction exists.

Mr. FUQUA. Is that the main concern that you have?

Mr. HOSENBALL. Primarily.

Mr. FUQUA. And that the commander would have arrest authority?

Mr. HOSENBALL. Well, he has the authority to make sure that an offender does not damage the Shuttle nor harms himself or anybody else aboard the Shuttle, and can use physical, reasonable physical force, to make sure that that doesn't happen, so we think that is adequately covered under existing law and regulations.

Mr. FUQUA. What arrangement is made should the aircraft commander become incapable of handling the ship? Are there any provisions that some means is taken, it may even be force?

Mr. HOSENBALL. I believe—and we can verify this, but I am almost certain—that we do have a line of succession in the event that the aircraft commander becomes incapacitated. I am almost certain that that does exist, but we can check on that. We were concerned about that.

Mr. FUQUA. And who makes that determination, since you only have two, the commander and the pilot?

Mr. HOSENBALL. You should at least have three hopefully—the pilot, copilot and the mission specialist, all of which will be specially trained, so you have three lines of succession. We would hope that would be enough.

Mr. FUQUA. Oh, yes. I am thinking if there is a determination that the commander maybe psychologically was not capable of making a reentry or going on to completion of the assigned mission—maybe I have seen too many movies.

Mr. HOSENBALL. It has happened aboard ship.

Mr. FUQUA. And with the routineness—well, I shouldn't say routineness because it is not, but with the frequency of missions that you may have, and I would hope that severest screening that would eliminate the problems associated with that as much as you can, that there could be a time when it is felt that somebody should take over the command, to complete the mission or to return safely.

Mr. HOSENBALL. Mr. Chairman, you have just given Mr. Mossinghoff probably another assignment. Do you want to add anything, Gerry?

Mr. MOSSINGHOFF. I think we should go back and look at that in detail. I think the instantaneous communications we will have with Houston, and the fact that the Director of Flight Operations I believe has inherent authority to relieve a commander of his duty, in which case the automatic line of succession would go from the commander to the pilot and then to the mission specialist, may make the problem a slight one.

I do think we ought to take a detailed look to make sure that the case, and that the Director of Flight Operations, does have that inherent authority to relieve the commander or anyone else of their responsibilities.

In that case, then, it becomes a matter of the new commander, if it is the pilot, then using under our regulations whatever force is necessary to restrain the relieved commander.

Let's take a look at that and make sure that that is the case.

Mr. FUQUA. The other question comes up, if you have non-U.S. citizens aboard, would they be subject to U.S. law while they are on board? I think that should be very clear.

Mr. HOSENBALL. We think the outer space treaty does provide for it, and also the registration convention has jurisdictional and control over persons in it. It does provide for—at least the registration convention does—provide for agreements on how that jurisdiction and control should be either shared or allocated.

In my discussions with ESA, for example, that question has come up, and we think the best way to take care of that is by agreement when foreigners fly, whether they would be subject to our law or whether we would in fact, like a status of forces agreement, maybe have them tried in their own courts.

We recognize the issue. It is there, and we are addressing it.

Mr. FUQUA. You mentioned in the outline of the actions that the Space Transportation System was not considered a common carrier. Why would it not be considered a common carrier?

Mr. HOSENBALL. Gerry, do you want to go into detail?

Mr. MOSSINGHOFF. Mr. Chairman, our primary reason was that, as we researched the law of common carriers applying in Federal areas, that the Congress was always very clear when it established a common carrier it said so in just those words.

It laid out in great detail the obligations of a common carrier, and then provided a regulatory overlay of one form or another to regulate the common carrier.

In this case there is an absence of all of that detail. We took the position that——

Mr. FUQUA. Does that absence exempt you?

Mr. MOSSINGHOFF. It certainly doesn't indicate any legislative intent that we would be a common carrier.

Mr. FUQUA. I am thinking of the fact that you are charging a fee to non-Government entities, specifically to non-Government entities.

Mr. MOSSINGHOFF. Yes. Our position——

Mr. FUQUA. You are an independent trucker, then?

Mr. MOSSINGHOFF. Right. Our position is we are a contract carrier and what we carry and for what fee, and we obviously have to be evenhanded about our fees, but what we carry is dependent on our contracting with the user through our launch services agreement.

Mr. FUQUA. You are a nonregulated——

Mr. MOSSINGHOFF. Self-regulated.

Mr. FUQUA. Your rates are not set by a regulatory agency, too?

Mr. MOSSINGHOFF. That is right, that is exactly right.

Mr. FUQUA. In entering into joint endeavors with private partners, can they retain the ownership rights?

Mr. HOSENBALL. They can, as we have stated. It is one of the elements that go into a decision as to entering into the joint endeavor. We tried to make it quite clear, and think it is necessary, that if we are going to have the first steps into commercialization, that incentive will have to be there.

Mr. FUQUA. You think that enhances the use of the STS?

Mr. HOSENBALL. Right, but as we indicated, and as the regulation indicates, you have to examine it on a case-by-case basis, and it is one of the important factors that goes into the kind of arrangements you are going to enter into.

Mr. MOSSINGHOFF. Mr. Chairman, I might add something to that, too. I think there is an unresolved legal issue involved in these joint endeavors. I think that patent rights can be divided equitably between the private concern that invests its own money and the Government's concern.

I think we would probably take a position that at least we shouldn't be sued under any invention or patent infringement coming out of a joint endeavor where we are a full partner. At least we ought to have what is sometimes referred to as a shop right to practice the invention ourselves.

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In the area of proprietary data, the issue I think is far more complicated because of the Freedom of Information Act. NASA, as you know, doesn't decide what records of it that it has.

If it has valuable proprietary data, and the private concerns competitor wants that data, there is a perfectly expedient legal procedure to try to get it, and that is through the Freedom of Information Act.

It may well be, as we gain some experience here, this may be another area where we might be back talking to you and to the subcomittee and the full committee about some guidelines that might be adopted to ease that problem.

Right now, for example, there is a case pending in the Court of Appeals here in town where a District Court has ordered the Federal Bureau of Investigation to provide copyrighted pictures, in response to a Freedom of Information Act request, even though the pictures are available from the copyright owner, but at a higher price.

The District Court said the picture should be made available through the Freedom of Information Act. We are watching that case and others, but it may be an area where we might come back and have a problem.

Mr. FUQUA. You mentioned in your statement about the patent and the data rights provision and the reimbursement policy and that it reserved the powers to the administrator to require the Shuttle user to license the patent rights.

What would trigger this device, Neil?

Mr. HOSENBALL. For example, somebody proposes to go up with an experiment which he believes might cure cancer. We think it would be irresponsible if he couldn't meet the world's needs or the Nation's needs in producing the cure and that we should require him to license owners and make it available at a reasonable cost to the public.

I have given you the extreme example, but there could be other situations where the administrator, in discharge of his public responsibility. We do have to know, and we will know what they are going up there for and the Administrator will make that determination so that we can protect the public interest and the public as a whole.

Mr. FUQUA. At the same time you can encourage experiments that might be in the national interest.

Mr. HOSENBALL. That is right. Whoever is making the investment. We are not saying that he should not charge a royalty to those others that produce it. So he will get a return on any investment.

We are not asking him to give it away free. We think that does not in any way discourage investment and going ahead with a particular experiment or particular process.

Mr. FUQUA. Are you satisfied with the present patent policies that NASA has, or do you think it could be modified or changed to expand or to stimulate investment in the commercialization of patents?

Mr. HOSENBALL. Let me start off, if I may, and then have Gerry come in. If you don't know, he is an ex patent lawyer who can

probably speak to it. He has been very active in ongoing Government interagency committees, looking at that problem.

I think I am right when I state we are satisfied with our current system. We have some concern that the system Governmentwide ought to be changed, and we can live with approaches that have been suggested in making those changes.

Our own conclusion is that an inventor and private enterprise working together will bring an invention to commercialization. Our own experience has been that we don't think Government agencies do a good job in getting those inventions, or new technology, into the public domain.

We think we have probably done, if I may boast a bit, the best job of any agency in doing that, but we don't have the resources or the know-how we think to see what is out there in the market, to make investment decisions that have to be made by a commercial entity, and that patents would best be left with those who will move forward the invention.

You may want to add something, Gerry.

Mr. MOSSINGHOFF. Just perhaps add that I agree with Neil's conclusion, and particularly with respect to the ability of getting contractors to work for NASA and to get those contractors to use their best elements to work for NASA.

There is no problem with that at all. There are other industries dealing heavily with privately financed backgrounds, and I think the patent policies there cause a lot of friction.

We are in a business which has been federally financed, and there is a clear line there. I don't think we are encouraged by the results when we take title and license. We can document a utilization for those patents that NASA owns and we attempt to license to some other private concern to practice it.

We have a success rate of about 1 percent, which I think it pretty low. Our success rate where the patent is left with the contractor and the inventor is much higher. It is a pretty consistent 20 percent, so I think that the results over the last almost 20 years now, 15 or 20 years, indicate that if the primary goal is to get the invention utilized and on the marketplace, that goal is achieved better through a waiver approach where you leave title with the contractor than through a so-called title approach where we take title and try to license some other third party.

Mr. FUQUA. So you think with the flexibility that the administrator has now the policy is serving in the national interest?

Mr. HOSENBALL. Yes.

Mr. MOSSINGHOFF. I think it could be improved. I think we should try to bring the licensing number up to that where the contractor owns it, which is the difference between 1 pecent and 20 percent.

I would think that that would indicate maybe we ought to go more toward the successful part of the program, more toward the 20 percent.

Now, we could do that under NASA's existing statutory authority, but we have as an overall guideline said that overriding criterias there ought to be a Governmentwide policy, so when a company contracts with the Government, it gets the same deal, and the

arrangement isn't different, depending on which agency it happens to contract with.

Mr. HOSENBALL. We are experimenting to get some of our things out in the market and have been concentrating on an effort to increase that 1 percent, and in kind of an experimental way, to see how it can best be done.

It has probably received more attention in the last 2 or 3 years than it has in the past, but whether we will be successful or not we don't know.

We do think that Government-wide, at least, as Gerry indicated, leaving it with the inventor, leaving it with the company that has resources to promote it, is probably the best way of getting innovation, and getting the invention on the market.

Mr. FUQUA. In the indemnification authority you have a provision which reads "that such indemnification may be limited to claims resulting from other than actual negligence or willful misconduct of the user."

What do you mean by "actual negligence on the user's liability"?

Mr. HOSENBALL. The provision was put in there in order to meet some concerns of other agencies that were involved in reviewing our legislation. We don't think it restricts our authority at all, but the concern was expressed that there may be circumstances where in effect you may not want to give full indemnification.

That is the reason the provision was put in. There may very well be circumstances where you would not want to give total indemnification. I personally don't know of any, but you can come up with some theoretical situation which might arise.

And so we accepted the recommendation of this interagency group and put the language in. If you notice, it is permissive. It does say "may."

Mr. FUQUA. Do you expect to indemnify foreign users on the Shuttle?

Mr. HOSENBALL. We think that we will apply a nondiscriminatory policy across the board. It is the only way to encourage not only domestic users of the Shuttle but also foreign users of the Shuttle, and we intend to do so.

Mr. FUQUA. You mentioned in item 4 that the Space Shuttle is not considered an aircraft under the Federal Aviation Act of 1958. That was based on an opinion of the Chief Counsel of FAA dated March 11, 1977.

What would be the result if new counsel came along and interpreted that a different way?

Mr. HOSENBALL. It certainly could happen. We made an independent determination that it was not an aircraft within the meaning of the Federal Aviation Act. However, it is the Federal Aviation Act, and we did go over to solicit the opinion of the Chief Counsel.

In the event there was a new Chief Counsel that someday disagreed, we probably would go through the Justice Department procedure in getting the Attorney General's opinion. He would then construe both our act and the FAA act, and if the Attorney General was to rule against us, we would probably be back up here again seeking some new legislation to clarify the situation.

Mr. FUQUA. What would be the impact if somebody came along and said you were an aircraft, say the Counsel has changed his mind, the Justice Department ruled in their favor in that case? What would it do to you?

Mr. HOSENBALL. All the things that go along with FAA regulations, that would be certain kinds of markings, certain kinds of lights and the rest of it. That is one of the reasons they recognize I think that really the Shuttle is not an aircraft. It really is intended to go into space.

They do have a certain responsibility as far as the lanes are concerned, and we do notify them when there is a Shuttle flight, so that aircraft can be warned that a Shuttle launch is taking place. But, if there was such a ruling, NASA would have to comply with everything that comes along with FAA regulation.

Now, Government aircraft are not as highly regulated as commercial aircraft, so the full extent of that regulation isn't clear. As I indicated, we had reached the conclusion that the Shuttle wasn't an aircraft, and having gone to FAA and gotten a confirmation that we are right, why we didn't really go into the details of what it may mean to us.

Mr. FUQUA. One of the problems might be the certification requirements.

Mr. HOSENBALL. That is a potential. Military aircraft generally and Government aircraft generally do not have to be certificated as such, but you go through the entire process, equivalent process of informing the FAA and advising them as to the nature of the aircraft and the rest of it, but they don't go through a formal certification process.

Mr. FUQUA. Mr. Flippo?

Mr. FLIPPO. Thank you, Mr. Chairman.

I was just enjoying the excellent dialog that you were conducting. I think it is very helpful and very informative to have that type of dialog. I think that you might consider, going back to the flight controller, the chain of command on board, that maybe you shouldn't hire anyone named Bogart to fly that Shuttle. Then you wouldn't have the Caine Mutiny.

I was wondering if you would elaborate upon the main differences between the Space Shuttle launch agreement and an expendable launch vehicle. Could you elaborate on the major differences?

Mr. HOSENBALL. I can elaborate a little bit. Basically they are not too different than expendable launch agreement and the approach we took in the expendable launch vehicle situation. For one reason, our customers were somewhat familiar with expendable launch contracts, and to the extent that we could keep the same language that they had worked with before, my lawyers try to do that.

As I indicated, there are an awful lot of regulations that have been issued in connection with Shuttle use, the reimbursements, and the transition policies. All these have to be implemented in some way in contractual language, so there have been significant changes in pricing, scheduling, in transition and those kinds of areas.

We have tried to implement in our launch services contracts those things that Mr. Yardley thought he required by way of commitments, so there are substantial changes to accommodate

those requirements. But in general, we have tried to keep whatever we could because people get familiar with certain language and they have seen it operate.

So to the extent that we could retain it, we have, but there are substantial changes.

Mr. FLIPPO. I want to talk with you just a brief moment about this idea of getting the information contained in patents out and getting it utilized through your technology transfer department.

I am not sure that that is the correct application I am looking for. I think it would be interesting to find this out. Who is tied into your libraries? Who has access to your resource computers, to examine what patents might be available or anything like that?

Mr. HOSENBALL. I just happened to receive a fairly good briefing from our TU people last Monday, presented to Dr. Frosch in his monthly management review, as to how NASA technology is getting out.

The patent division of my office works very closely with the TU people. They help us identify potential users of our inventions, the ones that we have in our portfolio available for licensing.

We do some of this within our own office, particularly where we have letters of inquiry. The biggest system, of course, is our regional centers that have been established to get NASA technology out.

They have a list of available patents. There is a whole series of things that we are trying to do to make sure that the public and commercial interests are aware of the kinds of patents we have.

Where requested, and the patent is available for license, if there happens to be a Government employee who made the invention, say one of our laboratory employees, we have made him available to the commercial concern so as to give the know-how to develop the patent. So we are doing many, many other things.

Gerry, do you want to add anything more?

Mr. HOSENBALL. No. I think as Neil said earlier, we probably have as aggressive a program as exists in Government in trying to get this out. I was going to mention the fact that where I think our patent system really serves its purpose is where we have a Government employee as an inventor.

So the two issues, when you allocate rights to inventions, are: Is it an in-house or out-of-house invention? Where we have Government employees, for example, Barbara Askins, who I am sure you met from the Marshall Space Flight Center, her invention involving enhancing faint images on a photographic plate is a breakthrough. She was named as the inventor of the year last year by a national organization.

Similarly, Frank Nola's power factor controller, we already have 22 patent licenses on that, and we are handling it as fast as we can. So where we have an in-house inventor like Miss Askins or Frank Nola, I think we do a very good job of getting that invention used.

Those are two of the I guess most significant inventions we have had in the last several years.

It is again the question of the inventor also having an interest, and if the inventor is with the organization, he has the interest. He even knows who might be interested in using it, and that kind of

assistance is very useful in identifying people that will promote the particular invention.

Mr. FLIPPO. I am very interested in the technology transfer aspects. I think that it would be very interesting—we can follow it up some other time—to know——

Mr. FUQUA. We will have Dr. Calio up during hearings.

Mr. FLIPPO. I appreciate that.

Mr. HOSENBALL. I saw a three-page, single-space list of things that we have invented or helped on covering all sorts of medical devices and everything else. I think we know what is there, and it is a question of getting it out.

I think the best bet is to have Mr. Callio go into some detail on how it is being done.

Mr. FLIPPO. The point that I am trying to make here is that I think that kind of information is not well known by the general public, and I think that public knowledge is very important to the support of the entire program.

I think that more work in getting that information out, in making the public aware of those contributions, would be beneficial to everyone.

Mr. HOSENBALL. I think everybody in NASA would agree with you, sir.

Mr. FLIPPO. Thank you, Mr. Chairman.

Mr. FUQUA. Thank you very much.

Mr. Dornan, do you have any questions?

Mr. DORNAN. I don't.

Mr. FUQUA. Thank you very much for your testimony this morning.

[Answers to additional questions asked of NASA follow:]

QUESTION #1:

Are there any questions of civil jurisdiction of the United States in Space Shuttle operations?

ANSWER:

Article VIII of the 1967 Outer Space Treaty (The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space including the Moon and Other Celestrial Bodies, October 10, 1967) provides that:

> "A State Party to the Treaty on whose registry an object launched into outer space is carried shall retain jurisdiction and control over such object, and over any personnel thereof, while in outer space or on a celestial body."

The United States is a party to this treaty, and thus would retain "civil jurisdiction" over U.S. space operations. Similarly, the liability policies we are formulating, for example, the cross-waiver of property damage liability would, by their very terms, apply to activities in outer space.

There may be areas of "civil jurisdiction" where statutory changes will be indicated--for example in the application of patent law, as we gain experience--but we believe that for the present questions of civil jurisdiction are sufficiently resolved for us to move into and gain Shuttle flight experience.

QUESTION #2:

Will NASA be able to enter into joint endeavors in which private partners can retain complete ownership rights in patents and other intellectual property?

Do you believe it would be in the national interest to allow private ownership of such rights to encourage usage?

ANSWER:

Yes, NASA will be able to enter into joint endeavors in which private partners can retain ownership rights in patents and other intellectual property. However, rather than leaving complete ownership rights with the private partner, I feel that certain rights should be reserved by NASA to protect governmental and public interests. At a minimum, NASA should reserve a royalty-free right to use the results of the joint endeavor for NASA and/or governmental purposes. In addition, consideration should be given to reserving additional rights to assure promotion of commercial usage, and as necessary to alleviate any serious threat to the public health, safety or welfare should the private partner be unable to do so. The exact

scope of these rights will have to be negotiated case-by-case depending on the circumstances of each undertaking, in order to strike a balance between private initiative and the government and public interests. (The legal basis for this position is provided as Appendix D to my testimony of September 26, 1979.)

Yes, I believe that it is in the national interest to allow private ownership of rights to encourage usage, provided certain rights are reserved to protect governmental and public interests, as discussed above. Our experience has been, regarding the technology transfer process in general, that leaving intellectual property rights with the originating private party having the initiative, the risk capital, and ready access to the innovation/inventor, is the best way to bring new technology to the market place. We see no reason why this experience should not carry over to joint endeavors that may be flown on the Shuttle. The national interest can be protected by the reservation of certain rights, as indicated, with no need for the government to acquire ownership rights.

QUESTION #3:

Patent and data rights provision in the Shuttle reimbursement policy (Tab F, paragraph 1214.104) reserves power in the Administrator to require the Shuttle user to license patents rights.

What circumstances would trigger the Administrator exercising this discretion?

Do you believe this is acceptable to broad utilization of the Shuttle?

ANSWER:

The right to require a user to license patent rights will not be acquired in a reimbursable launch agreement unless the Administrator determines in advance that the activities to be performed by the user are for research and development in a field of technology likely to produce inventions having a significant impact on the public health, safety or welfare. Even then, it will be limited to only those inventions conceived or first actually reduced to practice as a result of the launch and related services provided to the user, and will not extend to a user's background rights. An example is where a new drug is likely to be developed as the result of the proposed launch. Also, where such a right is included, it probably would not be triggered unless the patent owner proved to be unable to produce the drug in sufficient quantities, at reasonable prices, to meet the needs of a national program to control or irradicate a particular disease. And when triggered it is expected that the patent owner would be entitled to royalities reasonable under the circumstances. Beyond

this, it is difficult to predict when the discretion would be exercised until an actual situation arises. It is unlikely, however, that NASA would make such judgments on its own cognizance, but would coordinate with agencies having principal responsibilities in areas that impact the public health, safety and welfare.

This is believed to be acceptable to broad utilization of the Shuttle. The circumstance where the license rights would be needed is very limited, in that our experience to date has been that most reimbursable launches do not encompass research and development activities of a nature requiring the acquisition of such license rights. Also, even if acquired, such rights represent a situation where, in all probability, the Government could rely on eminent domain rights under 28 U.S.C. 1498, or where in private litigation a court would be reluctant to grant injunctive relief.

QUESTION #4:

Mr. Hosenball, would you elaborate on the guidelines which have been established for the participation of foreign astronauts in the Shuttle program?

ANSWER:

Last summer, the Administrator addressed separate letters to the European Space Agency (ESA) and the Canadian Government outlining general guidelines under which NASA would entertain training foreign nationals as mission specialists. These guidelines were developed in response to specific inquiries by both. Dr. Frosch proposed that NASA accommodate foreign nationals as mission specialists on STS flights where: (1) the country or agency (ESA and Canada are the only ones to date) concerned is a major contributor to STS development; (2) the flights involved are predominately the concern of that country or agency; i.e., it sponsors half or more of the payload.

Each country/agency would perform its own competition for mission specialists recruiting, based on suitable criteria provided by NASA. The nominations would be forwarded to NASA for concurrence as to suitability in each case, the final selection to be made by the country/agency from the names which have received concurrence. In the interest of crew harmony and final suitability, NASA would retain the right to approve the actual flight crew.

Prior to flight, the foreign national Mission Specialist Candidates would undergo a one or two-year training evaluation program very similar to the current NASA astronaut candidate program. The country/agency involved would pay the training/salaries/subsistence costs for each of these Mission Specialist Candidates. NASA would define training requirements, training costs and any impact on overall

payload pricing policies within a few months.

QUESTION #5:

With regard to the Federal Aviation Act of 1958, what would be the impact if the Space Shuttle were judged to be an "aircraft"?

ANSWER:

The Federal Aviation Administration (FAA) has determined that the Space Shuttle is not an aircraft. However, the FAA is charged by statute with, among other things, the "control of the use of the navigable airspace of the United States and the regulation of both civil and military operations in such airspace in the interest of the safety and efficiency of both." (FAA Act, §103(c); 49U.S.C. 1303(c)) Thus, the authority of the FAA over a particular contrivance or device depends not upon whether such a device is an "aircraft" but rather upon whether it uses or is intended to use the navigable airspace of the United States. Consequently, the FAA has the authority to insure that Shuttle operations are compatible with the safe and efficient use of such airspace.

If the Space Shuttle had been determined to be an aircraft, Shuttle operations would be hindered because they would become subject to many Federal Aviation Regulations (FARs) which are unnecessary and even incompatible with Shuttle operations. Although the Shuttle would, if it were an aircraft, be a "public aircraft" rather a "civil aircraft," even public aircraft are subject to flight rules contained in the FARs and must comply with Air Traffic Control (ATC) clearances and instructions, absent an emergency. The Space Shuttle is launched into orbit, in the same general manner as the earlier expendable rocket launch vehicles and in no way resembles an aircraft during takeoff. During the latter portion of the reentry and landing phase, when the Shuttle Orbiter has descended into the denser layers of the atmosphere, the Orbiter possesses some of the functions of a glider. This means that the Shuttle Orbiter is limited in its maneuvering capability as it returns to Earth from outer space and cannot possibly operate subject to FAR flight rules or comply with ATC clearances and instructions. Most landings, in fact, will be done automatically by computers onboard the Shuttle. Recognizing this, the FAA, after consultation with NASA, has decided that the most effective and efficient way to fulfill the FAA's statutory duty to provide for the safe and efficient use of navigable airspace vis-a-vis Shuttle operations is to set aside a special block of restricted airspace in which only authorized aircraft such as chase planes would operate during Shuttle operations. The FAA thus has sufficient authority to take any other necessary actions vis-a-vis Shuttle operations to insure safety and efficiency without actually defining the Shuttle as an "aircraft."

QUESTION #6:

Would you elaborate on why the STS is not considered to be a "common carrier"?

ANSWER:

As I indicated in my testimony, this issue was addressed, at my request, by the Deputy General Counsel and his conclusions are set forth in a memorandum of August 18, 1977 (Appendix A of my testimony, pp 8-13).

The NASAct, while providing NASA with authority sufficient to operate the STS on a "rountine" basis, does not go so far as to give NASA authority to operate the STS, or any of the NASA expendable launch vehicle systems, as a common carrier. Moreover the Comsat Act does not in any way make NASA a common carrier. While the Comsat Act does create in section 201(b) a duty of NASA to provide "satellite launching and associated services" to Comsat, this duty relates only to Comsat and not to the general public; a common carrier, on the other hand, is one which holds itself out to the public as engaged in a certain type of transportation or other service which is available to the general public for compensation. Lastly, there is no law which compels NASA to provide launch and related services for all who would apply.

NASA is not an "air carrier" under the Federal Aviation Act of 1958. That there is no United States statutory law which makes NASA a common carrier or would even allow NASA to operate the STS as a common carrier is consistent with the traditional Governmental role as a regulator of non-U.S. Government entities which are common carriers. Of course, the U.S. Government has in the past created common carriers, but such entities are specifically not parts of the U.S. Government and are created by statutory authority expressly stating that the newly created entities are to be common carriers.

Some attention should be given at this point as to why NASA should not operate the STS as a common carrier, since it would be possible theoretically to amend the NASAct to provide NASA with such authority and responsibility. The United States has made several international commitments which conflict with such authority and responsibility. The United States has made several international commitments which conflict with the concept that common carriers must not discriminate among customers in offering and providing services, but must serve all members of the public equally. These include the Spacelab Agreement with the European Space Agency (ESA) and the 1967 Outer Space Treaty, neither of which would allow the United States to operate the STS as a common carrier.

QUESTION #7:

What authority will the Shuttle Commander have with regard to foreign nationals on board the Shuttle?

ANSWER:

Our proposed regulations on the Authority of Space Transportation System (STS) Commander (Appendix L of my testimony) give the Commander "absolute authority to take whatever action is in his/her discretion necessary to (1) enforce order and discipline, (2) provide for the safety and well being of all personnel on board, and (3) provide for the protection of the STS elements and any payload carried or serviced by the STS." This authority includes use of any means reasonable and necessary, including physical force. Further, there is provision for subjecting an individual, if necessary to restraint--i.e., an "arrest" --until the individual can be delivered to proper authorities. Our proposed regulation expressly extends to all individuals on board, whether or not they are U.S. nationals.

QUESTION #8:

To what extent is the Space Shuttle Launch Agreement different from expendable launch vehicle agreements?

ANSWER:

In drafting the Shuttle launch services agreements, we attempted to maintain a continuity with the expendable launch agreements concepts and language which are familiar to our launch users. Certain policies were changed, however, necessitating corresponding changes in language. For example, we now offer Shuttle services on a fixed-price basis. This required complementary new provisions dealing with scheduling, postponement and cancellation of Shuttle launches and required that the particular services to be provided at a fixed-price be spelled out in the launch agreement.

To take advantage of an astronaut-flown reusable Shuttle, we offer a reflight guarantee.

In the liability area, as a result of recent legislation, Pub. L. 96-48, we are now in a position to provide insurance and idemnification to our users which when reasonably and prudently used will ensure that users will not consider the potential liabilities of flying onboard Shuttle a serious obstacle to the exploration and use of space. We have also now assumed what we believe to be a greater but not unreasonable share of the risk for patent infringement liability and damage to Government property, including the Shuttle, than under the expendable launch services program. The new crosswaiver of liability provision in the Shuttle launch agreements is in part recognition that,

for the first time, several unrelated users may have its employees and property involved in payload operations, which payload is to be flown on one launch vehicle--the Shuttle.

Suitable new provisions have been added to deal with the transition period during which a user may have his Shuttle flight backed up with an expendable launch vehicle. A provision has also been added which outlines the responsibilities of NASA and the users for the upper stages.

QUESTION #9a:

Mr. Hosenball, is NASA satisfied with its patent policy?

ANSWER:

In general, NASA is satisfied with its patent policy. We have flexibility within Section 305 of the National Aeronautics and Space Act (42 U.S.C. 2457), and our policies and implementing procedures there under are understood and reasonably well-accepted by our contractors and user community. Our concern is more with the development of a government-wide policy which would produce greater uniformity of result under like circumstances, reduce administrative burdens on both the contractor and the government, and do more to promote commercial utilization of government-funded technology.

QUESTION #9b:

How successful has the policy been in stimulating investment to commercialize inventions?

ANSWER:

The commercialization rate of patented inventions made under NASA contract is close to 20% when title is left with the contractor and slightly more than 1% when NASA retains title and licenses the patent itself. This rate is approximately 2% for patented inventions of NASA employees. With regard to commercialization when title is retained by the contractor, we have no data as to what an optimum commercialization rate should be under these circumstances, but feel it is successful in light of the complexity of the technology.

QUESTION #9c:

Are patent policy changes needed to stimulate commercial use of the Shuttle?

ANSWER:

We do not at this time believe that further patent policy changes are needed to stimulate commercial use of the

Shuttle. We have tried to maximize private incentives for reimbursable launches and joint endeavors, the activities under which commercial use is most likely to occur.

QUESTION #10a:

Does the NASA patent policy put government in the role as a competitor to private industry?

ANSWER:

The NASA patent policy does not put Government in the role as a competitor to private industry. NASA does not grant exclusive rights (either by waiver or license) where the Government itself intends to develop the invention to the point of practical application. Rather, exclusive rights are used as an incentive for private entities to achieve commercialization of Government-funded technology which would not be otherwise so utilized. One objective of NASA patent policy is to promote new products and processes through private initiative and thereby enhance private competition, and it is not intended for the Government itself to be in a competitive role in carrying out this objective.

QUESTION #10b:

What changes in patent policy would assure or encourage commercialization of inventions funded under government R&D contracts?

ANSWER:

In order to assure or encourage commercialization of inventions funded under government R&D contracts, any changes in patent policy should provide greater flexibility in granting commercial rights to the contractor, and should reduce administrative burdens on both the contractor and the Government. Also, there should be greater uniformity of result between agencies under like circumstances.

QUESTION #11:

Mr. Hosenball, Section 308 paragraph (a) relating to NASA's indemnification authority has a provision:

> "That such indemnification may be limited to claims resulting from other than the actual negligence or willful misconduct of the user."

What effort would the "actual negligence" provision have on Shuttle users' liability?

Does NASA also expect to indemnify foreign users of the Shuttle?

ANSWER:

We do not believe this "actual negligence" provision restricts NASA's authority to agree to indemnify a user whether or not negligent. Our current thinking is that we will agree to indemnify a user for third party liability arising out of STS operations, which liability is in excess of available insurance, whether or not the coverage results from the user's negligence. We expect that $500,000,000 of insurance will be made available at a reasonable premium protecting both the user and NASA.

The "actual negligence" provision gives NASA the flexibility to adjust our insurance and indemnification provisions in our Shuttle launch agreements to meet reasonably the U.S. Government's and the users' needs based on our experience in providing launch services. This provision was placed in the legislation, authorizing NASA to insure or indemnify, as a result of an interagency recommendation.

We expect to indemnify foreign users of the Shuttle to the same extent as comparable domestic users so as to encourage reasonably their use of the Shuttle. This policy is consistent with the United States Policy Governing the Provision of Launch Assistance announced by the President on October 9, 1972.

Mr. FUQUA. Our next witness will be Mr. William D. English, vice president for legal and government affairs, Satellite Business Systems.

We are very pleased to have you here this morning.

STATEMENT OF WILLIAM D. ENGLISH, VICE PRESIDENT, LEGAL AND GOVERNMENT AFFAIRS, SATELLITE BUSINESS SYSTEMS, ACCOMPANIED BY BARRY MAYEFSKY, GENERAL ATTORNEY, BUSINESS MATTERS

Mr. ENGLISH. I have with me Mr. Barry Mayefsky, an attorney in my office, who is directly responsible for negotiations of our launch arrangements with NASA.

Mr. Chairman, members of the subcommittee, for the record I am William D. English and I am vice president for legal and government affairs at Satellite Business Systems.

I appreciate this opportunity to give you SBS' perspective on the problems of transition to a systematic reliance on the Space Shuttle. As you may know, SBS has been an early and constant supporter of the Space Shuttle program.

In 1977 SBS was the first commercial user officially to request that NASA launch a satellite on the Space Shuttle we made our first progress payments to NASA in that year. As of October 1 of this year we will have paid over $7 million in Shuttle progress payments.

We think SBS exemplifies the high technology customers of the eighties for which the Shuttle is ideally suited.

SBS was formed in December 1975 by Aetna Life & Casualty Co., COMSAT, and International Business Machines Corp. SBS will establish a domestic satellite system to provide communications dedicated networks for businesses, Government agencies and other organizations having significant communications requirements. The networks will be fully switchable and provide users with a full range of communications services—voice, high-speed data, high-speed facsimile, and teleconferencing—all in a digital format.

The SBS system will be innovative, flexible, and technologically advanced. It will include small Earth stations sited on customer premises, dynamic allocation of capacity, and time-division, multiple access techniques with demand assignment. The significance of this is that SBS customers can quickly change their communications traffic among different applications—voice, high-speed data, high-speed facsimile and teleconferencing. This permits a user to shift capacity from voice services during day to high-speed data applications at night, for coast-to-coast bulk data transfers by computer and high-speed facsimile.

Of course the heart of the SBS system will be its communications satellites. SBS will have three satellites, two in orbit and one available for contingency purposes.

Because SBS will begin its commercial service in January 1981 we had planned to have our first pair of in-orbit satellites launched in 1980 on the Space Shuttle. The cost and operating advantages of the proposed Shuttle program for SBS are obvious, so we have been very interested in a rapid and smooth transition from rocket to Shuttle launches under reasonable arrangements.

From our perspective, however, the critical deficiency has been and remains our inability to plan on a Shuttle launch with confidence. SBS was originally scheduled and based its business financial planning on a Shuttle launch in July 1980, but due to the slips in the Shuttle program our first launch on the Shuttle has been rescheduled by NASA to the fourth quarter of 1981. Therefore, SBS will in all likelihood have to exercise its Delta rocket back-up option for the first launch in order to begin operations, as scheduled, by January 1981.

Although the Delta back-up is invaluable to private enterprise in the transition period, it does not completely answer all planning concerns. First, the increase in cost per launch to SBS between the Shuttle and Delta is approximately $15 million per launch. A Delta launch in October 1980 is now priced at approximately $22 million versus approximately $7 million for a comparable SBS shuttle launch. Second, the Shuttle's unique ability to provide several launch opportunities during the multiday Shuttle mission offers a high probability of a successful deployment of a user's payload.

SBS still plans to launch at least its in-orbit backup satellite on the Shuttle. Any further slip in the schedule for Shuttle operations, however, would require SBS either to delay its second satellite launch or to contract for a second launch by the far more expensive Delta rocket.

Why should this subcommittee or the public in general be concerned with higher launch costs to SBS and other early users of

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the Shuttle? The reason is quite obvious—the very significant cost differential between rocket and Shuttle launches can only inure to the detriment of communications users and the public generally. Therefore, SBS hopes NASA will be successful in resolving remaining technical problems and establishing the Shuttle as an operational launch vehicle as soon as possible.

As an early Shuttle user, SBS is also concerned that the Delta launch vehicle program continue until at least two Shuttle orbiters are operational. Maintenance of the Delta program will insure that the United States has a continuous launching capability in the event of a malfunction in the first orbiter early in the Shuttle program. Likewise, if users wait for the Shuttle and at the last minute new delays occur, there presently is no method for scheduling a Delta launch on less than 9 months' notice. Furthermore, by mid-1981 a user may not be able to call up a Delta launch as that program is presently scheduled to be phased out. Of course, the solution is to insure that the Shuttle program, with appropriate backup, is maintained and supported so that users do not look to alternate non-U.S. sources.

I want to turn now to some of the contractual and legal issues which arise in the new Shuttle program from a user's perspective. As SBS is still negotiating contractual arrangements with NASA, I will not comment on specific problem areas.

I would like, however, to point out that the Shuttle affords both users and NASA an opportunity for flexible, innovative contracting. NASA has already shown imagination in solving some of the novel problems raised by the Shuttle program.

While we expect early users and NASA to solve most of these novel problems, Congress has played an important and constructive role in the ongoing process as demonstrated by the recent passage of the new section 308 of the National Aeronautics and Space Act of 1958, as amended, as that section was enacted in the NASA Authorization Act of 1980. Section 308, as you know, authorized NASA to provide liability insurance on a reimbursable basis and to indemnify potential third party claims above the maximum amount of liability insurance users are able to acquire.

In implementing this insurance provision, NASA is requiring private users such as SBS to obtain a maximum of $500 million in commercial third-party liability coverage naming the U.S. Government as an insured party. In return, NASA agrees to indemnify users for any third-party liability above that maximum insurance coverage.

This legislative solution is of tremendous importance if private risk capital is to be available for the financing of high technology satellite ventures such as SBS. Without such legislation, SBS and others could be subject to absolute liability for launch activities well in excess of insurable amounts—a major deterrent to private financing. I should emphasize that such risks are quite theoretical and the available insurance should be adequate.

SBS considers NASA's reasonable implementation of a sound piece of legislation a major breakthrough in insuring significant commercial use of the Shuttle program. It was gratifying to see the quick congressional response to a common user concern and the effective manner in which the new statute deals with this problem.

With continued commitment, flexibility and imagination from Congress, NASA and the early users such as SBS, I believe we can effect a rapid, smooth and fair transition to a full reliance on the Shuttle for our launch needs in the 1980's and beyond.

In summary, SBS believes the Shuttle program is a significant step forward in encouraging the full utilization of space for advanced communications and other applications.

Thank you very much, Mr. Chairman, for the opportunity to appear before the subcommittee.

Mr. FUQUA. Thank you, Mr. English.

You made a very valid point about continued use of the Delta launch vehicle until at least two Shuttle orbiters are operational. Could you just elaborate a little further on the importance of this?

Mr. ENGLISH. I think, Mr. Chairman, as I indicated——

Mr. FUQUA. You mentioned it briefly.

Mr. ENGLISH. Yes.

Mr. FUQUA. But I think you have a lot more to say about it.

Mr. ENGLISH. We do consider that it is most critical. I guess I can give you an example. Delay to the SBS company, and we have through regulatory process and problems of our own encountered roughly a year and a half delay in getting into operation to this point, increases our capital requirements by roughly $100 million per year.

Mr. FUQUA. I thought you paid $7 million. I think that was in your statement, right?

Mr. ENGLISH. What I am talking about, Mr. Chairman, is the general business impact of delay.

Mr. FUQUA. Yes.

Mr. ENGLISH. I am making the point, in the transition phase from the rocket to the Shuttle, of the importance of the Delta to us. It is emphasized by the cost of delay to our venture. The importance of seeing that that Delta program continues until there is a steady state Shuttle operation, including a second Shuttle vehicle, seems to us to be of significance because otherwise our business planning, our scheduling, and our capital resources are scheduled on an assumption that within a reasonable period of our target launch you will actually get into orbit.

Otherwise, you have major investments out of which you are not earning any revenue, so the scheduling to commercial users is a very critical factor.

Without the Delta backup, that scheduling does not have anywhere near the reliability in terms of major capital investments such as SBS.

Mr. FUQUA. Do you think that the financial community would be willing to participate in this backup capability?

Mr. ENGLISH. Of course, we are participating in the backup capability, in the sense that it is a program that is priced to the commercial industry on a different cost basis than the Shuttle; that is, it is closer to full reimbursement to the Government for the Delta launch.

So in effect the demands of Government are immediately translated and directly translated into production requirements from McDonnell Douglas for the Delta, so that private industry today is,

to a very, very substantial extent, financing Delta backup launches.

To what extent the Government is doing so, and to what extent industry might further participate in that, is a very good point to insure that the Delta backup continues through this transition phase. That is something we certainly should look into, Mr. Chairman.

Mr. FUQUA. You indicated you felt like there would be no problem in being able to acquire the adequate insurance for the indemnification program, that obtaining the insurance would not be a problem.

Mr. ENGLISH. I think that is our belief at the moment. We are currently, through our insurance broker in the United States, and through London underwriters, in the marketplace, attempting to achieve the $500 million liability limit that NASA has indicated would be the appropriate implementation of the legislation that this subcommittee reviewed.

We have not reached that level yet, but we have reasonable confidence that we will be able to do so.

Mr. FUQUA. You don't see that as a major obstacle then?

Mr. ENGLISH. Not at the present time. There may be difficulties as others move into that marketplace, when you have a situation where you are looking at multiple commercial payloads on a single Shuttle. We, of course, have not encountered that because we are the first to enter that marketplace, but there are some interesting insurance issues which both the users and NASA are continuing to look at with great interest.

Mr. FUQUA. That was my follow-on question. Do you see any liability questions that still remain, that might inhibit the use of the Shuttle?

Mr. ENGLISH. I do not think we do at the present time, Mr. Chairman. I think, as I indicated, NASA has—and I think that is largely Neil Hosenball and Jerry Mossinghoff's efforts in their office—done a very effective job in attempting to scope out the problems that are foreseen at this point. Now, of course, there certainly will be problems arising that are not necessarily foreseen in terms of mixes or combinations of users on single Shuttle launches, but I think they have done an excellent job in dealing with what could be foreseen at this time.

Mr. FUQUA. How about the patent policy and patent ownership questions? Are you satisfied with those as they exist?

Mr. ENGLISH. We are at this time, Mr. Chairman, although our interest is academic, because for the types of uses that we are now contracting for, there is no experimental activity involved, and the likelihood that any invention or discovery would arise out of our services from NASA is infinitesimal, I would say.

Mr. FUQUA. Mr. Flippo.

Mr. FLIPPO. Thank you, Mr. Chairman.

Would you like to be able to contract with NASA for performance and schedule commitment, rather than on a best-effort basis? We would like to contract with NASA on that basis, I believe, wouldn't we, Mr. Chairman?

Would that improve your capability?

Mr. ENGLISH. Yes, Mr. Flippo, it certainly would. I cannot say that I do not understand the best-efforts position of the Government, and I should point out that of course the question which I think you asked or the chairman asked, the difference between what is being offered in the Shuttle phase contractually, in the way of commitment, is very substantially improved over the arrangements that have been in existence for more than a decade for the expendable.

The fixed-price aspect, the reflight guarantee, are things that were absolutely nonexistent in the rocket program. Just as an example, you plan as a communications carrier, you anticipate your costs, you plan your rates, and you go into business on those rates. In the past, in 2, 3, sometimes 4 or 5 years following your launch, you would still be dealing with the total extent of the reimbursment that you would have to make for the expendable launch vehicle under the old program, and of course you had absolutely no reflight guarantee. You paid for the launch, and if it was unsuccessful, regardless of whose fault, you simply bought the rocket.

Mr. FLIPPO. I appreciate your testimony very much.

Thank you, Mr. Chairman.

Mr. FUQUA. Mr. Dornan.

Mr. DORNAN. I do not have any questions at this point because of the vote. I wanted to go into a series of questions, but I want to make this quorum call.

Mr. FUQUA. Yes, and we will have a vote after that so we will be gone for a while. I was hoping we could get through.

Mr. DORNAN. I just wanted to ask any advantages that you would see from being an early Shuttle user against the balance of associated risk.

Mr. ENGLISH. Mr. Dornan, quite frankly, advantages of being an early Shuttle user do not come readily to mind in our particular instance.

Mr. DORNAN. I was hoping there would be a myriad of advantages, because we need all the early users we can get.

Mr. ENGLISH. We certainly are committed to the Shuttle program, there is no question about that. And the fact that we have suffered or probably will suffer a $30 million unanticipated financial hit on our business planning by reason of Shuttle delays does not dampen our enthusiasm for the Shuttle program. It enhances it, but that is one of the curses, if I can call it that, of being not only the early user, but the earliest user of the Shuttle, and we knew that there would be a risk of that nature. We did, I guess, assume that we might miss on the first launch, but probably not the second.

We have requested NASA, by the way, to see if in our second launch, which is now scheduled for the January-April time frame in 1981, could be put on one of the Shuttle preliminary flights. The operational schedule of the Shuttle is now October 1981. We have requested NASA to consider that alternative launch arrangement.

I should say there certainly are some advantages I think to being the first commercial user of the Shuttle. You have an opportunity to be a pioneer in negotiating the arrangements, and I certainly think that allows you to have more leeway than if you were faced

with a major precedent of existing contractual provisions that are very difficult to move off of.

There are advantages in approaching the insurance market and influencing the type of insurance that a commercial enterprise needs which is risking hundreds of millions of dollars.

Mr. MAYEFSKY. Also on a Shuttle flight as opposed to a Delta rocket flight you do have the added opportunity to deploy later in the mission, because it is a multiday mission, so it does give you some technical leeway that you did not have before. We are not certain at this time exactly how much of an advantage that is in the early flights, but we are exploring that with NASA. We have asked NASA to program that into their Shuttle flight plans, so that we could take advantage of that, in case there was some slight malfunction in telemetry or something else to say delay us for a day, and will go a little later to make sure we have a successful deployment.

Mr. DORNAN. Mr. English, do you foresee any possibility where you might use the European launch vehicle?

Mr. ENGLISH. No, certainly not at this time. We do not.

Mr. DORNAN. That is all I have, Mr. Chairman.

Mr. FUQUA. Thank you very much.

Mr. ENGLISH. Thank you. It is a pleasure to be here.

[Questions and answers for the record follow:]

Question 1. "If SBS purchases a Delta launch vehicle, will you procure the launch vehicle directly from the manufacturer or through NASA?"

Answer. Under the present backup arrangements proposed by NASA, SBS will pay NASA $22 million for launching SBS' satellite on a Delta 3910 launch vehicle. That price includes the launch vehicle itself without the Delta Payload Assist Module which SBS is purchasing separately from Hughes Aircraft Company. Also required under the present arrangements is a $1,250,000 direct payment to McDonnell Douglas, as the SBS pro rata share of the Delta 3910 launch vehicle development costs.

Question 2. "NASA has determined that the space shuttle will not be a "common carrier." What affect would an opposite position have on shuttle utilization?"

Answer. As NASA has taken the consistent position that it cannot legally nor as a policy matter provide launch services as a "common carrier," it is hard to speculate as to whether or not a change in this position will increase utilization of NASA's launch services. However, without NASA adopting the status of a "common carrier", NASA has improved its service commitments under the shuttle program. As I have pointed out in my testimony, NASA how provides for fixed price launch arrangements as well as a single shuttle reflight guarantee. Continued improvements in the shuttle launch arrangements will certainly encourage increased utilization of the future Space Transportation System.

Mr. FUQUA. Our next witness will be Paul G. Dembling, practicing attorney here in Washington, and a person who has been before our committee many, many times. We are happy to have you here. I apologize for the delay.

STATEMENT OF PAUL G. DEMBLING, ATTORNEY, SCHNADER, HARRISON, SEGAL & LEWIS, WASHINGTON, D.C.

Mr. DEMBLING. Thank you very much, Mr. Chairman. I am pleased to respond to your invitation to appear before this subcommittee to make a statement with regard to: (*a*) An organizational alternative for the U.S. space transportation system; (*b*) some of the legal issues involved with the Space Shuttle.

It is my understanding that Mr. Beggs, who was chairman of the panel for the National Academy of Public Administration, appeared before you yesterday, and covered the work of that panel.

Mr. FUQUA. I believe you were a member of that panel?

Mr. DEMBLING. I was a member of that panel, and I was asked to comment on it briefly at this hearing. In order to speed up your hearing, I would respectfully ask that my prepared comments on the panel's work and conclusions be inserted in the record and I will continue with the legal issues.

Mr. FUQUA. That will appear in the record.

I. ORGANIZING FOR THE NATION'S SPACE SHUTTLE PROGRAM

Mr. DEMBLING. Two years ago, the National Aeronautics and Space Administration specifically requested the National Academy of Public Administration to determine the organizational location best suited for the operation of the Nation's Space Shuttle program. The Academy convened a panel to consider this matter. I was privielged to serve as a member of this seven-person panel which was chaired by James M. Beggs. The other members of the panel were Alan L. Dean, William T. Golden, Herbert Roback, James P. Romualdi and Prof. Harold Seidman. Staff personnel from the Academy that assisted this panel were Gen. DeWitt C. Armstrong III and Dr. Richard L. Chapman. The full report by the panel was submitted to the National Aeronautics and Space Administration in June of 1977.

The panel addressed itself to such questions as, Who should manage and direct such a space transportation organization? Once NASA has brought the system to an operating condition, should the system then be a part of the Government or in the private sector. Should it be an organization in which Government and private sector share control? If it is in the Government where should it be located and how organized? Should it remain within NASA, or should it be an independent agency in its own right?

After extensive analysis, the panel concluded that the space transportation organization should be a component element of NASA at least in the near term.

The possibilities considered included a private or a mixed ownership corporation several existing departments, a new independent Federal Agency, and NASA itself.

The key assumption was NASA's projection of Shuttle use—about two-thirds usage by the U.S. Government and one-third by others. It is my understanding that this projection is still true and that the shuttle has been booked completely until approximately 1984.

It was felt that the economics of the situation effectively ruled out private or mixed ownership at least for the near term. To generate a return on investment sufficient to attract private capital would oblige user charges per flight much higher than now planned, reversing the competitive advantage over expendable vehicle launches. It was felt that if commercial usage truly flourished, then at a later date some private investment in the system could become financially feasible.

The panel considered Federal ownership and control appropriate as long as Federal agencies remained the major users. After a review of the possible location of the space transportation system in the various organizations mentioned, the panel's detailed analysis concentrated on three organizational locations: (1) NASA; (2) the Department of Transportation; and (3) an independent agency. A Government corporation to operate the space transportation system was not a distinct alternative since it could be formed within as well as outside of existing departments and agencies. The corporate form was examined in that context. The panel established nine criteria and compared the three lcoations by objectively testing each one against these criteria.

The nine criteria were: (1) advancing national purposes; (2) meeting defense needs; (3) meeting other agency needs; (4) political feasibility; (5) financial feasibility; (6) international functioning; (7) external functioning; (8) affecting other NASA activities; and (9) transition from present organization.

The comparison showed a marked difference in expected performance depending on whether the space transportation system and NASA were joined or separated. The two together reinforced and protected each other. The system could contribute to and draw from the other elements of NASA while NASA could tightly coordinate the whole of the U.S. civilian space effort.

If separated, it was felt that the space transportation system and NASA would abrade each other and be exposed to outside pressures, primarily budgetary, because of the added costs of separation and the competition for funds with other groups. A divided civilian space effort appeared to be duplicative, invite criticism, and work against the stability and sustained coordinated progress in space activity.

The space transportation system is one of NASA's most important and visible programs. It is one with great promise of public benefits. To locate it in another Government department or agency certainly would place it in competition with the other programs which are in that agency or department. To establish it as an independent agency would mean that the space transportation system would have to justify its existence as a truncated space agency without the close support and resources of NASA, now well experienced in Government, and in the civilian space effort.

The general conclusion of the panel was that NASA should conduct space transportation operations at least in the near term.

II. NASA'S AUTHORITY TO OPERATE THE SPACE TRANSPORTATION SYSTEM

In connection with the recommendation made by the panel of the National Academy of Public Administration that the National Aeronautics and Space Administration operate the space transportation sytem in the near term, I again reviewed the authority of NASA in this connection. It appears to me that NASA's organization provides the authority to operate the system.

I recall also that during the drafting of the NASA's organic act it was contemplated that providing space launch and associated services related not only to the exploration of outer space but also to its

ultilization for the peaceful purposes of mankind. However, it was plainly stated during the hearings on the act that NASA was not to be a regulatory agency nor was it to operate a commercial transport service. The reusable space transportation system is consistent with what NASA has been doing since its establishment. This is also borne out by the legislative history of the NASA Act.

Under Section 203 of the NASA Act—42 U.S.C. 2473—NASA is authorized to:

> (1) plan, direct, and conduct aeronautical and space activities * * * and in the performance of its functions, NASA is authorized in (c) (1) of that section:
>
> To make, promulgate, issue, rescind, and amend rules and regulations governing the manner of its operations and the exercise of its powers vested in it by law:

Under this section, NASA is authorized to establish and charge fees for launch and associated services.

In (c) (5) of that section 203, NASA is authorized to:

> Enter into and perform such contracts, leases, cooperative agreements * * * as may be necessary in the conduct of its work with any agency or instrumentality of the United States, or with any State, Territory or possession, or with any political subdivision thereof, or with any person, firm, association, corporation, or educational institution.

In the body of the organic act also it provides for NASA to provide services with or without reimbursemnt. In fact, the use of the words "cooperative agreements" was deliberate in order for NASA to be permitted to conduct services for the private sector and be reimbursed for those services. This language was based on several Comptroller General decisions at that time.

Later in 1962, when the American Telephone & Telegraph Company (A.T. & T.) requested NASA to launch its satellite, Telstar, this matter was checked with the Comptroller General of the United States and with the Department of Justice. Both affirmed that the words "cooperative agreements" were words of art and they indeed permitted NASA to provide launch and associated services on a reimbursable basis. The agreement with A.T. & T. was therefore designated a "cooperative agreement."

Some 7 years later, 1969, when the question was raised regarding NASA's authority to launch a communication satellite for Canada, the Department of Justice stated that there was no legal impediment to NASA's providing of launch services on a reimbursable basis. During the two decades of its existence, NASA has provided reimbursable launch services to U.S. Government agencies, to foreign countries, and to international organizations all on the authority of the NASA Act.

The question has arisen with regard to NASA's authority to operate a program after a basic technology has been developed. For example, when communication, weather, and Earth resources satellite programs were determined to be operational, NASA turned these over to other organizations. However, these were policy decisions that were made at the time rather than on the basis that NASA did not have statutory authority to operate them.

It, therefore, appears clear that the space transportation system could be operated by NASA in the near term without the necessity of additional legislation.

III. INSURANCE AND INDEMNIFICATION

I was particularly pleased to see that this committee during its deliberations on NASA's Authorization Act for 1980—Public Law 96-48—added a new section 308, entitled "Insurance and Indemnification," to the National Aeronautics and Space Act of 1958. That new section gives NASA broad and flexible authority to facilitate an orderly and equitable allocation of third-party tort liability risks among those involved in the operation and use of the Space Shuttle. This section 308 carries forward the underlying purpose of encouraging widespread commercial and other non-U.S. Government use of the new national capability that the Space Shuttle represents.

Ten years ago, on June 17, 1969, I testified before the Committee on Government Operations, House of Representatives, that NASA for some years previous had sought authority to indemnify contractors and to compensate victims for injury, damage, or loss that they might incur as a result of activities conducted for NASA by a contractor. Since the 86th Congress, NASA has attempted to obtain legislation to assure adequate protection to the public and to Government contractors for widespread injury, death, or property damage that may arise out of certain accidents.

While there are many statutes dealing with injury, damage, or loss as a result of natural disasters, that is, floods, hurricanes, et cetera, there is none of any consequence—with the exception of the Price-Anderson amendments to the Atomic Energy Act, 42 U.S.C. section 2210—that deal with injury, damage, or loss as a result of manmade catastrophic accidents.

Others are Public Law 85-804 limited to the availability or appropriations; 10 U.S.C. 2354, for research and development programs in the Department of Defense; 38 U.S.C., section 216, Veterans' Administration prosthetic and medical programs; and Public Law 94-380, the Department of Health, Education, and Welfare swine flu program.

Therefore, you can understand my feeling that a giant step has been taken by the Congress on the indemnification road.

During the consideration by the Congress of amendments to 31 U.S.C. section 724 dealing with appropriations for payment of judgments and compromise settlements against the United States, I suggested that this section also cover the settlement authority of NASA contained in subsection 203(c)(13) of the NASA Act—42 U.S.C. 2473(c)(13). This was done by Public Law 95-240. The amendment authorized that for any claims approved by NASA "for bodily injury, death, or damage to or loss of real or personal property resulting from the conduct" of NASA's functions, payment could be made "out of any money in the Treasury not otherwise appropriated." That March 1978 change was significant when NASA had to deal with claims that might have resulted from the return to Earth of Skylab.

Again, in the NASA Authorization Act, 1980, I was also pleased to see that this committee increased the authority of NASA to settle claims up to $25,000 from the previous amount of $5,000.

This concludes my statement. If you have any questions, I shall attempt to answer them.

Mr. FUQUA. Thank you very much, Paul. You were here this morning during the discussion with Neil Hosenball about the criminal and civil jurisdiction in the operation of the Shuttle. Is it your opinion that the United States has adequate protection in this area?

Mr. DEMBLING. I believe it does. I understand Mr. Hosenball's concern with regard to the criminal aspects. I believe that if it is worked out in the manner that he has suggested, it would solve the matter completely. With regard to the civil jurisdiction, I do not think that there is any problem at the present time.

Mr. FUQUA. What effects do you think that international issues might have on the Space Shuttle operation?

Mr. DEMBLING. With regard to the question of liability, the international aspects are certainly covered by the Outer Space Treaty of 1967. The other treaties such as the Registration Treaty, and such as the Astronaut and Return of Space Objects Treaty cover other aspects of the Space Shuttle program.

Mr. FUQUA. On the part of your statement that dealt with the study of the National Academy of Public Administration, if Space Shuttle operations were turned over to some other agency, who do you think that agency should be, or should it be a new corporation?

Mr. DEMBLING. That was one of the greatest problems the panel had in considering where the program might best be located, if it were not located in NASA. We considered the Government Corporation Control Act as a vehicle for establishing a Government corporation. A corporate organization could be established within NASA as well as any other agency, or independently. We felt that the Government Corporation Control Act provided impediments to a smooth functioning organization that would be required to deal with the kinds of problems that the Space Shuttle has before it.

One serious problem would be that the corporation's financial accounting be on a business-type basis. All costs as well as income must be explicitly identified in a profit-and-loss presentation. That was one reason we did not feel that that was a viable basis. We concluded that NASA would be the best place for the space transportation system until it really got going as a fully operational program.

Mr. FUQUA. You have had a strong background in NASA, your work at the General Accounting Office, and others. From your perspective, do you see the regulations and policies that NASA has issued relating to the Space Shuttle, as promoting or impeding the utilization of the Shuttle?

Mr. DEMBLING. I have not studied all of the regulations in depth, but I have reviewed some of them. I think that what NASA has been doing recently has tended to promote space operation. The move toward fixed-price contracts, assuring reflights when there have been failures, the patent and data policies, have all tended to make this program much more viable.

I think that the indemnification provision is a tremendous breakthrough in the liability arena, and I think that that will make for greater enhancement of the program.

Mr. FUQUA. Do you think that NASA's policy as it relates to the rights of patents and data policy should be more stringent, or do

you think there is adequate protection for both the private sector as well as Government?

Mr. DEMBLING. I recall that when the NASA Act was first passed, there was a great concern at NASA that the patent provisions, would tend to make contractors move away from contracts with the agency. That really never happened. I think it did not happen because of the approach taken. The agency gave exclusive licenses. This was more than other agencies gave. I think that NASA has been using that authority properly.

The procedure for exclusive licensing of contractors who have developed inventions or innovations has done a great deal to move away from the "warehousing" of patents that I see in most agencies at the present time. Taking title to inventions created under Government contracts does not create the conditions for use of those inventions in the marketplace for utilization by the private sector. It really does not do anything for the use of those patents for which the Government has title. It has been a warehousing operation for the most part.

Mr. FUQUA. Throughout the discussions there has been talk of privately funded shuttle user. What would be your definition of that? How would you classify a private funded shuttle user?

Mr. DEMBLING. I am not sure I fully understand your question, Mr. Chairman.

Mr. FUQUA. They mentioned the private funded user. What in your mind constitutes a private funded user?

Mr. DEMBLING. Is this a situation where the——

Mr. FUQUA. Somebody has a payload that goes on. Maybe it was developed with Government funds at some point. We try to categorize what is private funded versus Government funded. It is really related to patent rights, and so forth.

Mr. DEMBLING. Where there is proprietary data developed by a Government contractor, and that contractor seeks to protect that data there can be agreements entered into with the Government for its use by the Government.

I am familiar with agreements that have been entered into by contractors with the Government to protect its proprietary data, and for the Government to have full use of that data, but not to release it to other parties that might be in competition with that developer who developed the technology with his own funds. There can be agreements entered into to protect the proprietary data, the innovations, the trade secrets that have been developed by the Government contractor and yet for the Government to have full use.

Mr. FUQUA. Do you think that is adequate now?

Mr. DEMBLING. I do not see any problem there. It depends on how the agency carries out the authority it has to enter into such agreements. There can be licensing of that proprietary data based on agreements with the Government contractors, that is licensing for Government purposes, and still protect the one who has developed the basic technologies with its own funds.

I do not see any problem in that arena, and I think that the NASA Act provides enough flexibility so that those kinds of agreements can be entered into.

Mr. FUQUA. Thank you very much for your testimony. I apologize for keeping you later.

Mr. DEMBLING. That is quite all right.

Mr. FUQUA. The subcommittee will stand adjourned.

[Whereupon, at 12:40 p.m., the subcommittee adjourned.]

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