PSAC AD HOC SST REVIEW COMMITTEE

REPORT

03/30/69

033069.SST

03/30/69 Final Report of the Ad Hoc Supersonic Transport Review Committee, Office of Science and Technology (R.L. Garwin, Chairman). (033069.SST)

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY
WASHINGTON, D.C. 20506

August 17, 1971

Dear Mr. Koff:

Enclosed for transmittal to your clients, Messrs. Gary A. Soucie and W. Lloyd Tupling, is a copy of the "Final Report of the Ad Hoc Supersonic Transport Review Committee". In the suit Soucie v. David, which names myself and the Office of Science and Technology as defendants, you have sought to obtain the release of this report under the provisions of the Freedom of Information Act. Our compliance with your request will moot any further litigation. Accordingly, a motion to dismiss is being filed by the government in the District Court.

Our action in this regard has been prompted by continued public interest and certain impressions which have arisen depicting the government as attempting to conceal hitherto undisclosed factual data on the SST program. To dispel any further misconceptions that might result from continued litigation, we are releasing the report at this time.

In connection with its release, I would like to place the report in proper perspective so that there can be no misunderstanding about its role in the formulation of the Administration's position on the SST program. The report was one part of a full consideration of the program in early 1969. Other reviews recommended continuation of the program in contrast to one recommendation of this report. After studying all the factors involved, on September 23, 1969, President Nixon formally announced a go-ahead on the program.

The views expressed in the report were, of course, those of the committee members, presented to aid in the decision-making

process. In releasing the report, we do not imply that those views are supported by the Administration.

Sincerely,

Edward E. David Jr.

Edward E. David, Jr.
Director

Mr. Peter L. Koff
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~~PRIVILEGED~~

Released by US Govt. 8/17/71

OFFICE OF SCIENCE AND TECHNOLOGY

FINAL

REPORT

OF THE

AD HOC SUPERSONIC TRANSPORT REVIEW COMMITTEE

March 30, 1969

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FINAL REPORT OF THE AD HOC SUPERSONIC TRANSPORT REVIEW COMMITTEE OF THE OFFICE OF SCIENCE AND TECHNOLOGY March 30, 1969

I. INTRODUCTION

The U.S. Government is currently engaged in a development program for the design, development, fabrication, assembly, and 100-hour flight test of two identical prototype supersonic transport aircraft. According to the Contract and its important Modification 15, "the prototype airplane shall constitute the basis without construction of any intermediate models, for a safe and economically profitable production version of the SST." Further, by January 15, 1969, the contractor shall submit to the Government, "a completely integrated design, fully substantiated by physical tests and detailed engineering analyses, as distinguished from estimates, approximations, or parametric designs.... The design will clearly and satisfactorily demonstrate, in the judgment of the Administrator of the FAA, that a prototype airplane manufactured in accordance with such design will meet the criteria and requirements for the prototype airplane specified in Exhibit A, Part I, Section D" [of the contract].

In order to help guide a U.S. Government decision among the possible courses of action, the Ad Hoc Committee submits this report, the result of eight full days of intensive deliberations,* including briefings from General Electric and Boeing, as well as a visit to Boeing.

II. POSSIBLE ACTIONS REGARDING THE DEVELOPMENT CONTRACT

As of April 1, 1969, the Government will have open to it the following important choices:

1. to continue the development program as contracted, with a 90%-10% cost sharing up to the cost over-run point of $909 million (total of the current phase for Boeing and General Electric Company), and with a 75%-25% cost-sharing beyond that (for a total FAA-estimated Phase III cost of $1.14 billion),

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*We have had briefings or discussions from those individuals listed in the Appendix.

2. to terminate "for default" the contract with Boeing before April 15, 1969, thus recouping some $47 million which would be lost if the contract were terminated "for convenience" or after that date,

3. to terminate the contract before April 15 "for convenience", having obligated a total of $481 million, and with a further expenditure of about $40 million required,

4. without terminating the contract, to negotiate a further modification of the contract in order to lead to a prototype program in some way more desirable to the Government.

Termination for Default

There are substantial grounds to believe that the Government could terminate the contract "for default." These grounds are of three types:

1. The fixed-sweep prototype, as proposed, will have take-off and landing runs some 50% longer, take-off and landing speeds very substantially higher, and other characteristics deficient with respect to the prototype required under the contract.

2. In addition to the individual deficiencies as exemplified above, the philosophy of the contract may be judged not to be followed. According to Modification 15, the contractor must demonstrate a high-assurance program to actually develop the prototype, but serious unresolved questions remain, and in many ways the design is not fully substantiated as required by the contract.

3. It may be judged that the contractor has not demonstrated that the production airplane which follows from the prototype will be a "safe, economical ... " commercial supersonic transport.

We cannot judge the legal question of default, but it is a matter of urgency that material supporting such a judgment be obtained from the Department of Transportation.

III. ALTERNATE PROGRAMS

Aside from the formal question of the contract, there arises the problem of the Government's goals in this matter. As we see it, the Government might proceed with programs of various types.

1. The Government could continue its support of the development program, with concurrent or decoupled production, but abandoning the philosophy that the program be of low risk and recognizing the high probability that government support will be necessary to obtain the $3.5 billion to $5.5 billion of capital necessary for a production program. Thus the Government could explicitly recognize that an all-private program to lead from the present prototype development to an economically viable aircraft is unlikely of success, and the Government could continue notwithstanding.

2. The government could proceed with a prototype program only, well decoupled from a production program, and make the explicit statement that it would not be involved in any way in the financing of the production program. In this way the Government's investment could perhaps be limited to some $2 billion without commitment of national pride and without labored and overdrawn arguments as to the desirability of the Government's participation. At the same time, the Government could support large-scale experiments properly designed to test the influence of the factors on which the demand is based. In this case, the government might propose that funding arrangements be modified to eliminate the provision for recovery of government investment, but with greater participation by the industry (Boeing and General Electric) during the prototype development phase.

3. The production aircraft could deliberately be accepted as one of significantly shorter range or smaller payload than specified in the present contract, and the Government could count on eventual growth of the engine in order to produce an economically viable aircraft. This might require explicit subsidy during production and probably during operation, until a second-generation aircraft were introduced.

4. Finally, the Government could terminate the contract now, whether for default or for convenience, announcing that the reasons advanced for the program have been found wanting, that likelihood of return of the Government's money is not high, and that many technological goals have already been achieved, with further work on the program benefiting largely the supersonic transport and not the Government Treasury, nor technology in general, nor with considerable likelihood the balance of payments.

IV. CONSEQUENCES OF NOT PROCEEDING WITH THE U.S. SST

Among airlines and informed individuals there is widespread agreement that there is no economic reason for proceeding with the U.S. SST in the absence of a commercially profitable advanced Concorde or TU-144. U.S. airlines can fly the Concorde competitively against foreign carriers, and any consequences of the absence of a U.S. SST must then be sought in the detrimental effects on the U.S. aviation industry (Boeing Aircraft Corporation in particular) or in the effects on balance of payments. There seems to be an assured market for Boeing 747's and for continuously improved subsonic aircraft, thus contributing to the health of Boeing and to the balance of payments in much the same way as (and largely in competition with) a successful SST.

The chief disadvantage of terminating the SST program might be sought in the dislocation of those currently engaged in the program and in the "loss of aviation leadership." At present Boeing is spending at a rate approximately $5.5 million per month, and the 2100 people on the program could well be used to strengthen the Commercial Airplane Division at Boeing and to improve Boeing's position as bidder on certain military airplane contracts. Further, there are other aspects to "leadership in aviation" than the flying of profitable or unprofitable supersonic transports. As indicated elsewhere, the U.S. already has the technological leadership in the form of the Mach 3 cruise SR-71, and we look forward to leadership in making reliable, rapid, and efficient air transport available to more and more of our people.

In any decision concerned with uncertainty, it is desirable to understand the maximum possible exposure. The extreme condition through, say, 1990 with a successful Concorde and no U.S. action appears (according to analyses done for the FAA)

to involve U.S. airlines buying and operating perhaps 230 total Concordes at a purchase price of some $20 million each. Since this possibility is not a critically severe threat to our national interests or well-being, we believe that the SST program decision can be taken on the basis of expected value and not on the basis of a necessary hedge against disaster.

V. FINDINGS

FINDING 1: Technical Risk.

We are quite confident that a prototype, Mach 2.7, 635,000 pound aircraft can be built and flown by the contractor. We believe it highly unlikely that this goal can be achieved by March 31, 1972, with a prototype of such a nature as to adequately demonstrate the payload and to serve, with only 100 hours flight test, as the foundation of a safe, profitable, economical production supersonic transport. Specific items of the program are of high risk--among them the noise specifications, the matching of the engine inlet to the airframe as well as the engine to its inlet, and the adequacy of the landing gear. More important and more fundamental is the fact that the estimated design payload constitutes only 7% of the aircraft gross weight, as contrasted with a realized 12-30% for a subsonic commercial transport of longer range. Our accuracy of design of structure, and our ability to calculate fuel consumption and adequate fuel reserves is not such as to insure that the payload will exceed 2%, which would have disastrous effects on the economics of the aircraft, although such an aircraft could indeed fly and even fly across the ocean with greatly reduced passenger load. In short, this is a very sensitive airplane, and it is not unlikely that the prototype would demonstrate a payload-range combination considerably smaller than that estimated.

FINDING 2: Timing of the Production Program.

We find it highly unrealistic to expect to obtain all-private financing for the production aircraft before the prototype aircraft has been flown and extensively modified as required. We believe that a decision to go to production should not be made sooner than about a year after the first flight of the prototype, which itself might be delayed until December 1973. Production decisions might well not be taken until 1975,

and the commercial SST might then appear in 1981. We find that the risks associated with the accelerated time scale of the existing program are unacceptable for a commercial venture.

FINDING 3: Market Demand for SST.

Just as the performance of the aircraft is so highly leveraged by its payload, and the accuracy of our design methods is inadequate to determine this payload to within 50%, so the demand side of the question as to the commercial viability of a supersonic transport is equally uncertain. Demand has been estimated from the projected growth of air travel, the increase of incomes in the relevant period, the estimate that a traveler values his time at 1.5 times his hourly earnings rate, and a supersonic stimulation of travel (trips, for instance for business reasons, which would otherwise not have been made) of 40%. These factors are all highly important in the estimate of a successful program.

The sonic boom of the Boeing SST, of the Concorde, and of the Soviet TU-144 are all such that public reaction in the U.S. and in Europe will not allow their operation over land. We recommend below that the U.S. Government state that SST's producing a boom intensity in excess of 1 pound per square foot can clearly not be operated acceptably over land, that all presently conceived SST's far exceed this intensity, and thus will without question be denied operating permission over the U.S. There is universal agreement that there is great uncertainty in the market estimated for supersonic transport restricted from flying over land. No steps have been taken to resolve these uncertainties (as by controlled experiment to determine the value of time), and we find that they will not be appreciably less by the time the production decision is desired in 1971 or 1972.

The airlines believe, and we agree, that the SST would have to be operated at a fare surcharge, but the response of passenger demand to a given surcharge is most uncertain. For instance, intuition suggests (in agreement with the views of certain U.S. airlines but with no strong statistical support) that SST-induced traffic across the North Atlantic will be business traffic. However, the declining percentage of business travel in international routes may reduce substantially the average value of time and the supersonic stimulation, perhaps to the point at which only 250 airplanes would be sold in

competition with subsonic jets at reasonable fare surcharge. Further, we note that the 747, which will be mature in service by 1976 will undergo continuing improvements in productivity (and, for instance, in in-flight entertainment or comfort) and will be an even more formidable competition for the SST than the 1970-era subsonic transport assumed in the analyses to survive unchanged to 1990. This evolution may thus reduce the market even for a technically successful SST to a very low level. In short, the market is a great unknown, which will not be resolved by a prototype program. If the Concorde enters commercial service, even unprofitably, we will obtain considerable information on these questions.

Air-traffic-control delay in the terminal area can substantially affect the feasibility and profitability of the SST, to a considerably greater extent than for a subsonic aircraft, in part because the subsonic craft have greater design ranges and can thus be flown over the shorter trans-oceanic ranges with greater loiter time than the SST, and in part because the productivity of a craft making a 6-hour transit is not so much diminished by a 2-hour delay as is that for a craft making a 2 1/2-hour transit. While it is within the U.S. competence to have an adequate air traffic control system by 1978, there is no program in being (because of lack of technical leadership and budgetary limitations) to provide the airports and the systems to achieve this goal in the face of that same rising traffic which is necessary, but not sufficient, for a commercially successful SST.

Although the FAA now estimates a sales price of $40 million for the SST, recent experience with the C-5A shows that it is possible for a technically successful program, nominally within the development budget, to result in a production aircraft costing 75% to 100% more than the contract price. During the same time, the 747 has been developed and is being sold presumably profitably at the price originally specified. Should the SST sales price escalate by 50% to $60 million, the FAA-expected market of 500 aircraft would drop to some 250 aircraft, making a very unattractive program. This very real possibility adds to the uncertainty of a viable SST program.

Further uncertainty of the market results from the necessity to predict the actions of IATA (International Air Transport Association). IATA often sets fares higher than those which would be achieved on a free market. IATA is likely to

attempt to prevent 747 fares from dropping and is also likely to insist on a surcharge of SST flight, just in order to reduce the demand, if such should develop. If SST's become common, IATA may well attempt to reduce the necessary surcharge by increasing the level of subsonic fares, thus increasing the minimum cost of available transportation. U.S. international air carriers, as well as a few others, have long urged lower fares for international travel, and there is a real policy question as to the extent to which the United States government wants to support this essentially restrictive association. In any case, IATA obviously is more interested in minimizing the losses of small, uneconomic, foreign international carriers than it is in maximizing either the profits of manufacturers, of the U.S. airlines, or the interests of airline travelers.

FINDING 4: Availability of Capital for the Production Program.

We believe that private financing will be very difficult to obtain in 1972 for a venture combining risk with such nominal return as the SST promises even if the FAA estimates should be realized. Boeing's report of June 1968 on the plan for financing Phase 4 (extensive prototype flight testing, certification, and engineering--$395 million) and Phase 5 (production--$3-5 billion capital required), judges it probable that adequate private risk capital to finance SST production will not be available in the early stages of the program. Boeing agrees at present that there is a very high probability that Phases 4 and 5 cannot proceed without government involvement; e.g., in the form of loans, guarantees to private investors, etc. This is true even if the call for capital is delayed until the technically successful conclusion of Phase 3, since the expected return on investment is not attractive to private capital. This view is equivalent to the statement that the U.S. Government investment in the Phase 3 prototype development will not lead to U.S. SST's without further Government involvement less advantageous to the government than to the suppliers of private capital. It should be noted that the sales price for the SST would be set by Boeing, and at such a level as to maximize the expected return to Boeing and to the suppliers of private capital. With a monopoly supplier, this is likely to result in a price somewhat higher than the market prices determined by the FAA analyses, and thus a return to the Government on its development investment even lower than would otherwise be the case.

FINDING 5: Status of Concorde and TU-144.

The first Soviet supersonic commercial air transport flew December 31, 1968, and the Concorde initially in March 1969. Both aircraft have thus far been flown only at subsonic speeds, and the Concorde, at least, is not expected to fly supersonic until December 1969. Both aircraft are aluminum and thus limited to Mach 2.0 to 2.2. Having reviewed the existing knowledge on the Concorde and TU-144, we believe that the Concorde of the present size, and its production versions (unless they are entirely different aircraft), are too small and have too little margin to be productive aircraft for trans-oceanic flight. For example, the production Concorde, with capacity for more than 124 seats, is now expected by the airlines (February 27, 1969) to carry only 95 passengers Paris-New York and only 66 Frankfurt-New York, with further restrictions at New York on days warmer than 82°F and at Madrid beyond 45°F. A larger, follow-on Concorde would bear not much more relation to the existing prototype than would a U.S. SST to the U.S. B-70 and SR-71 experience.

The TU-144 has considerably more growth potential than the Concorde, but with a design range of some 2500 miles. It is thus not competitive with the Concorde in its present form. Further, although the Soviet Union can offer the TU-144 at an arbitrary price, foreign airlines would have to be assured of a continuing relationship with the Soviet Union, of a supply of parts, etc., as well as, of course, of an operating profit with reasonable fares. It is not at all clear to us that extensive Soviet sales of the TU-144 (to U.S. airlines, as well) would be to this country's disadvantage, particularly if the aircraft were sold at a loss.

FINDING 6: Government-Manufacturer-Client Relationships.

It has been a ground rule of the U.S. SST program that the Government support should interfere as little as possible with the traditional relationship between the manufacturer and the airline client. This results in the Boeing Company's freedom to set the price of the aircraft*, to require progress payments by the airlines, to defer payment to its suppliers, etc. It also results in the U.S. Government supplying a one-sided loan, with substantial risk of loss of its investment and with a rigid limit on the amount which can be returned, dependent not upon the profits earned by Boeing but simply on the number of aircraft

*Although the Director of the FAA SST Development Program has stated otherwise, legal advice to the Panel does not support the right of the government to influence prices.

sold. The Boeing Company report on the development of a plan for financing Phases IV and V indicates that further government participation will be required, in the form of guarantees, low-interest no-recourse loans, or other involvement which will have the result of increasing the yield and reducing the risk to private suppliers of capital, while putting the taxpayers of the United States in a position of higher risk and much lower maximum return. We believe that is an improper role for the U.S. Government.

FINDING 7: Environmental Problems.

Adverse effects of the SST on the environment can be considered either as a technical deficiency in the prototype development program or as an impediment to successful marketing. Among these effects are the noise of the SST in the vicinity of the airports (particularly, high "sideline" noise), and the possible influence on the climate of the large quantities of water left in the atmosphere at 60,000 to 70,000 feet by the operation of large numbers of SST's. The airlines and the manufacturers are already paying substantial penalties in increased development cost and reduced potential performance in order to reduce airport noise to a more acceptable level (from, say, 125 dB for community noise on a 707 to about 110 dB for community noise on a 747). The sideline noise in the range 118 to 125 dB expected for the SST is far above the trend which can be achieved with profitable subsonic aircraft (about 105 dB for a 747), and may result either in excessive economic penalties for the SST or in a great increase in noise level in the vicinity of certain international airports. In either case, the noise characteristics of the SST add substantially to the market uncertainty.

VI. REASONS FOR GOVERNMENT PARTICIPATION IN THE DEVELOPMENT PROGRAM

The following four reasons are advanced in support of Government participation in the development program.

1. The Government will invest $1.3 billion, which in case of a successful production program, will be returned by the 300th production aircraft. If 500 aircraft were produced on the accelerated program as it now stands, the Government would receive a return-on-investment ("ROI")

of 4% by the 500'th aircraft (the FAA estimate of the market).

FINDING

We believe that the development cost will substantially exceed $1.3 billion, both because of difficulties and over-runs and because of the necessity for extensive flight tests. Further, we believe that a practical production program, whether privately or government financed, will result in aircraft at least two years later than presently planned, thus delaying the Government's return and further reducing the ROI. More importantly, we do not regard the recovery of the Government's investment itself as very probable, and find that this is a high-risk investment with a very limited maximum return. Both the government and the private sector can do much better with their money in other programs, the private sector choosing from the great range of ventures from toll roads to subsonic aircraft to educational technology, and the public sector other programs with lower risk and much larger return. Even if the government investment at a low ROI and high risk makes private capital available, the low over-all return on investment indicates that the benefits and growth derived from this program would be less than the private sector would create on its own, without direction from the government.

2. It is claimed that a successful supersonic transport program will give the Nation leadership in aviation, thus advancing the aircraft art, enhancing national pride, and contributing (by technological fallout) to other fields.

FINDING

We believe that the technogical contribution to other fields will be very limited. Elements of the SST are already under development for other reasons. Some real advances have already been made by the SST program in the fabrication of titanium, and these will be employed and refined in military and subsonic commercial aircraft. National pride is very difficult to assess, but we must also look at the blow to national pride if a profitable supersonic transport is impossible or if it can be supported only by government subsidy. There

is no doubt that a successful development program will aid supersonic commercial flight, but this specific benefit is already included in the other reasons.

Leadership in aviation is important, to enable U.S. industry to sell abroad, but further, to contribute by means of a reliable, rapid, and inexpensive transportation system to the pleasure and effectiveness of U.S. citizens and to the productive growth of the Nation. As for the technology of supersonic cruise flight, the U.S. has undoubted leadership as evidenced by the frequent operational flights of a fleet of Mach-3 cruise SR-71 aircraft, which have been flying routinely for several years. Thus the U.S. is not irrevocably prevented from entering the commercial SST field at some later date. Further, the U.S. has a base from which leadership in aviation could be built in the direction of automatic flight-control-systems, advanced air-traffic-control systems, improved airport access, and improved customer service. There is a rich array of alternative programs which could contribute to leadership in aviation, of which we are aware as individuals but which we have not investigated in depth as a committee. Some of the possibilities have been subjected to considerable analysis, e.g. V/STOL transportation systems, or are more conventionally deserving of government support (e.g., air traffic control).

Further, leadership in aviation and contribution to airline safety, both domestic and foreign, could be achieved by the initiation of a program of communication and navigation satellites, which could then be used as a base for automatic precision navigation and surveillance. Another opportunity for leadership in aviation, requiring government participation, would be a program to provide on-board standard equipment for all existing U.S. aircraft, including general aviation, to allow greater automatization of the air-traffic-control system.

3. The claim is made that a successful U.S. supersonic transport development program will contribute to the balance of payments by the sale of aircraft to foreign flag carriers, and that an American SST will keep us from having to buy Concordes with a resulting unfavorable balance of payments.

FINDING

A commercially successful U.S. SST would lead to substantial aircraft sales to foreign airlines and to reduced

purchases of the Concorde by U.S. airlines. The increased receipts on the aircraft account, however, would be partially offset by reduced sales of U.S. subsonic aircraft and increased U.S. ticket expenditures on foreign airlines. More importantly, a substantial part of the market for a U.S. SST is estimated to result from increased travel induced by the higher speeds; this increased travel would substantially increase U.S. travelers' ground expenditures abroad, as has occurred since the introduction of the subsonic jet aircraft. On net, the balance of payments effects may be either positive or negative but are likely to be small.

More fundamentally, we seriously question the relevance of possible balance of payments effects in the 1980's to decisions on present government programs. The very real present international financial problem is due to gold outflow and the rigidities of the present international financial system. Since World War II, the outflow of gold from the U.S. has been essentially independent of our net balance of trade position. Even a high-confidence prospect of positive balance of payments effects in the 1980's would not alleviate the fundamental problems--either now or then. Indeed, it is even possible that we shall be trying to find means to decrease a "favorable" balance of payments in the 1980's.

4. The claim is advanced that a successful SST production program will involve some 50,000 direct employees, supported by some 100,000 indirect employees, together with a considerable multiplier effect on the economy. Thus it is noted that this program would contribute substantially to the general domestic economic well-being of the United States.

FINDING

The SST program would have about the same employment effects as other public and private programs involving a comparable expenditure for capital and highly skilled labor. A favorable multiplier effect on the nation's economy would occur only if these resources would have been idle in the absence of the SST program. Under present and projected employment conditions, the primary employment effects would be increased relative employment in the local areas in which the SST is produced and an increased relative price of certain resources (e.g., aviation engineers, titanium, etc.) to the nation as a whole. More importantly, it is clear that other programs

would yield a higher rate of return with less risk, as evidenced by the anticipated difficulty of raising private capital for the SST, even after a substantial government investment. The SST program would reduce our potential for economic growth by the amount of the difference between the returns from the program and other public and private activities. We conclude that the claimed employment effects must be dismissed as a relevant argument for the SST program.

VII. UNDER WHAT CONDITIONS IN GENERAL IS IT DESIRABLE FOR THE GOVERNMENT TO SUPPORT DEVELOPMENT?

This question is one of the utmost importance and involves the basic role of government. At the outset, we note that we are unanimous in recognizing an important and vital role for government in supporting a wide range of development activities which promise major potential benefits to our society.

1. The Government has an obvious responsibility to stimulate development which improves the effectiveness or economy of government operations such as the postal service, education, and national defense.

2. The Government should also assist development in those areas where private initiative is inadequate to bring important new products or services rapidly to the market place because of the inability of an individual or private organization to reap the full benefits of his development effort. This latter situation can occur as a consequence of restrictive codes, regulations and government policies which prevent rapid commercial exploitation, or because it is easy for others to copy the original innovation without contributing to the costs of development. Examples could include large-scale manufacture of housing, and high-speed tunneling machines.

3. There also are cases in which a development program has a low probability of success but the benefit to society would be very large in the event of success. Government support of such activity is almost always essential if the magnitude of the required development investment is high and this support seems in order if the expected return on the Government's investment is high enough to compensate for the risk. Nuclear power plants were developed in accordance with this rationale.

4. Finally, there are instances in which simultaneous decisions are needed by several factions, including regulatory agencies, if developed equipment and techniques are to reach the intended market. Private sector investment is inhibited under these conditions because all involved parties must agree to move in a common direction of technological advance in order to exploit the benefits of the development. In the aviation industry, for instance, coupling will be required among VSTOL civil aviation, automatic-flight-control equipment, and advanced air-traffic-surveillance and navigation systems. In this case, the aircraft manufacturers, the pilots, the controllers, the FAA, and the airlines must agree on an over-all system and no one of these groups can safely proceed to develop a portion of the system without assurance of technical and schedule compatibility in the other areas.

The development of a supersonic transport does not fit into any of the four categories outlined above for extensive governmental support. In this sense the SST program, if continued with heavy government support, creates a new precedent for the support of large-scale development projects leading to a single product of a single manufacturer; the benefits of which are limited and, if realized, will be enjoyed by a relatively small high-income segment of the population.

VIII. RECOMMENDATIONS

1. We recommend the termination of the development contracts and the withdrawal of Government support from the SST prototype program. We take this position for the following reasons:

a. Even if the present program is successful, SST operating costs will exceed those of then-available subsonic aircraft. The attendant surcharge makes the airline market uncertain, and given present pricing practices may lead to high subsonic fares.

b. The airplane market uncertainty, coupled with the developmental and production cost uncertainty and the magnitude of the investment involved makes the program unattractive to private financing at the present time. For these reasons substantial government involvement is likely to be sought in the supply or guarantee of some $3-5 billion of capital for the certification and production of a U.S. SST.

c. There is a substantial uncertainty regarding the range and payload and the environmental effects of a production aircraft flowing from the present prototype development program. The costs and duration of the program are both likely to increase in the attempt to develop an adequate production aircraft.

d. There is substantial doubt that the present configurations of the Concorde and the TU-144 will become commercially viable aircraft.

e. If the Concorde ultimately does become a viable commercial aircraft, U.S. carriers will buy it, but the balance of payments argument is not so strong as to warrant a present government investment in the U.S. SST.

f. We recognize that cancellation of the SST development program will prevent the U.S. from having a competitive SST until the late 1980's at best. We feel that the prestige associated with a U.S. SST does not warrant the expenditure involved. Further, in view of the doubtful performance and economic viability of either the Concorde or the TU-144, together with present U.S. leadership in sustained supersonic cruise aircraft (the SR-71 holds 9 world records and its performance merits a total of 20) we conclude that U.S. leadership in aviation does not depend upon an affirmative U.S. SST decision in the near future.

g. The SST is essentially a large commercial venture. When the right combination of technology and market demand appears, the U.S. aircraft industry may well decide on its own to proceed with the development and production of an SST. In that case U.S. Government financing would be unnecessary. Without that private conviction Government involvement seems inappropriate.

2. If the Government proceeds with an SST program, contrary to our Recommendation 1, we recommend:

a. that the Government modify the presently conceived program of prototype development and overlapped production to allow for an extended period of flight tests and experimental refinement of the aircraft before making a commitment to a production program, and

b. that the Government plan to participate in financing the SST program through certification and well into the production phase.

3. In any case we recommend

a. that the Government take positive action to ensure that the knowledge and technology developed to date with the SST program be available throughout the entire U.S. civil and military aircraft industry.

b. that the Government form a high-level policy committee to determine the possible benefits and penalties associated with continued support of the International Air Transport Association (IATA), or alternatively, with a concerted effort by the U.S. Government to introduce lower fares or fare competition in international travel. This single policy question has more potential impact on the U.S. balance-of-payments position and on the availability of travel than does the SST program and it should be the result of a conscious decision.

c. that the U.S. Government publicly announce that the sonic boom characteristics of the SST, the Concorde, and the TU-144 are expected to be far above the 1 pound per square foot level, which itself would be unacceptable for overflight of the United States, and that action be taken to establish rules under the authority of Public Law 90-411 to deny such commercial overflight. Research to determine a lower acceptable boom level should continue.

d. that the U.S. Government immediately proceed to establish noise criteria for SST aircraft which are the same as the standards applied to equivalent gross weight subsonic aircraft under Public Law 90-411. It is important that all succeeding generation aircraft be required to demonstrate compliance with these criteria.

APPENDIX

The Ad Hoc SST Review Committee heard briefings from or engaged in discussion with many qualified persons, among them:

Federal Aviation Agency

Major General J. C. Maxwell

Boeing Company

D. Bale
H. Haynes
K. F. Holtby
J. A. Horn
H. E. Hurst
V. J. McCrohan
D. J. Olson
P. L. Peoples
J. Swihart
T. A. Wilson
H. W. Withington
J. Yeasting

General Electric Company

L. B. Davis
D. E. Hood, Jr.
J. C. Pirtle

Institute for Defense Analyses

N. J. Asher

TWA and the Airline SST Committee

R. W. Rummel

Pan American

W. W. Hibbs

The Committee also had many discussions with individuals, such as:

R. Bisplinghoff
N. Golovin
C. W. Harper
D. J. Hornig

and with personnel of Booz-Allen and of the Central Intelligence Agency.