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STATEMENT OF ALAN S. BOYD, SECRETARY OF TRANSPORTATION, BEFORE THE SENATE COMMITTEE ON AERONAUTICAL AND SPACE SCIENCES ON JANUARY 26, 1967.

Mr. Chairman and Members of the Committee:

I am Alan S. Boyd, Secretary of Transportation. I appreciate the privilege of appearing before you today to discuss the important subject of policy planning for aeronautical research and development.

I wish I could tell you precisely what our research and development policy is or will be. I would then be in a position to talk about the anticipated results of such a policy. Unfortunately, at this stage in the formation of the Department, firm statements are not possible. At best, I can give you an expression of my personal thinking on the problem as of now. I may want to return a year from now and disown some of it.

The Department of Transportation, naturally, expects to play a very large role in developing executive branch policy for aeronautical R & D. Congress, in enacting the legislation that created the new department, declared that among the purposes was the establishment of a department "to stimulate technological advances in transportation; to provide general leadership in the identification and solution of transportation problems; and to develop and recommend to the President and the Congress for approval national transportation policies and programs to accomplish these objectives . . ."

One step in the fulfillment of these purposes is the undertaking of comprehensive studies of the entire transportation system of the United States. This to be followed by detailed recommendations as to what our transportation goals should be and what kind of a transportation system would best meet the goals. During the early days of the Department, research and development may well be its most productive function.

I believe the present status of our aviation industry is a testimonial to the value of past aeronautical research. America's advanced technology has produced the finest aircraft in the world. The world demand for these aircraft has maintained high levels of investment and employment in the nation's aircraft manufacturing industries and their suppliers, and continuously placed a plus sign in the U. S. International Balance of Payments Account. With this advanced technology, airlines have risen to a place among the leaders in the U. S. economy. I note that between 1950 and 1966, revenue ton miles carried by U. S. scheduled air lines increased at an average annual rate nearly four times that of real Gross National Product. And during the same period, air line employment rose from 83 thousand to nearly 206 thousand, to remain one of the few rapid employment growth industries in the domestic economy. Moreover, the investment expenditures of airlines ranked 7th among the nation's leading industries in 1965; and the level of investment spending is considered by economists as a key factor in sustained national economic growth.

From the aviation developments there is also a technological fallout which aids in the solution of other transportation problems. For example, turbine powered rail cars, ground effects machines and surface effect ships are all largely derivatives of aviation technology.

I can observe no sign of any abatement of these trends. Most industry forecasters are bullish on future rates of growth in both passenger and cargo service and the levels of employment and investment. They base their optimism on the results of a still more advanced technology that lies just beyond - jumbo jets with their low cost passenger fares and their potential for cargo

service; supersonic transport with its mastery of world distances as well as time; aircraft based on C5 or equivalent technology for the short-haul market; and vertical or short take off and landing craft which may serve in the short-short haul market, the 25 to 200 mile area where most intercity trips occur.

Despite such promise for the future, I feel that serious operational defects have begun to appear in our air transportation system. One of these is the problem of airport congestion, a problem which threatens to minimize all that has been gained through advanced aircraft technology. At the same time, aircraft noise and sonic boom have emerged as serious social problems. These problems plainly indicate that notwithstanding the quality of our past research, our future research efforts must be broadened.

The airplane, more than any other vehicle, is dependent upon other forms of transportation. We can all see that the airport is a tremendous generator of surface transportation demand. We have , in the past, simply ignored this fact and allowed our airports to develop independently of ground transport facilities. Ordinary efficiency requires, and emergency conditions demand, that present airports be improved in their relationship with surface mobility. And our future airports should not be developed except as integral parts of total transportation systems.

In my opinion, we have yet to use the systems analysis process effectively in the development of airports as part of the air transportation system. Although military jet bombers ought to have been seen as the forerunners of commercial jet transports, few airports had the facilities to support their

operation when they were placed in service. Similar conditions are developing with regard to the jumbo jets and the supersonic transports - aircraft which were being designed several years ago and which are still half a decade from commercial operation. It has been stated, conservatively, I believe, that airport development always lags at least 3 years behind the airplane.

These new high-capacity aircraft will emphasize the dependency of air transport on surface modes to a greater degree than ever before. There is, it seems to me, little wisdom in permitting the simultaneous arrival of two or three 747's and the abrupt discharge of over a thousand passengers unless there is some way to process and remove these people from the airport quickly.

In air cargo the problem may be even more complicated. Size and weight limitations have prevented aircraft from participating fully in the intermodal transfer of containerized cargo. The arrival of the super cargo craft, with its ability to handle a number of the standard 8 X 8 X 40 foot van containers, will make it possible for the airplane to become a full-fledged participant in a coordinated freight transport system. But for this to happen, a great deal more attention must be given to the systematic design and location of air cargo terminals.

Aircraft engine noise is a prime social problem. I understand that there is much on-going research into the reduction of noise via design of engine inlet contours, compressors, fans, and exhaust ducts. New engines for the C5A,

for example, were designed as much to reduce noise as to increase thrust. However, it appears that there are probable limitations on the amount of noise reduction possible by engine design.

Flight procedures have been utilized to reduce the intensity of noise. Power reductions have been required. Pitch attitude on climb-out have been restricted, and other aircraft maneuvers have been devised to prevent low level flight over populated areas. While these measures are helpful, they obviously must stop short of jeopardizing the safety of the aircraft. I feel that all of these measures, and perhaps others, should be considered in a systems analysis aimed at minimizing the noise problem. DOT, HUD and NASA, with FAA having prime responsibility, are already participating in systems studies at three major airports. These studies are intended to develop a sound basis for establishing noise abatement procedures, and much is at stake for the aviation industry as well as the community.

The balancing of private rights and public necessity is not a novel problem. We may find, in the final analysis, that aircraft are inherently noisy, that not too much can be done about it. Perhaps after doing all we can to minimize the noise level, we may wish to trade off the noise nuisance against the many benefits of air transport. Much work remains to be done before we can say we have reached that stage.

Sonic boom is another issue which I feel requires the application of a systems approach. There seems to be general agreement that insufficient research has been done on the sonic boom; that is, on the effect of aircraft

design on the boom, the atmospheric conditions under which a given level of overpressure would be most severe, or even the acceptable level of overpressure for the average individual. Research on the technical, social, and economic aspects of this problem should be continued.

I would like to turn at this point to some of the specific issues listed for further consideration in your committee report, again with recognition that I cannot be very specific.

First of all, there are the questions about the degree and type of involvement of the Federal government in the promotion and funding of aeronautical research and development. As you know, the Federal government, from the very beginning, was involved in the development process of the transportation industries - from the early post roads, and the land grants to railroads, up to today's Northeast Corridor project and the supersonic transport. All of these projects are the newest manifestations of a long-standing national policy. And while the old maxim still holds that the Government should do for the private sector only what it cannot do itself, the existence of a cabinet level organization which, for the first time, provides an instrumentality through which industry and government can identify transportation problems and work for solutions on a comprehensive rather than a fragmented basis, is bound to influence the method of executing this national policy, including aeronautical R & D policy.

In this new and additional involvement of the Federal government in civil aviation, the entire transportation system will be considered within the framework of its economic and social environment. The major role of the Department of Transportation in a scholarly sense, is to identify the ways that the transportation system can best contribute to our broad social and economic goals while minimizing the conflicts inherent in such a process. I am of the opinion that coordination of all our research and development effort is required to insure timely introduction of new technology for all modes of transportation. Moreover, better analytical techniques must be developed for measuring the costs and benefits of alternative programs (including research programs) and balancing our transportation objectives.

As we learn more about what needs to be done, the Department of Transportation expects to offer leadership in stipulating the direction of aeronautical research and development.

Your Committee Staff Report raised the question, 'Is the level of expenditure for aeronautical research high enough?' I would answer, "Probably not!" Not enough transportation research has been performed in total or in any mode. This is not to suggest that we need an immediate, drastic increase in the level of our aeronautical research or even our total transportation research. What we do need is to put the needs of each mode into balance with the needs of the total system. As we do so we should expect the research for all modes to increase.

Another question concerns the "D" in aeronautical R and D - the activity which occurs between the laboratory and the certification of a piece of new equipment. With the changed posture of military aviation research and development and the evolution of the weapon's systems concept, the Defense Department probably gets a better weapon at lower cost. This approach, however, probably produces less fall-out to civil aviation in terms of usable hardware, since the final product closely meets military needs and is consequently less adaptable to civil needs. I see an unresolved issue arising on how a commercial design, or version, can practicably grow out of a military design, since civil adaptation after the military development is less feasible now than in the past.

I am concerned that most of the expenditures on V/STOL research have been by the military and a military V/STOL system may be forthcoming very soon. The final system might have few civil applications although much of the technology may be transferable. For vehicles such as the XC-142, X-22 and those contemplated in various jet lift system studies, the missions, design objectives and design philosophies are too different for interchangeability of the vehicle between military and commercial users. Various aviation experts state that five years of development and $300 - $500 million would produce profitable commercial V/STOL systems. Who should foster and fund such a development? The answer is not yet apparent.

The SST program is, of course, our nation's most important attempt at developing an aircraft for commercial use through government initiative and funding. There are many complex problems to be solved in connection with this kind of Government participation. They include especially questions of sharing of costs between Government and the manufacturer and recoupment of the Government's investment.

I believe that where there is an identified national need for the development of a particular type of air vehicle, and that development is not taking place in private industry, and where the national need outweighs the cost of development, the Government ought to consider financial assistance. But I personally would like to think that the greater contribution from Government in the future will be identification of systems needs, including the kind of civil air vehicles needed, followed by the development of these vehicles by private industry with the encouragement and cooperation of the Government.