

in fact the problem areas that NASA is vigorously attacking within the scope of funds provided by Congress.

NASA's responsibility in the Government's interagency aircraft noise abatement program is well defined. The broad objective of NASA is to perform the research and development required to reduce engine noise and to provide information upon which judgments can be made for the most effective overall approach to solving this problem.

Specifically, NASA's research is aimed at:

- (1) Obtaining a fuller understanding of the physical processes involved in the generation of noise, in a search for some presently unrecognized means of preventing the generation of noise.
- (2) Developing means to reduce noise at its source through major changes in jet engine design.
- (3) Determining practical methods of suppressing to a maximum extent that noise generated by jet engines.
- (4) Investigating new aircraft operational techniques which will reduce the ground noise level without detriment to operational safety.

Results of these studies should be of assistance to those concerned with developing guidelines for the solution of the total noise problem which includes the economics of land use in critical noise areas near airports.

Three important steps have been taken already by NASA with industry assistance toward noise abatement. One is the initiation of the quiet engine program, which has the final objective of combining all of the possible noise control techniques into an engine of about 20,000 pounds thrust which would be 15 to 20 decibels quieter than present engines.

In the initial phases of the program, the entire engine cycle will be studied with a view toward changes in the design and arrangement of various engine components to reduce noise generation. Concurrent with the engine development program, present plans call for contracts with airframe manufacturers to study the problems of integrating the quiet engine into typical commercial jet transport aircraft.

During aircraft take-off and landing the major sources of noise are from the fans and compressors. Thus in another important move, two aircraft companies have been selected by NASA to undertake a 32- to 36-month coordinated research program to examine the extent to which fan and compressor noise generated by current engines can be suppressed through changes in nacelle design.

The contracts call for engineering studies, design analyses, fabrication, ground runup and flight testing to determine the effectiveness and feasibility of modifying front-fan jet engine noise. The flight tests will include the measurement of the ground noise level for the acoustically treated four-engine jet transports used in the studies.

The third important step by NASA is the expansion of its studies of operational techniques for noise abatement through research in pilot displays and new control system techniques by means of simulation and flight testing. The feasibility and potential gains for such systems will be demonstrated.

Mr. Chairman, I would urge the committee to give careful consideration to the efforts NASA has made and has programed for the future. I firmly believe that only through technological advance can we hope for meaningful progress in the long run.