

Interior Secretary Stewart L. Udall last December launched a study of the possible effects of commercial supersonic flight. The study group was to consider aircraft noise and sonic booms as a new form of environmental pollution, their effect on man and other organisms, and their effect on archaeological and historical structures.

The group has now reported. Among its recommendations:

- Nonmilitary supersonic flight be regarded as experimental at this time.

- Supersonic flight over populated areas be allowed only on an experimental basis while a full study of boom effect is made.

- Immediate large-scale experiments be carried out with existing supersonic planes to simulate intercity SST operations.

- A Presidential committee be established to hold hearings in all regions of the country likely to be affected by supersonic overflight.

Among other conclusions the report notes that if overland flight is forbidden, the "development and use (of the SST) would face a serious handicap." This, among other things, prompted a rapid reply from the FAA:

"The Secretary of Transportation (Alan Boyd) and the administrator of the Federal Aviation Administration have said publicly and repeatedly that commercial flight at supersonic speeds over the United States will not be permitted if the consequences of the sonic boom generated by such flights are judged to exceed public acceptance or to threaten the natural environment.

"All decisions regarding the economic feasibility of a U.S. SST have been based on the assumption that flight of the SST will be confined to overwater routes."

A Boeing Co. spokesman says development costs of the aircraft (\$945 million for the Government, \$271 million for the manufacturers, principally Boeing and General Electric, and \$60 million for the airlines) will be recovered if 300 planes are sold. He says the sale of 500 planes by 1990 is expected even if overland flights are forbidden. Boeing says 1,200 planes might be sold if there are no route restrictions.

The report says little about some of the things the study group was originally convened to study. Land-dwelling wildlife is expected to make a "quite rapid" adjustment to sonic booms, and aquatic life is not expected even to notice them.

There may be structural damage to some historical and archaeological buildings and sites, such as the Mesa Verde cliff dwellings, but this could be minimized by rerouting aircraft.

The direct effects the report predicts "sometime after 1975" include an estimated 20 million to 40 million Americans under the expected flight paths

being subjected to between 5 and 50 booms per day, depending on location. Another 35 million to 65 million would get one to 50 booms per day of lower intensity. At their worst, the report says, these booms would be as annoying as a large truck traveling at 60 miles per hour passing within 30 feet of the hearer.

## TURBOCAR

### Not dead but sleeping

It has been almost 15 years since Chrysler Corporation announced the first successful road-testing of a gas turbine automobile in this country. Since then, the turbocar has not seen the commercial light of day. It is far from dead, but its life may be more limited than its boosters once proposed.

This month, at a meeting of the American Society of Mechanical Engineers, some of the most prominent men in the field of turbine engines deliberated on the status, and the fate, of the gas turbine. It is moving, they agreed, toward the trucking and heavy equipment industries and to a lesser extent the military, but not toward the family garage.

Even so, it will take until the mid-70's before the turbine is a marketable commodity.

"The gas turbine of the present and the near future," says Dr. Bruno Eckert of Daimler-Benz AG in Unterturkheim, Germany, "will not be able to replace the Volkswagen engine from the economic point of view."

In the United States, most automobiles makers are in agreement. Ford is primarily working on turbines for trucks, acknowledging the difficulty of developing a turbocar.

General Motors is concentrating mainly on turbine engines for heavy-duty vehicles. Arthur Underwood, manager of the General Motors Research Laboratories, states flatly, "the gas turbine engine has no chance in passenger cars."

It is not simply such economical engines as the Volkswagen model that edge out the creation of a salable turbine-powered automobile. The mechanical engineers admit that perhaps if the automobile industry could start from scratch, the race might be closer.

But the industry cannot, and the long-term economics of the situation are a barrier to the jet-powered car, one that will not be breached for many years, if ever.

And it is precisely economics which bid fair to outweigh such advantages as a more powerful engine pound for pound, clean exhaust gases (little pollution), little maintenance, cheap fuels,

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longer engine life, no radiator and negligible oil consumption, where private car potentials are concerned.

For more than half a century, the automotive industry has been involved with the piston engine. To introduce the turbine engine now would mean a much larger initial purchase price by the consumer and the scrapping of millions of dollars worth of capital equipment by car makers and immense investment in new equipment.

But there is also a flaw in the gas turbine itself. Operating at full capacity on the open road, the turbocar excels a piston engine in fuel economy. The problem is that the opportunities to operate a car at full capacity on crowded highways and jammed cities are limited. Under conditions of part load and low power the piston engine gives greater fuel economy.

**But if** high temperatures can be used, and lost-cost materials, such as ceramics, the turbine could be competitive with piston engines. Experts agree that a heat exchanger is essential for a vehicular turbine engine if it is to be competitive on a fuel economy basis.

The turbine engine first compresses air and gas, then heats them to about 1,700 degrees F. The hot gases strike the blades of a turbine rotor, which drives the compressor. The gases then strike blades on a separate turbine rotor, which rotates a shaft and, through a transmission, rotates the wheels.

**The heat** exchanger takes the hot exhaust gases and reintroduces them into the cycle between the compressor and burner stages. Without the heat exchanger, the only other way to obtain the temperatures necessary for combustion would be to use a richer fuel mixture, a step which would mean reduced fuel economy. The heat exchanger, however, means increased engine complexity, weight and cost.

**Because the** gas turbine operates most efficiently while running wide open and carrying a peak load, it is a natural engine for the trucking and heavy equipment industries. It is in this field as well as the military, where powerful engines to drive huge trucks, earth movers, and tanks are needed, that the turbine will first come into automotive use.

The only auto maker still deeply interested in a turbocar is Chrysler. The research department there is working on a sixth generation turbine engine.

Part of the reason for Chrysler's going ahead on the turbocar is the enthusiastic response it received from 203 men and women who tested 50 cars from October 1963 to January 1966. Each user drove a car for a three-month period. Favorable comments were received on the smooth, vibrationless engine; reduced number of moving parts and fast ignition.