ventional plane, the rotational speed makes it seem to the pilot that the plane is descending faster or slower than it actually is, depending on whether the nose is rising or falling; there is no such effect with DLC, since the aircraft is always at the same angle with the ground.

DLC is not the only exotic innovation being planned for the SST. All the altimeters and airspeed indicators will probably operate from electrical sensors instead of mechanical ones. Going electrical hardly seems worthy of notice in such an advanced craft, but, says Blake, "it's a matter of forcing progress on the airlines."

"They have their stockpiles," he says, "and they want to use the same instruments on the 727 as they did on the 707. It's the same with the SST."

The designer of the SST's huge engines, General Electric Co., has made far fewer changes in its design, and is concentrating on uprating the engines from the thrust of the experimental version, about 47,000 pounds, to that called for in the final design, more than 60,000 pounds per unit. Early development problems included sheet metal cracks, turbine shroud rubbing and unwanted resonance in the compressor blades, but the FAA seems satisfied that these difficulties have been ironed out. The only major modification has been the change from an eight-stage to a nine-stage compressor. This was included in the original plan, and should enable enough more air to be pulled through the engines to reach their intended thrust without increasing their size.

Financially, the SST seems set to go, despite Vietnam and the plane's principal opponent, Senator William Proxmire (D-Wis.). Last week the House approved $142 million for the plane in fiscal 1968, and directed the FAA to add into the working kitty the $35 million "payback reserve" fund previously accumulated to reimburse the airlines if the project were shelved. Most of the discrepancy between the resulting total and the $198 million requested by the administration came from trimming off the $19 million additional payback reserve requested for fiscal 1968.

SONIC BOOM

Ground Effects May Slow SST

People who treasure quiet don't live around airports. Today it is relatively easy to escape the throbs, screeches and drones of incoming and departing aircraft—one simply moves away from the flight pattern.

In the mid 1970s, there could be no place to hide—if supersonic transports are allowed to fly over land.

If they are, sonic booms like thunderclaps five or six times a day will be a permanent fact of life for a good part of the population. The question is: What price in noise and annoyance are citizens willing to pay for the option of jetting across country in 1.5 hours; at 2.7 times the speed of sound?

So far there is no definitive answer on human tolerance—the Air Force and the Federal Aviation Agency are both studying the problem. But one thing is clear.

The SST booms offer no physiological danger. "Threshold levels for damage to hearing are 100 to 300 times the energy the sonic boom will generate," says Dr. Milton Whitcomb, executive secretary of the National Academy of Sciences committee on hearing, bioacoustics and biomechanics.

Whereas the SST is expected to create booms with an overpressure of two pounds per square foot, hearing damage requires pressures of around 300 pounds. And if ears are safe from damage, other functions, such as heart rate and circulation, should be unaffected.

So concludes the Academy's committee under chairman Dr. John Dunning of Columbia University, in its forthcoming report. The Dunning committee was set up three years ago to advise the Government on the SST in terms of its anticipated effects on people, structures and animals. It conducts no research of its own, but reviews the available information.

Sound Overpressure (lb/ft^2)	Sound Overpressure (dyn/cm^2)	Predicted Effects
0-1	0-478	No damage to ground structures; no significant public reaction, day or night.
1.0-1.5	478-717	No damage to ground structures; probable public reaction.
1.5-1.75	717-837	No damage to ground structures; significant public reaction particularly at night.
1.75-2.0	837-957	No damage to ground structures; significant public reaction.
2.0-3.0	957-1435	Incipient damage.

C. W. Nixon/Acoustical Society

Beyond the problem of safety, however, lies the question of psychological tolerance. The most widely known study on human reactions, an Oklahoma survey done in 1964, found some 20 to 25 percent of the people subjected to sonic booms saying they could not tolerate five to six booms a day on a continuous basis.

In another analysis, Dr. K. D. Kryter of the Stanford Research Institute reviewed laboratory experiments with sonic booms at SST levels and concluded: the noise seems to be as "acceptable as the sound presently heard indoors directly under the flightpath of subsonic jet aircraft at an altitude of 1,500 feet following takeoff."

Dr. Whitcomb, a member of the Dunning committee, believes the tolerance limit will likely lie somewhere below two pounds per square foot. "Over two there is a growing body of evidence that the booms are going to be intolerable to enough people to make trouble." The SST, coming in at about 2.1 pounds, is "on the border," says Dr. Whitcomb.

Actually the problem is worse than that. As the SST skims through the air, it drags behind a cone of shock waves that interact with atmospheric conditions to create very minor booms or unusually big ones. Some booms have been magnified two or three times by atmospheric conditions.

If the SST were to hit six pounds per square foot very often, it would probably become totally unacceptable for overland flights because of public protest.

But until the SST actually flies, no one can judge precisely how it will interact with "burbles" or eddies in the air. In one instance, says Dr. Whitcomb, a burble might act like a lens, bending the shock wave into sharper focus; in another, it might dissipate the impact.

A St. Louis study in 1961 calculated that for every flight with overpressures ranging from 0.4 to 2.3, there was less than one (0.83) actual incident of property damage per million people.

"We don't know whether people adapt or get more irritated," says Dr. Whitcomb.

There is some evidence that people do adapt to sonic booms just as they adapt to airport noise. The trouble is that these studies, by necessity, were done on people who opt to live near

airports, says Dr. Whitcomb. That leaves out all the people who choose otherwise. "We are, in effect, building a railroad track through their backyards."

The Academy recommends some six to eight further studies which should be carried out before the SST is approved for overland flights.

Sooner or later, says Dr. Whitcomb, the Government will have to decide what boom level it will allow over the United States. At this point, the SST cannot be modified to do away with the sonic boom problem, though in 10 or 20 years, that may be possible, says Dr. Whitcomb. ◈

CARIBBEAN FRUIT FLY

Florida Crops Threatened

Except for the gilded upthrusts of Miami and Miami Beach, Florida's Dade County stretches flat and rich with orange groves and vegetable fields. Now the cities and the visitors they attract—not always human—threaten the countryside and its crops.

The huge agricultural areas that make Florida one of the nation's most important food production states and the nation's winter vegetable center are threatened by the highly destructive Caribbean fruit fly.

Estimates are that annual damage may already be running at the rate of $50 million a year.

Doyle E. Conner, Florida Commissioner of Agriculture, finds the situation so serious that he will immediately seek Federal aid for an all-out eradication program—the second to be undertaken—which he calculates may cost as much as $10 million. Aid may be slow coming, under Federal guidelines requiring documentation of economic threat. The U.S. Department of Agriculture says that, so far, only minor damage to citrus groves is evident.

The Caribbean flies were first discovered two years ago in fruit trees close to Miami International Airport, apparently brought into the country by some of the hundreds of planes landing each week from more southerly areas.

The Caribbean pests are cousins of the Mediterranean fruit fly, which is considered more dangerous only because it principally attacks valuable commercial crops, like citrus, on which depend much of the state's economy. Small concentrations of the Mediterranean fly were found twice within recent years in the Miami area, and were swiftly cleaned out by full scale emergency eradication efforts.

When the Caribbean flies were first found in the Miami area, a program for their eradication was also undertaken, but on a scale insufficient to do the job.

As a result, in the two years since then, the flies have swept into virtually every corner of big Dade County, which extends southward to the very edge of the Florida Keys. They've also multiplied at such an alarming rate that they're now found in 24 counties to the west, north and northwest of Dade.

The startling breeding rate of the Caribbean flies is evident in the numbers taken from special bush and fruit tree traps, designed to keep a check on their rate of increase.

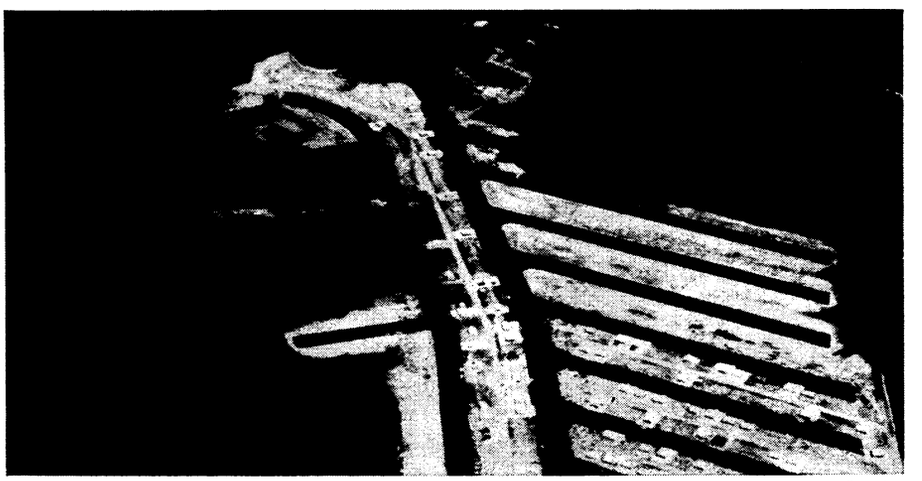
Official state agriculture commission figures show that only 356 flies were found in Dade County traps during March of 1966. The reasons for the alarm become clear on the basis of figures just released, showing that in March of this year, the same number of traps produced 6,076 flies. In Broward County, adjoining Dade to the north, traps caught only 132 flies in March of 1966. But 1,967 were found in the same month this year.

The Caribbean fly attacks a wide variety of hosts, including peaches, limes, sour oranges, grapefruit, tangerines, sweet oranges, bell peppers, tomatoes, mangoes, kumquats, loquats, guavas, rose apples, gooseberries and tropical almonds.

Malathion and similar insecticides are used for Caribbean and Mediterranean fruit fly control. However, at the University of Florida, Dr. R. M. Baranowski, associate entomologist, is working on a program to effect eradication through sterilization of Caribbean fly male adults. This was notably successful in the elimination of screw worms among cattle (SN : 3/11), which annually caused tens of millions of dollars in losses. The USDA gave the university a $31,000 grant for the Caribbean fruit fly sterilization work and the state augmented this with another $24,000. The effort has not yet produced a successful formula, but Dr. Baranowski says he's hopeful. ◈

CONSERVATION

Last Ditch Fight for Vanishing Estuaries



Interior

New Jersey housing creeps over marshland near Atlantic City.

Estuaries, the often swampy areas where rivers meet the sea, are a valuable but vanishing part of America's natural resources. Though they are essential as breeding areas for many of the most desired fish and shellfish, estuaries are rapidly being dredged and filled.

California, with relatively little estuarine fish and wildlife area to begin with, has suffered the greatest rate of destruction—67 percent. New Hampshire, Connecticut, New York and New Jersey have lost between 10 percent and 15 percent of their estuarine areas to dredging and filling.

Efforts to slow this rate of retrograde progress have met with little success in the past. But last week, the Federal agencies most concerned—the Army and Department of Interior—agreed, under Congressional prodding, on a policy designed to protect important estuarine areas from unnecessary development.

The Army's Corps of Engineers has, in the past, issued waterfront construction permits without much regard for conservation. Under the new agreement, they will submit all requests for permits to the Interior Department for comment on their effects on wildlife.

Interior officials will still have no final authority, but the Army has agreed to respect their judgment. The knowledge that conservation has strong support in Congress should make this easier for the Engineers, who are canny