the first, for the reason that Section U would be taking the first step toward becoming a new statistical organization, competitive with ASA and IMS.

The foregoing discussion concerns the presumably more difficult part of a possible program for Section U—that concerned with the "advancement of science." The other part, concerned with the popularization of knowledge, can also be rich. Here we may think of sessions for informing the general public and other groups within AAAS of the use of statistics in various domains, including governmental agencies; of successful statistical studies in science; of the meaning of indeterminism; and of the nature of statistical tests, of methods of estimation, and so on.

The development of a scholarly group depends upon a number of factors and in the early stages it is difficult to visualize all the likely avenues. The plan for Section U sketched here appears to be an attractive possibility. However, there may be other possibilities. The time and place to consider them is 29 December in Philadelphia, at the evening session of Section U.

NEWS AND COMMENT

Supersonic Transport: Next Step in Civil Aviation Is a Difficult One

Sometime before next summer, the administration plans to announce whether it will seek federal funds for the development of a wondrous and costly machine, a civilian supersonic transport (SST) that would travel at least 1400 miles per hour and perhaps as fast as 2000 miles per hour.

Officially, the question of federal involvement is an unsettled one, pending the completion of studies by the Federal Aviation Agency. But under the pressures of Soviet-American rivalry and competition within the Western world, it is a virtually foregone conclusion that the decision will be to go ahead. Since the required technology is on hand or within sight, the almost certain result is that within a decade an American SST will be in commercial operation. Of far less certainty, however, is the question of whether the SST, like a 400-mile-an-hour passenger car, may not be so technically marvelous as to be out of touch with the social and economic world in which it will have to fly and, hopefully, earn its way.

Considerations of this sort have never before been of much concern to the airline operators, who have literally thrived on speed; but the virtue of the SST—providing speed of an entirely new order—is also the source of considerable doubt about the wisdom of an immediate commitment to an accelerated program of development, at a cost estimated between $500 million and $1 billion. (Unlike previous civil aircraft developments, the SST's development will have to be wholly government financed, since the manufacturers who would like to build it are generally acknowledged to lack funds to develop a prototype.)

Those who hold these doubts readily concede that the ultimate arrival of the SST is desirable and inevitable. At issue are the questions of how soon, and in what order of priority among the various needs of air transportation.

Although there is no shortage of cocksure assertions on every aspect of the SST, the realm of certainty is a fairly small one, a point that the FAA takes pains to emphasize in response to demands that it hurry up and say yes. The demands emanate mainly from the aircraft manufacturing industry, which has been brought to lean days by the missile and by the high productivity—and hence the requirement for relatively low numbers—of subsonic civilian jets. The potential customers for the SST, airline operators, are yet to recover from the immense cost of their rapid conversion to jets, and, while they pay due homage to the SST's speed, their attitude appears to be one of morbid fascination.

This is perhaps best understood when it is noted that U.S. international air carriers last year managed to ring up a net loss of $1.1 million out of operating revenues of $722 million; that British Overseas Airways was $140 million in the red in its last fiscal year; that the 18 scheduled airlines on the North Atlantic run, the most heavily traveled international route, were able to fill only 57.4 percent of their seats during the tourist month of July; that domestic trunk lines are gratified that their combined deficit for the first 9 months of 1962 is only $6.2 million, compared with $14.3 million for the same period last year; and that the industry's interest on loans now totals $90 million a year.

Against this gloomy financial background there stands the overwhelming certainty that, all other things being equal or not radically different, the SST's incredible speed would quickly draw passengers away from slower competitors. At 2000 miles per hour, it would travel from New York to Los Angeles in 1 hour and 40 minutes, as compared with the present 5-hour travel time of a subsonic civilian jet; and it would cross from New York to London in 2½ hours, cutting close to 4 hours off the best commercial speeds now obtainable. But there is no guarantee that all other things will be equal or not too different, and from these doubts arises the question of whether the SST will be a technical triumph and a financial flop.

For example, at this stage, despite pat assurances to the contrary, there is considerable doubt as to whether the SST will be more or less economical to operate than the subsonic jets with which it will be competing. This is a critical issue, since the airlines' path to economic health lies in the direction of lower costs and lower fares. A fast trip at a higher price would unquestionably appeal to those travelers who consider cost secondary to convenience, but it would not bring the masses flocking to help the airlines pay for their SST's.

There is also no certainty that the sonic boom problem can be reduced

to manageable proportions. The virtue of the SST is supersonic speed, but supersonic speed produces window- and nerve-shattering shock waves that would make the present public furor over jet whine seem insignificant. To keep the boom away from populated areas, it is estimated, the SST would have to refrain from flying at supersonic speeds at altitudes below 40,000 feet. But this calls for trading off the SST's greatest attraction—speed. It is optimistically asserted that for altitudes above 40,000 feet, the boom would be no more offensive than "distant thunder," but this is an opinion which may not be shared by the general public, whose right to seek relief from damage caused by low-flying aircraft was affirmed last March by the Supreme Court.

There is also no certainty as to how the flying public would take to supersonic travel. Although the airlines do not want to talk about it, there is no doubt that fear of flying—however safe it may actually be in relation to other forms of travel—deters many persons from air travel. Since the SST would operate at altitudes where sudden decompression would be fatal, construction of a windowless version is under consideration. But will the customers take to windowless flying? And if windows are provided, how will they react to the cherry-red glow that will spread over the wings as the SST achieves supersonic speed?

The answers that are offered are that skillful planning can assure that the plane will be economical, that the sonic-boom problem will be licked, and that travelers will come to accept windowless travel or glowing wings just as they came to accept the fiery exhausts of piston craft and the flapping wings of today's subsonic jets.

A more serious, and ingenious, objection, however, has been raised by Bo K. O. Lundberg, director of the Aeronautical Research Institute of Sweden, in a study titled, "Is Supersonic Aviation Compatible With the Sound Development of Civil Aviation?" Addressing himself to the question of whether passenger traffic will present itself in sufficient quantity to enable the SST to pay for itself, Lundberg concludes that economic utilization of the SST's high speeds would involve around-the-clock scheduling, with some extremely inconvenient arrival and departure times. Thus, at subsonic speeds, the present approximate time of 7 hours from New York to Paris—with a time difference 6 hours later—permits a variety of scheduling arrangements that combines reasonably full utilization of the plane in any 24-hour period with arrivals and departures that do not require the traveler to land or take off in the middle of the night or early morning. Furthermore, the subsonic flight time offers the possibility of catching some sleep. However, with a 2000-mile-an-hour SST, Lundberg points out, any attempt to recoup the higher cost of the craft by having it make more trips than its subsonic competitors would run into customer resistance to inconvenient scheduling. "Considering the long ground times (including travelling times to and from bus terminals) at both ends," he writes, "a takeoff time before 9 o'clock in the morning and a landing time after 10 in the evening will be rather unpopular. . . . It might at first seem that the significance of these factors has been exaggerated, but it is important to remember that there will always be competing subsonic services available with highly convenient departure and arrival times. . . . It follows," he continues, "that, with as short a turn around time as one hour, it is just possible with a Mach 3 (2000 miles an hour) SST to squeeze in three single flights between 8 A.M. in New York and 11:30 P.M. in Paris, but the first and last of these flights are likely to be rejected by many passengers, unless the fares were heavily reduced," and this, Lundberg contends, would then make it doubtful that the SST could pay for itself.

The small remaining doubt as to whether this government will undertake an SST program was further reduced last week when the French and British concluded an agreement to cooperate in the development of a Mach 2.2, 1400-mile-an-hour craft. But even if the Anglo-French decision had been to hold off on the project, it is unlikely that the United States would be inclined to refrain from going ahead. Thoughout congressional hearings on the subject, and in private conversations, administration officials have stressed that the SST is a prestige item in East-West rivalry, and they do not wish to be empty-handed if the day should arrive when Khrushchev drops into New York after a 2000-mile-an-hour flight from Moscow.

The studies now under way by the FAA, in conjunction with the National Aeronautics and Space Administration and the Air Force, are directed at a wide range of problems, but perhaps the most basic is whether the American SST should be a Mach 2 or a Mach 3 craft. It is generally felt that the lower speed of the Mach 2 would permit the use of an aluminum skin, thus reducing the time required for development; at Mach 3 speeds, aluminum loses structural integrity. This would make it necessary to develop new skin materials, very likely stainless steel and titanium combinations, about which a great deal is yet to be learned. The work already done on the stainless-steel Mach 3 RS-70, which is scheduled for its first flight early next year, provides a head start toward a Mach 3 transport, but the FAA is not overly optimistic about how much of the RS-70's technology can be adapted to a civilian transport, which would have to be far more refined, quieter, safer, and cheaper than any military relative.

One dominant line of thought is that, while an aluminum-skinned Mach 2 SST would be the most readily attainable version, it would be technologically at the end of the line, since an eventual move to higher speeds would require development of a new skin. With a steel-skinned craft, however, it would be possible to start at Mach 3, or even if the steel skin were employed on a Mach 2 SST, to lay a foundation for faster transports.

If the FAA produces an affirmative decision, it is not going to find the White House in a quibbling mood. Technical supremacy has become firmly entrenched as a guiding principle of the Kennedy administration, and, among the President's advisers, the SST project has taken on some of the aura of the moon race. It is pointed out, however, that in economic terms the SST race is in large measure immune to the sniping that is directed toward the lunar landing program. The aeronautical development resources of this country are now underemployed, and the SST would not be diverting skilled manpower from other undertakings; unlike most of the space program, it would be aimed at developing a marketable product and, whatever the attendant problems, there is no doubt that 2½ hours travel time to London is preferable to 6½ hours.

The main question is whether the world will be ready for the SST when the SST is ready for service. Its advocates give an emphatic yes. It will be quite nice if they prove to be right, but a costly embarrassment if things turn out otherwise.—D. S. GREENBERG