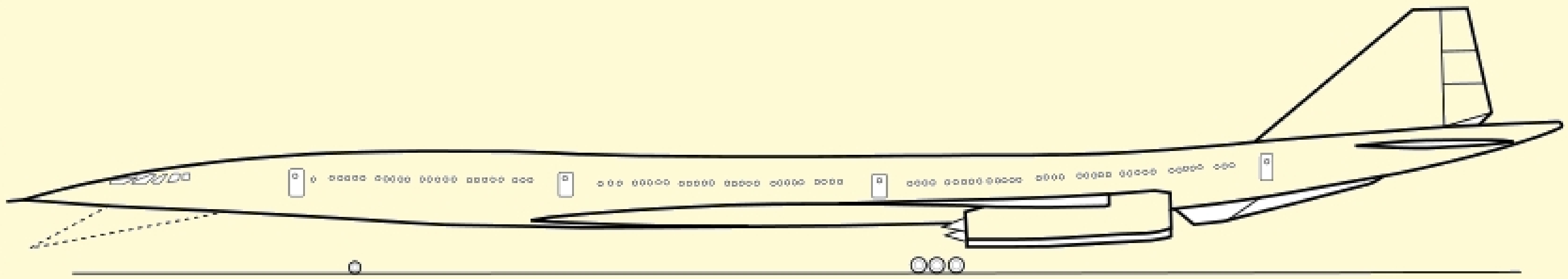
THE PROGRAM AND THE AIRPLANE



WHAT IS THE SST PROGRAM?
The United States SST Program is intended to develop a commercial supersonic transport that is safe, economically sound, and superior to competitive designs.

WILL IT BE PROFITABLE?
Even if supersonic flight is restricted to international overwater routes, the potential market for the SST is more than adequate to return the entire investment plus profit to the airlines and manufacturers and investment plus interest to the government.

WHY THE SST PROGRAM TODAY?
The U.S. SST Prototype Program must go forward without delay in order to obtain the best possible production airplane that will compete successfully with foreign SSTs.

WHO WILL PAY FOR IT?
Initially, the government, the manufacturers, and the airlines will fund the prototype development program. Ultimately, passengers and shippers will return this investment through their use of the production airplane.

WHAT IS THE AIRPLANE?
The SST is an 1,800-mile-per-hour airplane capable of carrying 280 or more passengers over distances up to 4,000 miles.

WHAT WILL THE RIDE BE LIKE?
SST passengers will experience safe, comfortable flight that is superior to that of present-day jets, at nearly three times the speed.

WILL IT BE SAFE AND DEPENDABLE?
The SST has been designed specifically to operate at high altitudes and supersonic speeds and is expected to achieve higher standards of passenger safety and airplane dependability than present-day jets.

WHAT WILL BE THE ECONOMIC IMPACT?
Ultimately, nearly every segment of the economy will feel the impact of the program through increased employment and a higher level of economic activity.

WHAT ABOUT SONIC BOOM?
The SST will be used initially on long-haul overwater routes where sonic boom will not be a problem. The Anglo - French SST (the Concorde) will pioneer acceptability of sonic boom over populated areas.

WHAT ABOUT NOISE NEAR AIRPORTS?
The increased performance and noise suppression design features of the SST will provide a substantial reduction in noise levels from those produced by today's subsonic jet transports during takeoff and landing over communities adjacent to airports.

WHAT CHANGES IN PRESENT AIRPORTS?
No changes will be necessary to increase the load-carrying capacity or the length of existing runways. Other changes in airport accommodations will have been accomplished in preparation for the advent of advanced subsonic aircraft of essentially equivalent or greater size, weight, and passenger capacity.

WHERE WILL THE SST FLY?
The SST will be used initially on high-density, long-haul overwater routes, such as the major transatlantic and transpacific routes.

WHY IS THE SST VITAL TO THE NATION?
The SST is required as a vital link in the worldwide transportation system, to maintain U.S. leadership in manned aircraft technology, to enhance national prestige abroad, to provide a continuing source of economic vitality, and to sustain the present favorable effects of jet aircraft sales on the international balance of payments problem.

WHAT IS THE SST PROGRAM?

It is a national effort requiring the combined participation of the government, the airlines, and the aircraft and engine industries to provide an improved transportation system between the United States and the rest of the world. More specifically, the primary objective of the SST Program is to develop a commercial supersonic transport that is safe for the passenger, superior to other commercial aircraft, and economically profitable.

Serious research and development work by the aircraft industry has been underway for more than eight years; the government has participated, through financial support and research, since 1961. Design competition between major airframe and engine manufacturers began in mid-1963.

In addition to the development of an American SST, the British and French Governments have been collaborating to build the world's first supersonic transport — the Concorde. The prototypes of this design are under construction, and the first flight is scheduled for February 1968. The first Concorde deliveries to the airlines are expected to take place in 1971.

At the end of 1966, the U.S. SST competition was won by The Boeing Company for the airplane and The General Electric Company for the engines. During the next four years — Phase III of the program — Boeing and General Electric will build and flight test two SST prototypes to demonstrate the feasibility of a commercial aircraft and prove the design under test conditions. Boeing and General Electric are now ready to proceed with prototype construction and test.

WILL IT BE PROFITABLE?

The SST Program must allow the airlines, the government, and the participating manufacturers to recover their entire investment plus interest and profit. To achieve this, the SST must be productive. Productivity, or work capacity, is the key to SST profitability. When the SST is introduced into airline service, it will carry more passengers faster on the lucrative long-haul overwater routes than any other airplane.

The accompanying table shows key factors that affect the profitability of the SST, the Concorde, the 747, and the 707. For purposes of comparison, today's profitable 707 subsonic jet has been assigned a unit value of 1.0. The airlines will pay a higher airplane price for the U.S. SST. But its higher productivity, (speed, seat capacity, and utilization) results in competitive direct operating costs.

A successful SST will have direct operating costs of approximately one cent per seat mile — just about the same as those of the best of today's jets — at all ranges from about 2,000 miles to transatlantic distances. At ranges less than 2,000 miles, the SST would be slightly more expensive to operate than present jets.

The air travel market is expected to grow at least tenfold in the next 25 years. Forty percent of this growth will be in the lucrative overwater market, in which the SST will operate initially. A successful supersonic transport production program, therefore, could be exceptionally large. Government and industry estimates indicate that at least 500 airplanes will be needed by 1990 to serve the intercontinental overwater routes only. If worldwide operation is permissible, with boom limited to sparsely populated areas, sales are expected to reach 1,000 to 1,200 airplanes by 1990.

A 500-plane overwater market will be adequate to provide a basis for developing a competitive airplane price that will allow the airlines to make a profit, return the government's investment, and permit a profit for the manufacturers. If the sonic boom should be acceptable to the public generally, and the airplane can be used for high-speed coast-to-coast transportation within the U.S. and over other populated land masses, the market would become much larger. A variety of SST models would be required, and improvements, such as have been typical of commercial aircraft programs in the past, could be expected.

Perhaps the most reliable indicators of the SST's potential revenue and profit capabilities are the airlines. The major airlines in the United States have placed at risk $1 million for each SST they have on order. To date, these airlines have committed more than $50 million to ease the burden of government investment during the prototype development program.

RELATIVE FACTORS AFFECTING PROFITABILITY

AIRPLANE	APPROXIMATE AIRPLANE PRICE	MAXIMUM CRUISE SPEED	TRIP SPEED AT 2,000 MILES INCLUDES TAKEOFF, CLIMB, CRUISE AND DESCENT		SEAT CAPACITY	SEAT CAPACITY COMPARISON	PRODUCTIVITY COMPARISON	DIRECT OPERATING COST PER SEAT MILE COMPARISON (IN CENTS)
			AVERAGE SPEED	SPEED COMPARISON				
707	$7.25 MILLION	560 MILES PER HOUR	495 MILES PER HOUR	1.0	147	1.0	1.0	1.0
747	$18.5 MILLION	600 MILES PER HOUR	520 MILES PER HOUR	1.1 TIMES FASTER	375	2.5 TIMES GREATER	2.5 TIMES GREATER	30% LESS
Concorde	$16.0 MILLION	1,450 MILES PER HOUR	950 MILES PER HOUR	2.0 TIMES FASTER	130	.1 TIMES LESS	1.4 TIMES GREATER	30% MORE
U.S. SST	$40.0 MILLION	1,800 MILES PER HOUR	1,125 MILES PER HOUR	2.3 TIMES FASTER	280	1.9 TIMES GREATER	3.6 TIMES GREATER	EQUAL TO 707

WHY THE SST PROGRAM TODAY?

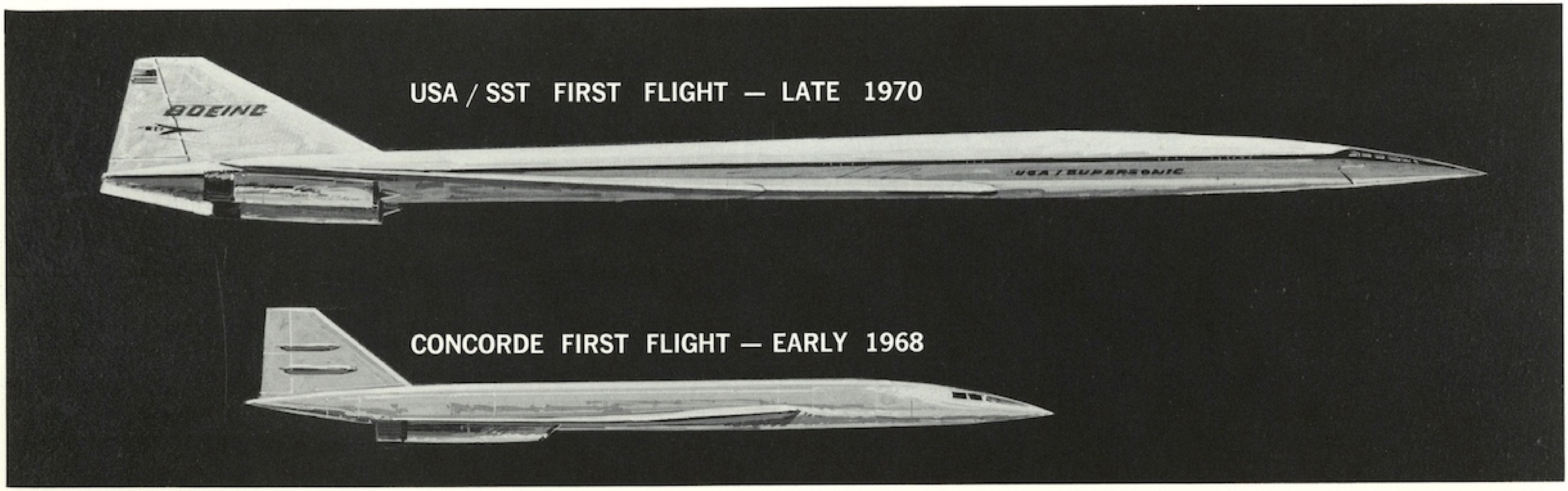
The SST Program should proceed with the least possible delay because:

1 The airplane is very large and represents significant advancements in technology; therefore, it is important to this nation's aeronautical leadership. The first step in conducting the program in as orderly and risk-free a manner as possible is to build and flight test two prototype airplanes to demonstrate that the airplane will, in fact, be capable of meeting the desired commercial standards. This will provide the basis for perfecting a production aircraft and engine design that will go to market soon enough to compete successfully.

2 Both the Anglo-French Concorde and Russian TU-144 (a supersonic transport under development in the Soviet Union), and their follow-on advanced versions, pose serious threats to this country's manned aircraft leadership and capability. We must assume that Concorde performance and schedules will be approximately as presently estimated. Consequently, a substantial number of Concorde deliveries can occur beginning in 1971.

We estimate the first U.S. SST prototype will fly in late 1970 and that production airplanes will be flying a little more than three years later. Certification and initial deliveries will be three to four years after the initial deliveries of the Concorde, as presently projected. We must begin the prototype program immediately, so as to be in a position to make effective decisions in the years ahead.

3 The large potential market is bound to have a substantial economic impact on any country producing supersonic transports. Without the U.S. SST, for example, sales of the Concorde could affect the U.S. balance of payments adversely by some $22 billion through 1990. Conversely, introduction of the U.S. SST into airline service by 1975 can be expected to favorably affect the U.S. balance of payments by $32 billion. Therefore, the U.S. SST may be credited with a total improvement to the U.S. balance of payments of $54 billion.



WHO WILL PAY FOR IT?

Airplane manufacturers and the airlines recover their investment in commercial jets today through airline ticket revenues, paid for by the traveler and the shipper. In tomorrow's SST market, the traveler and the shipper also will pay the revenues that will permit the airlines, the government, and the manufacturers to recover the investment and make a profit.

The fundamental difference between the investment requirements in today's subsonic jets and the SST is the sheer size of the investment and the time required to recover the larger amount. For example, with the 707 commercial jet, it was 12 years after beginning the prototype that the Boeing 707 commercial jet program arrived at a break-even point. In the case of the SST, it will take some 12 to 15 years before there will be any hope of return to the production program. In terms of dollars, the SST investment is approximately five times greater than the 707 Program and will, in all likelihood, take longer to recover. Without government support and financial participation, the program would suffer indefinite postponement.

Through negotiations, the government and the manufacturers have reached agreement on the cost-sharing and recovery provisions of the prototype contracts. The cost-sharing arrangements are 90 percent government and airlines and 10 percent manufacturer, up to the target cost. Beyond the target cost, the sharing is 75 percent government and 25 percent manufacturer, with no ceiling. This 10-percent (and potentially 25-percent) sharing, together with the investment of facilities and valuable skills, represents a significant commitment by the manufacturers relative to their financial capacity.

The government objectives in negotiating these agreements are:

- To recover all of the government investment by delivery of the 300th SST

- To recover the total investment plus six-percent interest by approximately the 500th delivery

WHAT IS THE AIRPLANE?

The Boeing SST will be one of the largest and the fastest commercial transport flying by the mid-1970s. It will be capable of carrying more than 280 passengers 4,000 miles at 1,800 miles per hour. Cruising altitude will range from 60,000 to 70,000 feet. Some of the major design features include:

- Movable wings are the SST's guarantee of safe, versatile performance. The wings sweep from a full forward position (used for landing); through two intermediate positions (used for takeoff and subsonic cruise, respectively); to a fully swept-back position for efficient supersonic cruise.
- For excellent low-speed and safe handling characteristics, the SST also has the familiar arrangement of wing flaps and slats used on current subsonic jets.
- A nose fairing lowers to provide better visibility for the pilot during takeoff, subsonic cruise, and landing.
- The SST is powered by four General Electric turbojet engines, each of which supplies over 60,000 pounds of thrust.
- Titanium alloy is used as the primary structural material throughout for its high strength, light weight, and heat-resistant qualities.

PERFORMANCE CHARACTERISTICS

	SST	707 Intercontinental
PAYLOAD RANGE	56,000 LB, 280 PASS. 4,000 ST MI.	29,400 LB, 147 PASS. 6,200 ST MI
CRUISE SPEED	MACH 2.7 APPROX 1,800 MPH	MACH .81 APPROX 560 MPH
CRUISE ALTITUDE	60,000 FT TO 70,000 FT	35,000 FT
APPROACH & LANDING	155 MPH 6,200 FT OF RUNWAY	157 MPH 6,250 FT OF RUNWAY
TAKEOFF	186 MPH 6,800 FT OF RUNWAY	191 MPH 11,600 FT OF RUNWAY

WHAT WILL THE RIDE BE LIKE?

Washington, D.C., to London in two hours and 45 minutes; that is the kind of time-saving schedule the SST promises for the 1970s. The SST's three-man crew will find their tasks aided greatly by new, highly refined data and navigation systems, producing performance and tracking information instantaneously and continuously. During takeoff and landing, the SST's lowered nose will give visibility greater than that in today's jets. Landing and takeoff attitudes are similar to present airplanes, with which the crews already will be familiar.

For the passenger, riding the SST will seem little different than riding aboard a conventional jet, except that flight times will be greatly shortened. Cabin interiors will be comfortable and spacious — more so than today's jetliners, as the SST's wider fuselage will permit double aisles and wider seats.

Even though the SST will fly supersonically over most of the distance, passengers are not apt to be aware of the speed unless the pilot so informs them. There will be no noticeable change as the airplane passes through the speed of sound, and supersonic flight will be smooth and quiet. The SST's engines are mounted aft and beneath the passenger cabin, which, combined with the effect of thermal insulation, will result in cabin noise levels below those of current jet transports.

Cabin temperatures will remain in the 70-degree range, even though air friction at supersonic speeds causes exterior skin temperatures to rise to 450 degrees. The most advanced and efficient environmental control systems will ensure comfortable cabin temperatures and air conditioning under all conditions.

WILL IT BE SAFE AND DEPENDABLE?

The SST has been designed specifically to meet the rigors of the environment in which it will operate — high altitudes and supersonic speeds. This design is based upon years of combined government and commercial experience with the requirements of large aircraft. The fund of knowledge available to and used by The Boeing Company in designing the SST includes the 707-727-737-747 commercial jet family and such advanced aircraft as the B-52, XB-70, F-111, and SR-71. The U.S. military has logged more than 200,000 hours of supersonic flight and has proved many of the concepts incorporated in the SST.

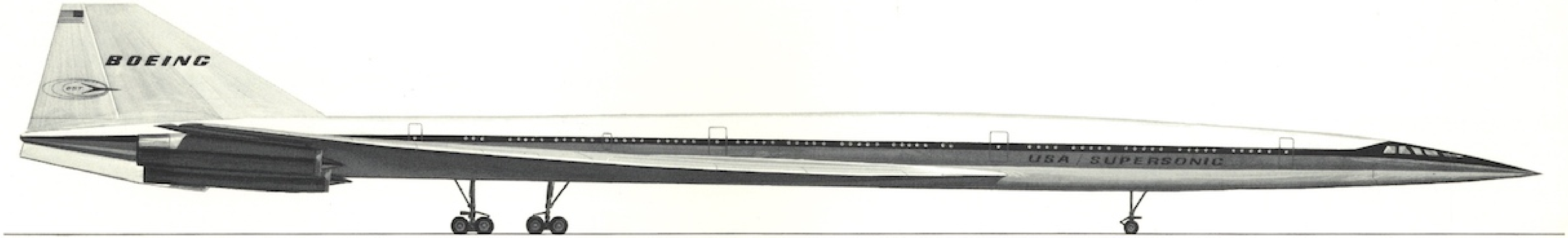
The four powerful General Electric engines are among the most important factors contributing to the SST's safety in the air. The tremendous thrust required for supersonic flight also gives the pilot an extra margin of safety in making important maneuvering decisions.

Just as Boeing has designed commercial transport aircraft using fail-safe principles for the past 40 years, so will the SST be built to fail-safe criteria. For each major structure or system within the airplane, there is a supporting structure or backup system to ensure safe operation under all conditions.

For example, should the SST sustain damage to the fuselage while in flight, titanium structural tear stoppers restrict the size of the hole. Even with such leakage, the SST's pressurization system will maintain cabin altitude at low, safe passenger levels, while the airplane descends to a lower altitude. The flight may then be safely continued at subsonic speeds.

Proved electronic equipment is being further refined to improve navigational accuracy. Weather radar will allow the pilot to anticipate and detour around storms and turbulence along the flight path.

The effects of radiation at the normal cruising altitude of the SST have been investigated. Predicted intensities would involve no limitations or special considerations for the crew, passengers, or operation of the airplane. Occasional periods of higher intensity (on the order of four times per year) may require deviation of flight plans to a lower altitude or an alternate course.



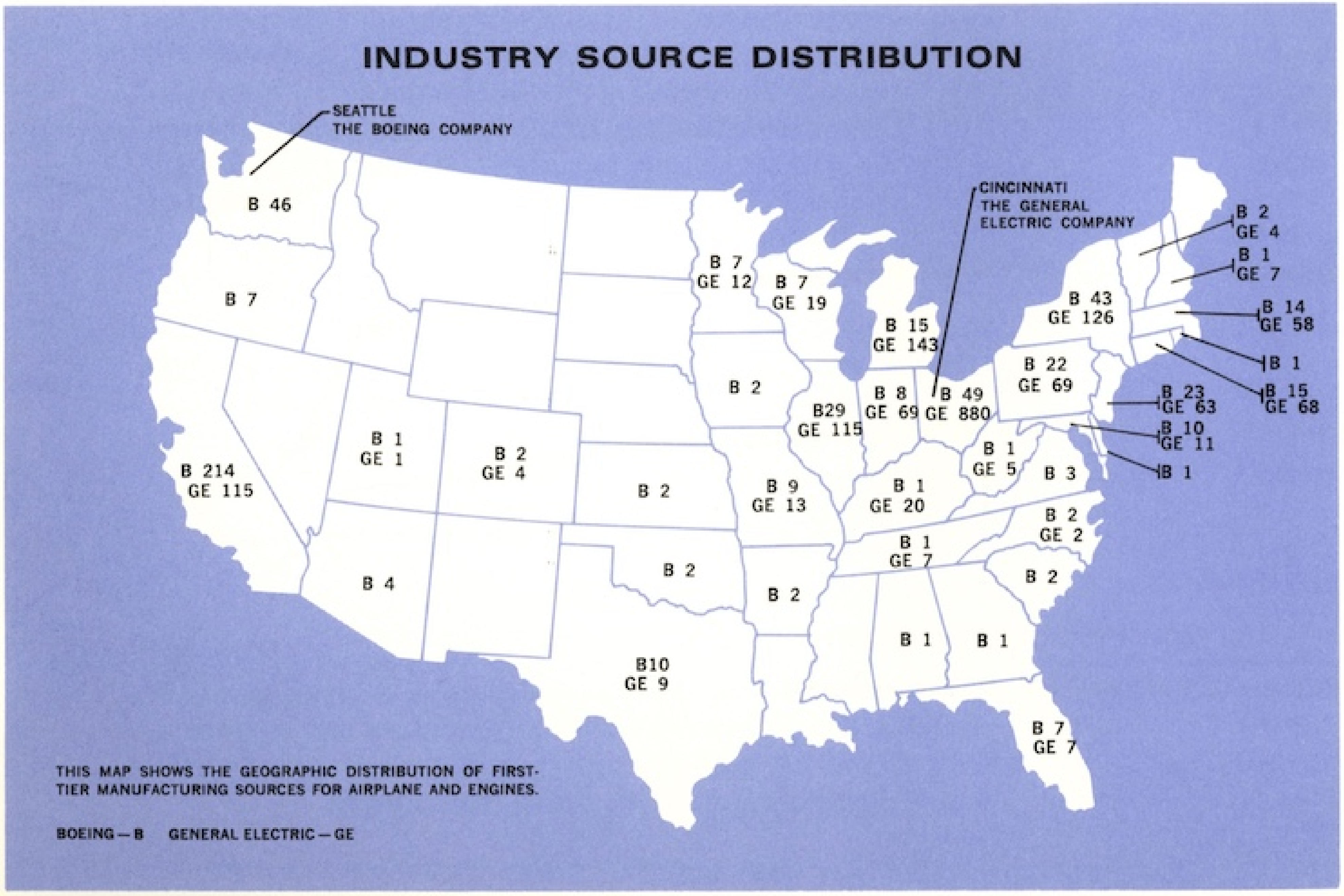
Engine and Maintenance — By mounting many accessories away from the engine, engine removal and maintenance have been greatly simplified. These engines will be conventional turbojet design, proved by millions of flight hours to have great reliability, high efficiency, and long life. The manufacturer is extending engine size in a carefully planned development program, involving extensive testing of component parts and complete engines in both real and simulated environmental conditions.	**Environmental Control** — There are four separate air conditioning systems, and the SST will be able to be dispatched with only three of them operating. The passenger cabin will maintain a lower cabin altitude — 6,000 feet — and more complete ventilation than is possible in current subsonic jets. Cabin air is circulated at the rate of 40 cubic feet per passenger per minute (about double that of current subsonic jets).
Wing Pivot — The pivot is big, sturdy, and simple; its load-carrying capability far exceeds that required for actual flight conditions. A full-size pivot bearing already has been tested beyond the production specification service life of the airplane. Both wings are linked together for identical movement, and the simple actuation system has double backup. The airplane can be landed safely even with the wings in the fully swept position.	**Titanium Structure** — Only half the weight of steel, stronger and more heat resistant than aluminum — these are the properties that made titanium alloy the ideal material for the SST. The structure is designed for a service life of more than 50,000 hours.
Landing Gear — Four main gears permit high gross weight takeoffs and inherently soft landings and provide a safety feature not available on present airplanes. Should an emergency occur, a safe landing can be made using only one main gear on one side of the airplane.	**Pilot Visibility** — The flight deck design is a direct result of recommendations solicited from airline pilots and engineers. The nose fairing lowers to provide better vision than today's aircraft for takeoff, subsonic cruise, and landing.

WHAT WILL BE THE ECONOMIC IMPACT?

The SST Program, during both the prototype and production phases, will provide desirable long-term employment stability for the airplane industry. During the prototype program, the airframe and engine manufacturers and their first level of suppliers will employ some 28,000 people at the peak period. The production program could employ as many as 60,000 at its peak. Additional jobs will be created for thousands of workers required by the other levels of subcontracting and related businesses and will spread outward to industries other than aerospace.

The map below illustrates the location and the number of likely first-tier suppliers for airplane and engine components. The table next to the map shows the estimated prototype program costs of the airplane and engine manufacturers.

Both Boeing and General Electric are conducting competitions and negotiating with a host of sources throughout the country. As these competitions and negotiations are completed with the first level of suppliers, further competitions and selections will be initiated for the next level of suppliers and so on until virtually every state in the union will be participating in the SST Program. With SST worldwide operation, sales of 1,000 to 1,200 airplanes are likely. From this number of airplanes the U.S. airlines are expected to generate approximately $60 billion in SST revenues through 1990. The SST, as is the case of subsonic jet production today, will become an important catalyst to the economy. As SST dollars are spent and respent, billions will be circulated; proportional tax revenues will accrue to the government.



PROTOTYPE PROGRAM

AIRPLANE

Boeing dollar estimate: 625,000,000

Dollars to be spent within the company: 334,300,000

Dollars to be spent outside the company: 290,700,000

ENGINE

General Electric dollar estimate: 284,000,000

Dollars to be spent within the company: 166,000,000

Dollars to be spent outside the company: 118,000,000

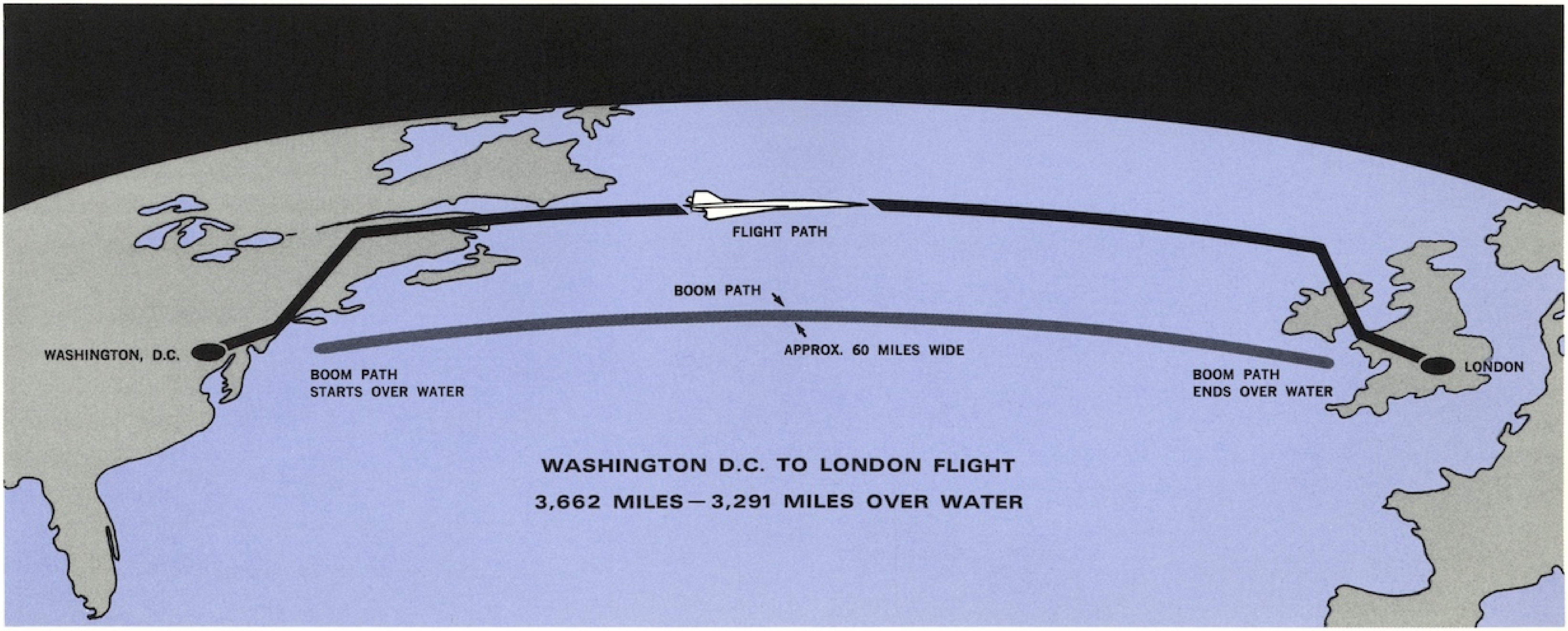
WHAT ABOUT SONIC BOOM?

All aircraft produce a sonic boom when exceeding the speed of sound. The SST will be no exception. Its boom characteristics will be minimum for an aircraft of this size, but it will, when flying supersonically, produce a boom.

However, the SST will operate initially on long-haul, overwater intercontinental routes. It will be most efficient and economical on nonstop flights of about 4,000 miles, where approximately 90 percent of the long-haul passenger miles now are flown internationally. The North Atlantic market alone accounts for about 25 percent of this figure.

On long-haul flights, the SST can afford to operate subsonically over land for reasonable distances and still remain economically profitable. On a typical Washington, D.C., to London flight, as shown below, the SST will take off and fly at subsonic speeds over land, change to supersonic speeds over the Atlantic and slow to subsonic flight as it crosses the English coast for the remainder of the distance to London.

Since the Concorde is to be introduced into service before the U.S. SST, it may well provide the answer as to whether or not supersonic flight will be acceptable to the public over populated areas.



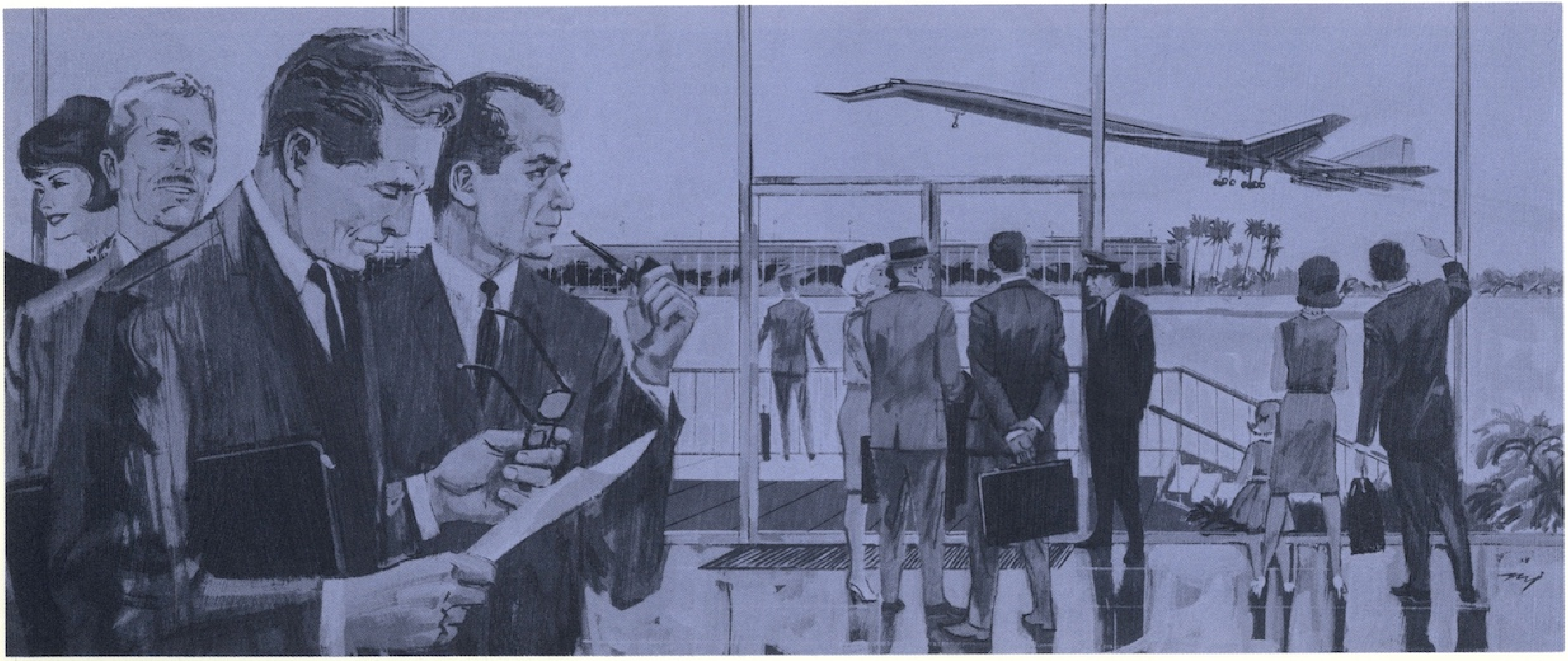
WHAT ABOUT NOISE NEAR AIRPORTS?

At airports and in adjacent communities, airplane engine noise is a matter of concern.

In many cases, SST sound levels will be significantly lower than those generated by present jets. For example, the compressor-whine noise experienced by communities under approach and landing paths of today's airplanes has been substantially reduced in the SST design.

Takeoff noise experienced by communities surrounding the airport will be reduced by tailoring takeoffs to the site. The SST's extremely powerful engines make possible shorter takeoffs and more rapid climb, quickly getting the airplane up and away. Because the SST will be at a higher altitude above the community than today's jets, the noise on the ground will be appreciably less.

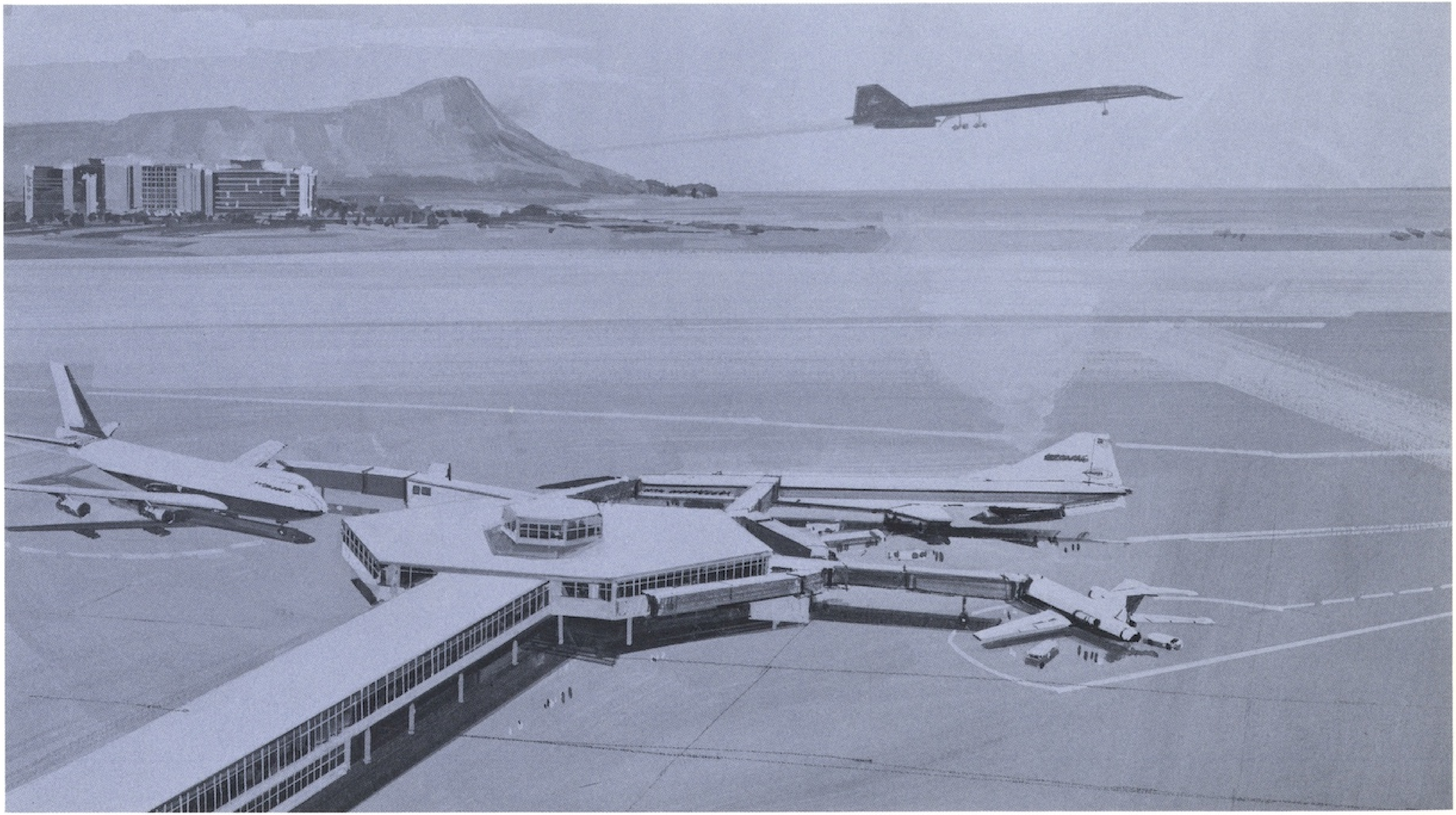
The SST's very large, powerful engines inherently generate more noise from the start of a takeoff to the liftoff than do the engines of current jet aircraft. Research and design study programs in noise suppression have defined some promising solutions to this remaining noise problem. These will be further developed and refined during the prototype phase. It is expected that by the time the SST begins commercial operation, noise generated during the initial part of the takeoff will have been reduced to levels commensurate with those of present jets.



WHAT CHANGES IN PRESENT AIRPORTS?

Because of air traffic growth, and the resulting airport changes that will occur in the next few years, existing international airports will not have to undergo large-scale alterations to handle the SST. Prior introduction of the large subsonic transports also will help in this respect. At typical airports, the SST will be suitable for normal parking — parallel, canted, or nose-in.

The four-post main landing gears, with conventional four-wheel trucks, allow the SST to operate from the same runway strengths as today's long-range jets.



WHERE WILL THE SST FLY?

As mentioned previously, the SST will be more economical to operate, and, therefore, most profitable, on long-haul, heavy-traffic routes, where its supersonic capability can be employed to achieve maximum efficiency.

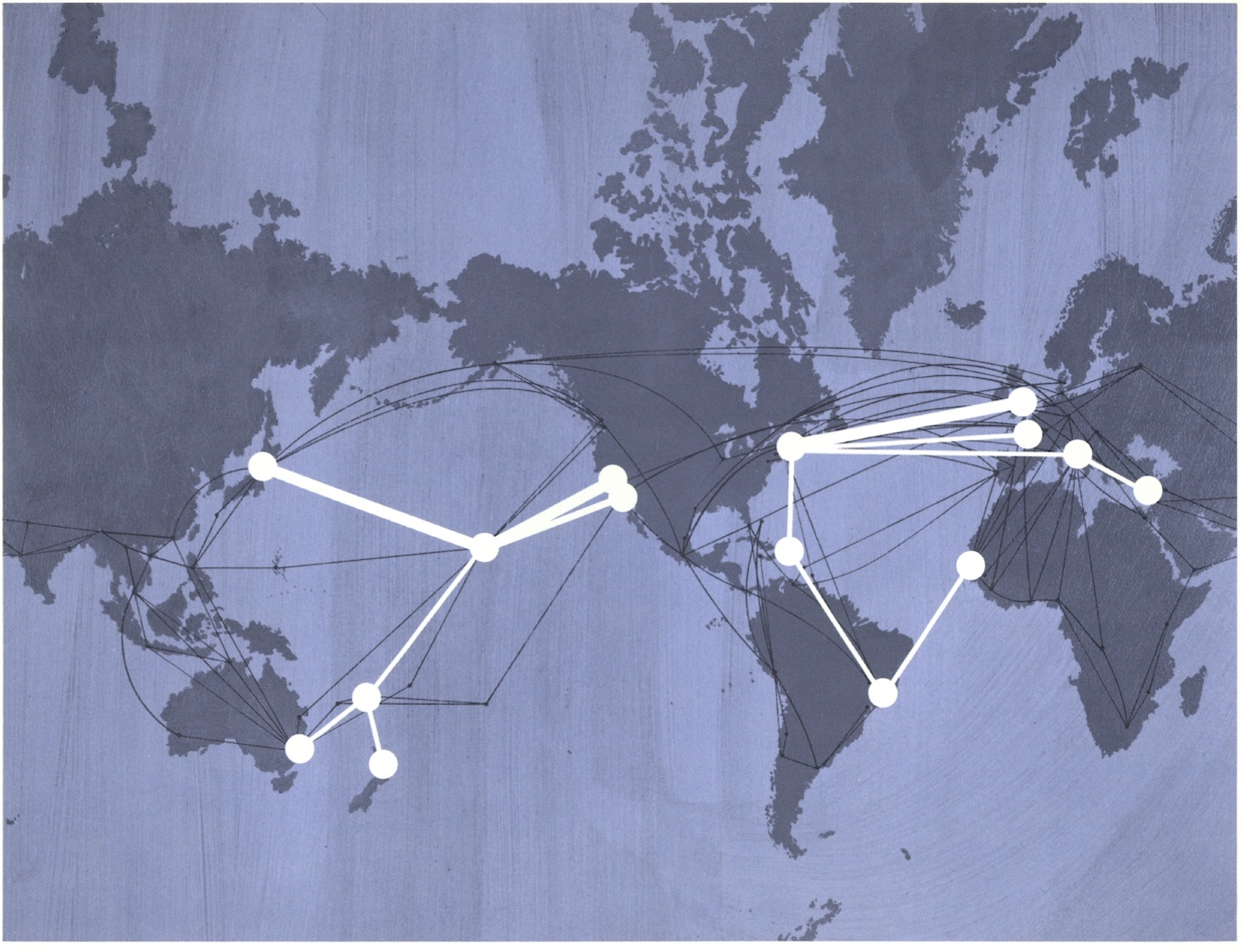
The map at right depicts the major world air traffic routes now in use. Note that the greater portion of most of the routes are over water or sparsely inhabited land masses.

The accompanying table lists SST flight times and route miles and compares them with subsonic jet flight times. Most of these routes are over 2,000 miles, and a significant number are in excess of 3,000 miles—distances over which the SST will operate most efficiently.

Even if restricted to subsonic flight on overland legs, most of these routes will permit enough supersonic overwater flight to make them profitable.

MAJOR WORLD ROUTES

	Great Circle Statute Miles	SST Mach 2.7 (1,800 mph) Alt 60,000 to 70,000 Ft Hr Min	707 Intercontinental Mach .81 (560 mph) Alt 35,000 Ft Hr Min
Washington, D.C. - London	3,662	2:45	7:30
San Francisco - Honolulu	2,395	2:00	4:55
Los Angeles - Honolulu	2,550	2:05	5:15
Honolulu - Tokyo	3,846	2:55	8:00
Honolulu - Nandi	3,169	2:25	6:20
Nandi - Sydney	1,967	1:45	4:10
Rio de Janeiro - Dakar	3,121	2:25	6:15
San Juan - Rio de Janeiro	3,233	2:30	6:25
Hong Kong - Tokyo	1,785	1:40	3:45
New York - San Juan	1,610	1:30	3:25
Rome - Beirut	1,358	1:25	2:45
New York - Rome	4,277	3:05	8:40
New York - London	3,442	2:40	7:00
New York - Paris	3,617	2:40	7:25

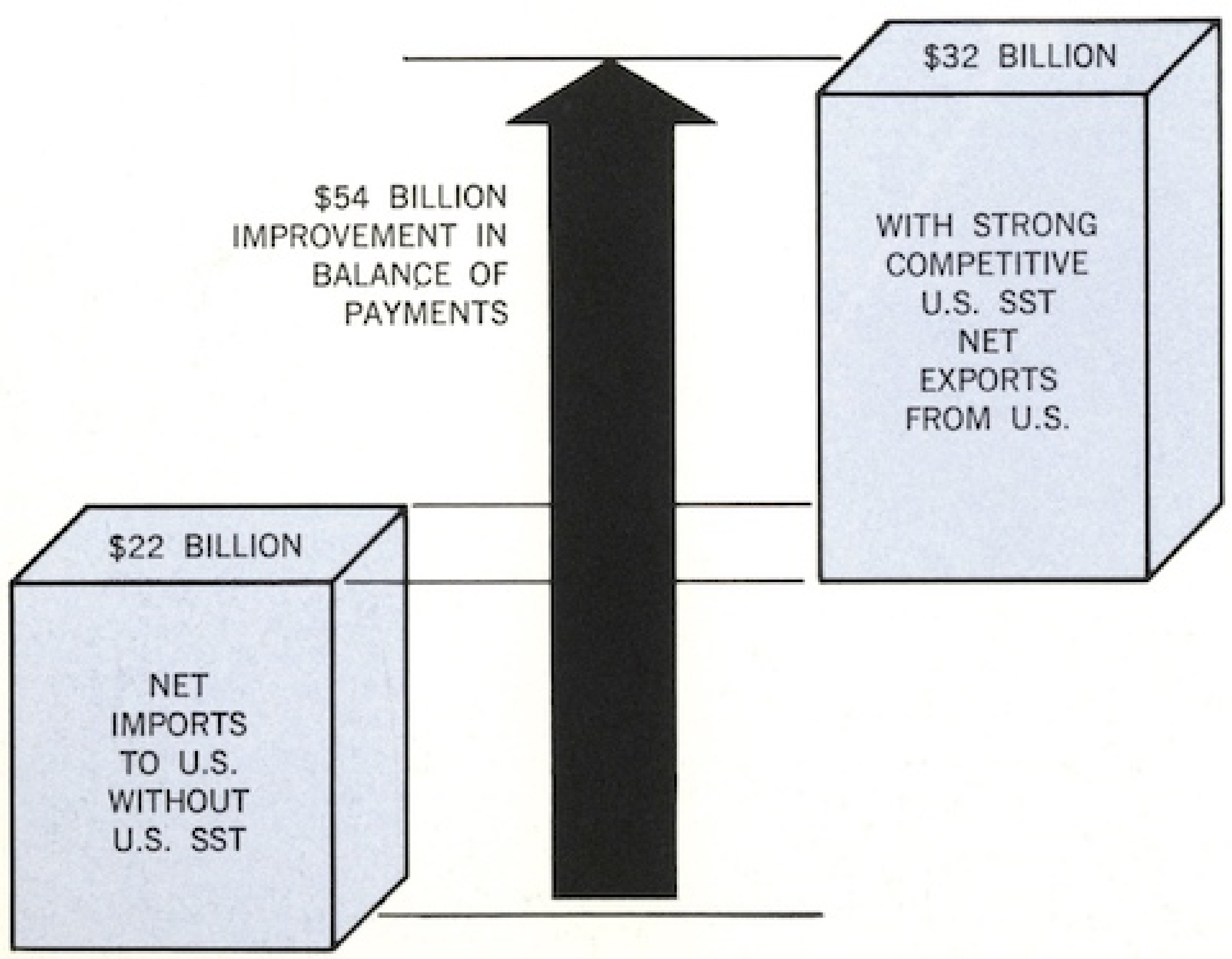


WHY IS THE SST VITAL TO THE NATION?

A successful Supersonic Transport Program would permit the United States to maintain its preeminent leadership in the field of aircraft design and manufacture. The advanced technology required for the SST — new aerodynamic concepts, new powerplants, new structural materials, new airframe systems — would strengthen and improve our capability in all fields of aviation and aerospace activities, as well as in direct application to large commercial airplanes.

The program would produce a favorable effect on the balance of payments, estimated to be as high as $54 billion (taking into account both sales of our aircraft abroad and the fact that, with an SST of our own, the U.S. airlines would not be required to purchase this type of equipment from foreign manufacturers).

BALANCE OF PAYMENTS (1970-1990)
IMPROVEMENT WITH U.S. SST



The United States is the only major nation in the world that relies primarily upon privately owned and operated transportation. A successful SST Program would result in a major improvement in our own transportation system, as well as a significant betterment of the international system of which our airlines are a part. Similarly, the SST will enhance national prestige abroad and continue the reputation of the American commercial jet airplane as an outstanding goodwill ambassador.

Historically, any basic improvement in the transportation system contributes substantially to the strength of the economy. The SST offers such an advance and will be a continuing source of economic vitality to the nation, providing stability in employment and taxable income.

Perhaps best of all, the SST would lead to better communication with the rest of the world and thus to a better world for us all. That, in brief, is the U.S. SST, its program, economics, and characteristics. The next logical step is to begin construction of the two SST prototypes.

MARCH, 1967

Berry, William Ward
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THE BOEING COMPANY SST