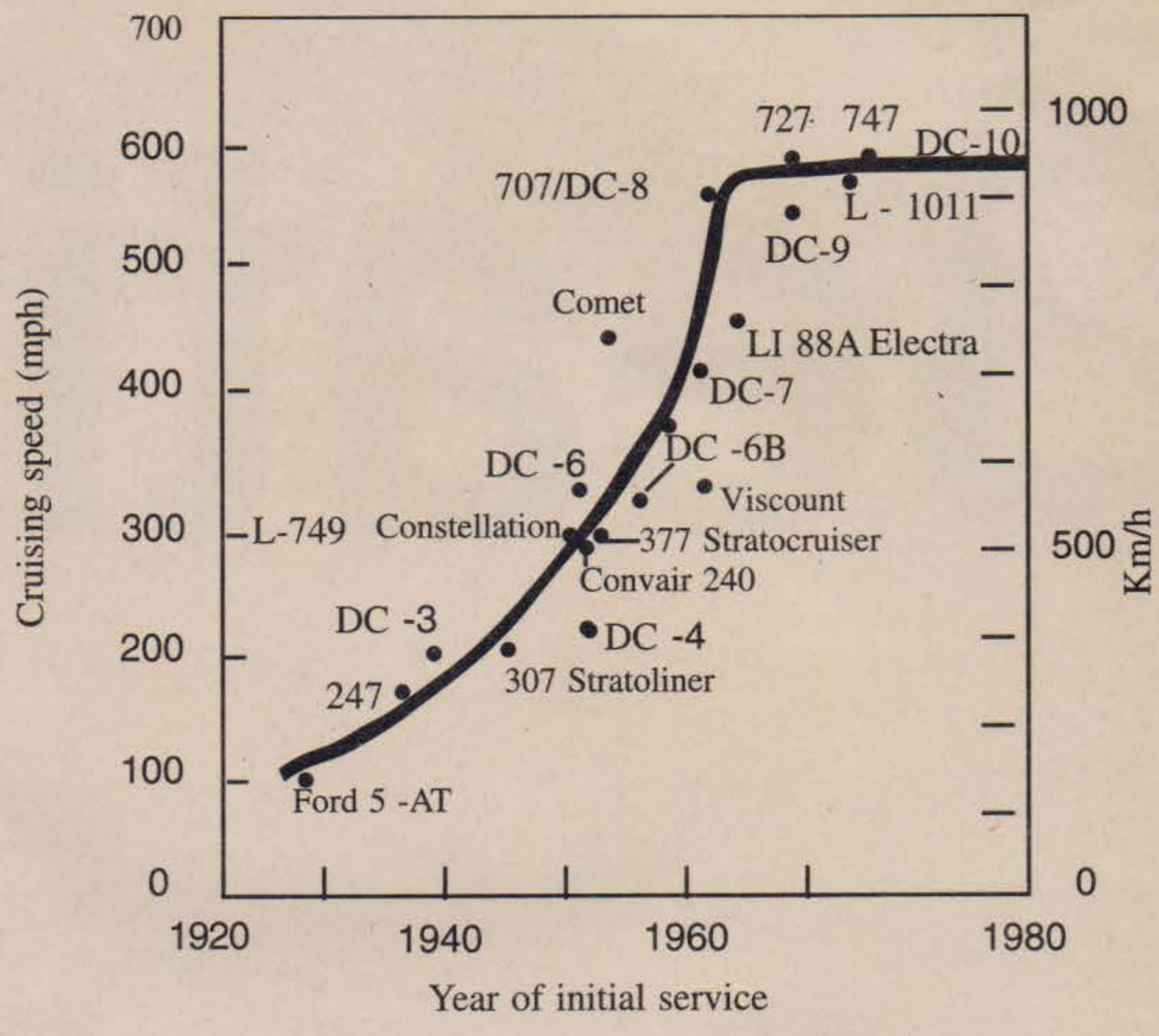
Sound

Beating

CONCORDE created a record of sorts recently when it traversed the distance between London and New York in a little less than 3 hours (2 hours, 52 minutes and 59 seconds to be precise), one and a half minute faster than the earlier record. This record coincided with the 20th year of Concorde's existence. When rest of the aircrafts are struggling to reach even the sonic speed, Concorde has been the lone exception achieving supersonic speeds.

■ G.P. Vinayababu

From the 'Wright Flyer' in 1903, to the Boeings in the early 1960s, the speed of commercial aircrafts increased exponentially, but have remained stagnant (or increased only marginally) over the years after that. All modern commercial aircrafts except the Concorde have been able to achieve a Mach number of 0.8, (Mach number is the ratio of speed of a moving body to the speed of sound) in stratosphere. Concorde with a maximum cruising speed of 1,320 mph is the fastest passenger carrier in the world today. So wouldn't it make sense to have Concordes all over the skies instead of the traditional aircrafts which are in use now?



Development of the speed of subsonic transport aircraft from 1920 to 1980

Source: What makes airplanes fly?

Though speed is a major factor in transportation in the modern age, that's not all which determines the choice of an airliner. Aircraft, however fast, cannot match the load carrying capacity of a ship. In the same way no other form of transport offers the speed when it comes to transporting life saving drugs to the affected place on time. Constructional/ operational costs, time and efficiency are important factors of consideration when it comes to deciding on an aircraft.

The conventional passenger aircrafts travel in the stratospheric region of atmosphere at subsonic speeds (below the speed of sound).

It is a common experience to all of us to spontaneously look up at the sky when we hear the sound of a jet aircraft. But we

Concorde in flight

Aircraft of development from the Wright Flyer to our time.

	Year	Takeoff Weight (lb)	Speed (mph)
pigeon		0.9	28
wandering albatross		21	45
VJ-24 hang glider		310	20
Nimbus-3 sailplane		1,500	50
Piper Super Club		1,750	72
Cessna 310 F		4,800	125
Wright Flyer I	1903	750	35
Ford Trimotor	1927	11,000	110
Douglas DC-3	1935	25,000	180
Douglas DC-6	1947	105,000	315
Boeing 707-320	1959	33,000	470
Douglas DC-9-30	1966	121,000	525
Boeing 747-B	1970	800,000	570
Douglas DC-10-30	1971	565,000	564
Airbus 300	1974	302,000	530
Boeing 767-200	1982	315,000	530
Airbus 300-600	1984	376,000	540
Airbus 320	1988	162,000	527

Source: What makes airplanes fly?

see no aircraft in sight in the direction of the jet sound. This is because the speed of jet aircraft is faster than the speed of sound. But in case of a subsonic aircraft we hear the sound long before the aircraft appears on scene which gets louder when it nears and slowly gets feebler as it moves away from us.

When an aircraft moves at sonic speed, shock waves are created which are refracted down to earth. This is popularly called as the 'sonic boom' which is intolerable to human ears. This would have been experienced by most of us when a jet aircraft passes above us. An object moving at supersonic speed will produce sound signals which are confined to a cone which is popularly known as the 'Mach cone'. The region enclosed within the cone is called the 'zone of action' and the one outside the cone is the 'zone of silence'. A bullet moving at supersonic speed creates shock waves along the slant edges (Mach lines around the Mach cone). This is true even in case of supersonic aircraft. The shock wave pattern around the cone creates a sonic boom on the earth surface.

Though sonic boom and sound levels have been greatly reduced in Concorde it remains a major hurdle in the construction of supersonic aircrafts for commercial purposes.

If sonic boom is one of the major reasons going against the construction of supersonic aircrafts, there are several other reasons for its non-acceptance. Cost of construction and operation of supersonic flights which involves various aerodynamic variations, is more. Also the seat mile cost - the cost to fly one passenger or a unit of weight for one mile, is atleast 3 times higher than the seat mile cost of Boeing 747.

The aerodynamic configuration chosen for Concorde is delta wing. This shape presented problems like large vortices curling up at the edges of the extremely swept back wings. This had to be suitably countered in the construction of Concordes. Heat developed is also more which had to be channelised properly in this case.

But a new line of research would make it possible to achieve hypersonic speeds (three to five times greater than the sonic speed) in commercial transportation. If we could build aircrafts which can rise above the clouds and dense layers of atmosphere and fly at extreme altitudes and re-enter land at a far away airport, the boom problem will vanish. An aircraft which could achieve this is being developed in the U.S and Europe.

This new flying machine has been dubbed the *Orient Express*. The construction of 'Orient Express' is based on the model of aircraft which re-enters atmosphere after a space mission like the 'Challenger'. If the same principle is adopted in passenger aircrafts, then a hypersonic transport can be a reality in the near future.

If speedier transportation is one main concern in the construction of passenger airliners, the other is the capacity of the airliner to carry more passengers.

Large subsonic transports

Air travel is currently growing at rates that will cause passenger traffic to double by the year 2005. So it is important to build larger aircrafts. Boeing has been a pioneer in building large commercial aircrafts. Its range of airliners have always laid emphasis on large, comfortable space for passengers. The first of the Boeing 747 series - which includes some of the largest aircrafts, was developed in 1960s. Many different concepts were studied in its development. The double deck and single deck aircraft designs were considered. The 747 was finally built with single deck with twin aisles. This configuration was wonderful for passenger comfort and could carry more than 500 passengers.

The potential future development of larger commercial transport airliners is being studied by Boeing and also by Airbus. Boeing proposes to incorporate technological excellence in its future large airliners-like high bypass engines, extensive use of composite materials, computer modelled aerodynamics and advanced integrated electronic systems.