

*A History of  
Sea-Air Aviation*

*Wings Over  
The  
Ocean  
part seven*

By John M. Lindley

World War I both helped and hindered postwar development of commercial air transport. The war helped to promote the development of aircraft which could be adapted to carry passengers. Prior to the war, airplane designers had built multi-seat, cabin and multi-engine airplanes, but the wartime demands for aircraft for bombing, troop or staff transport and long-range reconnaissance hastened these developments. Yet aviation in WW I also acquired a public image that was hardly beneficial to carrying passengers. Both aircraft and pilots had the image of fighters engaged in a life-or-

death struggle. To some degree, this image was accurate, but it hardly contributed toward convincing the public to try air travel.

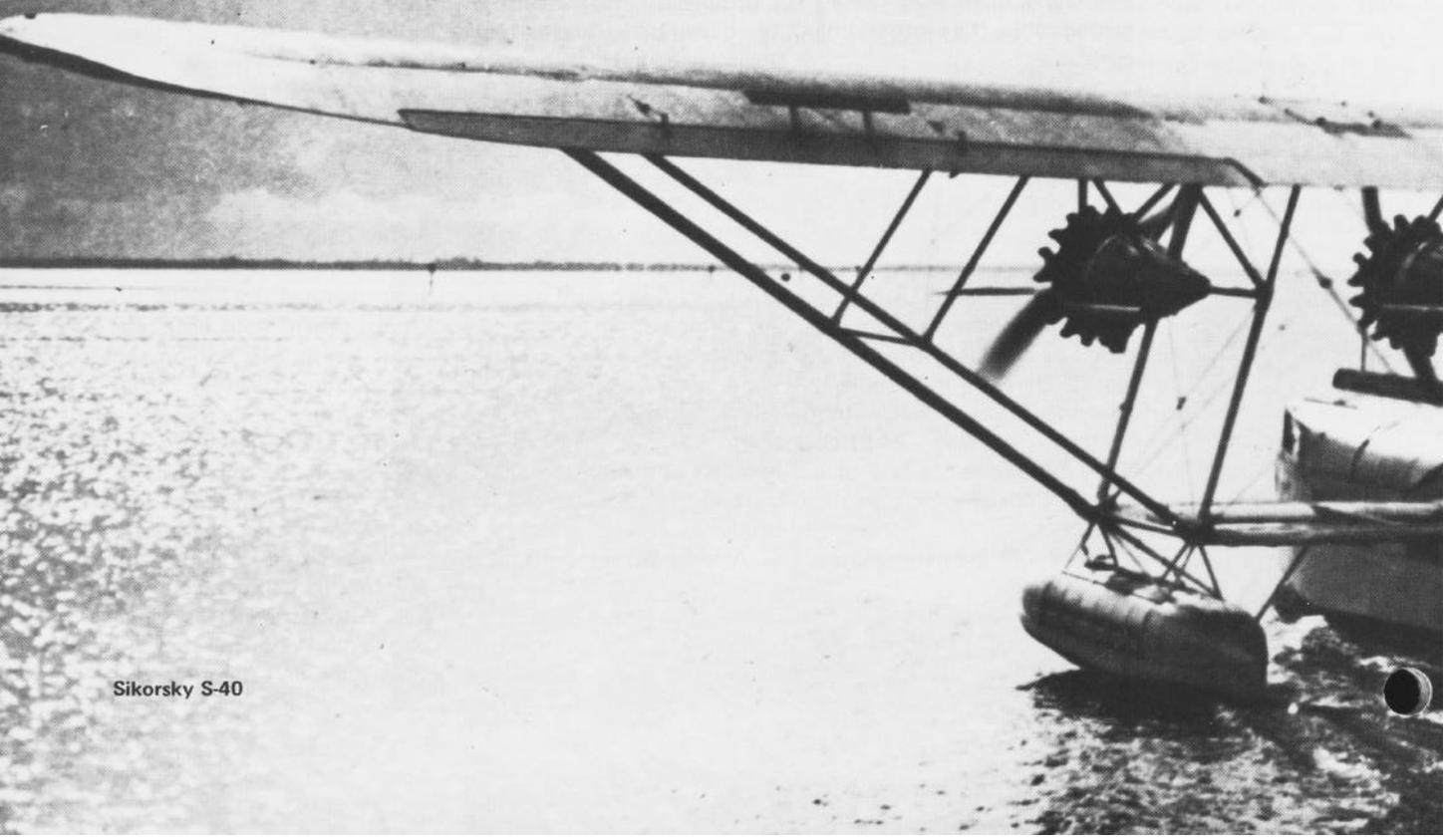
Despite these handicaps, the first commercial airlines got their start in 1919. Several companies in England and France initiated passenger services across the English Channel between London, Paris, Brussels and Amsterdam. A German line, Deutsche Luftreederei, began service within Germany. A French company established a run between Toulouse and Casablanca, Morocco, across the Mediterranean.

Air transport did not develop as rapidly in the United States as in Europe. Aero Ltd. offered flights between New York and Atlantic City in August 1919, using surplus HS-2 flying boats. Later in that year Florida West Indies Airways began flights between Miami and Nassau for passengers who wanted to avoid Prohibition by going to the West Indies for a drink. This company was soon taken over by Aeromarine Airways, Inc., which, as Aeromarine West Indies Airways, got one of the early foreign air mail contracts to carry mail and passengers between Key West and Havana. By 1921 they were using Curtiss F5L

twin-engine biplane flying boats which could carry up to 14 passengers. Aeromarine continued to expand in 1920 and 1922 but, despite running regularly scheduled flights for a profit, the company closed down its passenger services in 1923.

Another early air mail route was in Seattle, Wash. On March 3, 1919, Edward Hubbard began carrying mail with a Boeing C-700 biplane, equipped with pontoons, between Vancouver, British Columbia, and Seattle, across Puget Sound. Eventually service was between Seattle and Victoria, B.C. Later that year Hubbard switched to a Boeing B-1 flying boat which remained in service until 1927. This route was to save time on mail deliveries to and from the Far East by meeting vessels at their first landfall rather than at the pier. Even after Hubbard's death in 1929, the Seattle-Victoria air mail line continued its regular delivery of mail until its demise on June 30, 1937.

Prior to the establishment of Pan American Airways in 1927, the only other notable early commercial air service across water was the Syd Chaplin Airlines which began operations on July 4, 1919. This airline flew people from San Pedro, Calif., to Santa Catalina, 34 miles away. Although Syd



Chaplin Airlines changed hands and names several times until it was absorbed by Western Air Express in 1928, the company used flying boats for passenger service.

Infant commercial air transport in the United States suffered from several handicaps not present in Europe, where airlines were highly developed in the 1920s. Relatively few U.S. routes involved water crossings of great distance, such as the English Channel; within the United States inter-city routes were already served by efficient railroad lines (railroads in the 1920s were considerably more comfortable than airplanes); and lastly, the relatively low cruising speeds (no more than 100 miles per hour) of early aircraft were not that much faster than the railroads. Laboring under these handicaps, early airlines in the United States concentrated on carrying air mail.

When the U.S. Post Office decided to speed up air mail deliveries and Congress passed the Air Mail Act in 1925 (the Kelly Act) and subsequent legislation, airlines in the United States got the same boost that had made European airlines financially solvent: government subsidy. The Kelly Act put air mail service up for bid to

private contractors on a pound-per-mile basis. The Air Commerce Act of 1926 gave aviation legal status under the jurisdiction of the Department of Commerce and promoted improved navigational aids. The third amendment of the Kelly Act, known as the McNary-Watres Bill of 1930, provided an even greater help to U.S. airlines: the air mail subsidy rate would be based on the amount of space available on the aircraft for mail. This change in the law meant that since operators would be paid by space, there was incentive to fly larger aircraft. If mail did not take up all the space in the airplane, then the operator could use the available room for passengers. The sponsors of this law expected that eventually passenger fares would replace air mail subsidies as the principal form of airline revenue, but before that happened the financial future of most airlines would be secure.

As one historian, R. E. G. Davies,

puts it, U.S. air transport could not pay its own way because it could not charge fares within the reach of the ordinary traveler. Thus the McNary-Watres Act "was a neat compromise. The more mail that was carried, the more passenger accommodations could be provided." Yet these acts of Congress were not the only boosts to air transport in the 1920s.

The introduction of the Ford Tri-Motor Monoplane in 1926 and Lindbergh's flight in 1927 helped spur growth in commercial aviation. The impact of Lindbergh's flight is readily apparent. It showed what a well-built airplane could do when properly handled, and brought a new image of flying as a possible means of public transport to the attention of the nation. The Ford Tri-Motor was important in that it was more successful than other early commercial land-planes that were capable of carrying a reasonable load of passengers. Prior to



1926 when the Ford aircraft made its maiden flight, most passenger planes were flying boats. The reign of the flying boat as a passenger carrier lasted well into the 1930s, especially for overwater flights. But by 1926, landplanes were getting bigger and more reliable. At the same time, in large part because of air-mail operations, airfields and runways were gradually improved. Thus, with a few exceptions, landplanes superseded flying boats in commercial air service.

Flying boats dominated over ocean transport for two reasons. They were generally considered to be safer than landplanes because they were usually multi-engine craft which could land on water in an emergency. In addition they could operate out of places which had good harbors but lacked good airfields. Thus they proved to be ideal for flying to many cities in Central and South America, Africa and Asia.

In the history of sea-air aviation three flying boats of the 1930s are of particular interest and importance. The Dornier Company built several models of its Dornier *Wal* (Whale) flying boats which were very successful as passenger planes. Dornier produced what was perhaps the fullest development of the multi-engine design in a flying boat, its Do.X. which had 12 engines. In 1929 it carried 169 persons on a short flight over Lake Constance and in 1930-31 flew across the Atlantic to South and North America, visiting those continents for 10 months. In aviation history, the Do.X. is rivaled in size only by Howard Hughes' *Hercules HK-1*, also known as the *Spruce Goose* – an all wooden flying boat built in 1947 which made only one short flight.

When British Imperial Airways began to operate its Empire Routes between Great Britain and the Commonwealth nations in the mid-1930s, it used the Short Empire flying boat S-23C. The S-23C was ideally suited for operating out of places which lacked good airfields and, in addition, it could carry 23 passengers.

Another seaplane which rivaled the S-23C was the Boeing 314. It weighed 82,500 pounds and could carry 74



F5L modified by Aeromarine

passengers on short flights, 30 on longer flights. It had an elegantly equipped and appointed interior which made long overwater flights very comfortable. Boeing delivered the first of the 314s to Pan American Airways in 1939 at an initial cost of \$550,000 each.

With flying boats such as the Dornier *Wal*, the S-23C or the 314 available in the 1930s, the leading airlines soon opened new air routes to passenger service throughout the world. In the late 1920s French and German airlines began to offer mail service between Europe and the east coast of South America. In the early 1930s the North German Lloyd Steamship Line operated ship-to-shore mail service. While still far distant from the North American coast, either of the Lloyd liners, *Bremen* or *Europa* would catapult a Heinkel seaplane loaded with mail from the deck. It would fly to New York City via an intermediate landing point such as Nova Scotia. Some of these seaplane flights were as long as 750 miles and delivered the mail to New York from 24 to 36 hours ahead of regular mail delivery service. During the decade between 1929 and 1939, many European nations were preoccupied with establishing air serv-

ice between themselves and their colonial possessions: the British had their Empire Routes; the French, Dutch, Belgian and Italian airlines all established air service to their colonies. These routes made it possible for the air traveler to make connections from Europe to the Middle East, the Indian subcontinent, southeast Asia or Australia. Flying boats usually provided transportation on the long overwater stretches with landplanes used on shorter legs. Air operations to the colonies in the 1930s became a matter of national prestige partly because several different national airlines might operate out of the same airport where facilities were inadequate or stopovers were mandatory. Since the operating costs on these routes were high and the passenger loads were modest, most airlines flying to the colonies received either direct or indirect government subsidies to offset operating losses.

In contrast to these efforts, regular transAtlantic commercial service was aimed at fast transportation – for commercial reasons. Thus the French airline *Aeropostale* established the first regular airline service to South America in the early 1930s. The Germans provided not only airship service to South America with the *Graf Zeppelin*

and *Hindenburg*, but one of their airlines, DLH (*Deutsche Luft Hansa*) offered the first regular transAtlantic mail service in 1934. On the transoceanic leg they used a Dornier *Wal*. Two years later they initiated regular passenger service across the South Atlantic. Passenger service across the North Atlantic followed shortly because Pan American and British Imperial Airways worked out procedures for commercial operations across the Atlantic. Pan American opened regularly scheduled passenger flights from New York to Marseilles via the Azores and Lisbon on June 28, 1939, using a Boeing 314 *Yankee Clipper*, which carried 22 passengers. The crossing took 29 hours with a one-way fare of \$375; round trip \$675. Later Pan Am offered a northern Atlantic route from New York to Southampton, England, via Newfoundland and Ireland.

Pan American Airways started out in 1927 with a 110-mile air route between Key West, Fla., and Havana, Cuba. But, thanks to the astute management of Juan Trippe and his financial backers, some fruitful mergers with competitors and the winning of key foreign air mail contracts from the U.S. Post Office, Pan American grew enormously. By 1929 Pan Am was the master of Caribbean air travel. From there it branched out to encompass all of Central and South America, so that by the end of 1930, it had a total route mileage of 20,308 miles, which included a circuit of South America.

At first Pan Am used Sikorsky eight-passenger S-38 amphibians, flying into harbors and bases which the airline had built. As Pan Am's operations expanded, it switched to the Consolidated *Commodore*, a twin-engine flying boat that carried 20 passengers. Between 1929-1931 Pan Am introduced the first of the *Clipper* boats, the Sikorsky S-40, which soon became its trademark. These seaplanes could carry as many as 40 passengers. By the end of 1934, Pan Am had 103 land and 56 marine bases in Latin America from which it operated flying boats or landplanes such as the Douglas DC-2 and DC-3 and the Lockheed L-10 *Electra*.

In the mid-1930s Pan Am expanded its operations in two directions. It began to make survey flights across the North Atlantic in an effort to determine the problems and possibilities for transAtlantic service. It also began to study the possibility of transPacific flights. As early as 1931 Charles and Anne Morrow Lindbergh flew a survey flight from Canada and Alaska to Japan via Soviet Siberia. When the Soviets refused to allow U.S. aircraft to use bases in Siberia, Pan Am looked into developing a mid-Pacific route from Hawaii to Hong Kong via Midway and Wake Islands, Guam and the Philippines. Its surveys showed that there were two major problems in transPacific operations. Pan Am would need longer range aircraft and adequate bases en route.

Through a combination of good management, astute diplomacy and the availability of capable aircraft, such as the Martin M-130, Sikorsky S-42 and Boeing 314, Pan Am solved the problems of transPacific service. By November 1935 its *Clipper* flying boats were hauling mail from San Francisco to Manila in just under 60 hours. Almost a year later Pan Am opened this route to passenger service and, by 1937, had moved the western terminus to Hong Kong.

Then, Pan American began negotiations with New Zealand and the British for a route connecting Hawaii and Australia. Route surveys were made in 1935, 1936 and 1937, but when the British pressed the U.S. for reciprocal

landing rights at Hawaii and disputed the Pan Am claim to landing rights at Canton Island (a small coral atoll it wished to use as a stopover), Pan Am was stymied. In March 1938 the British decided to drop their claims to Canton Island and to abandon their efforts to get landing rights in Hawaii, clearing the way for Pan American. A Boeing 314 made the first passenger flight from San Francisco to Auckland, New Zealand, via Hawaii, Canton Island and Noumea, New Caledonia, on September 13, 1940. Within the next year, service was expanded to Singapore and Suva, Fiji.

Pan American could not have opened Caribbean, transAtlantic and trans-Pacific air routes without emphasizing technical excellence in its aircraft and flying operations. In 1932, for example, the airline developed a loop-type radio direction finder for aircraft which could be used with the standard radio receiver. It built improved ground direction finders to aid navigation and emphasized long-distance navigational training. By 1938 it required that navigators on transoceanic flights make celestial observations at least hourly, day and night; that drift be measured; that its many ground direction finder stations keep track of airborne craft; and that the planes, in turn, measure radio bearings. Aircrews were told not to depend upon only one system of navigation; instead they were to use and coordinate all available means of overocean navigation so that any errors would be minimized. In addition, Pan American had been developing improved weather forecasting using air mass analysis and a number of upper air meteorological stations since the early 1930s. With improved weather information, pilots and navigators could better determine optimal flight levels and courses to take advantage of favorable winds and, if possible, to avoid poor weather. By 1940, Pan Am had an admirable record for safety and near perfect completion of scheduled flights, as well as an air network greater in extent and scope than any of the leading airlines in Europe.

Not surprisingly, WW II disrupted normal air transport, especially long-



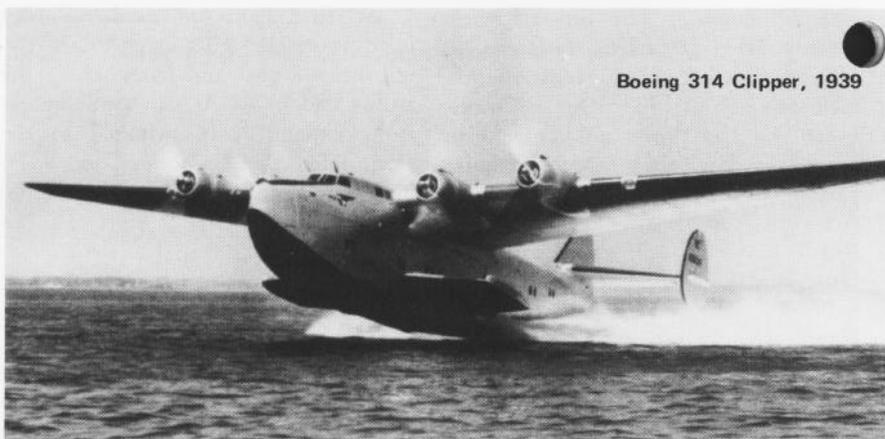
Berth in a Ford Tri-Motor

distance overocean flying. U.S. commercial air carriers tried to continue domestic business as usual, but heavy demands for overseas transport put a severe strain on them. Despite this, the airlines and their Air Transport Association, headed by Colonel Edgar S. Gorrell, willingly responded to the needs of wartime.

U.S. airlines began gradual wartime mobilization in the spring of 1941 when American and British airlines signed contracts for ferrying B-24 *Liberators* built in American factories to England. The Army Air Force established its Ferrying Command (later Air Transport Command (ATC)) on May 29, 1941. It wasn't long until the Ferry Command began ferrying airplanes to the Middle East and Africa across the South Atlantic from bases in the Caribbean. By the end of the war, air transport spanned the globe.

Although most of the domestic air carriers provided overseas air transport services for ATC and the Naval Air Transport System (NATS), Pan Am led the way in the development of overseas operations. Pan Am put its considerable experience to work in building airports, establishing new routes and providing the basic facilities necessary for transport operations around the world. Personnel from Pan Am and other airlines provided the Army and the Navy with valuable managerial expertise and counsel. Consequently ATC and NATS became, in effect, gigantic airlines composed of commercial air carriers — all under contract to provide transport services for the military forces of the United Nations throughout the world. In addition to the necessary managerial and operational aspects of air transport, ATC also established, with the aid of the airlines, various training schools to teach military personnel the procedures and methods of air transport operations.

As part of wartime air transport operations, NATS began work on December 12, 1941. It flew Douglas R4Ds (DC-3s) and later Douglas R5Ds (Army C-54 *Skymasters*) across the Pacific and to Alaska and Europe. This was a powerful and efficient civil aircraft fleet. An R5D, for example,



could carry 50 airborne troops, 24 hospital litters or a light tank, a truck or two scout cars or 155mm howitzers. It could carry a 7-ton load 500 miles or a reduced payload up to 2,500 miles. In addition to these landplanes, NATS also flew Consolidated PBV patrol bombers and Martin *Mariner* and *Mars* flying boats for transport services. By the end of the war, NATS had a staff of 26,600 persons and a fleet of 429 aircraft of which 159 were R5Ds. ATC was even bigger.

One wartime job which NATS and ATC performed with notable skill was flying important military and civilian leaders to various places around the globe. Pan Am, for example, carried President Franklin D. Roosevelt, General Dwight D. Eisenhower, Admiral William D. Leahy and several other senior leaders to the Casablanca and Teheran Conferences in 1943.

ATC and NATS (combined after the war to form the Military Air Transport System) did their share to win the war whether they were carrying mail, cargo, combat troops, wounded soldiers or VIPs.

World War II helped to produce a boom in air travel, once hostilities ceased. Wartime technical research and development led to safer and more powerful and dependable engines. Four-engine aircraft had become commonplace. There was a surplus of valuable equipment (airfields, navigational aids, radio, radar, weather facilities). In addition, the war had promoted a wider public acceptance of air travel. Thus by 1950 the general

public took intercontinental air travel for granted.

The development of Loran (long range aid to navigation) was typical of the way in which that conflict helped the future development of commercial air transport. Since both military combat and air transport aircraft were operating over great distances at sea, the Office of Scientific Research and Development in the War Department set about developing an electronic navigational aid which was entirely passive: that is, the ship or plane which used it emitted no signal which would reveal its position to the enemy. Loran was the answer. By day, airplanes or ships could get a Loran fix up to 700 miles from the Loran stations. At night they might get a fix as far as 1,400 miles from the transmitting stations (because of more favorable atmospheric conditions).

Beginning in the fall of 1942, Loran stations were set up on the coasts of Nova Scotia, Newfoundland, Labrador and Greenland. With any combination of at least three Loran stations (one "master" and two "slaves"), ATC planes flying to Europe or Allied surface vessels searching for U-boats were able to get accurate navigational fixes in the North Atlantic. These initial Loran stations soon won the acceptance and praise of both air and surface navigators. Consequently, Loran coverage was gradually expanded to include The Hump in China and Burma, portions of Europe and parts of the Pacific.

Wartime research and development produced other technical changes a

developments which fostered postwar commercial air transport operations. Long-range piston-driven landplanes began to replace flying boats on over-ocean flights. The flying boats had poor performance qualities (relative to four-engine landplanes) and high operating costs; thus they were being phased out. Helicopters and rotary-wing aircraft began making short flights where ground transportation was slow or inefficient. In the late 1940s, various airlines began to use helos for flights between the different airports in the Chicago area. By 1965 there were four scheduled helicopter networks operating passenger services in Los Angeles, New York, Chicago and Oakland-San Francisco.

Aircraft also conquered the North Pole again after WW II. On May 29, 1951, Capt. Charles Blair of Pan Am flew his own North American P-51 *Mustang* single-seat fighter over the Pole from Bardufoss, Norway, to Fairbanks, Alaska. Blair covered the 3,337 miles in 10 hours and 20 minutes, averaging 321.4 miles per hour. This solo transPolar flight effectively ended the era of pioneering Arctic flight and began the transition to commercial service over the Pole.

Scandinavian Airlines System followed Blair's lead and made the first commercial flights over the Pole on November 15-16, 1954. One SAS Douglas DC6-B four-engine propeller passenger plane, the *Helge Viking*, flew from Copenhagen to Los Angeles with a crew of 10 and 31 passengers. During

the same time period, another DC6-B, the *Lief Viking*, flew from Los Angeles to Copenhagen. Both planes flew as close to the Great Circle as practicable, covering 5,603 statute miles. The same trip via New York would have been 6,306 miles. The east-to-west flight took just over 27 hours; the west-to-east flight, nearly 24 hours. At that time, service between Los Angeles and Copenhagen via New York took about 30 hours.

Although the Germans and the British had been experimenting with jet aircraft since the beginning of WW II, the first passenger operation with jets did not begin until May 2, 1952, when BOAC put a de Havilland *Comet 1* into service between London and Johannesburg, South Africa. The *Comet 1* could carry 36 passengers at a speed of 500 miles per hour. Its success in passenger operations led other world airlines to begin the transition from piston-driven to jet engines. Pan Am led the field by ordering 20 Boeing 707s and 25 Douglas DC-8s in 1955. By October 1959, Pan Am offered round-the-world jet service. Today the air traveler can usually find jet service connecting all major cities in the world.

Sea-air aviation today includes a confusing welter of old and new aircraft. Piston-engine landplanes, seaplanes and flying boats, and even a balloon or two, among the older aircraft, are making flights over the oceans. Among the newer aircraft types, helos make short runs across

New York harbor or San Francisco Bay; jets, conventional or jumbo, speed around the world; and supersonic transports (SSTs) are making passenger flights.

There is no regular, commercial passenger transport by airship, but a few dirigibles are still in service. The Goodyear Tire and Rubber Company uses its blimps (non-rigid dirigibles) for advertising, public relations and televising sports events. One Goodyear blimp helped film the America's Cup 12-meter yacht races off Newport, R.I., in 1974. During those races, the airship demonstrated once more its stability as an observation platform and its capability for hovering or flying at slow speeds over a wide ocean area.

In contrast to the Goodyear blimp, the SST represents the latest technical innovation in transoceanic passenger flight. Although Congress cancelled funding of an American SST in 1971, the Russians and an Anglo-French corporation (British Aircraft Corporation and Aerospatiale-France) have built SSTs. The Soviet SST, *Tupolev 144*, made its first flight on December 31, 1968. It now provides service between Moscow and Alma Alta, the capital of Kazakh Republic in the USSR. In July 1975, the Anglo-French *Concorde* began regular passenger service between London and Bahrain in the Persian Gulf. On the initial passenger flight between these two cities, the *Concorde* made the 3,500 mile trip in 3 hours and 50 minutes, one-third faster than the conventional jet. Recently the Secretary of Transportation has given approval for the *Concorde* to make experimental passenger flights into Washington, D.C. If the *Concorde* flights between the U.S. and Europe are permanently established, the Atlantic will seem no bigger than a lake to the air traveler. One experimental flight from Boston to Paris and back to Boston took only 6 hours and 18 minutes at an average speed of over 1,000 miles per hour and a cruising speed of about 1,340 miles per hour. The conventional jumbo jet makes a one-way crossing in about 7 hours.



*To be continued*