The Sikorsky S-40

In 1931, it was the only choice for wide-body luxury.

BY PETER M. BOWERS

The distinction of being the first four-engine luxury airliner in U.S. service must go to the Sikorsky S-40 of 1931. The four-engine, 32-passenger Fokker F-32 beat it into service by nearly a year but was not as luxurious, was definitely not economical and was withdrawn within a year. The Sikorsky, on the other hand, pioneered what was then the world's longest nonstop overwater airline flight, 600 miles, for several years and remained in service into 1944.

The need for such a big ship was established by Pan American Airways, which rapidly was expanding its routes from Florida into Central and South America. It had been following a circuitous route along the coastline with landplanes and wanted long-range flying boats that could take a direct overwater route. Late in 1928, the airline invited bids from the industry for a flying boat or an amphibian tailored to the 1,500-mile route from Miami to Cristobal, in the Panama Canal Zone, via Barranquilla, Colombia. A stop would be made at Jamaica, the halfway point.

Sikorsky was the winner with the proposal that developed into the S-40 and was given a contract for three airplanes at $139,000 each.

Detail design of the hull began in April 1929 at the plant of the Sikorsky Aviation Corporation in Bridgeport, Connecticut. The hydrodynamic lines of the hull were worked out by towing models in the U.S. Navy's towing basin in Washington, D.C., and by towing other models alongside an instrumented motorboat on the Housatonic River in Connecticut. Actual construction began in December 1929.

The S-40 drew heavily on the configuration of the well-established Sikorsky S-38 twin-engine amphibian. It basically was an S-38 scaled up to a four-engine model with three times the weight and power.

The new amphibious flying boat was a real giant in its day. While not the first four-engine U.S. airliner, it was the first designed to a customer's requirements for a specific route and payload. Only two previous U.S. designs, both military, had greater wingspans: the Navy's four-engine NC boats of 1919 transatlantic fame at 126 feet and the Army's six-engine Barling triplane bomber of 1923 at 120 feet. Only the Barling topped the S-40 in gross weight. With a wingspan of 114 feet and a gross weight of 34,000 pounds, the S-40 was the largest and heaviest American airplane, as well as being the world's largest amphibian, when it entered service late in 1931.

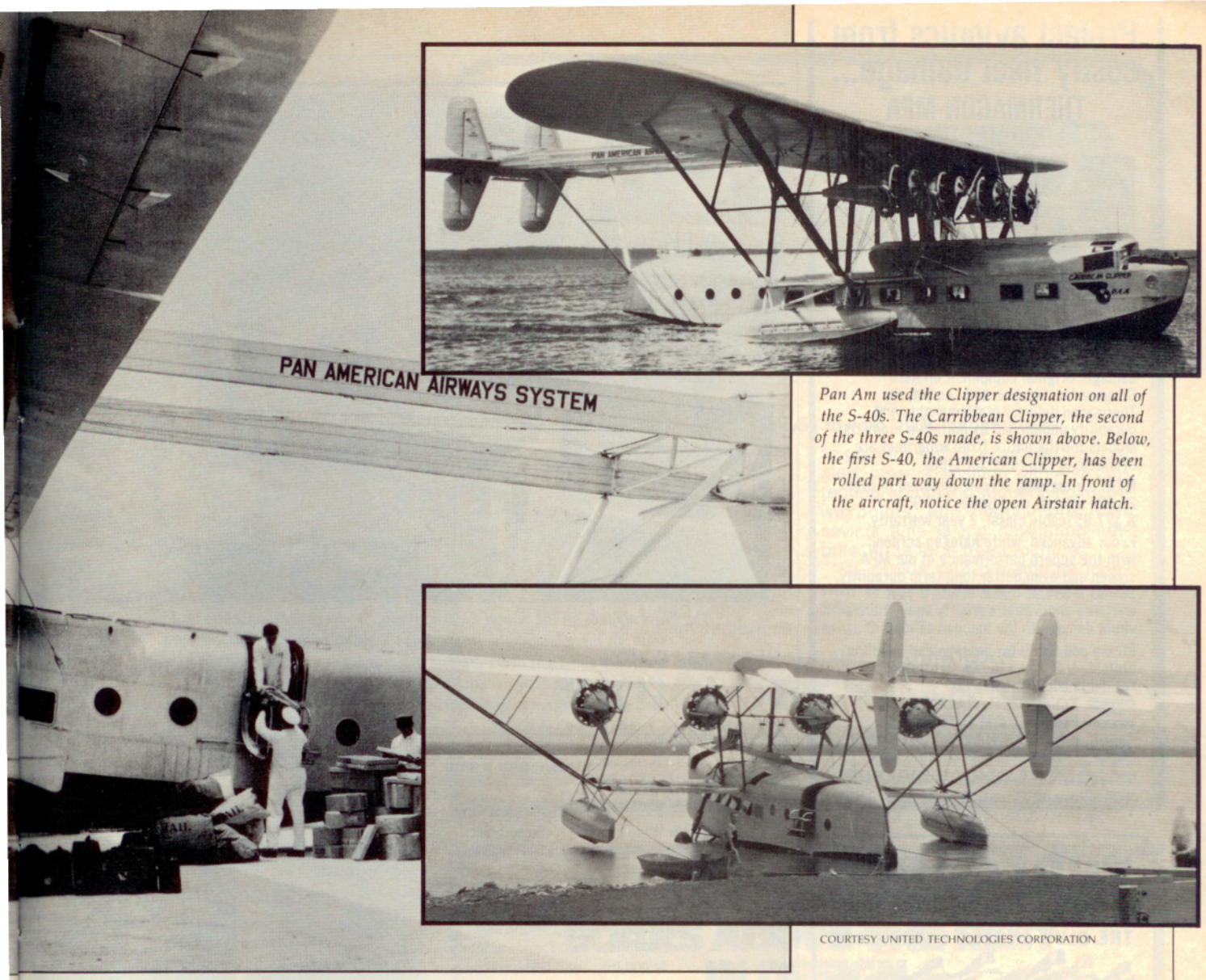
The builder, Igor Sikorsky, who had emigrated to the U.S. from Russia after World War I, was no stranger to extra-large aircraft. He had designed and built the world's first four-engine bombers in his homeland from 1914 into 1917. He founded his new American company in 1923 and struggled for several years before achieving commercial success with the S-38 in 1928.

Construction of the S-40 was all metal, with room for up to 45 passengers and a five-man crew in the stubby boat-like hull. This was divided into seven water-tight compartments. Entry was by means of a hatch in the top of the hull, then down a ladder into the roomy cabin. The cabin itself was the ancestor of today's wide-bodies, with a width of 10 feet five inches, nearly 18 inches more than a standard Pullman car.

Early studies indicated that the S-40 would have six-abreast seating, with three seats on each side of a central aisle; but in initial service, the seating was two abreast in wide easy-chair seats. All the rectangular cabin windows could be opened and were large enough to serve as emergency exits. A galley was located aft, with facilities for serving hot meals, a major step up from the traditional cold chicken and sandwiches and Thermos-bottle coffee then being served on the domestic airlines. There were separate lavatories for men and women.

The tail surfaces were carried on two metal box beams, stabilized by struts to the rear of the hull as on the S-38. There was one notable departure from the S-38, however; the S-40 did not have a lower wing. Instead, the outrigger floats were at the ends of horizontal struts, which substituted for the lower wing spars of the S-38. How-

PHOTOGRAPHY COURTESY THE SMITHSONIAN INSTITUTION



Pan Am used the Clipper designation on all of the S-40s. The Carribbean Clipper, the second of the three S-40s made, is shown above. Below, the first S-40, the American Clipper, has been rolled part way down the ramp. In front of the aircraft, notice the open Airstair hatch.

COURTESY UNITED TECHNOLOGIES CORPORATION

ever, the wide fairings used to streamline them were included in the total wing area.

The lower wing deletion reflected an interesting difference of thinking by different contemporary airplane designers. Sikorsky decided to do away with the lower wing because it was highly susceptible to corrosion and damage from water impingement during takeoff and landing. Consolidated, on the other hand, which had used struts to support the outrigger floats of its XPY-1 Navy patrol boat and the derivative "Commodore" airliners, expanded the float-support structure into a bona fide lower wing on its subsequent models.

The three-piece S-40 wing, using Sikorsky's own GS-1 airfoil, and the tail surfaces were of metal-frame construction with fabric covering. The hull was skinned entirely with metal.

A feature of the S-40 was the use of a 240-gallon fuel tank in each of the outrigger floats. Four additional gravity tanks of 140 gallons each were in the wing, one above each engine for a total of 1,040 gallons, enough for a flight of about 1,000 miles.

Powerplants were the 575-hp Pratt & Whitney "Hornet B." Over the life of the airplane, these and their replacements were operated uncowled and with various widths of Townend anti-drag rings and NACA cowlings. An unusual feature for the time was the installation of a mounting ring on top of the hull. This enabled the S-40 to ferry a spare engine to some point along the route without the need to carry it in the cabin. This beat Boeing's "fifth engine" ferry pod for the 707s and 747s by 30 years.

The retractable landing gear was hydraulically operated. The brakes, the biggest ever used at the time, also were hydraulic but used compressed air to operate the hydraulics. Each main wheel used 58 × 14 tires; the tail wheel was a main wheel from an S-38. No aerodynamic advantage resulted from retracting the gear; it was pulled up only to keep the amphibian's wheels clear of the water.

The landing gear was quickly removable for occasions when it was desirable to operate the S-40 as a pure flying boat. The decreased weight—approximately 1,800 pounds—allowed additional fuel or payload to be carried, but the reduced drag resulted in only a two-mph increase in cruising speed. The basic design had so much drag that the addition or deletion of three wheels hardly was noticeable. In some locations, the passengers entered the floating airplane directly from a dock or jetty; in others, they came aboard or were off-loaded via small boats. Imagine loading the sea-going equivalent of a 747 by this method today.

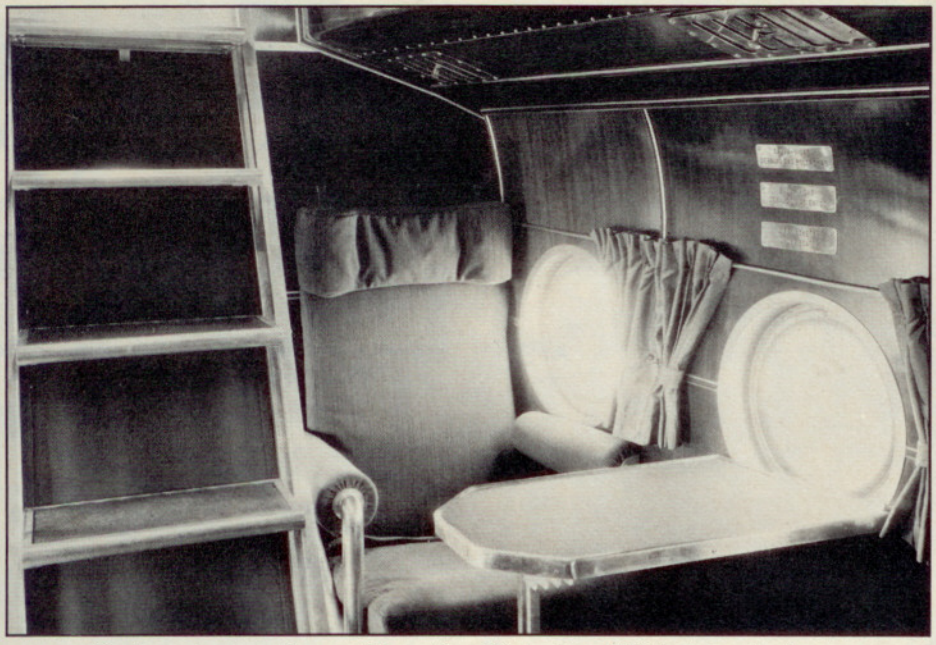
The first S-40 made its maiden flight at Bridgeport, Connecticut, on August 7, 1931, and received Approved Type Certificate A-454 on October 17, 1931. Before the paperwork came through, however, it was flown to Washington, D.C., where it was christened *American Clipper* by Mrs. Herbert Hoover, wife of the President, in ceremonies at the Anacostia Naval Air Station.

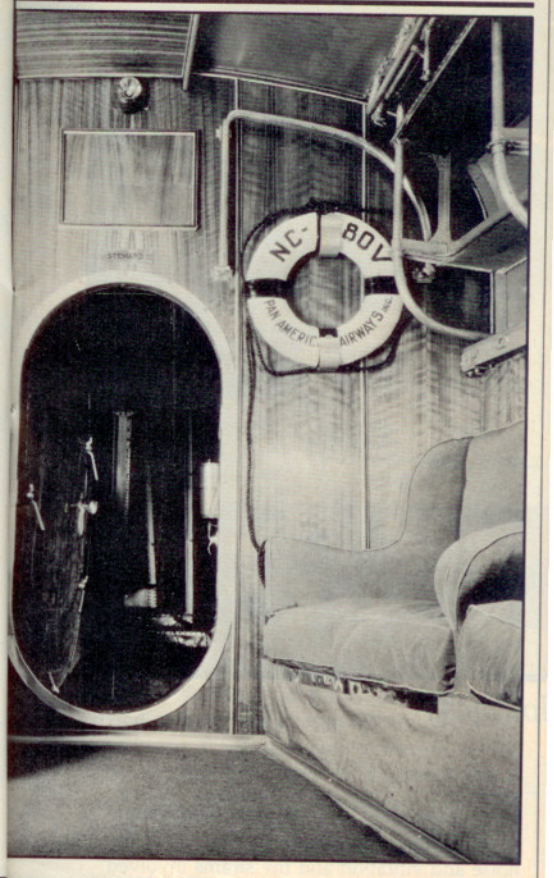
This christening started Pan Am's famous Clipper line. The airline was able to obtain a copyright on the word and, to protect its identification with Clipper, actually has gone to court to prevent others from using it.

The second and third S-40s were named *Caribbean Clipper* and *Southern Clipper*, respectively. Pan Am constantly has reassigned the various Clipper names among newer models, sometimes with the order reversed, as *Clipper America*.

Scheduled S-40 service from Miami to

continued

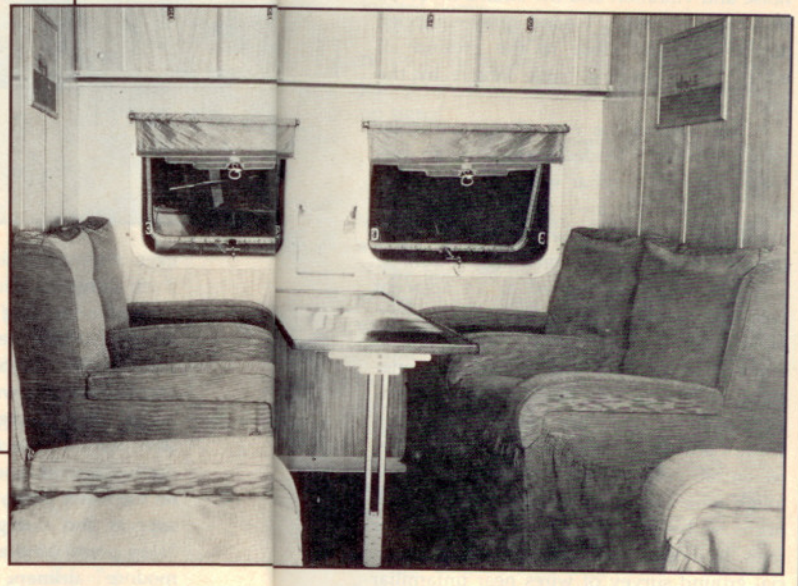




The brass plaques on the rear of the cabin wall (above) read "life jackets under the seats" in three languages. In the steward's compartment (right), heavy latches secured water-tight doors and life preservers hung on the walls. Shown below is one of the seven compartments, with two seats on each side of the aisle and rectangular windows that could be used as emergency exits.

SIKORSKY S-40

S-40 Amphibian	Specifications	S-40A Flying Boat
Pratt & Whitney Hornet B-1 575 hp @ 1,950 rpm	Powerplant	Pratt & Whitney Hornet T2D-1 660 hp @ 2,000 rpm
114 ft	Wingspan	114 ft
76 ft 8 in	Length	76 ft 8 in
1,875 sq ft	Wing area	1,875 sq ft
24,748 lb	Empty weight	23,787 lb
34,000 lb	Gross weight	34,600 lb
18.1 lb/sq ft	Wing loading	18.5 lb/sq ft
14.7 lb/hp	Power loading	13.1 lb/hp
	Performance	
134 mph (138 as boat)	High speed	140 mph
115 mph (117 as boat)	Cruising speed	120 mph
712 fpm	Initial climb	750 fpm
12,000 ft	Service ceiling	12,500 ft
900 sm	Range	950 sm



YESTERDAYS • WINGS

Cristobal began on November 29, 1931, with Charles A. Lindbergh as the pilot. The first stop was at Cienfuegos, Cuba, 300 miles away. From there it was 450 miles to Kingston, Jamaica, then 550 miles straight to Barranquilla. Lindbergh stayed at Barranquilla while his copilot, Basil Rowe, took the ship an additional 380 miles westward to Cristobal. Lindbergh took over again when the S-40 made the return trip.

The three S-40s continued on this route until 1935 when they were reworked in Pan Am's Miami shops and became strictly S-40 flying boats. Other changes were worked out in Bridgeport. The major change, other than elimination of the wheels, was replacement of the 575-hp Hornets with newer T2D-1 Hornets that delivered 660 hp. Oddly, these were smaller engines that reverted to the 1,690-cubic-inch displacement of the earliest Hornets instead of the 1,860 cubic inches of the B-model. The T2D-1 engine, which ran on the new 80-octane fuel, also turned the new controllable-pitch propellers that were just coming into airline service.

The technical changes, plus higher density seating, were enough to require a new ATC; A-562 was issued on March 4, 1935.

By that time, the S-40As had been replaced on the trans-Caribbean route by later Sikorsky S-421s, but remained in service on lesser routes, then were relegated to training duties. When World War II came along, Pan Am established training programs for the military, and the cabins of the S-40s were outfitted with training stations for 23 navigator trainees.

The first two S-40s finally were withdrawn from service in 1943 and the third in 1944 to end what were then extraordinarily long careers for big flying boats. □

Intrigued by airplanes long before his first ride in a Travel Air at age 10, Peter Bowers, AOPA 54408, has since logged more than 4,200 hours.

PHOTOGRAPHY COURTESY UNITED TECHNOLOGIES CORPORATION