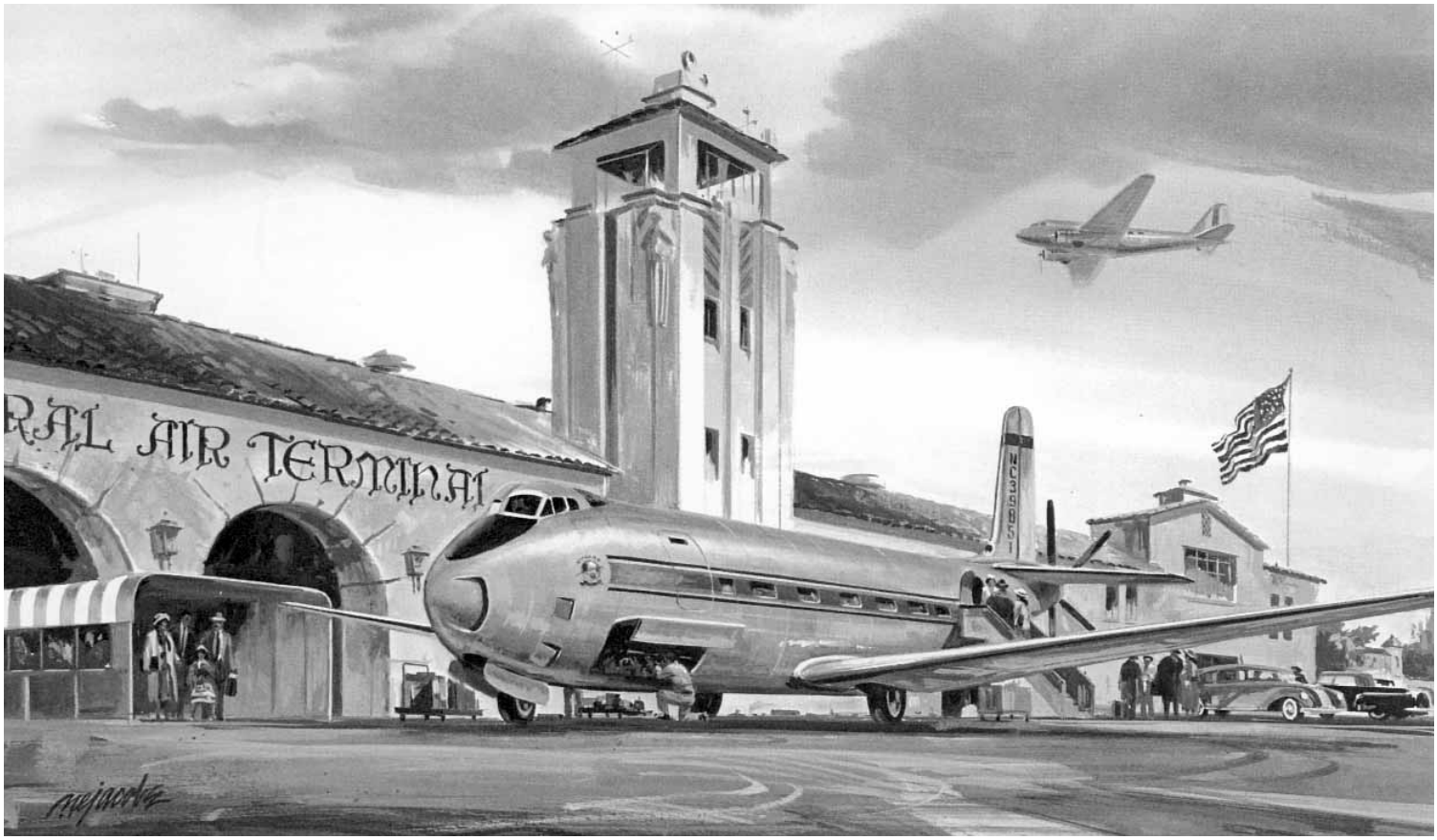



# THE DOUGLAS DC-8 SKYBUS

## by R. E. Williams

By mid-1945, WWII was in its final months. Aircraft production was slowing down and military contracts were being cancelled. Research and development engineers at Douglas, Santa Monica, were busy designing the aircraft that would serve the airlines in the coming postwar expansion years. They reasoned that three basic models with growth potential would be required for the short, medium, and long-haul route systems.

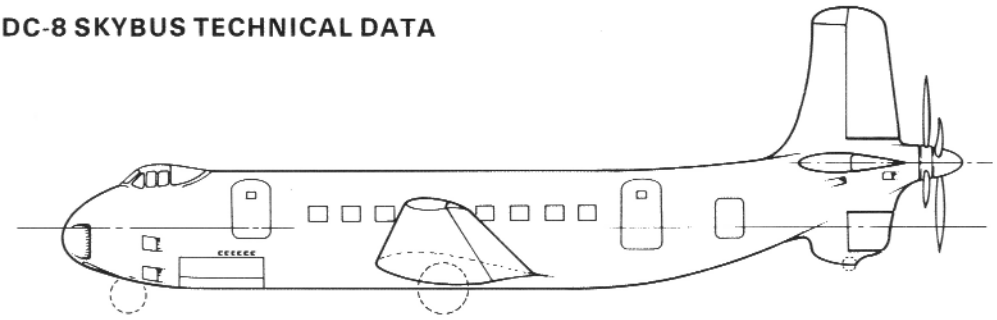
The DC-3, carrying 21-24 passengers, was a 10-year-old design and out of production after more than 10,000 had been built. It was deemed too small for airline operations and too expensive to operate. A replacement was needed. The DC-4, adopted by the military at the start of WWII as the C-54, was still in production with over 1,000 in service. Carrying 44 passengers, it would see wide airline usage into the 1960s. The DC-6, carrying 52-68 passengers, was a larger and more powerful version of the DC-4. The DC-7, as originally offered to the airlines, was a civil version of the C-74 Globemaster designed to carry 125 troops and a crew of 13. When finally produced, however, the DC-7 was a stretched version of the DC-6. The C-74 made its first flight from the Long Beach airport on September 5, 1945. By then, Pan Am had cancelled its order for 26 placed earlier that year, and no other airlines expressed any interest.

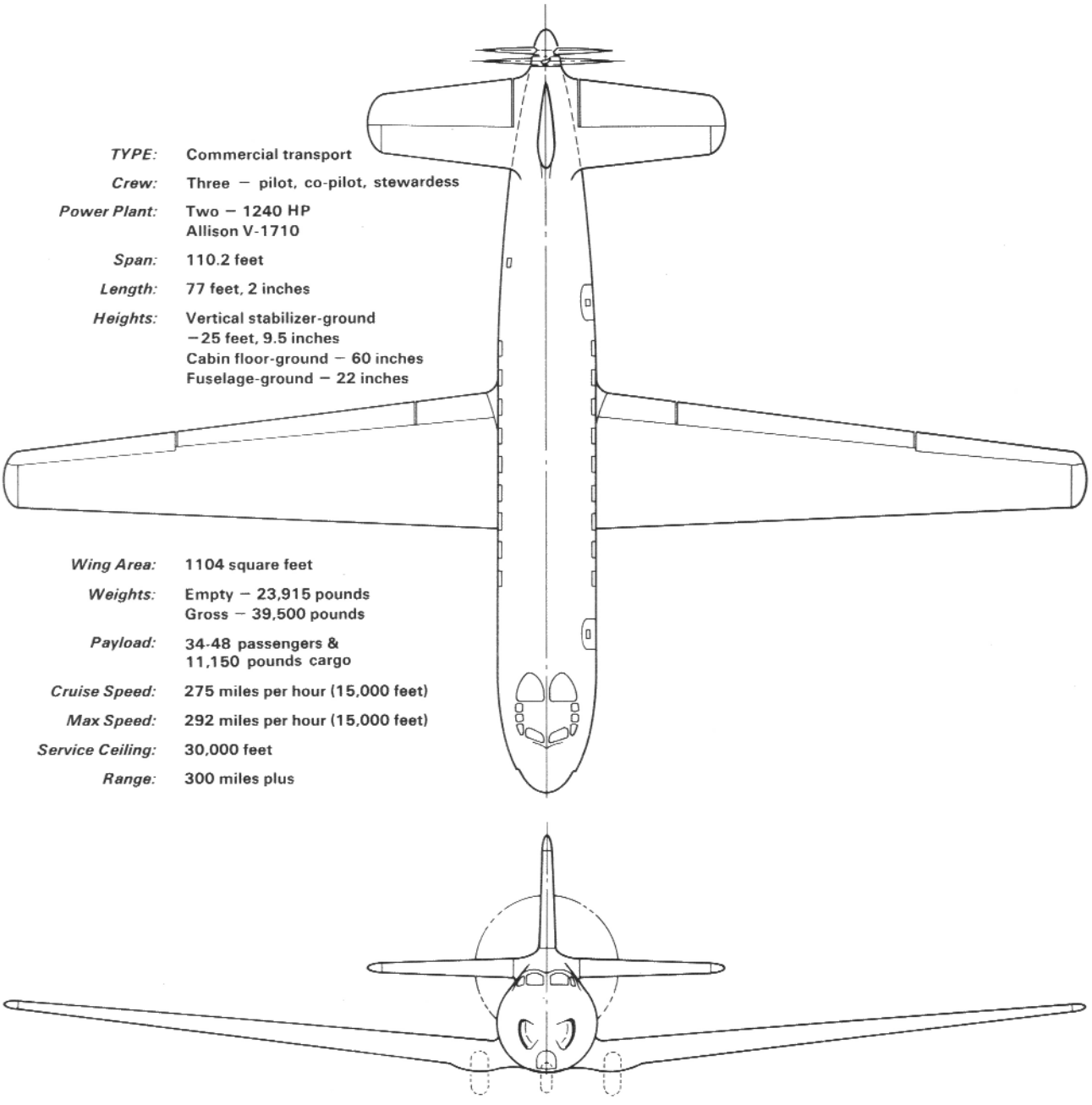
The DC-8 Skybus, Douglas Model 1004, was a radically new design intended to replace the DC-3 on short-to-medium range routes. It would carry twice the passengers at half the seat-mile cost of the DC-3.

Using design and performance data gained from the XB-42, which first flew on May 6, 1944, Douglas designers originated a new concept in transport aircraft: a twin-engine, low-wing monoplane incorporating the basic principle of "centerline thrust," an outstanding development in the design of multi-engined aircraft. Experimental flight tests with the XB-42 indicated superior characteristics relative to high rate of climb, high load-carrying ability, elimination of torque and

*Editor's Note: This article originally appeared in the Douglas Aircraft Company's* Douglas Service*, second quarter of 1984, and has been reprinted with the permission of The Boeing Company. The author was a long-time AAHS member and former Journal Editor Bob Williams. Many of the photos that appeared in the original article have been included, along with additional photos from various sources.*

## THE DOUGLAS DC-8 SKYBUS TECHNICAL DATA





| | |
|---|---|
| *TYPE:* | Commercial transport |
| *Crew:* | Three – pilot, co-pilot, stewardess |
| *Power Plant:* | Two – 1240 HP Allison V-1710 |
| *Span:* | 110.2 feet |
| *Length:* | 77 feet, 2 inches |
| *Heights:* | Vertical stabilizer-ground – 25 feet, 9.5 inches<br>Cabin floor-ground – 60 inches<br>Fuselage-ground – 22 inches |
| *Wing Area:* | 1104 square feet |
| *Weights:* | Empty – 23,915 pounds<br>Gross – 39,500 pounds |
| *Payload:* | 34-48 passengers &<br>11,150 pounds cargo |
| *Cruise Speed:* | 275 miles per hour (15,000 feet) |
| *Max Speed:* | 292 miles per hour (15,000 feet) |
| *Service Ceiling:* | 30,000 feet |
| *Range:* | 300 miles plus |

*Courtesy of The Boeing Company*


*An early painting by R.G. Smith depicts the Skybus over the midwest countryside. (Courtesy of The Boeing Company)*

propeller noise, large center-of-gravity range with adequate stability, and ease of control under any flight condition.

Centerline thrust eliminated the need for engines, propellers, and nacelles on the wings. Eliminating this drag produced a cleaner, more efficient wing that permitted the lowest possible floor height (60 inches from the ground) for a low-wing plane. This expedited loading passengers and cargo and simplified general maintenance.

The Skybus featured extremely short, fully retracting tricycle landing gear with a steerable nose wheel to facilitate ground maneuvering.

The straight tapered wing, incorporating a two-spar structure, had the latest airfoil design for optimum stall characteristics and the greatest practical amount of laminar flow. The wing leading edges had the latest type of heat-deicing, as did the tail surfaces. Integral fuel tanks of 1,000-gallon capacity were located between the front and rear spars.

The DC-8 Skybus was to be powered by two liquid-cooled 12-cylinder Allison V-1710 engines specially designed for enclosed application. Provisions were made to permit installation of other engines of this type when they became available. Located in the lower forward fuselage, the engines were enclosed in separate compartments that were stainless steel lined and vapor sealed for maximum protection from engine fires and fumes. Complete $CO_2$ fire-extinguisher systems were installed in each engine compartment and fuel cutoff valves were installed in the appropriate systems.

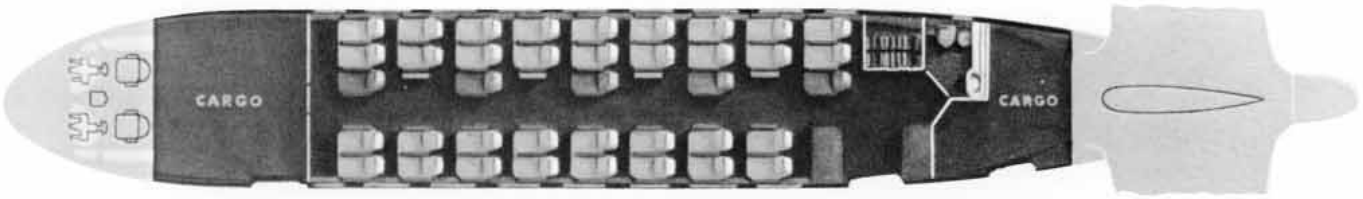
Drive shafts extended from the engines to the rear end of the fuselage where two 15-foot, three-bladed, counter-rotating, reversible propellers were separately driven through a standard reduction gear box. The shafting (each consisting of several segments connected by universal joints) was similar to that used successfully on the XB-42 and Bell's P-39 and P-63 fighters.

Engine coolant and oil tanks were located forward of the engine compartment near their respective cooling radiators, and were readily accessible for ground servicing. The coolant was a nontoxic, nonflammable mixture of glycol and water. The Skybus arrangement permitted waist-high servicing of fuel, oil, engine coolant, hydraulic fluid, heat and ventilating systems, and batteries. Large "bomb bay" type doors gave ready access to the engines from the ground, and permitted easy maintenance with a minimum of special equipment.

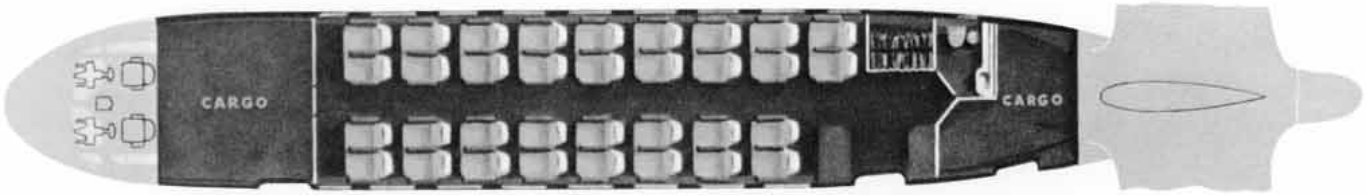
The unique "double-bubble" pilot's canopy, similar to those featured on the XB-42 and C-74, provided superior forward, side, and aft pilot vision.

The fuselage was circular in cross section to allow for pressurization. However, pressurization was offered only as an

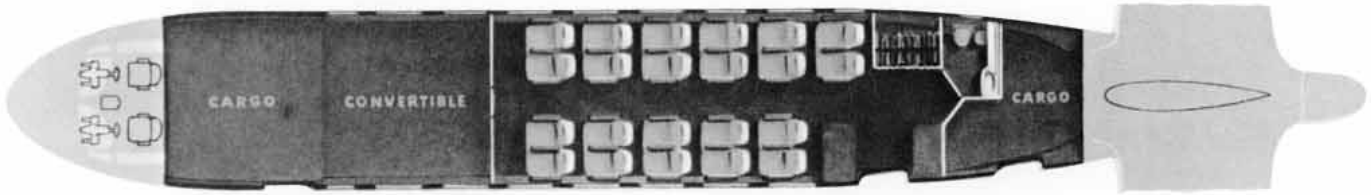
*The DC-8 Skybus was patterned after the Douglas XB-42A. Note the double bubble, "bug-eyed," canopy design. (Douglas photo from The Boeing Company)*



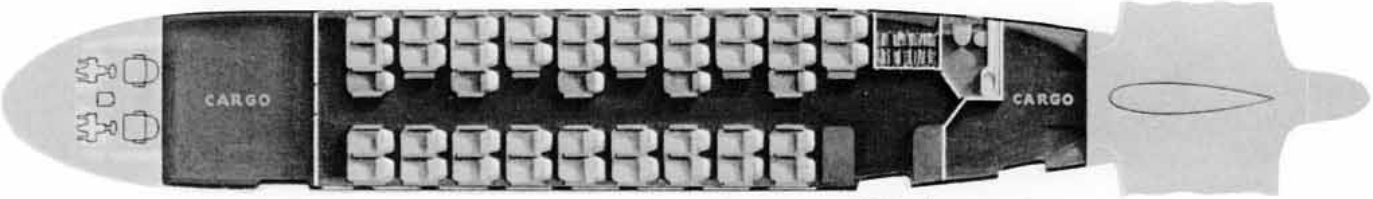

Plan view showing jump seats open and closed – 34 to 43 passengers – 40-inch seat spacing



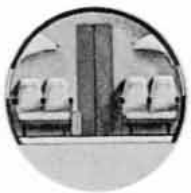

Plan view, deluxe seating arrangement – 34 passengers – 40-inch seat spacing




Plan view showing convertible cabin section – moveable bulkhead aft 120 inches

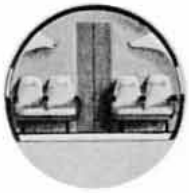



Plan view, standard arrangement – 38 to 48 passengers – 36-inch seat spacing



38-to-48 passenger standard arrangement

38-to-48 passenger arrangement with jump seat open



34-passenger deluxe seating arrangement




Inboard profile, standard arrangement – 38 to 48 passengers – 36-inch seat spacing

*Courtesy of The Boeing Company*

option. Two engine-driven pressurization blowers, together with heating and air-conditioning equipment, were capable of maintaining an 8,000-foot cabin altitude at 20,000 feet.

The styling and design of the Skybus interior used the latest materials and techniques for passenger appeal and comfort. The Skybus was presented in three seating arrangements: accommodations for 34 passengers, 34-43 passengers, and 38-48 passengers. The interiors of all three were identical, except for the seating arrangements.

The 38-to-48-passenger flexibility came from the use of 10 folding seats permanently attached to the right-hand aisle seats. These were of the same material and comfort as the fixed seats. The 34-to-43-passenger arrangement was identical except for an increase from 36 inches to 40 inches in the fore and aft seat spacing. The 34-passenger arrangement differed by elimination of the folding seats.

The cabin interior featured full-length overhead luggage racks and ceiling lights, under-seat storage space, and large (20 x 30 inches) polarized passenger windows. A convenient coat closet and storage space was provided opposite the rear entrance door by the cabin attendants' station. Galley space was provided next to the rear entrance, and the restroom was at the rear of the cabin. The restroom featured a chemical flushing-type toilet that was serviced from outside the aircraft. Large mirrors, a vanity and stool, and flush lighting made up the other appointments.

The two cargo compartments were located fore and aft of the passenger cabin. Both were accessible from inside the cabin and outside the aircraft.

The DC-8 Skybus had a unique feature for that period: a "convertible cabin." This patented feature offered operators the flexibility of hauling mixed cargo/passenger loads to gain maximum utilization of the aircraft. The seats were designed to be quickly stowed, with back and bottom cushions in the luggage racks overhead, and the frames folded against the cabin side walls to serve as lining protectors. The bulkhead, which formed the back of the forward cargo compartment, could be moved aft in 36- or 40-inch increments as required. Seat tiedowns served as cargo tiedowns. Thus, the forward cargo compartment of 234 cubic-foot capacity could be enlarged by 97 cubic feet increments to match the varying load mix requirements.

Douglas offered several equipment options to further adapt the DC-8 Skybus to special airline requirements. For short-haul operations requiring frequent stops - often at small-town airports - an internal step was available to minimize personnel requirements and turn-around time. The steps automatically extended when the door was opened. The upper portion of the door acted as a rain shield. A forward door was available to further aid in rapid passenger handling. One double seat had to be eliminated with the forward door installation.

Other optional equipment included additional lavatory facilities and an autopilot. These two items, along with the pressurization option, increased the empty weight of the DC-8 by approximately 900 pounds.

A sales campaign, which included a deluxe four-color brochure emphasizing the DC-8's prominent features, was initiated. Work continued on complex engineering problems. Although the drive system for the XB-42 presented few problems, the longer, vastly more complex arrangement envisaged for the DC-8 was a major factor in the subsequent termination of the project. At this stage, development costs had pushed the selling price to over $100,000 more than the price for the nearest competitor.

This is a small increase in price by today's standards, but in the immediate postwar years it was enough to make any airline think twice before buying - especially for such an advanced design. The airlines were further skeptical of the Allison engine of which they were totally unfamiliar.

Douglas tried to convince the airlines that the greater performance of the DC-8 would quickly offset its additional cost. However, the airlines remained unconvinced and opted instead for the Martin 2-0-2 and Convair 240, both conventional twin-engine 40-passenger aircraft.

When the DC-8 designation was finally applied to a production aircraft, it was used on the swept-wing jet that we are all familiar with. About the only thing common to the first and final configurations of the DC-8 was application of air intake scoops on each side of the nose. The clean, unencumbered wing design of the Skybus finally appeared on the DC-9.

With the cancellation of the DC-8 Skybus, Douglas never again pursued the "centerline thrust" propulsion theory for prop-driven aircraft, or the "bug-eye" canopy. However, this theory was not dead and has been subsequently applied to several newer aircraft. For example, Lear Avia of Reno, Nev., applied the centerline thrust propulsion theory on its Lear Fan executive plane.

No examples of the DC-8 Skybus were ever built; only renderings and models were created. One small model still exists in the Museum of Flying (formerly the Donald Douglas Museum and Library) located at the Santa Monica Airport, Santa Monica, Calif.


*Similarly unsuccessful to the Skybus, the Lear Fan differed in that it used two engines to drive a single pusher propeller. (1983 Lear Avia photo from the Earl See collection)*