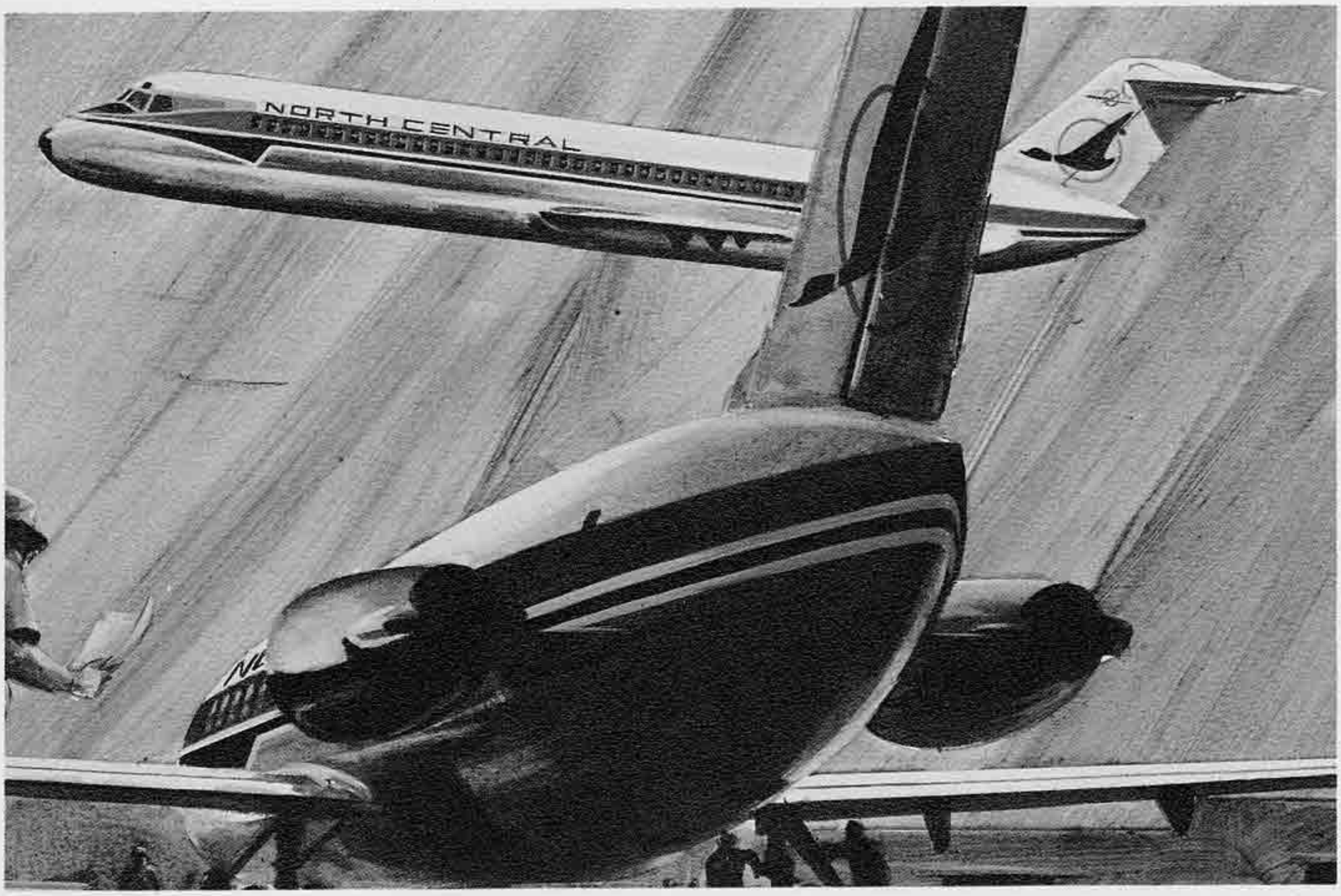
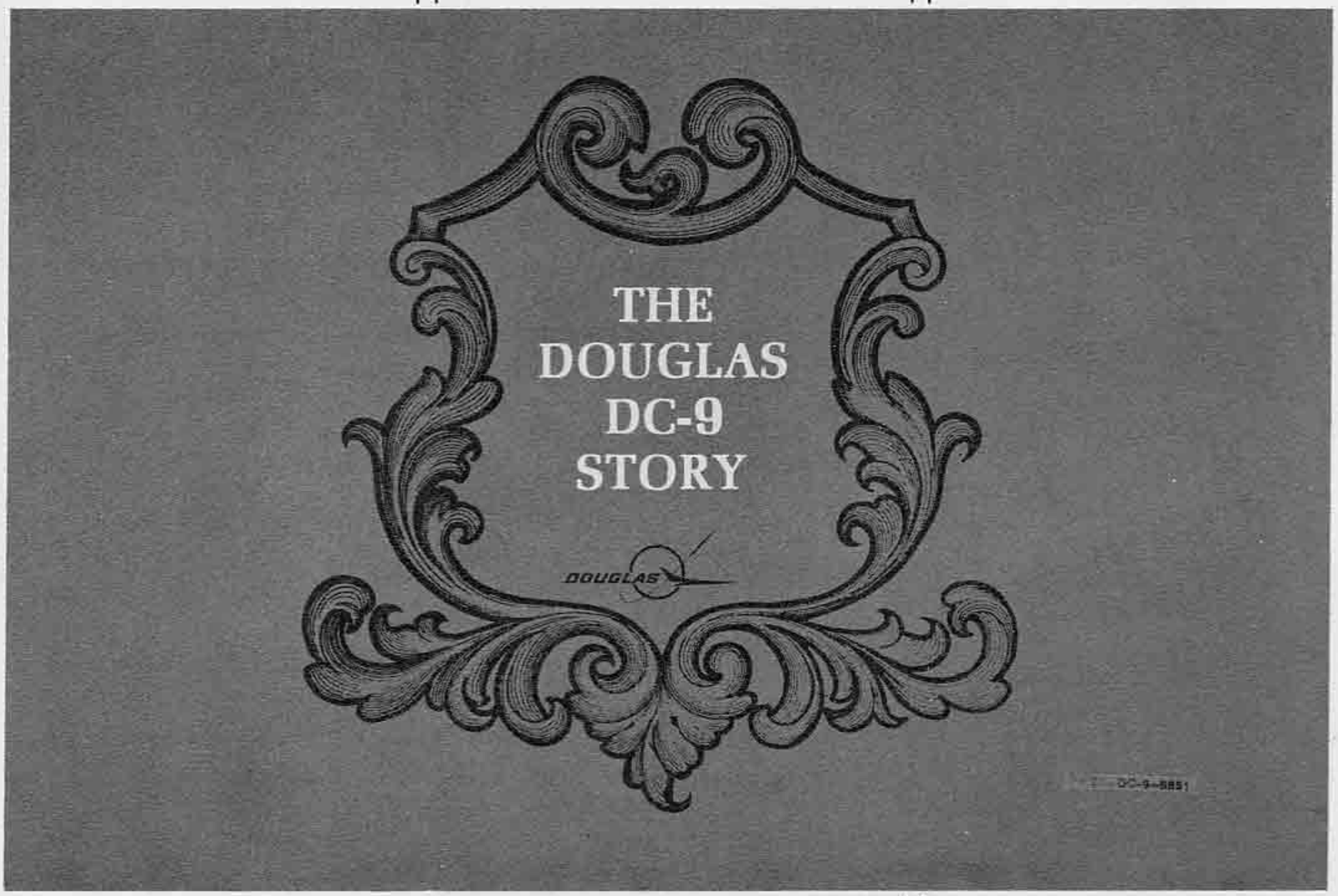
DOUGLAS



THE DOUGLAS DC-9 SERIES 30

DOUGLAS

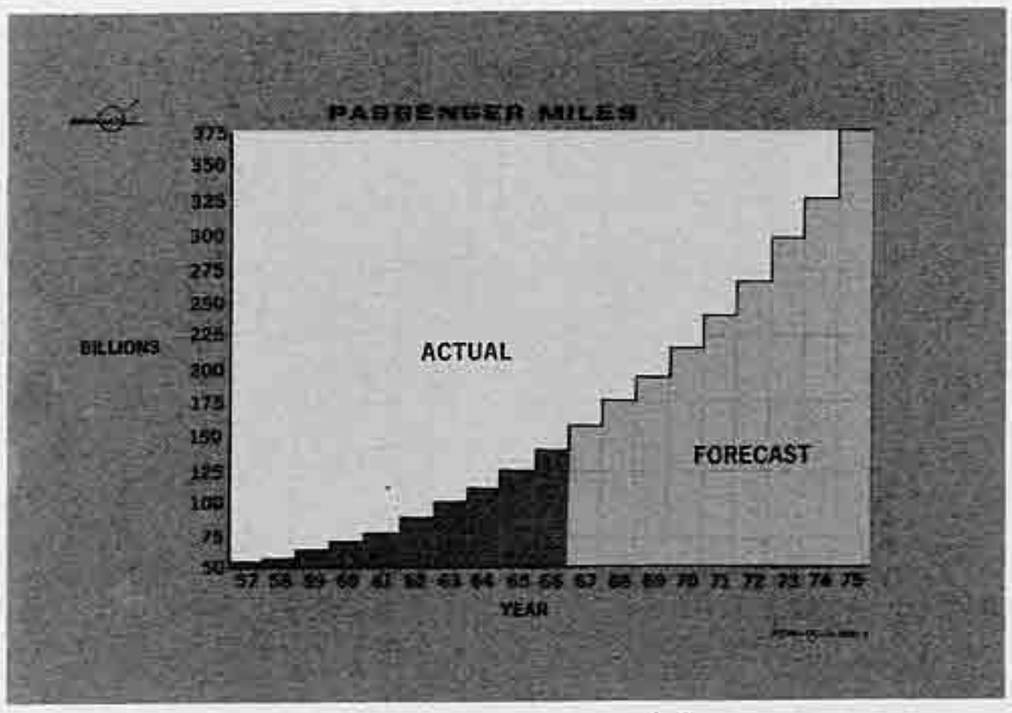
NORTH CENTRAL AIRLINES
SYSTEM SALES MEETING



At the present time, we are witnessing a positive up-surge in air travel all over the world. Today's so-called low season is almost equal to what used to be, a few years ago, the high season.

Presented by: DON R. HUNTER Douglas Aircraft Co., Inc.

NORTH CENTRAL AIRLINES
SYSTEM SALES MEETING
MINNEAPOLIS, MINNESOTA
FEBRUARY 8, 1967



The airline world's ICAO member countries flew more than 123 billion passenger miles in 1965 and our market research economists tell us that by 1975 this will increase to 375 billion passenger miles annually —enough miles to take one person to the moon and back 750 thousand times, or fly the entire population of Columbus, Ohio to the moon and back. Nearly two-thirds of the passengers will fly trips covering distances of 600 miles or less.

Currently, the U. S. domestic trunk and local service airlines produce six and three-quarters million aircraft takeoffs and landings per year. By 1975, this number will have grown to about eight million; however, today, eight years after the start of jet service, of all airports in the U.S. which have scheduled airline service, only a little over 50% are served by jet aircraft.

Beginning back in 1961, a Douglas aircraft twin-jet, then known as Model 2086, began to take shape on the drawing boards. Market research and feasibility studies were started, with these thoughts in mind:

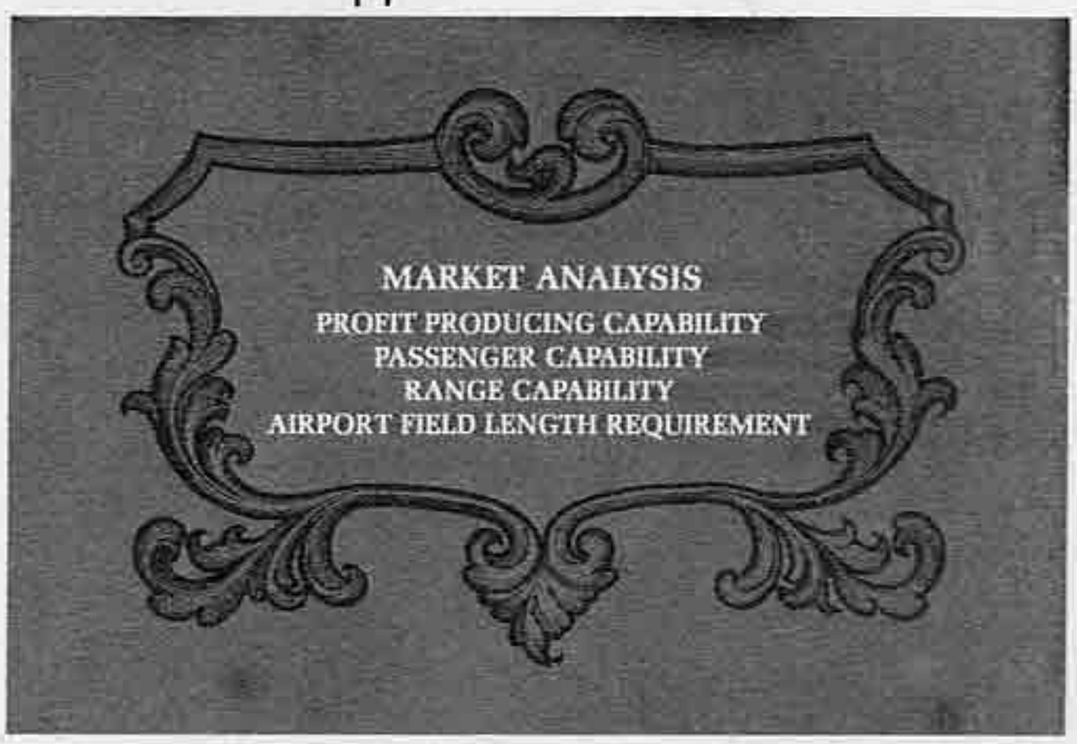
1) What should the aircraft be like in order for the commercial airlines to make money with them?

2) Is there a real need for such aircraft in a quantity to make the project profitable for Douglas?

We knew that many prop and prop-jet aircraft were becoming obsolete, but most importantly, we knew that pure jet aircraft were more efficient. Their speed is more than a convenience to the passenger.

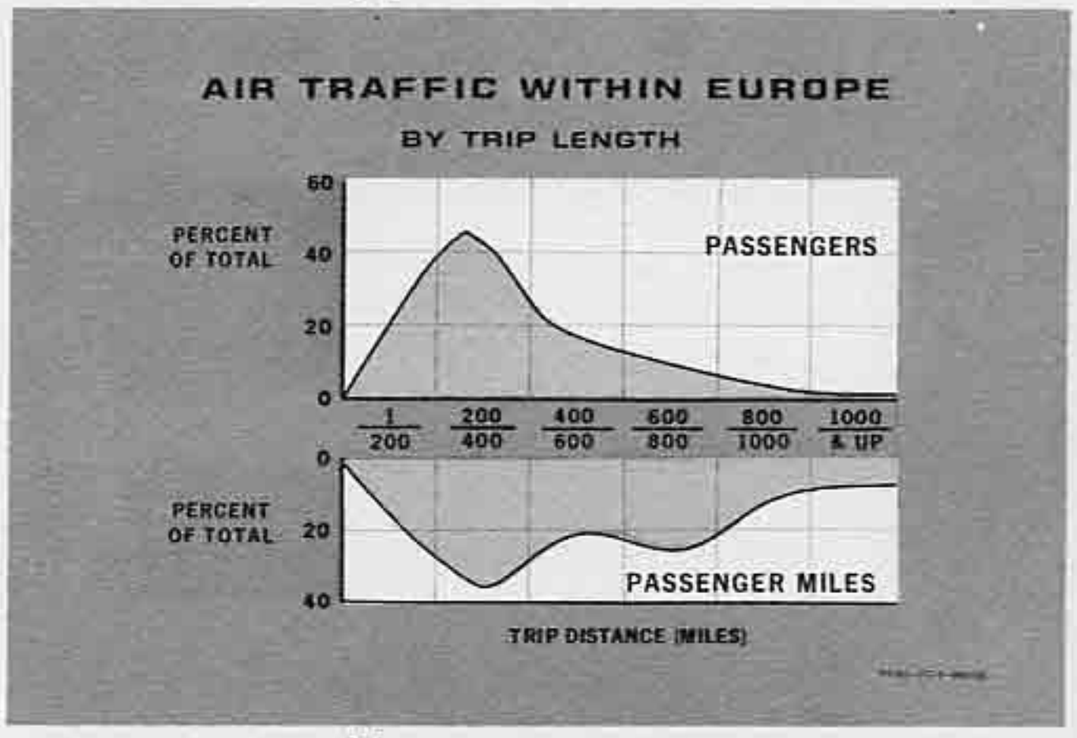
One DC-9 can do the work of two Viscounts or three Convair 340's. They provide the airline a better return on their invested capital.

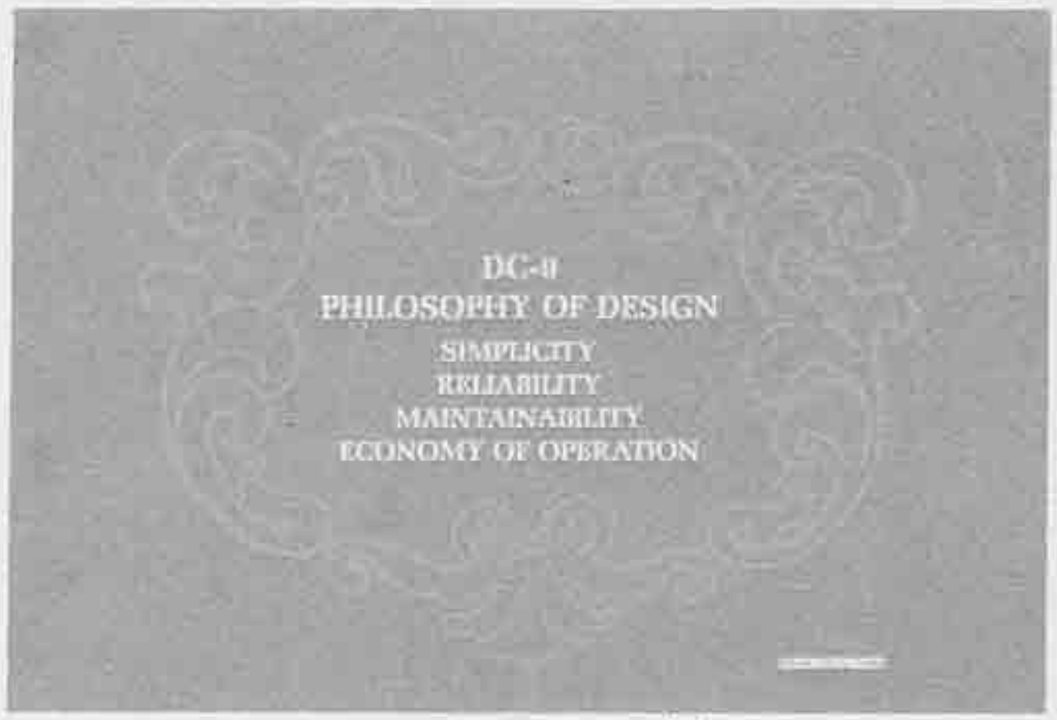
Douglas began a detailed analysis of the characteristics of the market indicated, using profit producing capability as a primary design objective. Airplane characteristics such as passenger capacity, range capability, and airport field length requirements, were considered. Sample airline route systems (both trunk line and local service) were analyzed in the search for an airplane configuration that most nearly fit the environment.



In developing the requirements for a new jet transport, we focused attention on the short-to-medium range market. An important factor that influenced the Company's decision to design the DC-9 was the heavy concentration of passenger traffic on short-range segments of both the European and U. S. market.

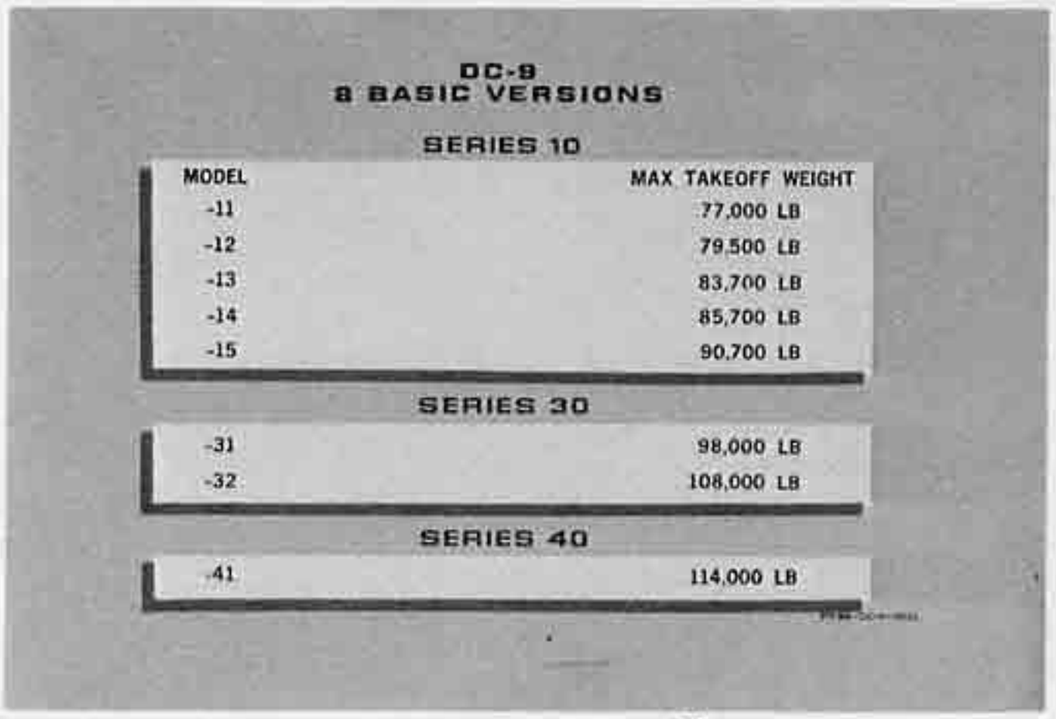
Number of travelers versus range are illustrated on the upper curve, and the passenger miles traveled are shown on the lower curve. It was this type of distribution that led to sizing of the DC-9.





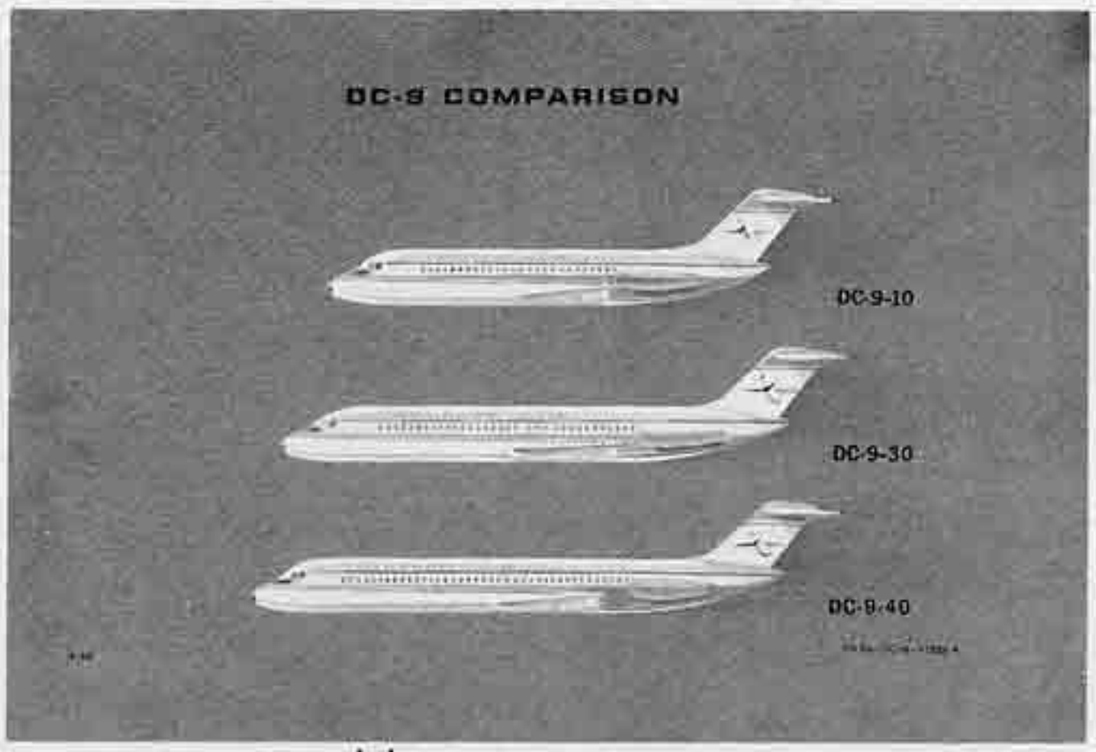
Our design philosophy was not necessarily to advance the state of the art, but rather, the state of reliability, maintainability, and economy of operation. We felt that the best approach was to concentrate our efforts on improvements to existing systems and components. Many meetings were held with technical teams of the world's commercial airlines to determine what systems and which components were the most reliable and the easiest to maintain. A major effort of our engineers was to design an aircraft that would require the minimum maintenance at line stations. Our design objective has been 99% dispatch reliability, or put another way, a mechanical delay rate that won't exceed 1% of all departures. Piston aircraft, at best, achieved a 2% level and the bigger jets average 4% to 5%.

Now, let's look at the DC-9. It is a short-to-medium range transport which has eight different versions.



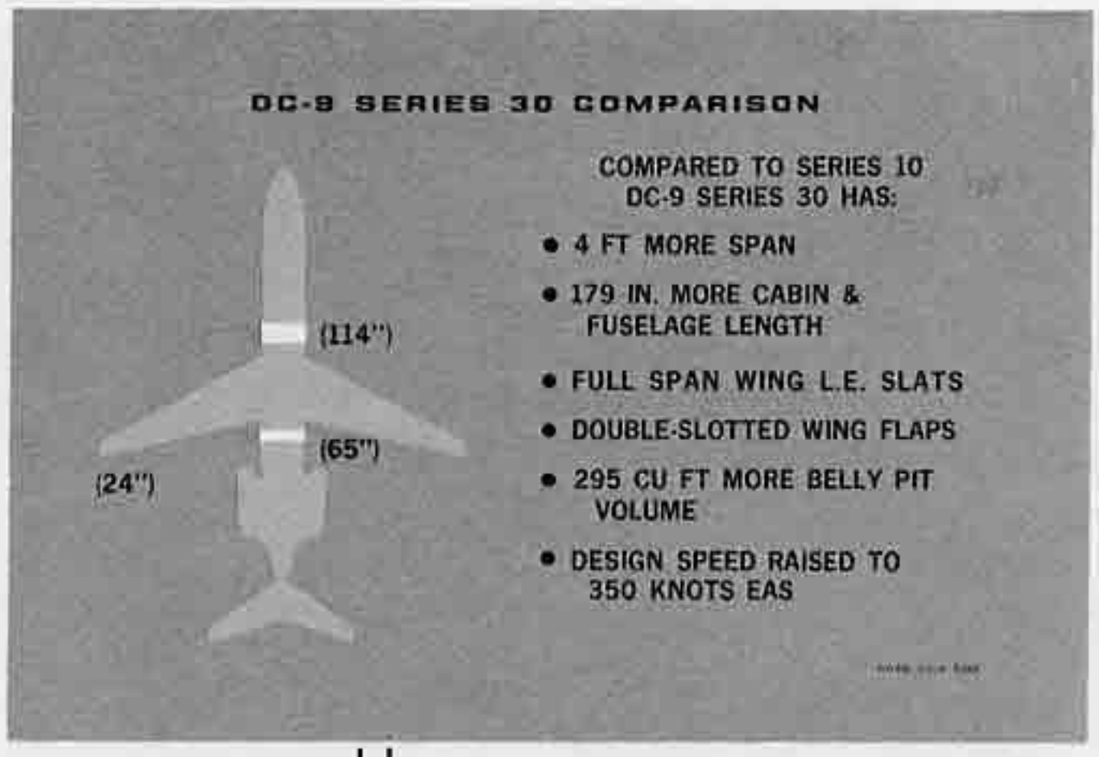
There will be five basic versions of the DC-9 Series 10; two Series 30; plus a Series 40. The difference in the Series 10 aircraft is in the weight of each version. The Series 30 is a stretched version of the Series 10. It has a 14 foot 11 inch longer fuselage. The Series 40 has a 6 foot 4 inch longer fuselage than the Series 30.

Here are three DC-9 models to illustrate the relative size between the Series 10, Series 30, and Series 40. The upper model is a Series 10, in the center a Series 30, and the lower model is a Series 40.



Compared to the Series 10, the DC-9 Series 30 has:

- Four feet more span
- 179 inches more cabin and fuselage (nearly 15 feet longer)
- Full span wing leading edge slats
- Double slotted wing flaps
- 295 cubic feet more belly pit volume

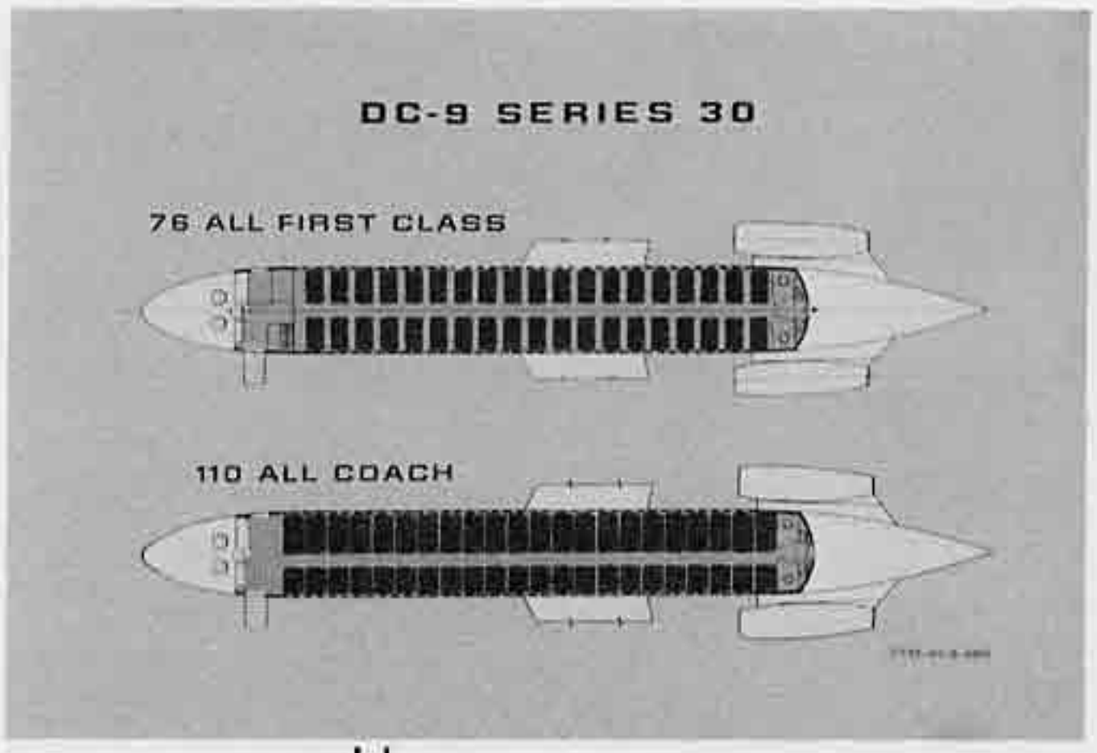


The Series 30 DC-9's will have maximum takeoff weights of 108,000 pounds with JT8D-7 engines that develop 14,000 pounds of thrust.

The Series 40 DC-9's will have power plants that develop 15,000 pounds of thrust.

The Series 30 DC-9 essentially increases the passenger capacity by adding five rows of seats. The Series 40 increases the passenger capacity another two rows of seats over the Series 30.

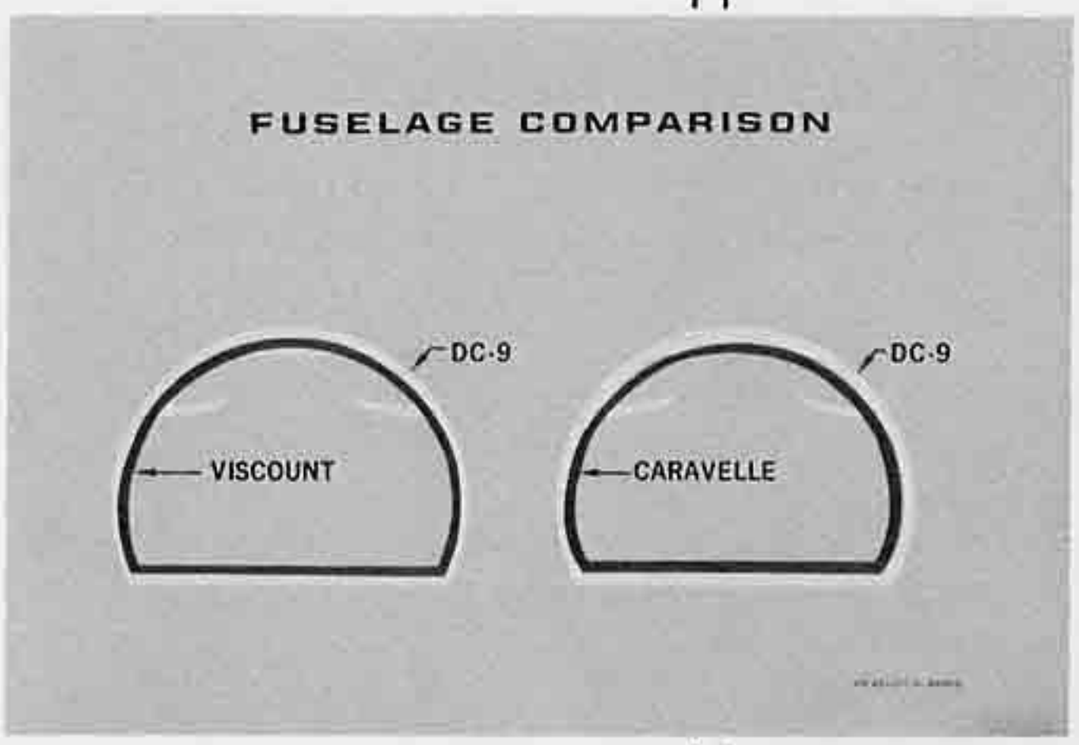
To avoid confusing you, the balance of my remarks will be based on the DC-9 Series 30, which is the model you are going to be merchandising.



The North Central Airlines' DC-9 will have a maximum takeoff weight of 98,000 pounds. The configuration specification calls for a total of 99 seats.

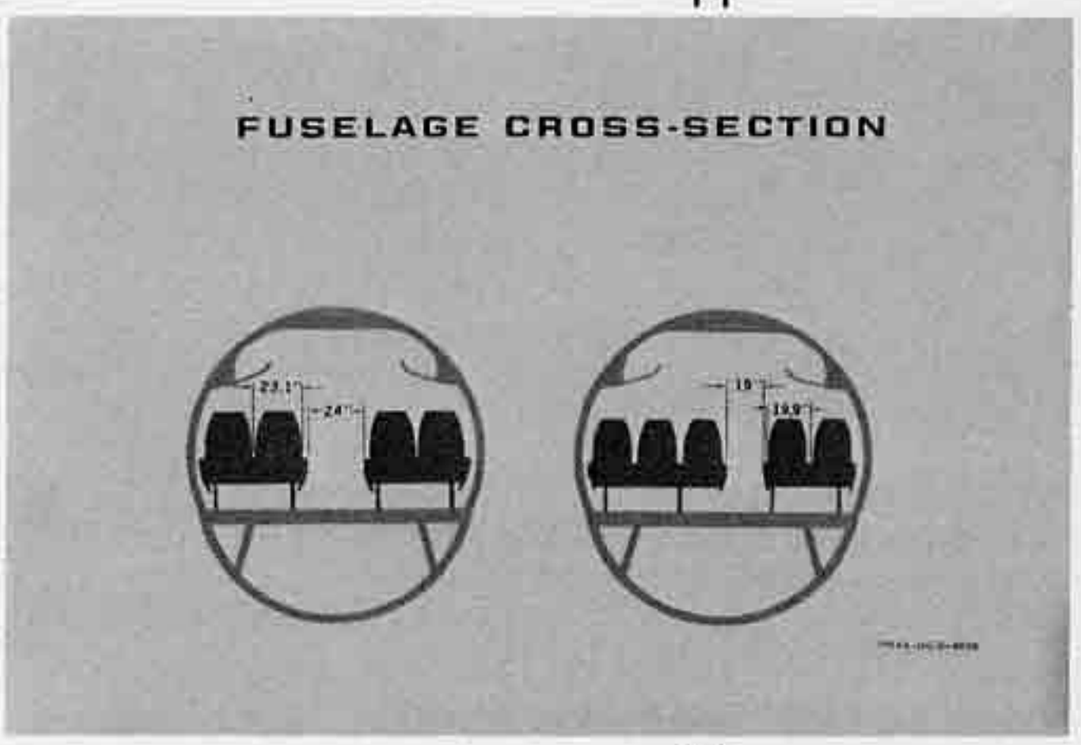
Your specification to us calls for two galleys, located in the forward section on the right side, two lavatories in the aft section and a double coat room in the forward area on the left side, plus an area in the aft section for either coat rooms or carry-on luggage bins.

It is equipped with two Pratt & Whitney JT8D-7 fourteen thousand pound thrust turbo fanjet engines, one mounted on each side of the aft fuselage.



The fuselage dimensions are larger than those of the Caravelle and the Viscount—two of the aircraft it is expected to replace.

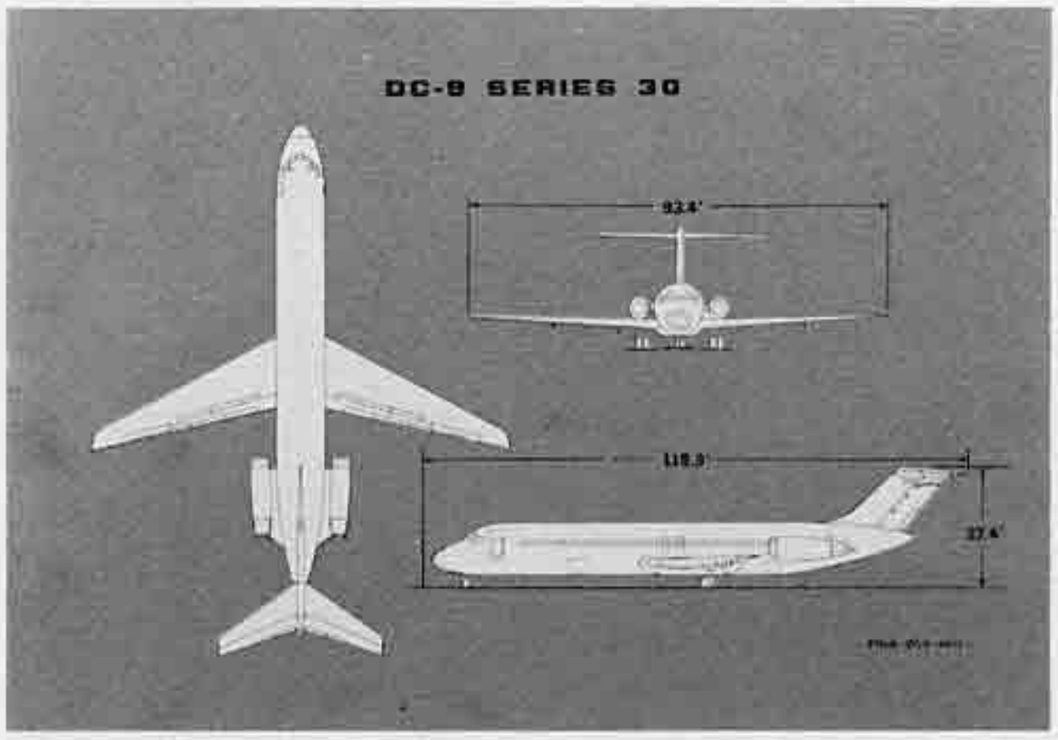
The fuselage cross section selected provides a comfortable passenger cabin with either four or five abreast seats installed and sufficient depth in the cargo compartment for excellent loadability. Windows, 10 × 14 inches, are located in each frame bay to provide good visibility with any seat spacing.



The five-abreast seats measure 17.9 inches between armrests, which is wider than the high density seats installed in current transcontinental jet transports. The seats are mounted on tracks in the floor. The seats may be positioned in increments of one inch. The tracks are straight throughout the full length of the cabin.

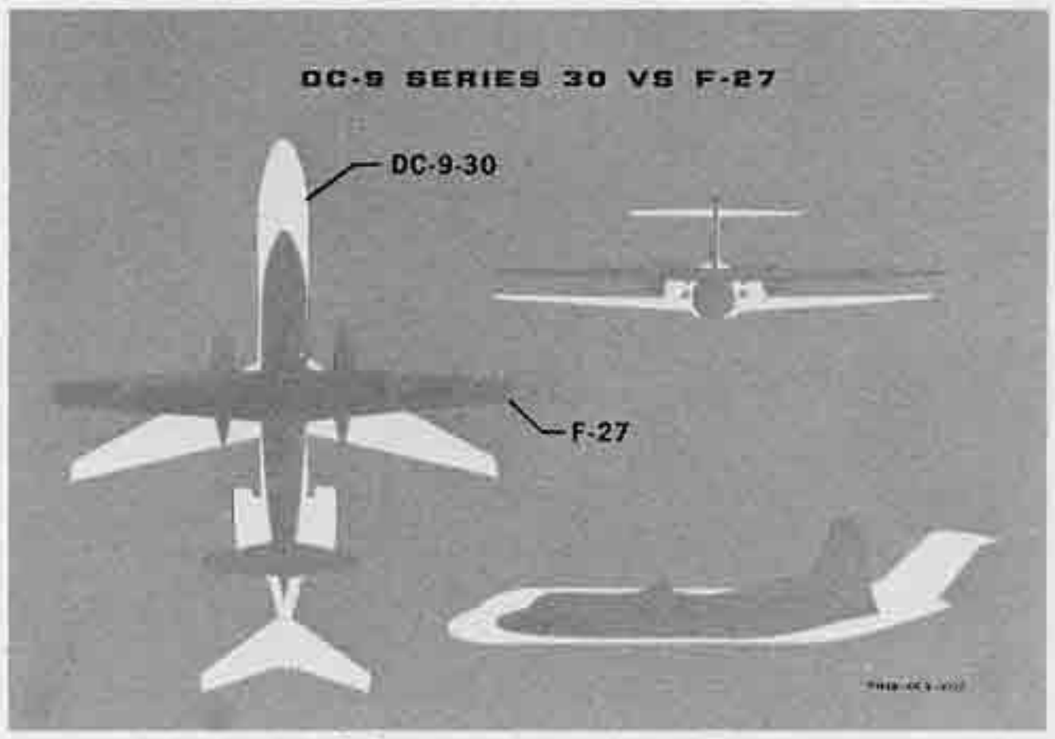
Passenger reading lights, cold air outlets and call buttons are installed in the overhead stowage racks.

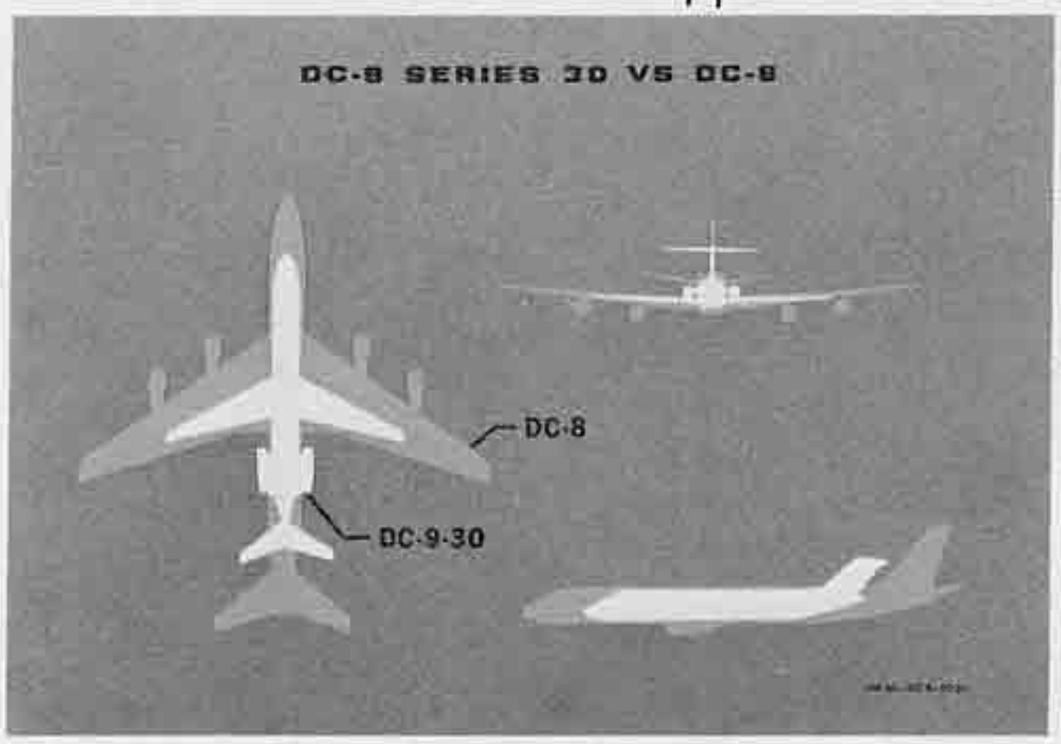
The moderately swept wing (24°) achieves high cruising speed capability. The wing area (1001 square feet) is only 17 square feet more than that of the DC-3. The physical dimensions include overall length of 119.3 feet and wing span of 93.4 feet, which is about two feet less than the span of the DC-3.

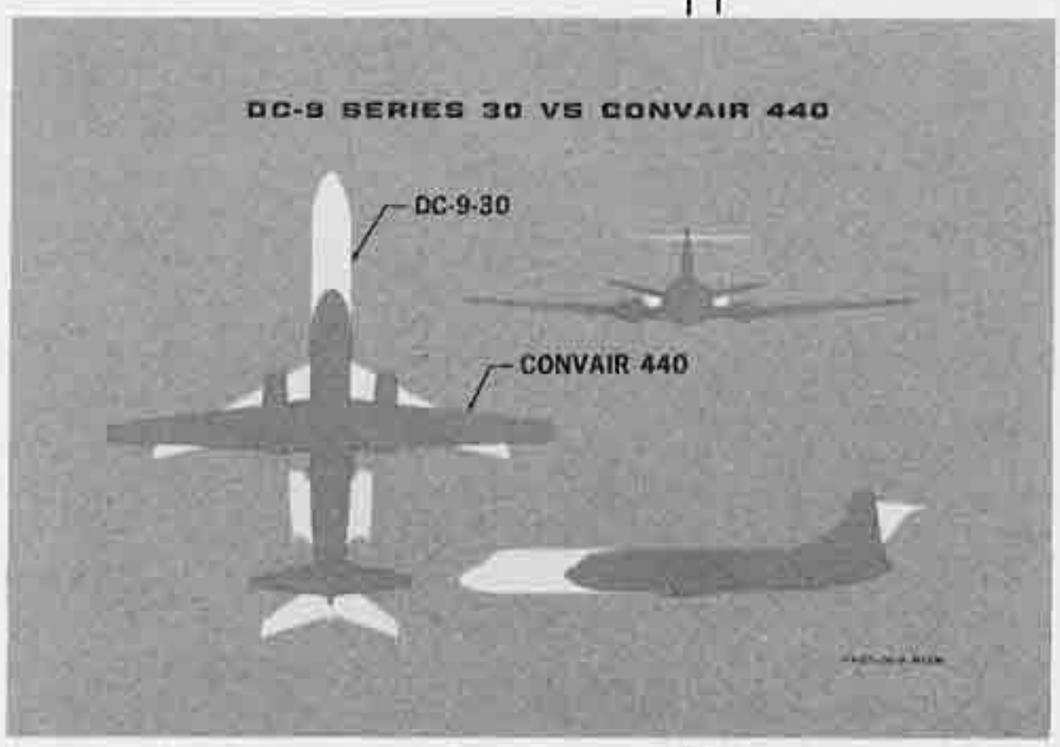


Size comparisons.

By way of external comparison, the DC-9 is shown in relation to the F-27.







Here is a comparison of the DC-9 to the DC-8.

Another to the Convair.

The Douglas DC-9 can operate into 98% of all airports in the U. S. which now have commercial service.

As a measure of performance, a DC-9 dispatched on a 500-mile trip with 50 passengers and their baggage would require an FAA runway length of 4,700 feet for takeoff. The actual runway distance used in normal takeoff is less, since the FAA runway length accounts for the case of an engine failure and continuation of the takeoff on one engine.

The cruise speed capability is approximately 555 miles per hour at an altitude of 25,000 feet. The wing design provides aerodynamic characteristics consistent with efficient operations and operates up to Mach .84. It is designed to provide the low approach speeds necessary for short fields, without sacrificing excellent handling and maneuvering characteristics.

Normal landing approach speed is 125 miles per hour with the full passenger load and normal reserves. By comparison, the DC-6 approach speed is 133 miles per hour.

A passenger entrance door, installed on the left-hand side of the fuselage, is plug type, 33½ inches by 72 inches in size.

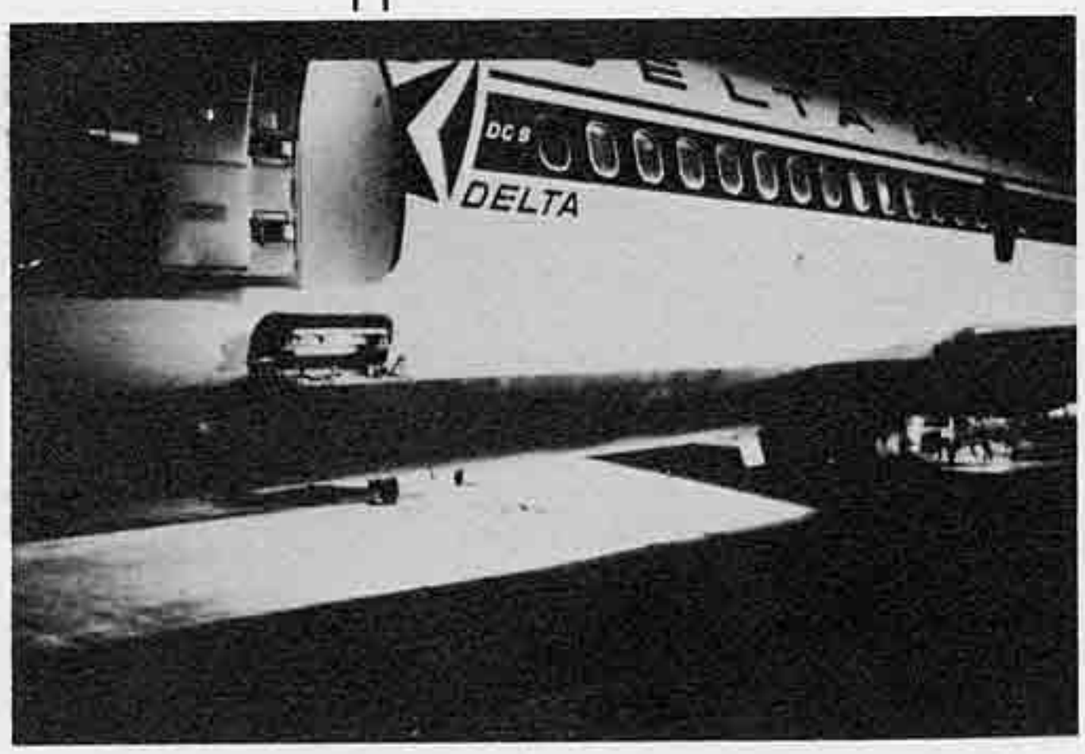
It can be opened from either side and is equipped with hold-open latches. A non-inflatable type evacuation slide is installed on the main entrance door and another in the galley service door. The doorway is also compatible with the standard jetway passenger loading service provided at major terminals.

The DC-9 has a self-contained, dc electrically operated passenger loading stairway.

The stairway access door cannot be closed while the stairway is in the extended position. The stairway retracts into a watertight stowage compartment below the cabin floor. The stairway, which is designed to accommodate uneven ground surfaces, is illuminated and has non-skid step surfaces. It is equipped with folding handrails designed to permit closing the cabin door with the stairway extended.

There are two emergency exits in the main cabin, 20 inches by 36 inches in size. There is another exit through the rear pressure bulkhead.


DC 9
DELTA


DC 9
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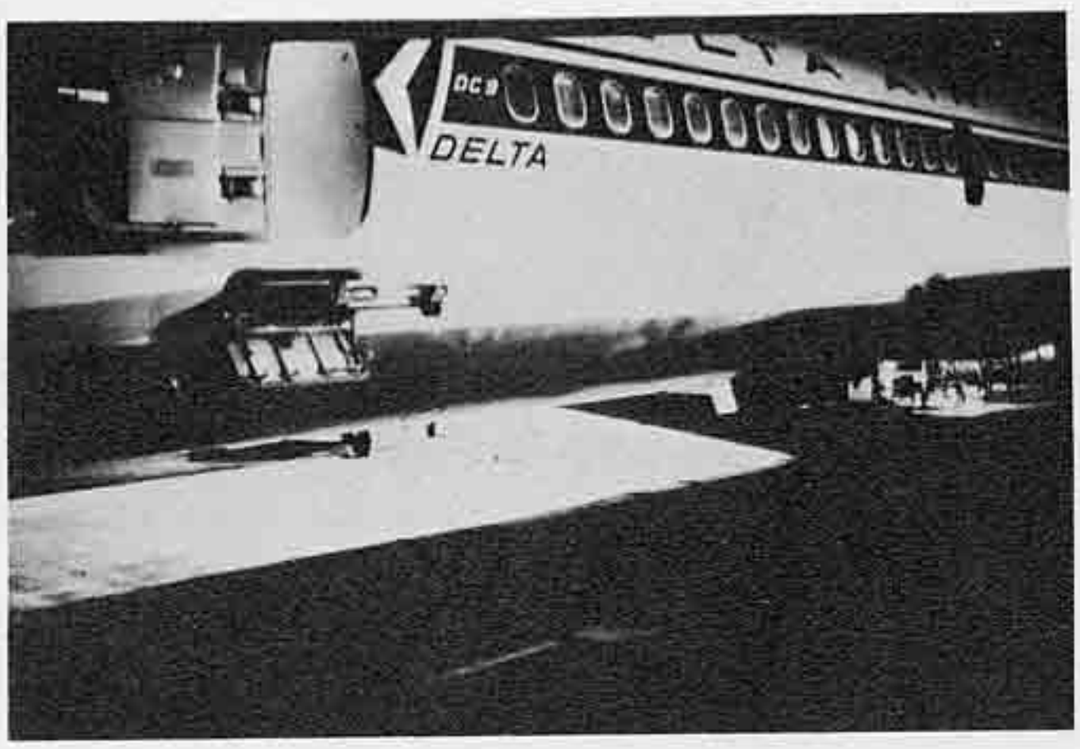
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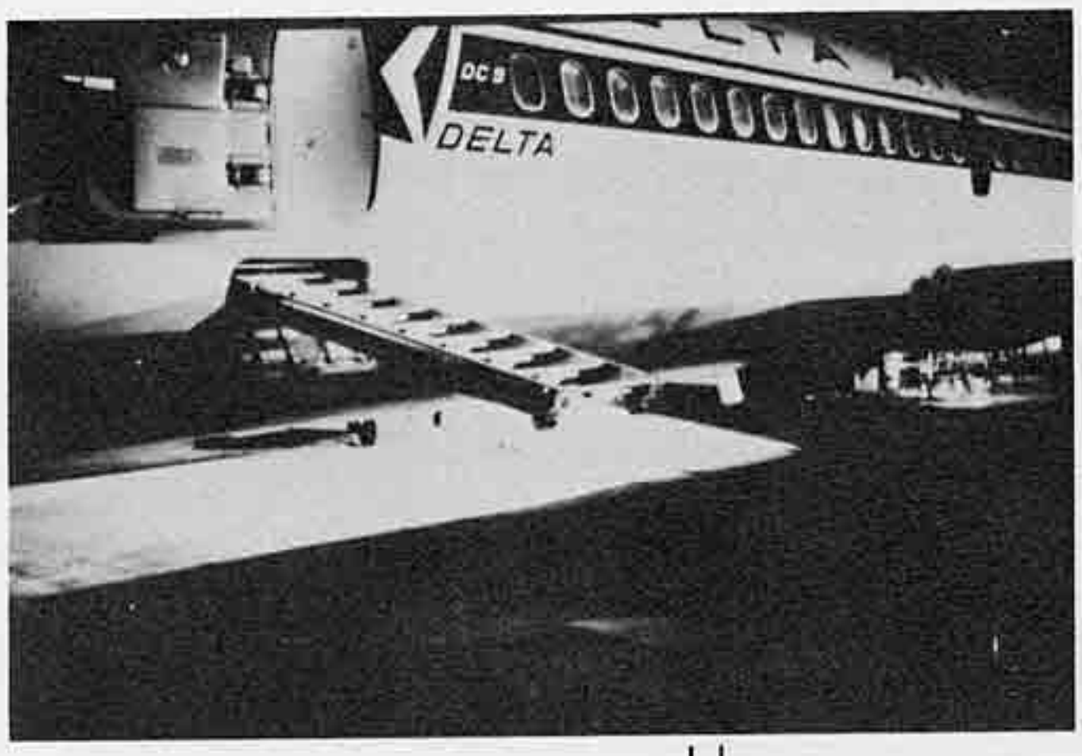
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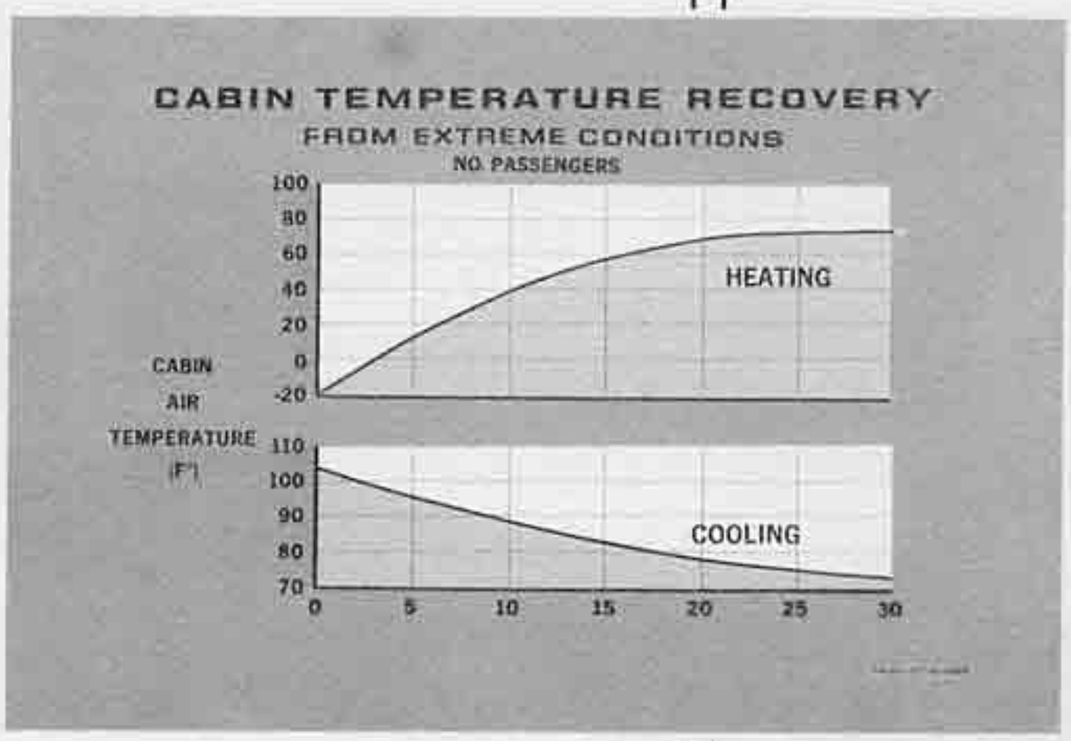
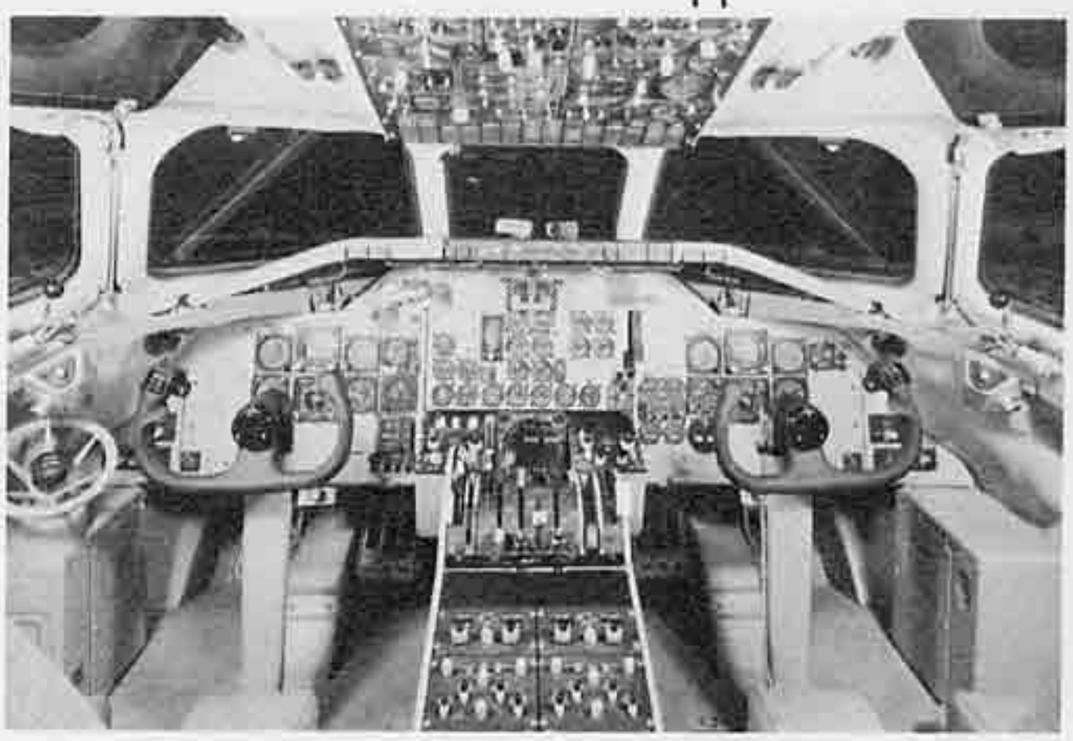
Here is a view of your ventral stairs.



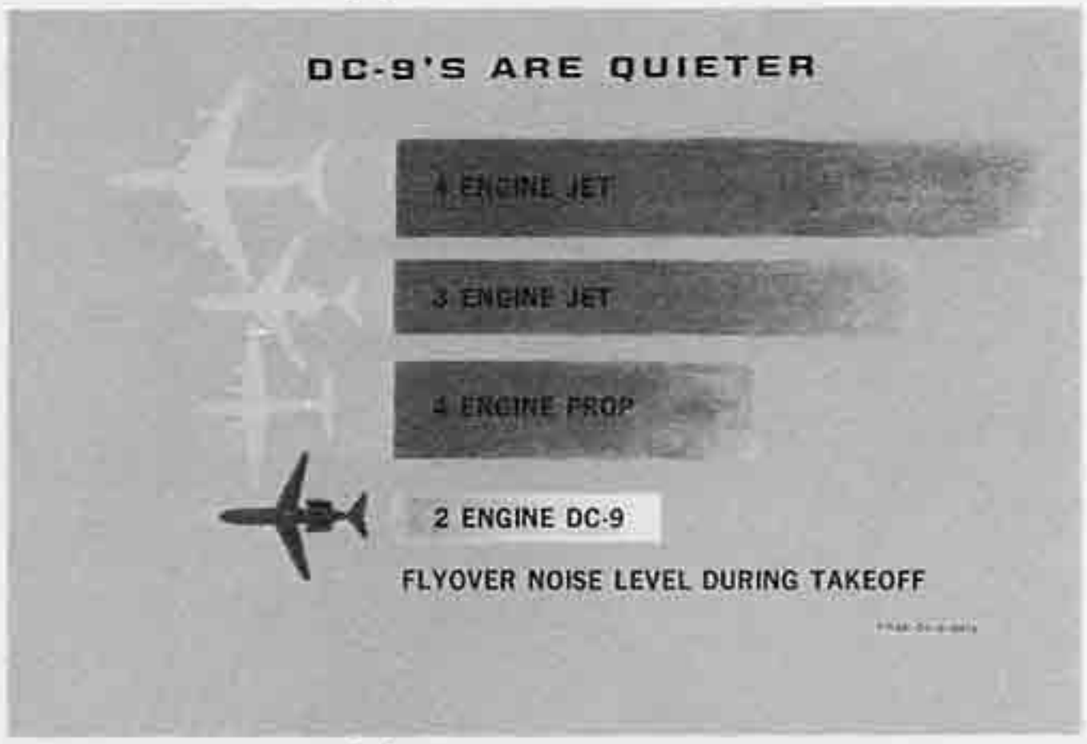
Passenger comfort will be comparable to that of the DC-8. An air cycle system producing a complete change of cabin air every two minutes is used for air conditioning. The flow rate provides 20 cubic feet of air per minute. The refrigeration capability can maintain a 75° cabin with a sea level ambient condition of 103°F. On the other side of the coin, adequate heat is provided to maintain a 75°F cabin with outside temperatures of 65°F below zero.



The aircraft is designed to be flown by a crew of two. Extensive human factors research and crew workload analysis have led to the development of a most efficient two-man cockpit. The DC-9 can be flown from either side by one man. Another factor of the DC-9 cockpit is the overhead annunciator panel. Master caution and warning lights in the direct vision of both pilot and copilot indicate a system difficulty. The crew member then looks to the annunciator panel which identifies the specific area requiring attention.

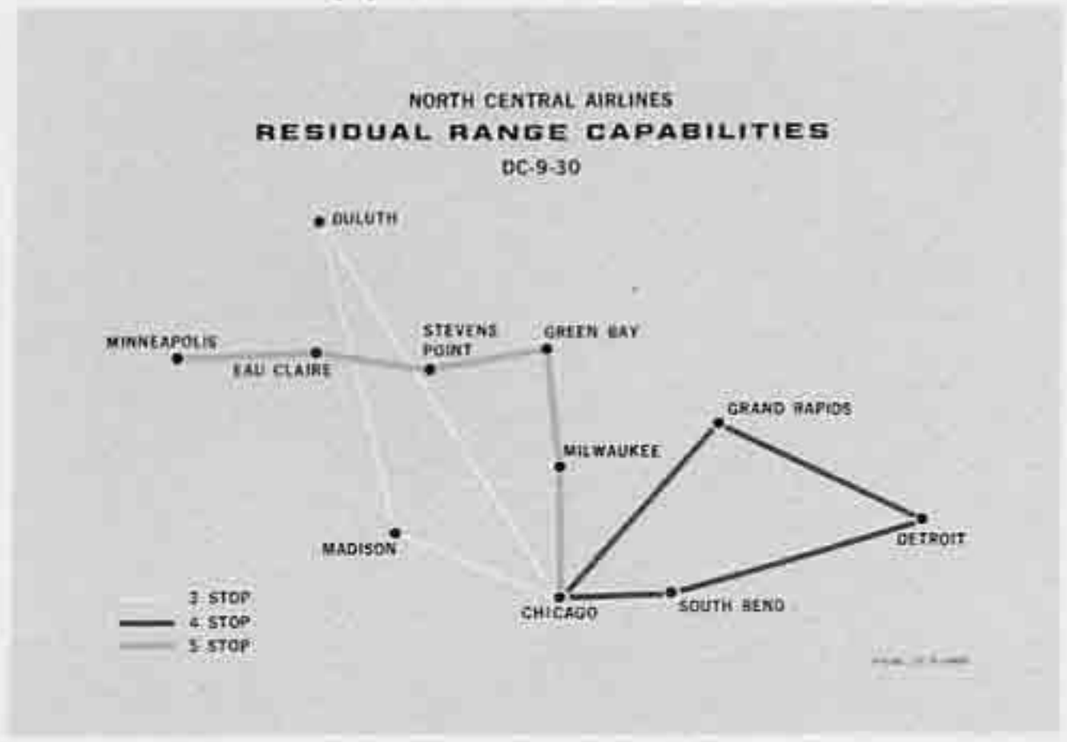
The DC-9 is much more quiet than four engine jets. We say the DC-9 has a "good neighbor" noise policy. The comparison shows a drop in the noise associated with both takeoff and landing. This is largely due to the number of engines and the high climb rate of the DC-9. Takeoff noise perceived by persons residing two miles from the point of brake release will show the DC-9 is 80% quieter than a four-engine jet and 30% quieter than four-engine propeller-driven airplanes, such as the DC-7.

During landing, to persons one mile from the touchdown point, the DC-9 will be 40% quieter than a four-engine jet. Your community should not be disturbed by the DC-9 operating in and out of its airport.



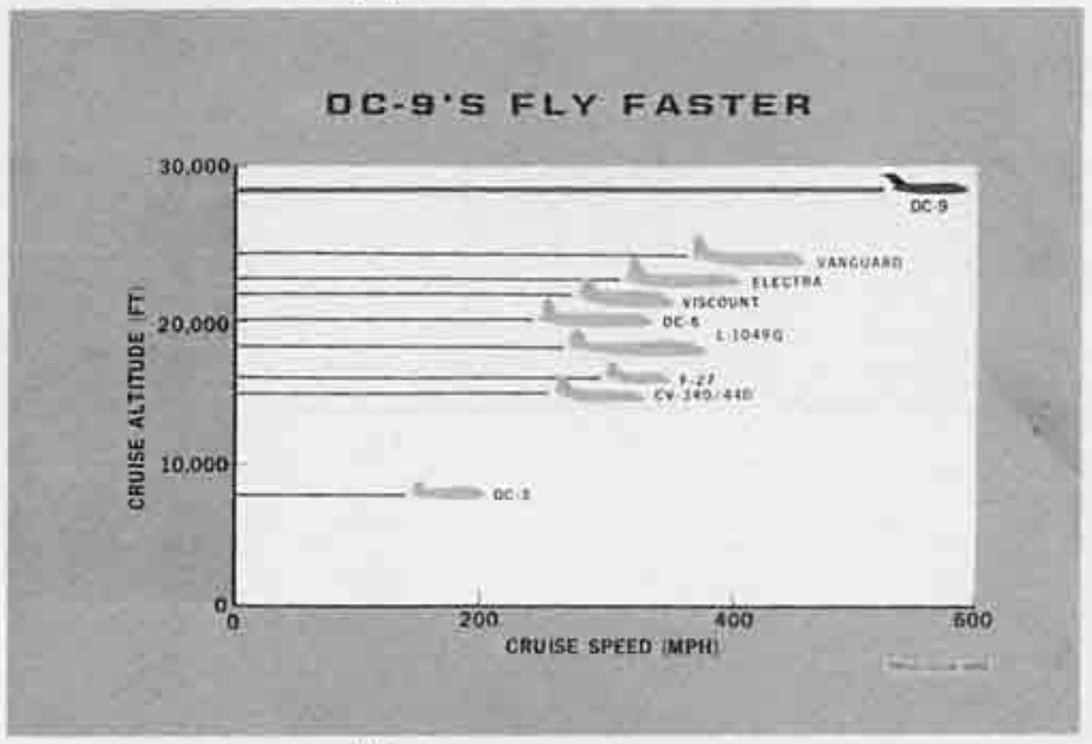
The performance capabilities can best be expressed by a payload range envelope. Due to fuel capacity and high structural landing weights of the DC-9, it is possible to make several flights without refueling. This chart illustrates a three-stop, four-stop, and five-stop residual range capability for your DC-9.

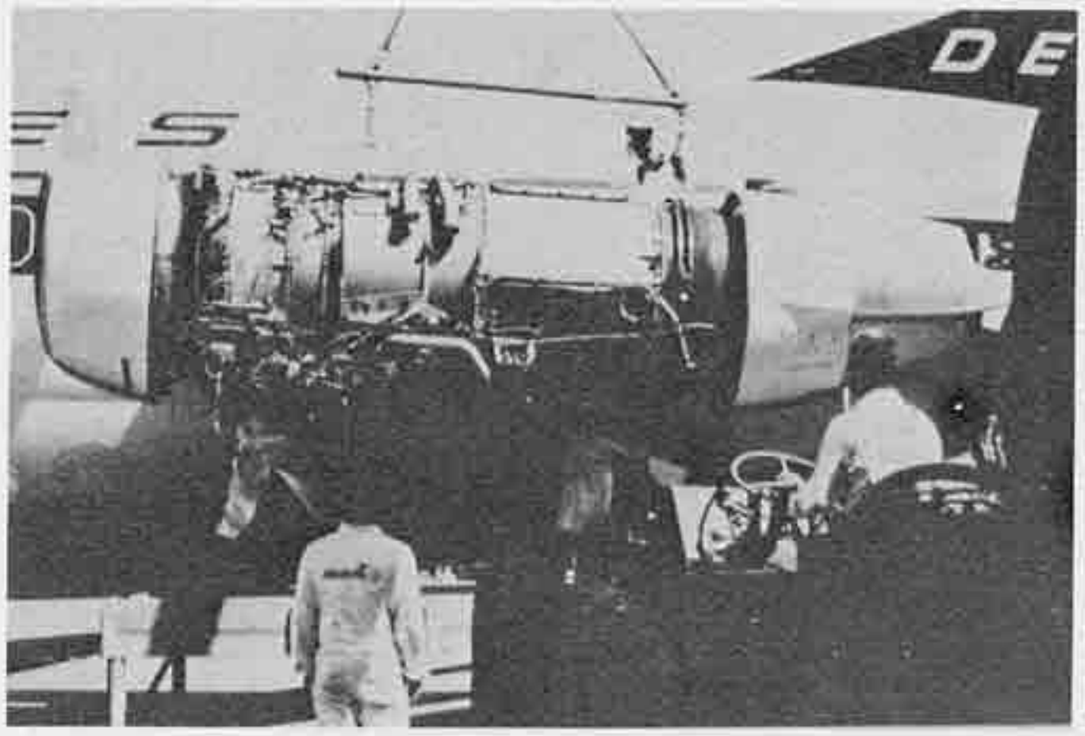
A flight could originate in Chicago, stop at Duluth and Madison, and return to Chicago with a full passenger payload without refueling. Or, a flight could originate in Chicago, stop at South Bend, Detroit, Grand Rapids and return to Chicago. Or, a flight could originate in Chicago, fly to Milwaukee, stop at Green Bay, Stevens Point, Eau Claire, and terminate in Minneapolis, without refueling. Another way in which this feature can be utilized to an economic advantage is that it permits the scheduling of fueling at those stations where fuel is most economical.



We mentioned earlier that the DC-9 has a speed capability of 555 miles per hour, which is nearly twice the speed of aircraft it will replace. Since 77% of the direct operating costs are based on speed, this is an important economic feature.

In this chart, you will see the relation in speed and cruising altitudes between the DC-9, the Vanguard, Electra, Viscount, Super "G" Constellation, DC-6, F-27, Convair 340/440, and the DC-3.





Refueling of the aircraft is a one-man operation. The pressure fueling point is in the right-hand wing leading edge at about shoulder height. The integral wing tanks have a total capacity of 3,679 gallons, which can be filled in 10 minutes through the high rate pressure fueling system.

Your DC-9 is equipped with an auxiliary power unit which can furnish electrical power and pneumatic power for both engine starting and cabin air conditioning.

Equipped with this gas turbine auxiliary power unit, the DC-9 has no need for ground handling equipment except at stations where functions such as galley or lavatory servicing are planned.

Passenger and baggage compartments are pressurized to provide a cabin altitude of 6,000 feet at an aircraft altitude of 30,000 feet.

Turn-around servicing of the DC-9 has been given special attention. It has a 30 minute, or better, terminal servicing capability for simultaneous servicing of the major aircraft systems, coupled with simplicity and accessibility of service points. This ensures low turn-around time with minimum manpower. In an actual demonstration, six mechanics changed an engine in 29 minutes.

An example of simplification is the DC-9 fuel system. The added weight and complexity of fuel dumping controls and mechanisms are unnecessary because the DC-9's maximum landing weight is 95% of its maximum takeoff weight.

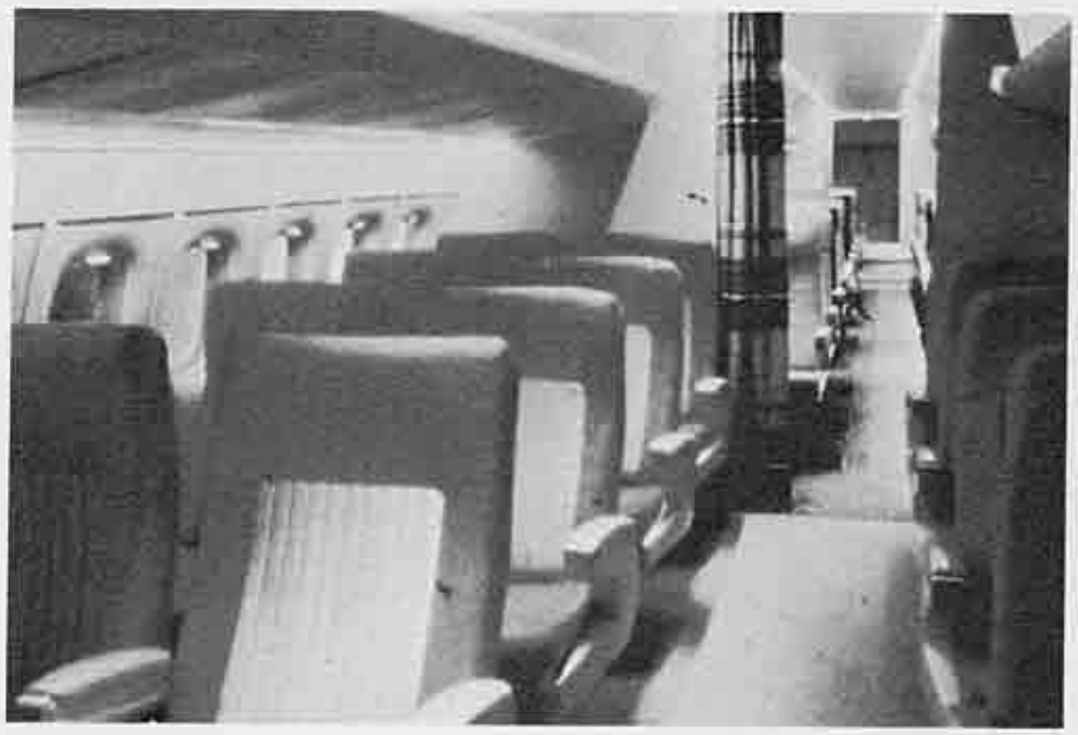
DC-9 Maintenance Savers:

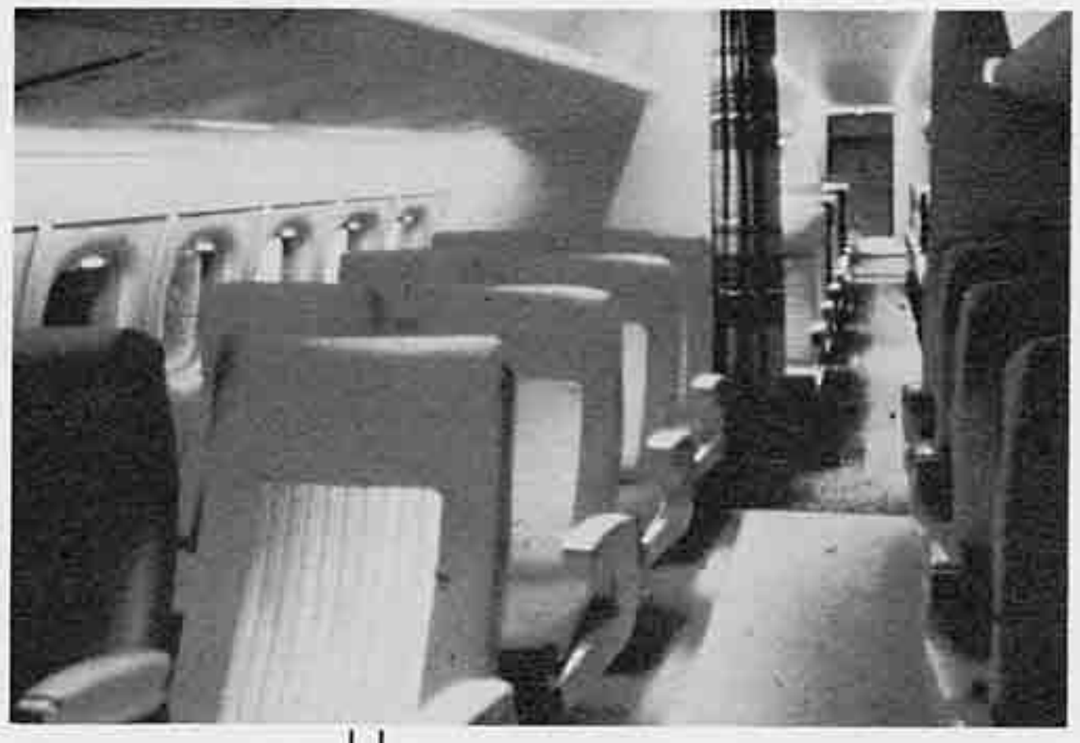
1) Built-in trouble indicators
2) Parts wear indicators
3) Repair "as needed"
4) De-rated engines – loaf and last
5) Duel "dispatch critical" items

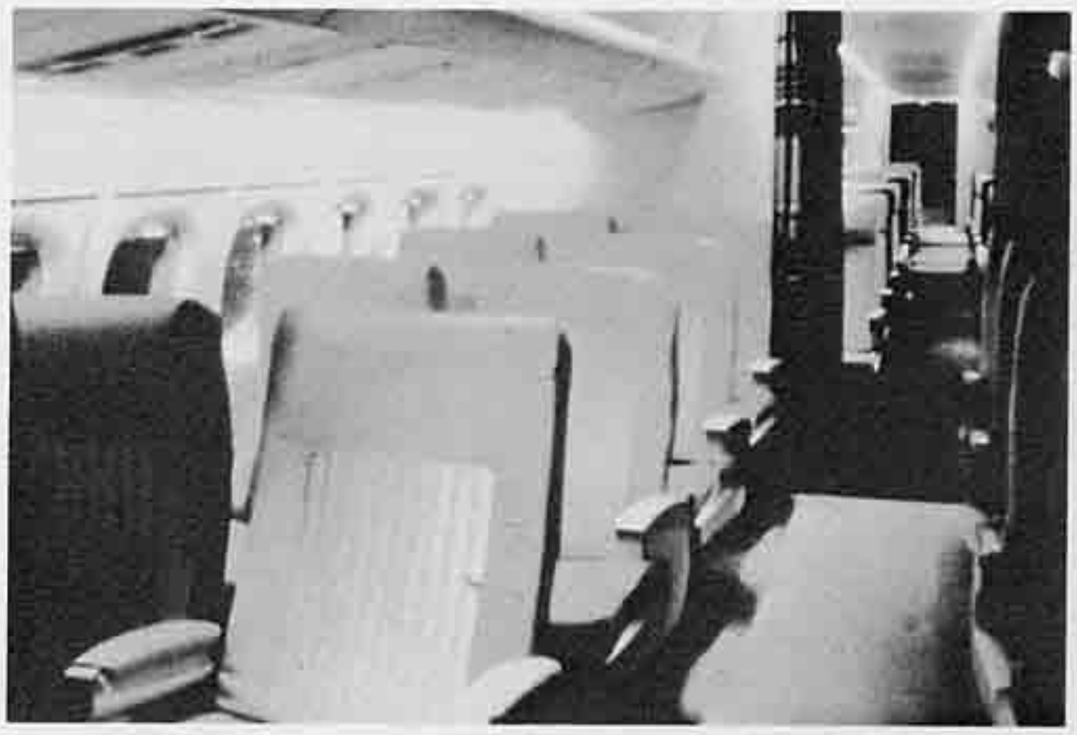
A number of items are included in the design to aid in the maintenance of the airplane. Wear indicators are installed to indicate when maintenance is needed. Timers measure operating time of individual components for the same purpose. In addition, there are built-in self-testing devices to aid in system checkout.

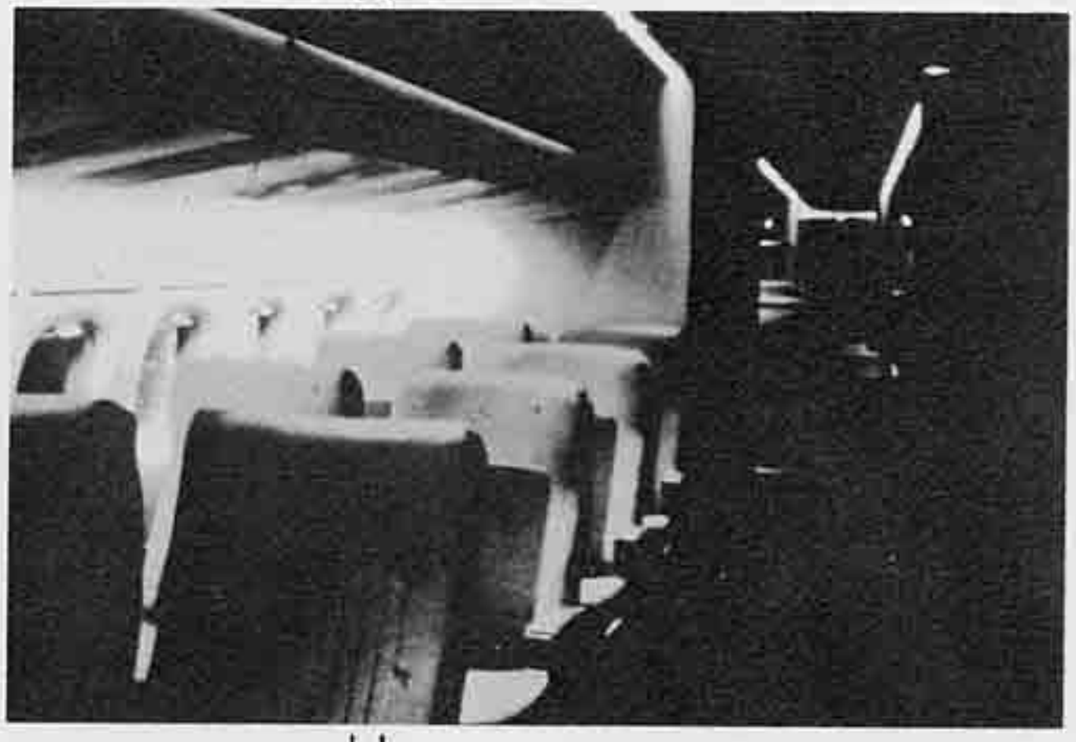
This is a photograph of the DC-9 interior styling mock-up. The purpose of the mock-up is to fully develop every detail of the passenger cabin for our customers.

These next series of slides taken in the mock-up will give you a feel for the various levels of interior lighting available. You will note we can go from a brightly lighted interior down to a very dim lighting which is still adequate to move about the cabin on night operations.





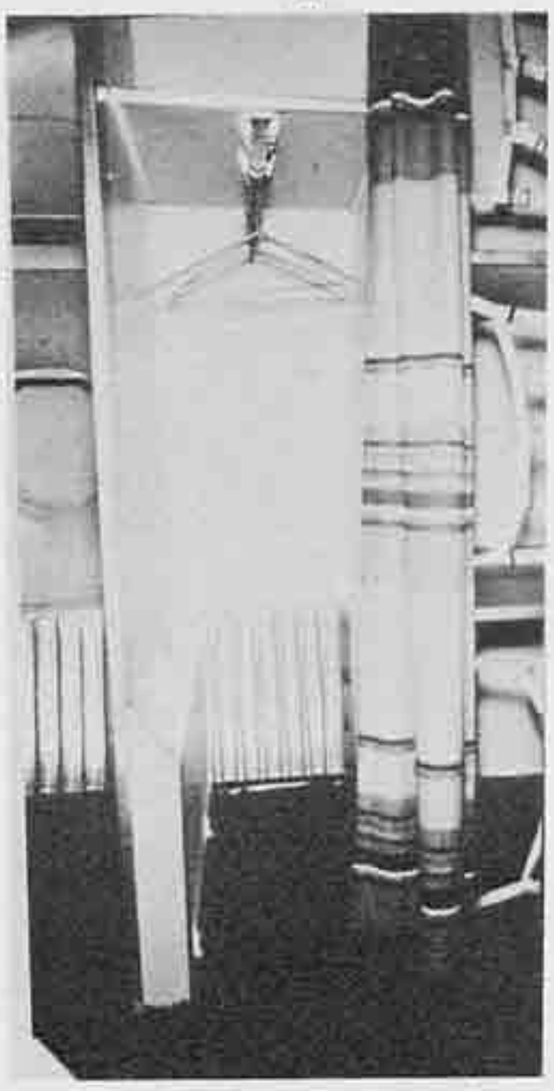




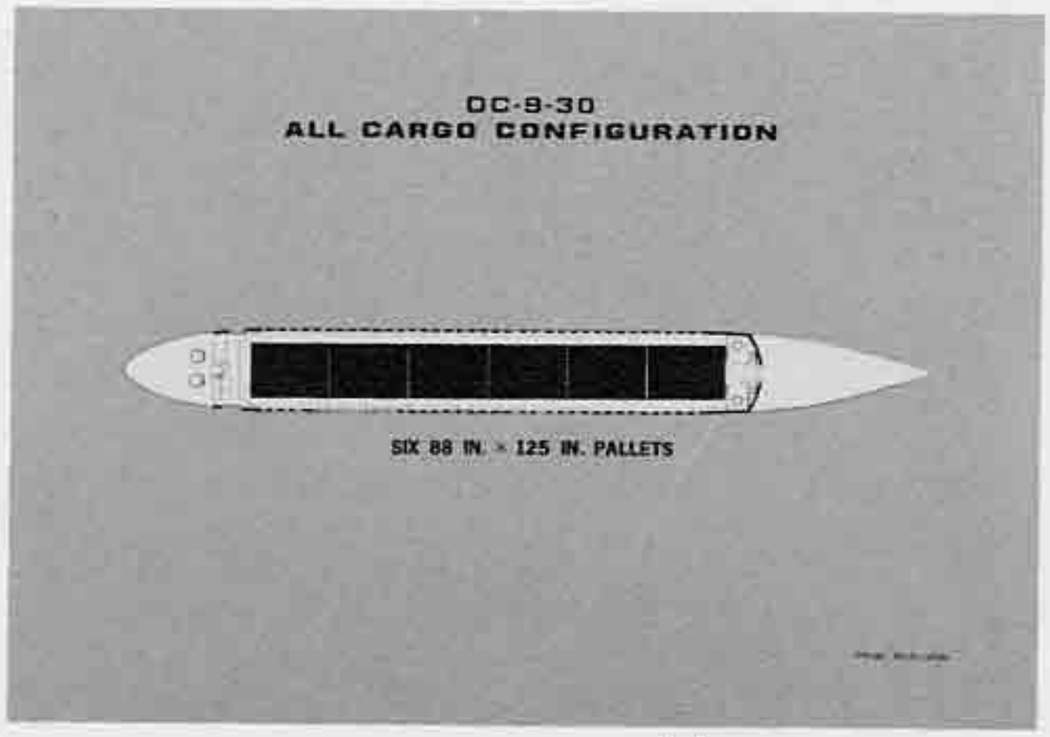
Here is a version of the galley.

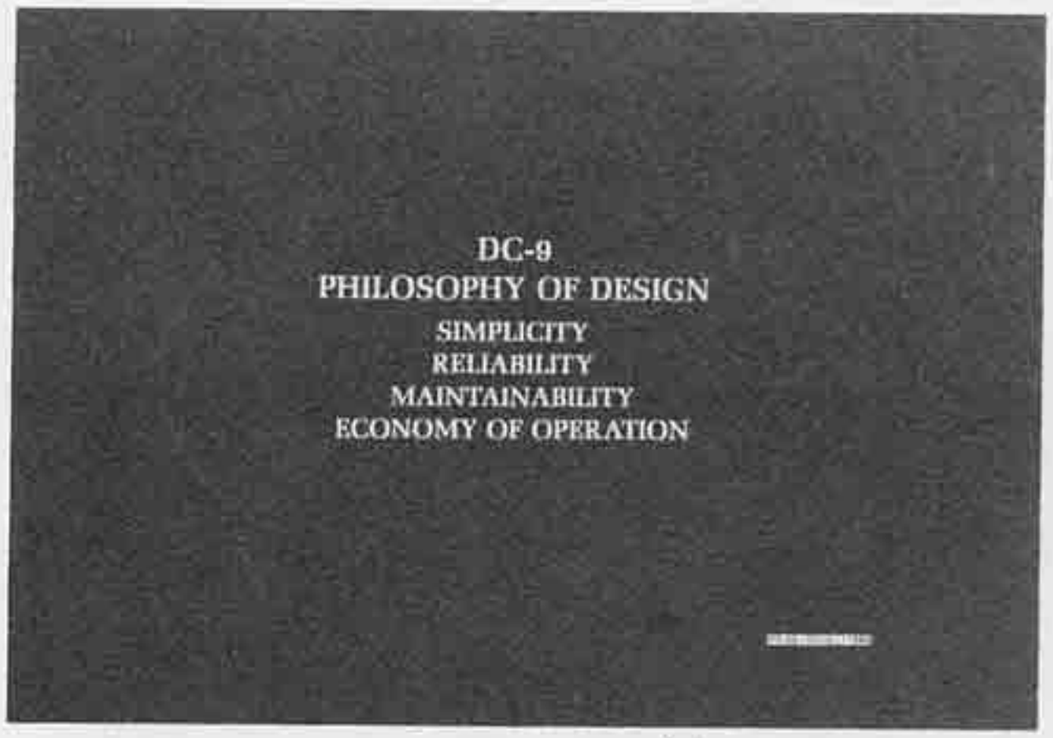
A view of the main cabin.

A view of the hostess seat, located at each end of the cabin.



Here is the coat rack area.





We believe that the next decade will see a steady rise in the amount of air cargo business occurring on all routes, including the short and medium range ones. The DC-9 is ideally suited for its operator to take advantage of this expanding market. Even with a full passenger payload, five to seven thousand pounds of cargo can be carried on the same flight. Further, a considerable amount of study and design has already been accomplished to configure the DC-9 as a cargo carrier as well as the flexible mixed cargo/passenger configurations. The cabin will accept six 88×125-inch cargo pallets.

A wealth of experience gained by Douglas over 30 years of building transports has made possible the achievement of a design philosophy which embodies the optimum in simplicity, reliability, low cost maintenance and economy of operation. These four features result in lower operating costs, as can be seen from the following:

SIMPLICITY — A count of components required to operate various aircraft systems shows the DC-9 to use considerably fewer parts than any other current commercial jet design, even allowing for the difference in size and the number of engines.

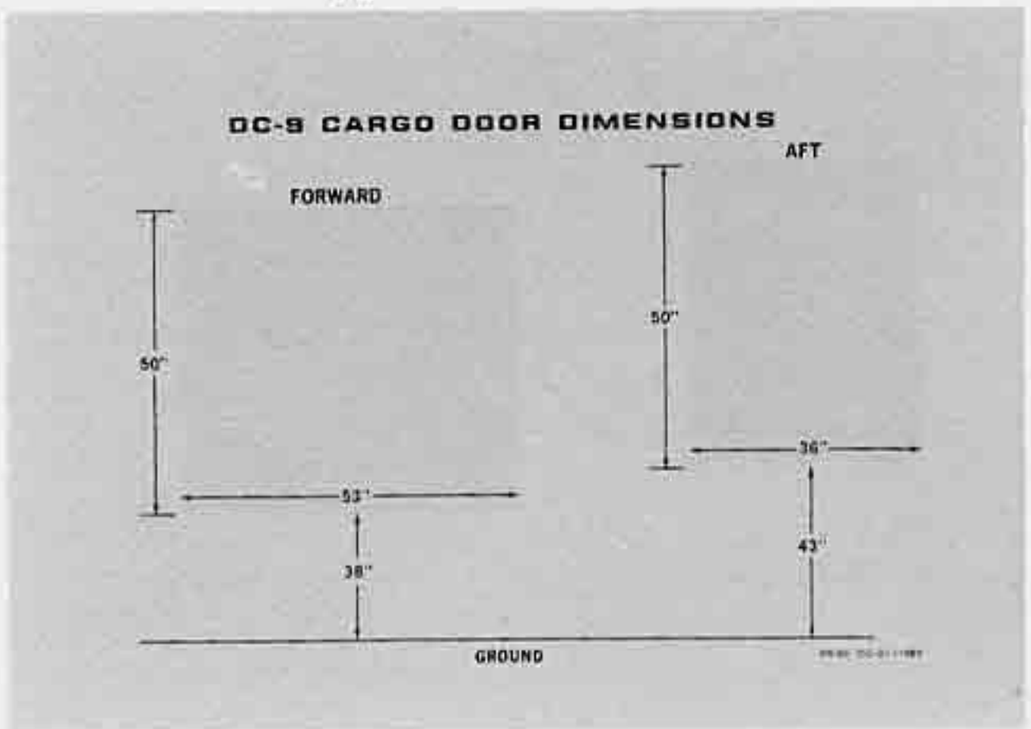
RELIABILITY — Selection of components has been based almost entirely on records or reliability. Even then, additional work has been done to improve reliability on these units.

MAINTAINABILITY — Modular concepts, the demonstrated capability for easy access, quick component removal and highly improved trouble-shooting techniques have been incorporated.

ECONOMY OF OPERATION — The DC-9 is a development of an aircraft that will carry a payload in "big jet style" at the least cost for the operator. Direct operating cost is one-half that of four engine aircraft or two-thirds that of the 727 (or 50¢ U.S. per mile less).

A number of components on the DC-9 are interchangeable from right hand to left hand. Also, many spare parts are readily fitted without additional machining and special fitting procedures. A net result is ease of maintenance and minimum requirements for spare parts inventory.

Many of you are actively involved in the sales, marketing and handling of cargo. The forward cargo compartment door is 53 × 50 inches, and is only 38 inches from the ground to the door sill. The aft cargo compartment door is 36 × 50 inches and is 43 inches from ground to door sill.



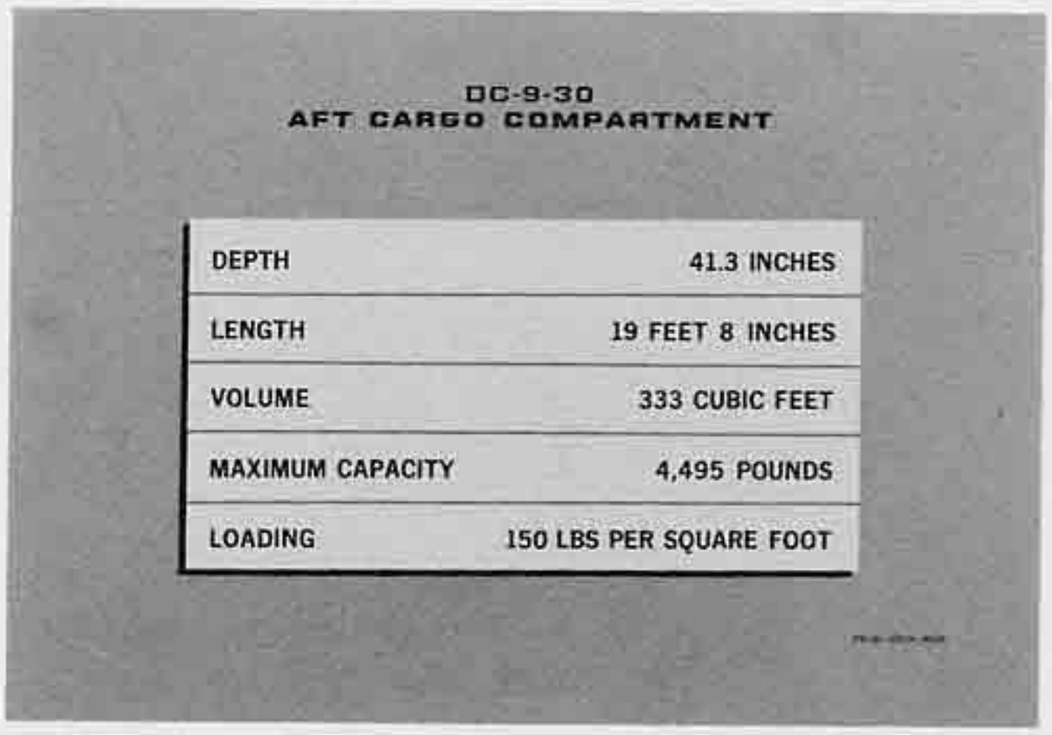
This slide shows the accessibility of the cargo doors without the need for loading stands and other equipment that tends to clutter a ramp during ground handling.

The forward cargo compartment has a maximum:

Depth	41.3 inches
Length	31 ft. 6 inches
Volume	562 cubic feet
Max. Capacity	8,430 pounds
Loading	150 pounds per sq. ft.

DC-9-30
FORWARD CARGO COMPARTMENT

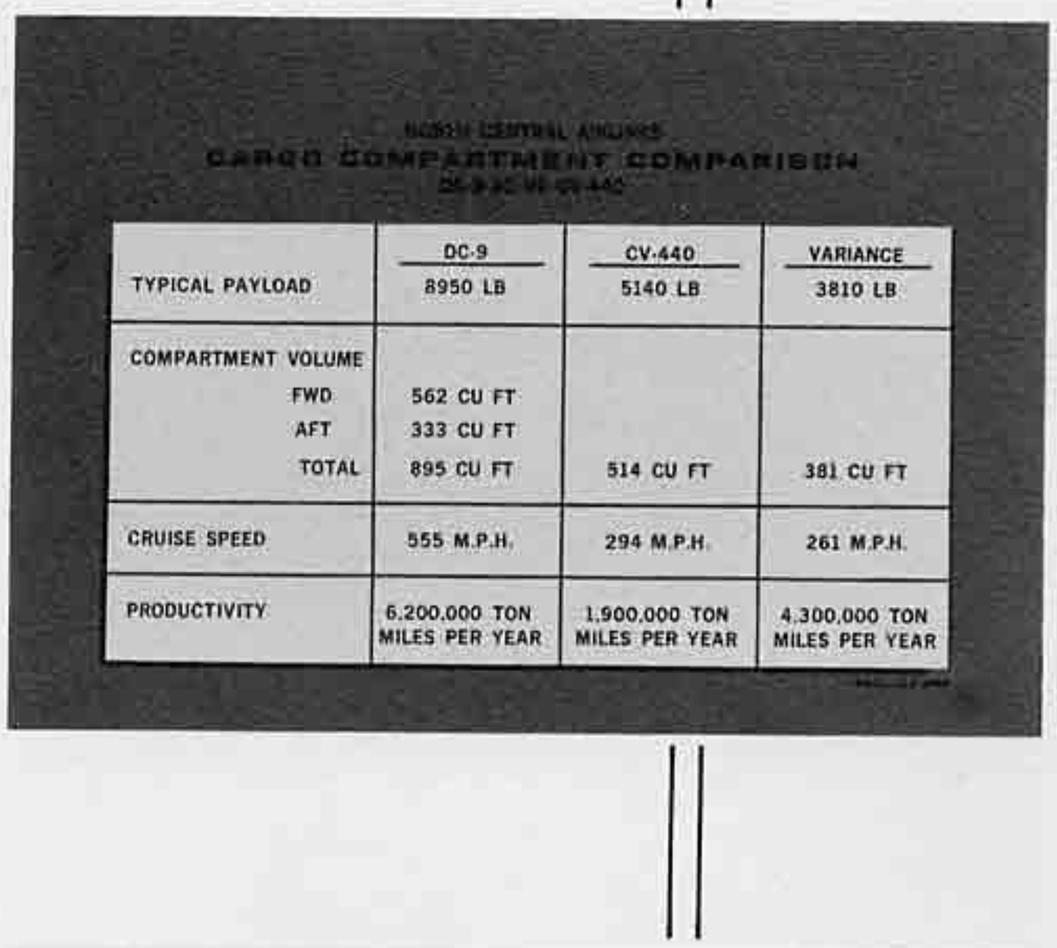
DEPTH	41.3 INCHES
LENGTH	31 FEET 6 INCHES
VOLUME	562 CUBIC FEET
MAXIMUM CAPACITY	8,430 POUNDS
LOADING	150 LBS PER SQUARE FOOT



The aft cargo compartment has:

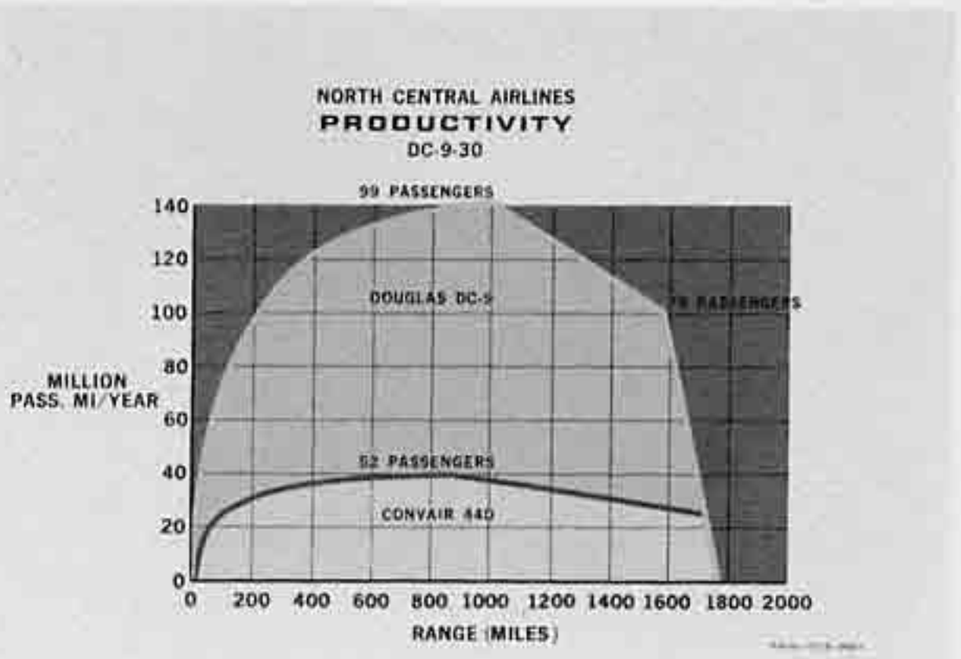
Depth	41.3 inches
Length	19 ft. 8 inches
Volume	333 cubic feet
Max. Capacity	4,495 pounds
Loading	150 pounds per sq. ft.

These combined, give you a total underfloor cargo volume of 895 cubic feet and a total capacity of 12,925 pounds. Both cargo compartments are pressurized and maintained above freezing. The forward compartment is heated to permit the transportation of animals.



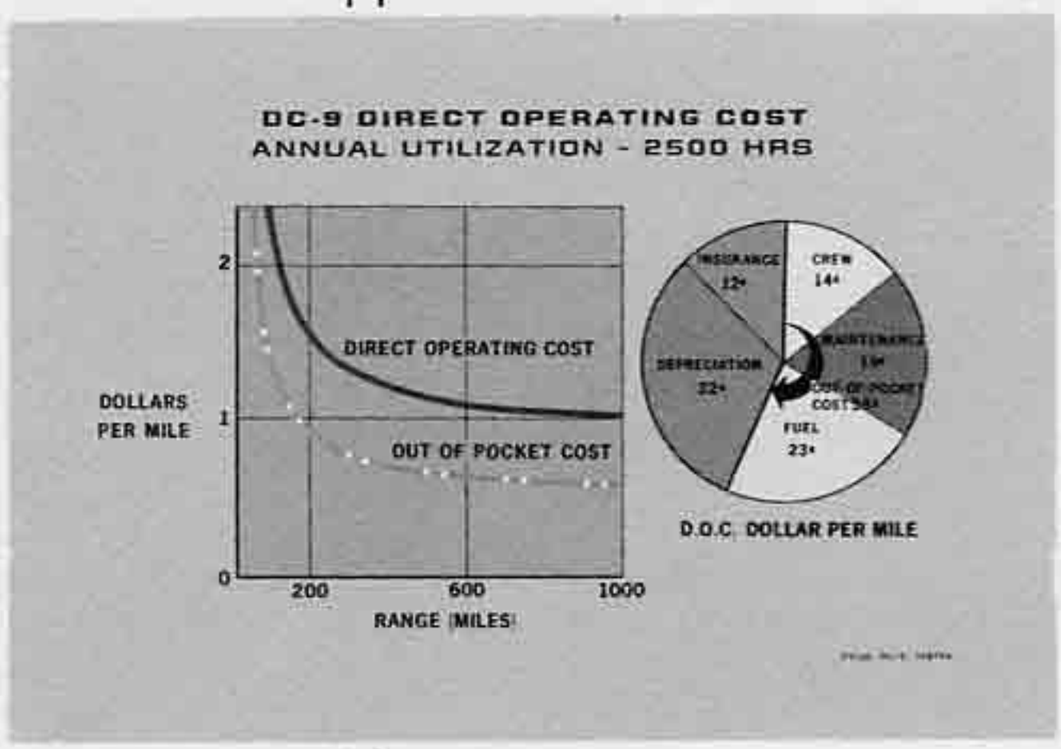
	DC-9	CV-440	VARIANCE
TYPICAL PAYLOAD	8950 LB	5140 LB	3810 LB
COMPARTMENT VOLUME			
FWD	562 CU FT		
AFT	333 CU FT		
TOTAL	895 CU FT	514 CU FT	381 CU FT
CRUISE SPEED	555 M.P.H.	294 M.P.H.	261 M.P.H.
PRODUCTIVITY	6,200,000 TON MILES PER YEAR	1,900,000 TON MILES PER YEAR	4,300,000 TON MILES PER YEAR

Here is an interesting cargo capability comparison between the DC-9 and the Convair 440. With 381 cubic feet more cargo capacity and 261 miles per hour cruise speed advantage, your DC-9 could produce 4,300,000 ton miles more than your Convair, or more than three times the capacity.



What the DC-9 can do for you. The productivity or capability to haul payload is compared to current propeller driven aircraft. This chart shows the capability of a Convair 440 versus a DC-9. Note the curve of the Convair reaches a peak at about 40 million passenger miles per year, while the DC-9 in this same range produces about 140 million passenger miles . . . over three times that of the Convair.

Direct operating costs shown were based on the well known 1960 ATA formulae. An annual utilization of 2,500 hours is assumed. Out-of-pocket costs, which are direct operation costs less depreciation and insurance, are 56% of the direct operating cost. The circular chart on the right hand side illustrates how the direct operating cost dollar is allocated. The out-of-pocket costs graphically illustrate the cost attraction of the airplane at the time it reaches a depreciated state.



Utilizing the revenue and operating costs shown on previous charts, we may obtain this DC-9 economic capability versus range.

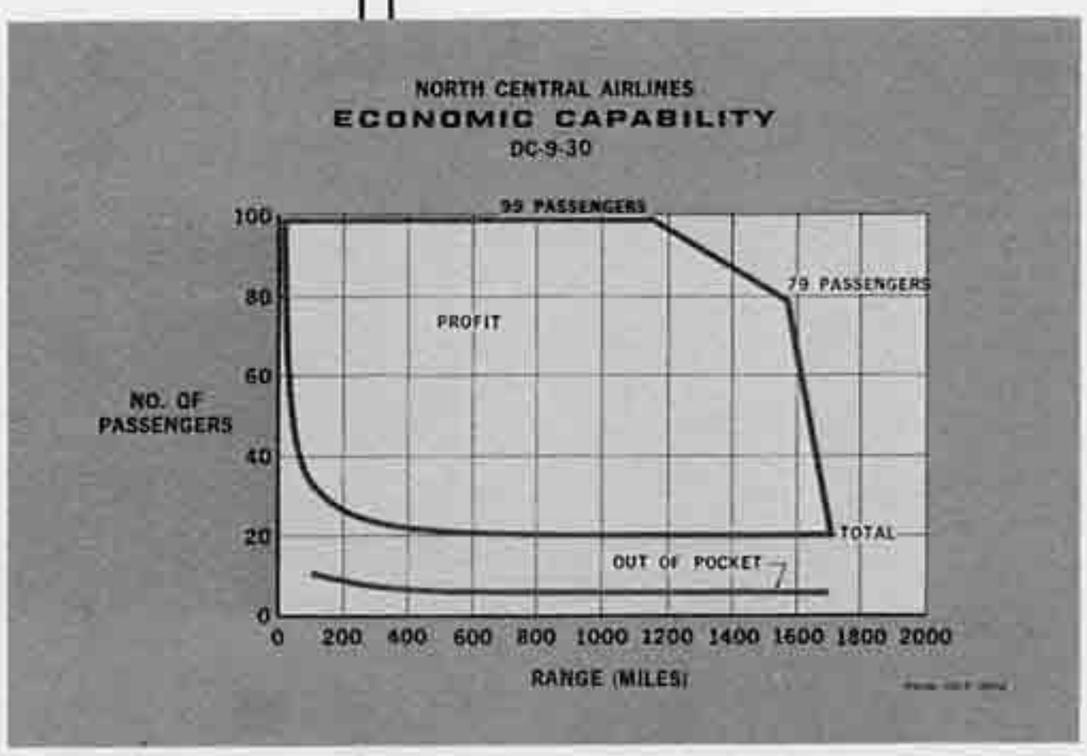
Indirect operating costs are included at 75% of direct operating cost. The chart shows that as low as 28 passengers will cover the total operating costs. More than this number results in a profitable operation.

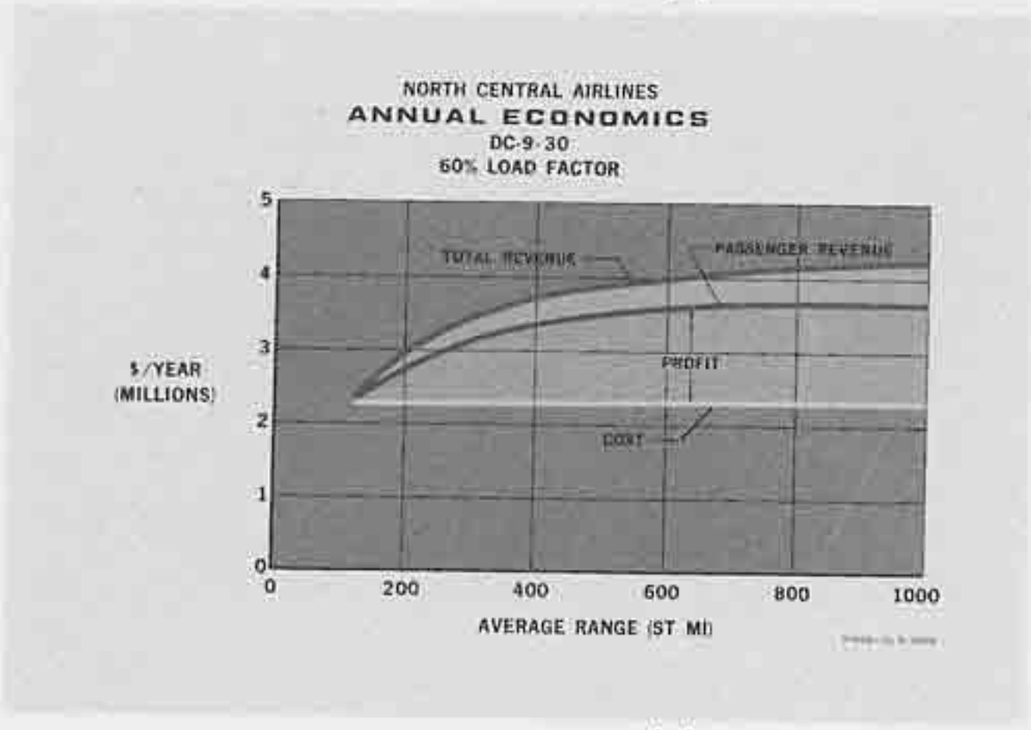
The out-of-pocket costs are covered by 10 passengers even at the shorter ranges, and less than seven passengers at the longer ranges. Annual revenues are illustrated as a function of average range. The shaded area between the total operating cost line and the revenue line represents the annual profit of one DC-9.

Total operating costs are nearly constant in spite of average range flown, although fewer total annual miles are flown at the shorter ranges.

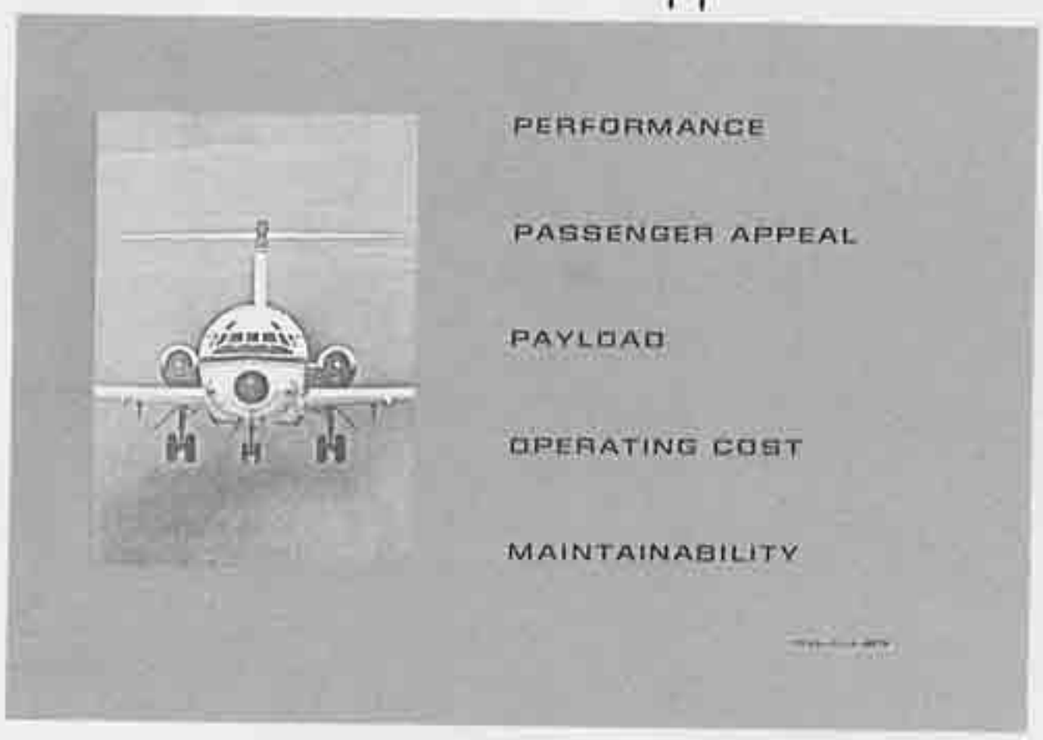
Passenger revenue is based on 60% load factor. The total revenue line is based on passenger revenue and cargo revenue, both at 60% load factor. Cargo revenues are taken at 25¢ per ton mile.

At an average range of 200 miles, the total annual revenue will be 3.02 million dollars, while total costs will be 2.30 million dollars, resulting in a profit of close to seven hundred thousand dollars per airplane, per year.





Let's look at it another way. Assuming seven to ten hours per day utilization (current jet aircraft are averaging better than ten hours per day) and a 60% average load factor, the DC-9 will pay for itself, including spares, in approximately 5½ years from passenger revenues alone. Even more significant, however, its operating costs are low enough to realize profitable operations over lightly traveled routes.



Now, to wrap this up with some sales features of your Douglas DC-9 that you should remember. In the performance area, it will have takeoff and landing capabilities which permit operations in and out of airports with runway lengths of 5,500 feet, excellent climb-out performance which helps to overcome jet noise problems in populated airport areas.

High cruise speeds, high landing weights, and therefore, excellent fly-through capabilities, which permit shorter ground time.

From the passenger appeal side, wide seats and aisles, excellent elbow, shoulder and head room, well developed and tested air conditioning system, good visibility for passengers, low interior noise level, freedom from engine vibration.

From the payload side, 895 cubic foot cargo capacity, high zero fuel weight, which permits large weight-limited payloads.

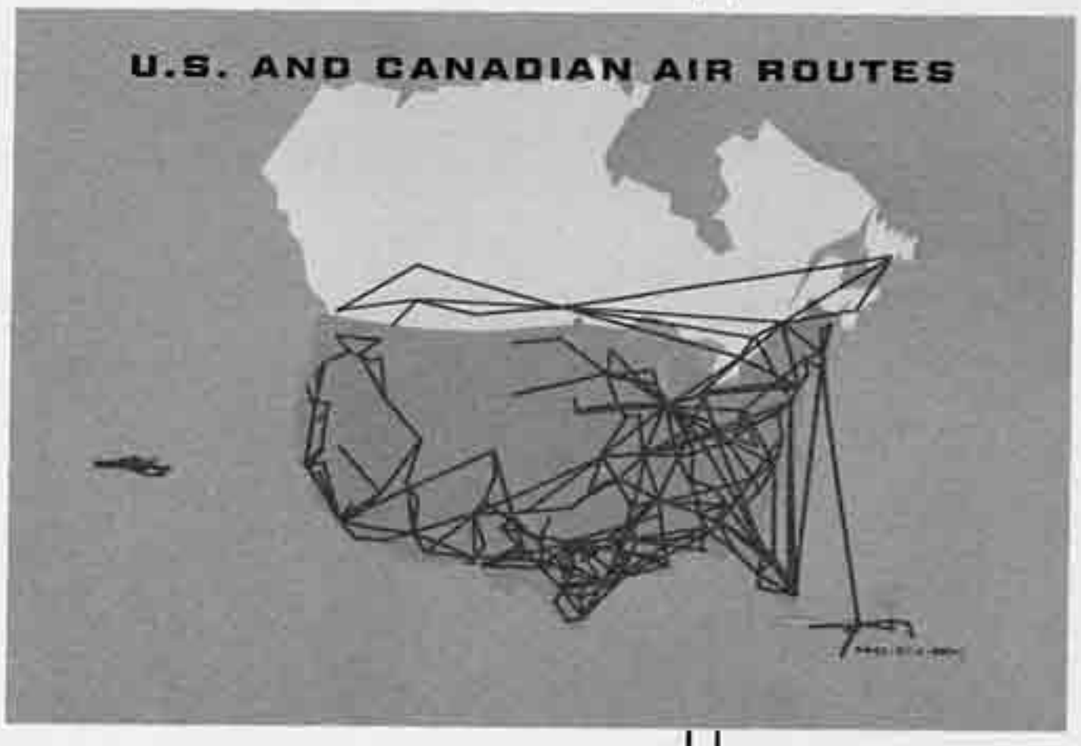
From the operating cost standpoint, simple two-man cockpit.

From the maintainability side, the utilization of de-rated power on the JT8D engines provides unparalleled maintenance and overhaul savings. Engine change within one hour, no fuel dump system, simple systems, designed with fewer parts than contemporary airplanes, unusually good access to systems components.

The first flight of the DC-9 was made on February 25, 1965, and it was certified by the FAA on November 23, 1965. Both of these historic events were accomplished three months ahead of the target date we established when we first announced our plans to build the aircraft.

The aircraft assigned to our test program made hundreds of flights, accumulating several thousand flight hours. Our engineering efforts and attention to detail really paid off, as this aircraft has proved to be remarkably free of design and test problems. In fact, one airline refers to the DC-9 as "The Bugless Douglas."

From the very start, up to the first flight of a DC-9, it takes approximately six months to complete this aircraft.



To bring you up to date on the airlines that have announced the purchase of DC-9's:

- In the United States:
  1) Allegheny
  2) Bonanza
  3) Caribair
  4) Continental
  5) Delta
  6) Eastern
  7) Hawaiian
  8) North Central
  9) Northeast
  10) Overseas National Airways
  11) Ozark
  12) Pacific Southwest
  13) Southern
  14) Trans Texas
  15) Trans World
  16) West Coast
  17) Standard

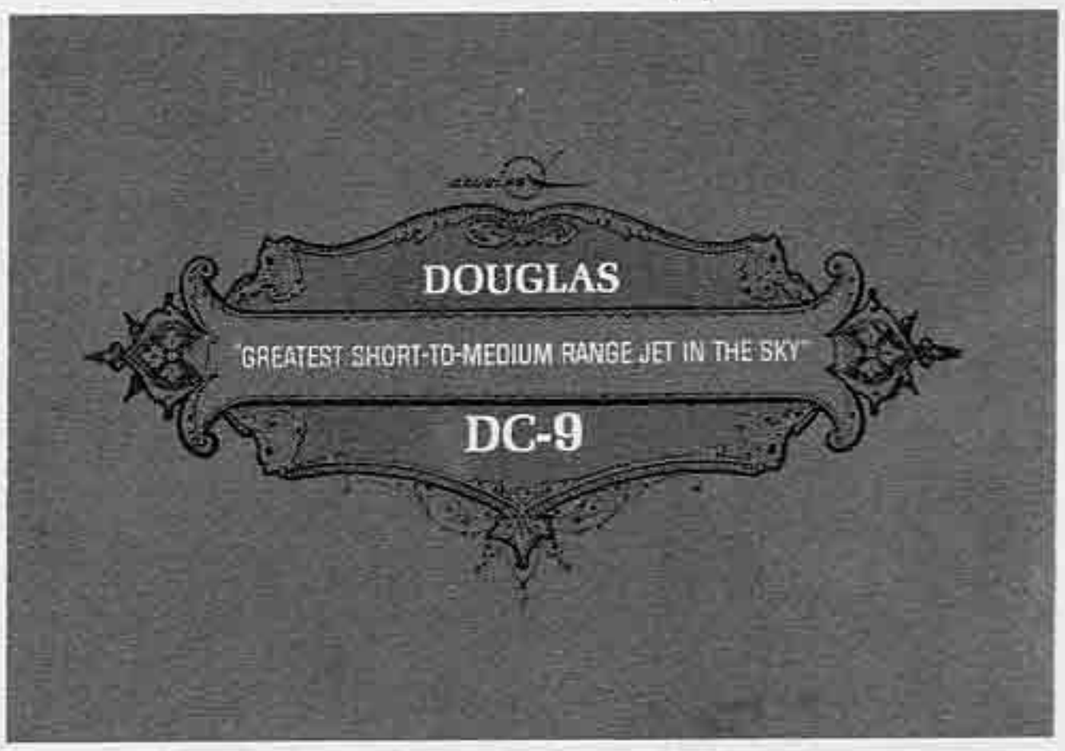
- International flag carriers:
  1) Aeronaves de Mexico
  2) Air Canada
  3) Alitalia
  4) Ansett -Ana
  5) Avensa
  6) Iberia
  7) K.L.M.
  8) Korean
  9) Martin Air Charter
  10) Saudi Arabian
  11) S.A.S.
  12) Swissair
  13) Sudflug
  14) Trans Australia

A total of 31 airlines. Their firm orders as of February 1, 1967, total 426 aircraft, with options for 119 more, or a total of 545.

Combining their route maps to illustrate the cities they serve, which could be included in DC-9 advertising and promotion, the United States map will look like this.

The balance of the world would look like this.

You will note there is a monkey astride the DC-9 on the badge you are wearing. That is a reminder to you that we at Douglas will deliver to your company the finest commercial aircraft in its class that will generate seat miles between your route segments at a higher level than ever in your company's history, and the "monkey will soon be on your back" to see that these seats are filled.



Your company has never had a greater opportunity for profit which, in turn, makes your future brighter. It is all up to you.

Good luck.

Good selling.

And, thanks very much for allowing me to be a part of your meeting.