

75  
THE

BOEING



707



AIR-INDIA





These traditional words of Indian greeting express my heartfelt welcome to you . . . aboard this Boeing 707 Rolls-Royce-powered Intercontinental Jet. In very truth, its speed and luxury, its comforts, its crew are *yours*, Dear Passenger . . . dedicated to your greater delight, as you savour to the full one of the most wonderful experiences of the modern world—jet flight.



There are many good reasons why I chose the big Boeing and why I chose Rolls-Royce to power her mighty engines. This booklet will help you to know why. But the reason for all the reasons, Dear Passenger, is you—for you were in my thoughts and in my heart when I made the choice—because, for you—it had to be the best!



# OUR WORLD ON WINGS



The Ornithopter—  
by Leonardo Da Vinci

Since time immemorial, man has dreamed of flight . . . envying the birds as they soared swiftly, easily through the skies. It took the genius of Leonardo da Vinci to devise, in 1490, a 'flying machine' . . . but even da Vinci's genius could not make his *Ornithopter* more than a *theoretical* machine.



Stringfellow's  
Steam Monoplane

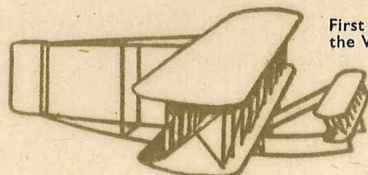
Three-and-a-half centuries later, Stringfellow produced his *Steam Monoplane*. But the start of our world with wings can be dated from 1892, when Lilienthal's

Glider bore the first man of all time through the air. Progress speeded up—the Wright Brothers' *Biplane*, the first *powered* aircraft, flew a distance of 852 feet in 1903 !

Then things began to happen—fighter aircraft were used in World War I—came the first mail planes, the first passenger planes, the first solo across the Atlantic, the first round-the-world flight . . . came the day when air travel was taken for granted . . . came the day when jets first streaked across the sky—came the day when the most powerful, the most beautiful thing on wings was born—came the day when a 707 was delivered to us and our heart flowed full ! Came wise-eyed men of the East on donkey back, by bullock-cart, to gaze and wonder at this splendid creation—made by man from his store of genius and skill . . . that you, Dear Passenger, may fly swiftly—more swiftly than ever before.



Lilienthal's  
Glider

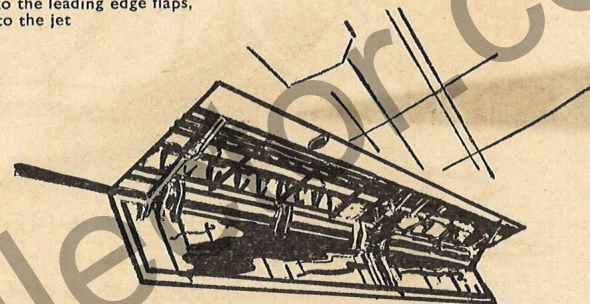


First powered aircraft—  
the Wright Brother's Biplane

## LEADING EDGE FLAPS—

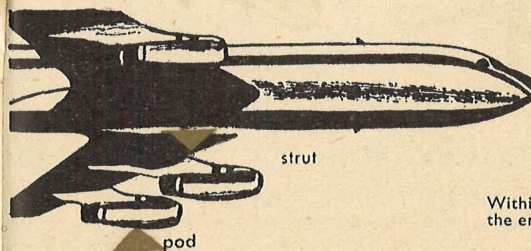
small flaps on the wings. Flush with the underside of the wing when the plane is cruising, they are extended during take-off and on landing, to maintain 'lift' characteristics of the wing even at the lowest flying speeds.

Better control at low speeds,  
especially at take-off . . .  
thanks to the leading edge flaps,  
unique to the jet



## MACH NUMBER—

so named after the Austrian physicist, Ernst Mach. Mach Number describes the relation of the speed of an object to the speed of sound, known as Mach 1. The speed of sound, or Mach 1, varies with temperature and altitude. At sea level, Mach 1 is about 760 miles an hour; at 35,000 feet altitude, Mach 1 is about 660 miles an hour. Thus, if you're flying at an altitude of 35,000 feet at 330 miles per hour, the Mach number is .5.



Within the pods are housed  
the engines and its accessories

## POD—

suspended on streamlined struts or pylons forward and below the wings, the four pods of your Boeing contain the jet engines and their accessories.



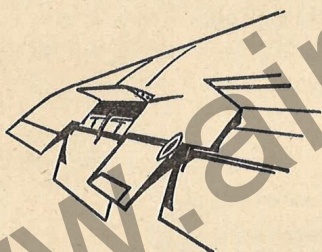
### PROBE ANTENNA—

situated on the tail of the Boeing, this spear-like projection ensures efficient high-frequency radio communication. . . being designed and constructed to ensure freedom from electrical disturbance from the plane itself.



### SHOCK OR COMPRESSION WAVES—

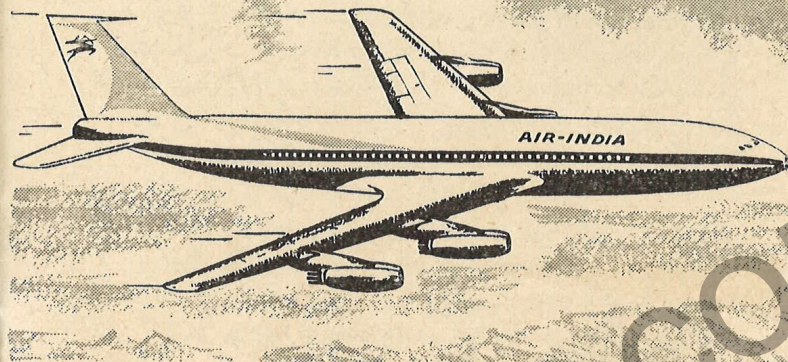
waves formed by the pile-up of air at the point where the air reaches the speed of sound in relation to the aircraft. A harmless phenomenon in a well-designed modern aircraft, these waves first form when the aircraft itself is still travelling considerably below the speed of sound but the air moving over the curved portions of the craft attains the speed of sound. You may sometimes see these waves on the wings as thin lines of light and dark running parallel to the leading edge of the wing.



Spoilers/Speed Brakes  
reduce the 'lift' on wings,  
also permit rapid deceleration

### SPOILERS/SPEED BRAKES—

hinged plates attached to the top of the wings and hydraulically raised and lowered. When raised simultaneously on both sides, they act as speed brakes . . . helping to slow the speed of the plane, or enabling it to descend rapidly without gaining speed. Used individually, they help in making turns as the Boeing turns to the right, the right-wing spoilers help to dip the right wing.



## BEAUTIFUL... AND SO FUNCTIONAL

Before you enter your Boeing, you certainly notice several features. . . all contributing to her beauty, all with specific functions.

There is the lance-like antenna pointing forward from the top of the tail. . . ensuring a longer range of easier communication, and preventing electronic disturbance from the instruments and systems of the plane itself.

There is the absence of propellers, enabling your Boeing to 'sit' closer to the ground. . . thus, to some extent, disguising its immensity.

And then there are the wings swept-back at an angle of  $35^{\circ}$ —sheer beauty, *functional* beauty!

Here we must deal with an old fallacy. . . it is just not true, as many people believe, that a swept-back wing is essential to high speeds. The fastest aircraft in the world today (it achieves fifteen hundred miles an hour and climbs to 90,000 feet) has straight wings. But straight wings must 'push' their way, straight on, through the air. . . and the greater the speed desired, the thinner the wings must be. In the case of your Boeing, straight wings would have to be so thin that all fuel would have to be carried within the plane (leaving precious little room for equipment and crew, cargo and baggage. . .



not to speak of passengers) and take-off and landing speeds would be so fast that runways would have to be anything between 15,000 and 20,000 feet long! So, the swept-back wing. . . which 'cheats' the air by sliding through it at an angle that makes it seem thinner than it is.

The wings of your Boeing look so slender, so elegant. . . yet they have amazing strength—they house all the fuel, they support the four Rolls-Royce engines; they carry the navigational lights, the landing lights, the hydraulic and electric systems. . . and a few miles of cables and wires. On the subject of electrical systems. . . that of your Boeing has a capacity of 120 kilowatts—enough to light 40 houses.



## AT TAKE-OFF

It takes about two minutes to start up all four Rolls-Royce engines. Perhaps you hear a faint sound as the compressors start their task of sucking in the air. If you're a seasoned air traveller, you note the absence of the warming-up period of piston engines. . . jet engines don't need warming up! A brief pause, while the Captain gives all instruments, engines and equipment a final check . . . he releases the brakes. . .

releases your giant jet for her swift, effortless take-off . . . releases her to soar upwards at 2,000 feet or more a minute. The take-off foretells the flight. . . smooth, swift, vibration-free, *quiet*.



## AT CLIMB

In the cushioned comfort of your cabin seat, you're missing one beautiful sight. . . your Boeing is sheer flight-designed beauty now. The sound you heard shortly after take-off was the roar of air rushing into the wheel well below the fuselage as the doors open to receive the retracting landing gear, and now a slim, sleek arrow is climbing smoothly, swiftly, to find the altitude she likes best—somewhere between 25,000 and 42,000 feet (that's between 5 and 8 miles in land language) . . . an altitude where the air is serenely calm, offers less resistance to her mighty thrust; where the sky is a deep, delightful blue, free of moisture and dust; where she and you leave the clouds and the weather miles below . . . with the exception of the rarest patches round which your radar-forewarned Captain guides his craft with consummate speed and skill.





SO SILENT,  
SO SMOOTH,  
WHY?

The air-conditioning and pressurizing of your Boeing are universally acclaimed as the finest achieved for any airliner. Outside, the temperature is 56°C (65°F) below zero . . . within it is controlled at a comfortable 21°C (70°F). And the pressurizing system is superb . . . up to 7,000 feet, pressure within the cabin is equivalent to that experienced at sea level; and even at the top altitude of 42,000 feet, cabin pressure is equivalent to that experienced at only 8,000 feet or lower.

The Boeing 707 fuselage is specially designed to keep the pressure safely inside . . . this being achieved by the 'fail-safe' design—of which more in the Glossary!

The triple-paned, fog-free, glare-preventing windows . . . like every other part of the plane . . . have undergone thousands of extreme pressure tests. And the doors, like bank vault doors in design, act as enormous stoppers . . . they couldn't be opened in flight even if anyone thought of trying to do so!



WHAT  
HAPPENED  
TO  
THE  
NOISE?

Within the cabin, quietness is almost tangible . . . you can speak in a normal conversational tone, hearing perhaps just a little engine noise at the rear of the cabin. This relaxing quietness is thanks to superior soundproofing, and to the fact that the engines are placed way out on the wings. You might also wonder how the 'smooth' ride has been achieved. Look out of your window: notice how the wind tips flex up and down? They're ironing out the bumps in your 'skyroad', acting as shock absorbers to give you the smoothest possible flight. Every aircraft wing is to some extent flexible . . . the Boeing's specially so . . . and yet so solid too!

Outside the cabin it is also far quieter than you would think possible . . . and to achieve this, for the benefit of people who work and live near airports, the Rolls-Royce company invested a vast amount of time and money in the development and perfection of *silencers* . . . fitted to the rear of each engine.

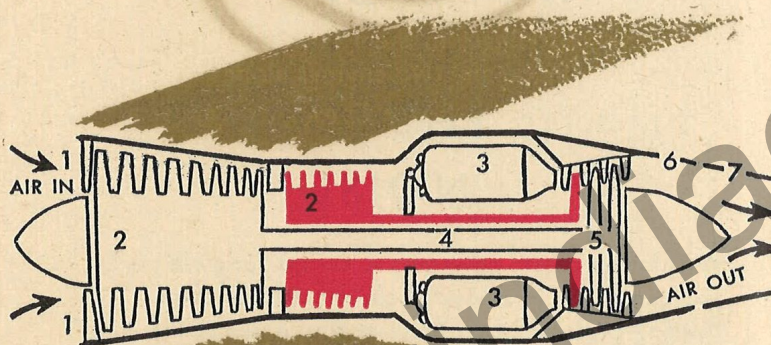


# THE JET ENGINE...

in brief

The first, perhaps most surprising, thing about a jet engine is that it is very much simpler than a piston engine. It has fewer moving parts; it is easier to control; it is easier to service.

Spark plugs are used to start the engines ... and only to start the engines. Thereafter the process which powers your Boeing is automatic. What is this process?



2 Compression Chambers

3 Burners

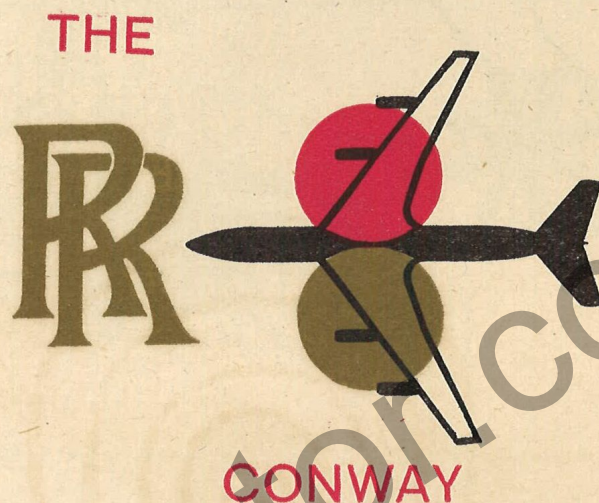
4 Shafts

5 Turbines

6 Tail Pipe

7 Jet Nozzle

Briefly—air passes continuously in through the front of the engine and out at the tail pipes. Pressure is built up by the air first being compressed ... it then gets hot ... moves into the combustion chambers ... mixes with kerosene ... ignites ... passes through the turbines which rotate a shaft connected with the compressor in the front of the engine ... and rushes out of the tailpipes ... 'thrusting' the aircraft forward. The faster the air goes out through the tailpipes, the greater is the thrust.



Our Boeings are powered by four Rolls-Royce Conway Bypass engines—the highest-rated jet engines in commercial airline service—and with such reserve strength in them that the mighty plane can fly steadily on any two engines alone!

In choosing the Rolls-Royce Conway, we chose a member of a proud family of aero engines. . . with a great record going back to 1914 . . . when the 'Eagle' was designed by Rolls-Royce . . . the aero engine that, five years later, was to power the first direct Atlantic crossing.

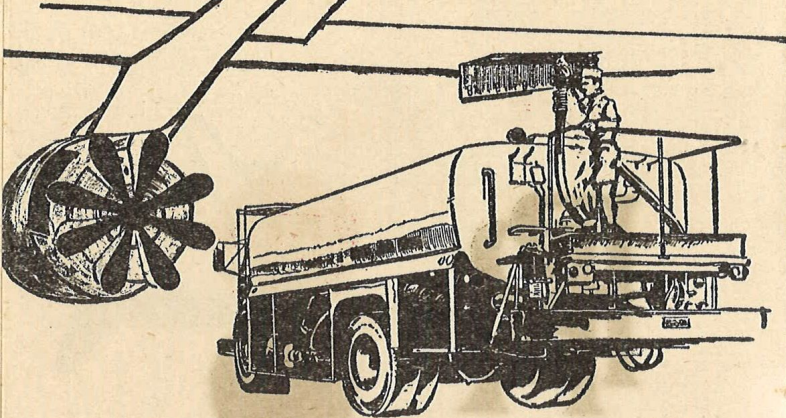
In 1945 came the world's first prop-jet to fly . . . the Rolls-Royce 'Trent', swiftly followed by the 'Derwents' which powered a Gloster Meteor to establish the first speed record of the jet age—616 m.p.h.

1953—the first prop-jet airliner enters regular airline service . . . with Rolls-Royce 'Dart' engines; and three years later a Fairey Delta 2, powered by Rolls-Royce 'Avon' engines established the first air speed record of over 1,000 miles an hour.

1958—and the first regular jet airliner enters service on the North Atlantic route—its engines, Rolls-Royce 'Avons'.

1960—and the RR Conway engines which power our Boeings have already proved themselves over millions of air miles . . . constantly achieving new records . . . carrying countless thousands of Boeing passengers—around the clock, around the world.





## FUEL AND RE-FUELLING

These engines use kerosene . . . and we can carry 14,700 Imperial gallons or 21,200 US gallons of it . . . far more than we need to carry you to your destination.

You'll probably want to watch refuelling operations at a stopover at least once. . . and for your information, the kerosene is fed in, from underneath the wings, at the rate of 1500 gallons a minute!



## THE SURFACE CONTROLS

It's fascinating to watch the surface controls on the wings . . . differing from and partly additional to, those of piston-engined aircraft. Your Captain, of course, steers up and down . . . to the right . . . to the left . . . in the 'normal' way—with much the same equipment as he would use on an ordinary plane—but he gets extra assistance from :

The **ailerons** . . . there are two sets of these on each wing of the Boeing ; together with the rudder, they control turns. When turning at low speeds, both sets are needed ; at higher speeds, only the inboard pair.

The **spoilers/speed brakes**—two on the top of each wing. They also help in making turns. A spoiler being raised looks something like a door opening, and it reduces the 'lift' on its wing. When the Boeing turns to the right, the right wing spoilers help to dip the right wing. Both sets act as brakes when landing.

The **leading edge flaps**—on the wings. They are unique to the jet, make for better control of the aircraft, at low speeds . . . especially at take-off when they assist the 'lift' of the wing.

The **adjustable horizontal stabilizer**—also unique, it keeps the plane level at high speeds (in simple terms, if you stand up and move forward these controls compensate for your movement by 'trimming' the aircraft to keep on an even keel).

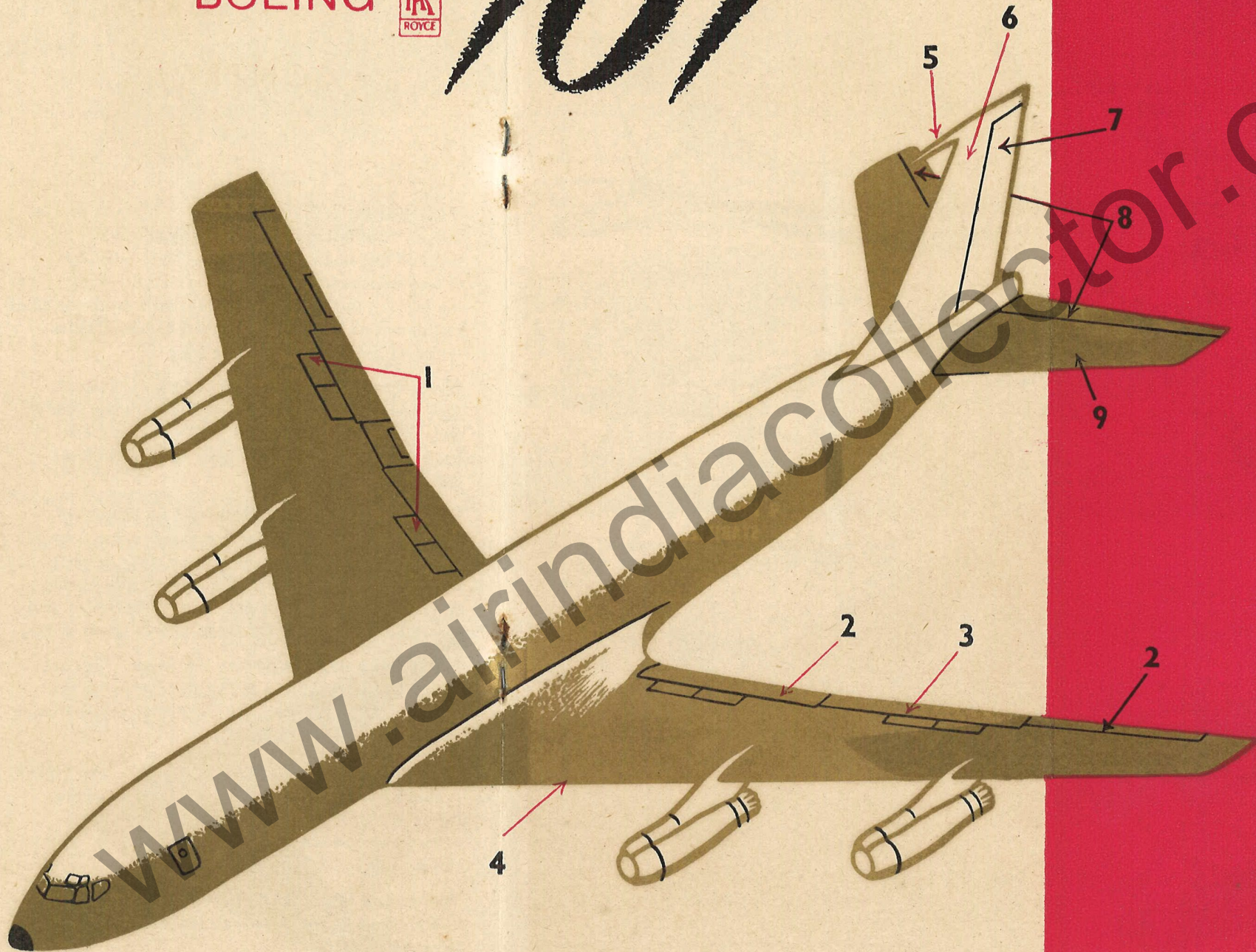
The **vortex generators** . . . on the top of the wings and on the tail, they improve the flow of air over the wing.



BOEING



707



- 1 SPOILERS
- 2 AILERONS
- 3 WING FLAPS
- 4 LEADING EDGE FLAPS  
(Under Wings)
- 5 HIGH FREQUENCY  
ANTENNA
- 6 VERTICAL STABILIZER
- 7 RUDDER
- 8 ELEVATOR
- 9 HORIZONTAL  
STABILIZER



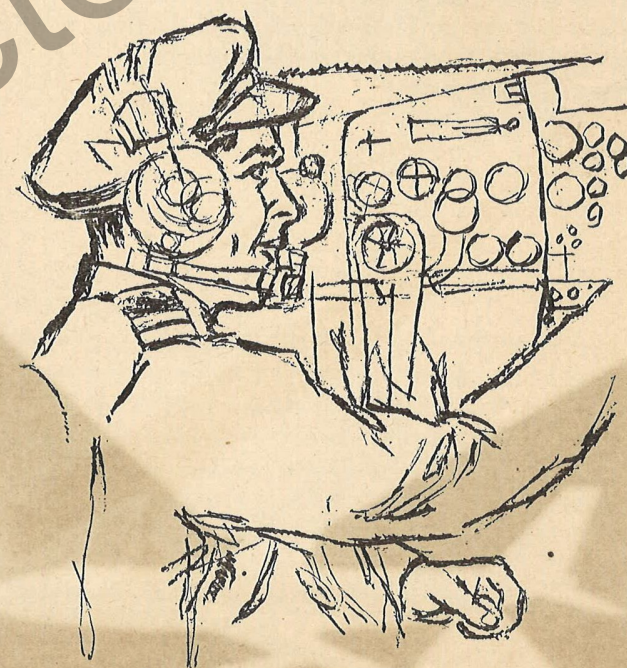


152 feet 11 inches of gleaming beauty...our first Boeing RR 707 Intercontinental...hundredth 707 off the Boeing assembly line !

## YOUR CREW

### the people who know about the Boeing

The Boeing 707 has been acclaimed by flyers all over the world, for its amazing power and its ease of control and operation. Your crew share in the admiration. In addition to thousands of flying hours' experience in other aircraft, each member has received long training in jet flying. . . and here is what they have to say about the aircraft they are privileged to fly in your service.



### The Captain

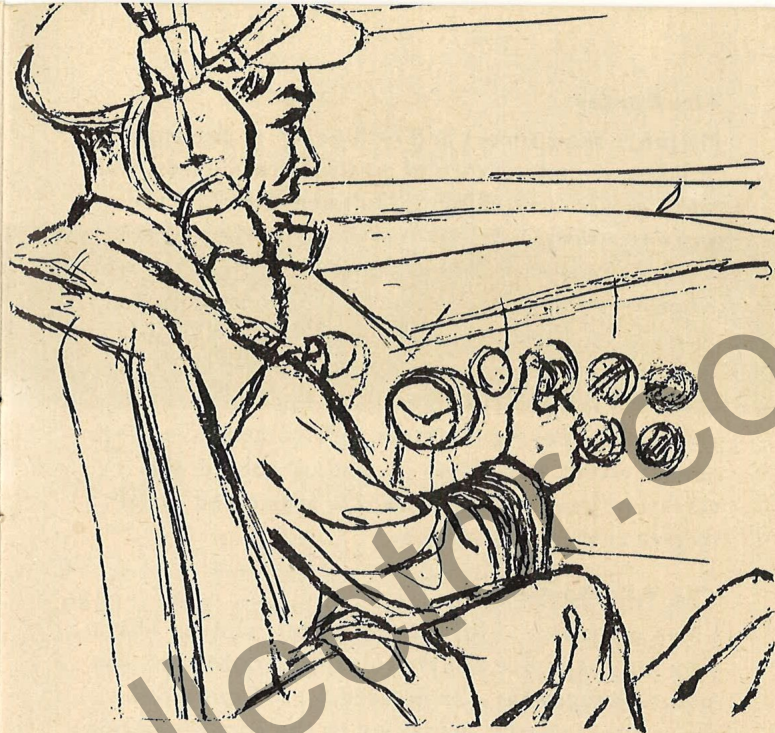
One needs over 10 years' flying experience with many types of aircraft to really savour the joy of flying a Boeing. Changes ? Yes, we've known them before . . . from one piston-engined plane to another . . . the size has changed, the number of engines and so on. But now we haven't progressed from Plane A to Plane B . . . rather from Plane A to Plane Z !



We discovered this the moment we started our 20 hours' training on the Flight Simulator. That's the training device that faithfully reproduces every detail and experience of actual flight . . . through every possible kind of weather and other condition . . . without leaving the ground.

Then came actual flight training . . . and we saw what 'Tex' Johnston meant by the Boeing being a beauty to handle. Enormous size, enormous speed, yet it's as manoeuvrable as much smaller, slower piston-engined craft.

There's the radar equipment. Makes it possible for us to ensure a much smoother ride . . . *and* helps in identifying coastlines from great heights and at great speeds. As a matter of fact, so many electronic and other devices are built into the Boeing that we fly to degrees of mechanical accuracy never possible before.



### **The Flight Engineer**

My job's to look after the engine performance and the electrical and mechanical equipment . . . and to supply the Captain with tabulated data that helps him to provide the smoothest, most pleasant sky-ride. I keep alert to weather conditions, temperature inside and outside the plane. I control the pressurisation of the cabin; the air conditioning. I manage the fuel and control the electrical systems. Quite a handful. But the Boeing chaps are an understanding lot . . . the controls aboard the Boeing are just what the Flight Engineer ordered—well-placed and easy to operate.

### **The Navigator**

The job of the Navigator? . . . to navigate! It calls for pinpoint accuracy . . . and the Boeing calls for pinpoint accuracy at high speed! In fact, I've got to work faster and more accurately than ever before . . . and I'm helped not only by the equipment, but by the amazing stability and absolute lack of vibration of the Boeing!

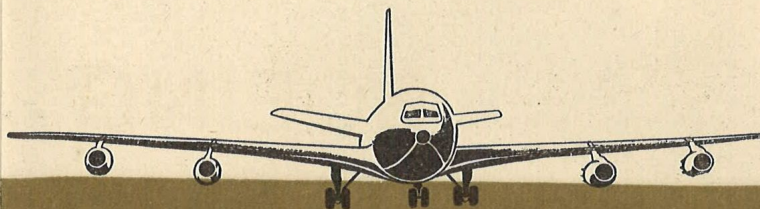


### The Purser

My job is the comfort and well-being of passengers in flight . . . taking care of meals, refreshments, and making sure they enjoy the full benefits of all the amenities provided. My first thought when I heard we were going to carry 133 passengers? 'How in the world were we going to serve them as efficiently and well as we always have?' Got the answer during my special training, and when I saw the Boeing. It was love at first sight! Two galleys, almost entirely electric, with coffee-making machines, refrigerators, *running* cooled water, hot plates . . . and, of course, the vibration-free ride that makes it very much easier to give really good service.

### The Air Hostess

I love my job . . . I love looking after people. That's why I love the Boeng. There's the smooth ride, the wider passageways, the quietness . . . I can move around more easily, attending to the comfort of one passenger without disturbing another—and that's important especially at night. The wonderful 'Call System', with its easily-identifiable lights, means I'm there almost as soon as I'm summoned. Yes, everything on the Boeing provides an atmosphere of gracious, spacious living . . . makes my job a real delight.



## WHEN LANDING

Because she doesn't have to lead with her nose when landing, your Boeing gives you a far smoother, though a very much more rapid, descent than you've experienced in piston aircraft. When you actually 'touch down' you'll probably be going about 150 miles an hour . . . which is only 20 miles an hour faster than today's piston aircraft . . . and here is what the Captain will have been doing.

First, he reduces the lifting power of the wings by raising the speed brakes of which we spoke earlier. You may hear a rumble as he does so. Then he lowers the landing flaps. And you hear the roar again as the doors open to permit the wheels to be lowered. There are ten wheels, eight in the main landing gear and two in the nose. They go down and their supports lock, with a bit of a 'clank'.

At touch-down, the Captain raises the speed brakes to their fullest extent, putting the weight of the aircraft on the wheels. As your plane touches the runway, he uses the *thrust reversers* . . . the engines open up again . . . and you may think he's revving up for a take-off! But no, he has reversed the direction of the mighty flow of air . . . sending it *forward* . . . which permits rapid deceleration.

Finally, the brakes are applied, to bring the aircraft to a smooth halt . . . and these brakes are another great feature of the Boeing—each brake incorporating an automatic anti-skid device. If this device 'feels' a wheel skid, it automatically releases the brake on that wheel until the skid has straightened out . . . then it reapplies the brake!



# YOUR BOEING ..707/437

Intercontinental

|                         |  |
|-------------------------|--|
| Wing Span               | 142' 5"  |
| Tail Span               |  |
| (horizontal stabilizer) | 45' 8"   |
| Length Overall          | 152' 11"                                       |
| Height Overall          | 38' 8"   |
| Wheelbase               | 59' 0"   |
| Tread                   | 22' 1"   |
| Width of fuselage       | 12' 4"   |
| Depth of fuselage       | 14' 2.5"                                       |
| Gross Weight            | 3,12,000 lb.                                   |
| Landing Weight          | 2,07,000 lb.                                   |
| Payload                 | 45,550 lb.                                     |
|                         | (with tanks full)                              |
| Fuel on board           | 21,200 U.S. gallons                            |
| Cruising Speed          | 575-605 m.p.h.                                 |
| Engines (4)             | RR Conway, each with a<br>thrust of 17,500 lb. |
| Range                   | 7,000 statute miles                            |
| Fuel Consumption        | 415 gallons per engine<br>per hour             |
| Landing Speed           | 125-150 miles an hour                          |
| Take-off Speed          | 167 miles an hour                              |
| Rate of Climb           | 2,000 feet or more<br>per minute               |
| Operating Altitudes     | 25,000-42,000 feet                             |







## GLOSSARY

### AEROELASTIC WING—

a swept wing which flexes in rough air, cushioning the effect of any bumps. Your Boeing has exceptionally flexible wings, ensuring a smooth ride.

### FAIL-SAFE DESIGN—

the failure of *any* part, however unlikely failure may be, is taken into account and compensated for; your Boeing is designed and constructed throughout on this principle.

### JET OR TURBOJET ENGINE—

a precision engine which takes in air at the front, compresses the air, adds fuel to it, and ignites the combination. The jet exhaust thus produced passes through turbines and out of the tailpipes . . . producing a forward thrust.

### JET AIRLINER—

powered by jet engines, and therefore requiring no propellers.



## BOEING... FROM THE BEGINNING

The Boeing Airplane Company has been the outstanding leader of modern transport developments for over forty years. Here is a record to look at with pride.

1916 — William E. Boeing and Conrad Westervelt get together in Seattle . . . to design and construct the first Boeing ever, the B & W Mail Plane, promptly bought in duplicate by the New Zealand Government.

1919 — Orders pour in from the United States Army and Navy.

1928 — Boeing pioneers the international airmail route between Seattle and British Columbia;

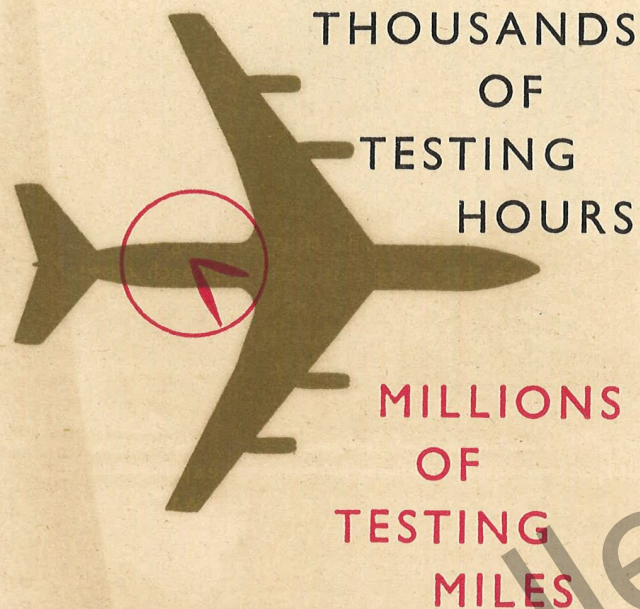
flies the first regular mail-and-passenger service between Seattle and Victoria (its two passengers a little uncomfortable in the open cockpit behind the pilot!) In these years, Boeing enters the field of one of its greatest glories . . . producing ten three-winged bombers in 1920, 200 MB-3A fighters in 1922. In these years, too, is designed and built the Boeing Model 40 . . . which will develop into the great series of passenger planes.

1929 — The 'Pioneer Pullman of the Air' . . . Boeing Model 80A—a three-engined biplane with enclosed cabin for eighteen passengers,



upholstered seats, sound-proofing, running water, individual reading lamps! The shape of things to come is very clear.

- 1930 — Boeing brings the world its first air hostess;  
1939 builds the Model 247 which reduces flying times in U.S.A coast-to-coast to only twenty hours, wins the Guggenheim Medal for 'Successful pioneering and advancement in aircraft manufacturing and transport'. A revolutionary bomber design is evolved; the 'Queen', Boeing Model 299, is built—the bomber that will write its name in history as 'The Flying Fortress'. And in 1939 comes the first 'Stratoliner' . . . air-conditioned, cabin-pressurized, first four-engined airliner to operate regularly on a transcontinental service.
- 1939 — Boeing produces fighter and bomber aircraft  
1945 in thousands; introduces the 'Stratocruiser' capable of a maximum speed of 383 m.p.h. while carrying a payload of 20,000 lb. And Boeing has turned to jets . . . pointing the way to the day in June . . .
- 1952 — When Boeing took the big decision . . . the 16-million dollar decision . . . to engage exclusively in the production of jets. . . a decision that brings us to another day . . . that day in July. . .
- 1954 — When Boeing Model 367-80, prototype of the 707 streaked 2,000 ft. along the runway lifted smoothly into the air on the first of its countless testing flights.



The Boeing 707 jet Airliner has a proud title—most thoroughly proven jet airliner ever to enter commercial service.

Two million engineering hours went into the development of the 707 prototype, first flown by 'Tex' Johnston, Boeing's chief test pilot, on July 15th 1954. He reported that it handled 'beautifully', was 'a simple, straightforward plane and very delightful to fly'. He did *not* say it was perfect; and, as the tests continued, improvements were constantly made, to make the aircraft as nearly perfect as is possible.

Every system in the aircraft—hydraulic, anti-icing, electrical, automatic pilot—have been tested again and again . . . separately and together . . . in every possible combination and permutation of conditions. Laboratory and flight tests have continued side by side for years . . . with every conceivable contingency considered and allowed for.

In effect, your Boeing 707 has flown millions of air miles over hundreds of thousands of hours before ever you step aboard.

#### STRATOSPHERE—

the atmosphere above approximately seven miles' altitude, in which the atmospheric temperature remains relatively constant—at about 65°F below zero. Your Boeing cruises just in or just below the stratosphere.

#### SWEPT WING—

a wing that slants backwards, thus enabling it to cut through the air more easily and approach closer to the speed of sound, while still being thick and strong enough to have the necessary capacity for fuel hydraulic and electric systems, etc. Your Boeing has a 35° swept-wing.

#### THRUST—

the force produced by the jet engine, expressed in pounds. Each of your Boeing RR Conway engines has a thrust of 17,500 lb. REVERSE THRUST, used for rapid deceleration, is produced by changing the direction of the air—sending it forward instead of backwards out of the tailpipes.

#### TROPOSPHERE—

all the atmosphere below the stratosphere. Your Boeing climbs swiftly upwards through the troposphere, to cruise at its upper limits or in the stratosphere . . . virtually above all weather, clouds and turbulence.