Commercial Air Wars: Strategies That Changed Commercial Aviation

IV

The Jet Age Comet to 737

Jim Rauf
• First aircraft of the Commercial Jet Age-
  • The Narrow Bodies
  • DeHavilland Comet
  • Boeing 707
  • Douglas DC-8
  • Convair 880/990
  • Boeing 727-100/200
  • Vickers VC-10
  • DeHavilland Trident
  • Douglas DC-9
  • Douglas DC-8-60
  • Boeing 737-100/200
A Bit of History De Havilland Comet

• Development of the Comet began during 1943 after the meeting of the Brabazon Committee, set up to determine the UK’s airliner needs following the end of the Second World War

• It was Sir Geoffrey de Havilland of the de Havilland Aircraft Company who proposed a pure turbojet airliner, and it was such an advanced design that de Havilland would have to take up both aircraft and engine design and development

• But following extensive development and research, the first prototype of the Comet 1 took off on July 27th 1949, to become both Britain’s and the world’s first jet airliner

• The airliner made its public debut just weeks later at the 1949 Farnborough Airshow, and it wowed both the public and potential customers alike with its sleek new design and new jet powerplants

• The Comet 1 had four Halford H.2 Ghost engines, while later versions such as the Comet 4 would be powered by variants of the Rolls-Royce Avon turbojets
A bit of History de Havilland DH.106 Comet

- Before too long, orders came flooding in
- **BOAC** and British South American Airways placed orders before the prototype flew, while airlines such as Air India, Japan Air Lines, Pan Am and Air France would place orders themselves once the Comet took to the skies
- A pair of early accidents for Comet’s when two failed to become airborne were soon blamed on the Comet’s wing profile causing a loss of lift at a high angle of attack, while the engine inlets suffered a lack of pressure recovery
- The wings would be re-profiled with a leading-edge droop, and wing fences added to control spanwise flow
- Another accident saw **BOAC flight 783** crash in a thunder squall just six minutes after takeoff from Calcutta-Dum Dum in India
- This was eventually blamed on extreme negative g-forces causing the aircraft to break up
- But the two accidents that really hurt the Comet’s reputation were **BOAC Flight 781** and South African Airways Flight 201
- On January 10th 1954, **BOAC flight 781**, flown by Comet G-ALYP, broke up in mid-air and crashed into the sea off the Italian island of Elba killing all 35 onboard
- **Comet G-ALYY**, on charter to South African Airways, would crash into the Mediterranean near Naples killing all 21 onboard, again having broken up in the air
- As a result, the entire Comet fleet was grounded
A bit of History de Havilland DH.106 Comet

• The entire fleet was grounded pending a full investigation into the two accidents
• What was happening was sudden depressurization of the Comet's cabin was to blame, causing the aircraft to disintegrate in midair
• The pressurization and depressurization cycles of the Comet were faster than any other aircraft, and this started to cause metal fatigue in the airframe
• In the early 1950s, this was something of a new phenomenon
• It was a particular problem around the square windows of the airliner
• The famous water tank test of a Comet fuselage revealed many of the issues
A bit of History de Havilland DH.106 Comet

• With the issues identified, de Havilland could work on fixing them
• All Comet 1’s were grounded for good, and it subsequently led to the Comet 4 being developed after a solitary Comet 3 was built, and the Comet 2, which was in effect a modified Comet 1
• One of the biggest changes was the oval windows that all new Comet variants would have, but despite the changes, the reputation for the Comet was ruined
• Airlines would cancel orders and while the new Comet 4 was developed, Boeing was working on the 707
• Douglas were producing the DC-8
• The American offerings would larger, faster, and more efficient
A bit of History de Havilland DH.106 Comet

• Only 76 Comet 4’s would ever be delivered to airlines, while hundreds of Douglas DC-8s were delivered, and over 1,000 Boeing 707s were delivered.

• The accidents that the Comet suffered hurt sales massively, despite the fact that the Comet 4 served its primary users of BOAC, British European Airways, and Dan-Air with great success, as well as other airlines around the world.

• Rival manufacturers would learn from the Comet disasters, and de Havilland chief test pilot John Cunningham said that representatives from Boeing and Douglas privately disclosed to him that, had the Comet not had its pressurization issues, then they would have them instead.

• The Comet changed the commercial aviation world forever.
A Bit of History  de Haviland  Comet

Comet 1  36-44 pax

Comet 1

Comet 4

Specification (Comet 4B)

Type: medium-haul jet airliner
Dimensions: wing span 32.87m (107' 10"), length 35.97m (118'), height 8.69m (28' 6"
Maximum take-off weight: 73,483kg (162,000lb)
Powerplant: four 46,80kN (10,50lbf) thrust Rolls-Royce Avon Mk 524 turbojet engines
Maximum cruising speed: 859knots (532mph)
Range with maximum payload: 5391km (3350 miles)
Service ceiling: 12,000m (39,370ft)
Flight crew: 4
Passengers: 101

DH.106 Comet

British European Airways (BEA) Comet 4B arriving at Berlin Tempelhof Airport in 1969

Role: Narrow-body jet airliner
National origin: United Kingdom
Manufacturer: de Havilland
First flight: 27 July 1949
Introduction: 2 May 1952 with BOAC
Retired: 14 March 1997 (Comet 4C XS235)
Status: Retired
Primary users: BOAC
British European Airways
Dan-Air
Royal Air Force
Produced: 1949–1964
Number built: 114 (including prototypes)
Developed into: Hawker Siddeley Nimrod
A bit of history The Boeing Company and William M. Allen

• **William M. Allen** was born in Lolo, Mont., and graduated from Harvard Law School. During the 1920s, he joined the law firm providing attorneys for the Boeing Airplane Co. and became a member of the company's board of directors.

• He served as company president from Sept. 1, 1945, to April 29, 1968, taking the helm when the end of World War II brought production to a standstill. Allen guided Boeing back to success, from the era of propeller-driven aircraft into the age of jets, intercontinental missiles and spacecraft.

• He was responsible for the introduction of the **jet transport** and oversaw the beginning of the **747** program. Allen was an innovator who encouraged diversification, and he helped create The Boeing Company's place in the **U.S. space program**.
A Bit of History  Boeing 707

• **Boeing** envisioned a jet-powered plane as early as 1943

• Wind tunnel tests of straight-wing jet aircraft indicated they would not use the full potential of jet-engine power

• Near the end of World War II, Boeing aerodynamicist **George Schairer** was in Germany as part of a fact-finding mission

• He saw wind tunnel data on swept-wing jet airplanes and sent the information home

• **Boeing High-Speed Wind Tunnel** was used to design the **XB-47**, with its slender 35-degree swept-back wings

• Another innovation was the concept of placing the engines in pods (nacelles) suspended under the wings

• This was the beginning of swept wing jet aircraft
A Bit of History  Boeing 707

- The British paved the way for commercial jets with the de Havilland Comet
- **Boeing** Company **President William Allen** and his management are said to have “bet the company” on a vision that the future of commercial aviation was jets
- 1952, the **Boeing** board gave the go-ahead to commit $16 million of the company’s own money to building the pioneering **367-80**, nicknamed the “**Dash 80**”
- Nearly all the profit the company had made since the end of the World War II
A Bit of History  Boeing 707

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- **Boeing** Company President William Allen and his management are said to have “bet the company” on a vision that the future of commercial aviation was jets
- 1952, the Boeing board gave the go-ahead to commit $16 million of the company’s own money to building the pioneering 367-80, nicknamed the “Dash 80”
- Nearly all the profit the company had made since the end of the World War II
- The Boeing strategy was to use the Dash 80 prototype for press and customer flights and an advertising campaign
- The Dash 80 prototype led to the commercial 707 and the military KC-135 tanker
- Both planes shared the basic design of the Dash 80 but were very different airplanes, neither one being a derivative of the other
- Airlines wanted the 707 fuselage to be 4 inches wider than the tanker’s
A Bit of History  Boeing 707

- Its width and the 100-foot length made it the largest passenger cabin in the air
- Placement of its more than 100 windows allowed airlines to rearrange seats
- The 707 wing had more sweepback, so it could fly about 20 mph faster than the DC-8
- In just two years travel by air eclipsed travel by rail and sea
- Boeing custom-designed 707 variants for different customers, e.g., long-range models for Qantas Airways
- Sales of the 707 outpaced the DC-8
- The 707s were intended as medium-range transports, they were soon flying across the Atlantic and across the continent
- Boeing delivered 856 Model 707s in all versions between 1957 and 1994
- Boeing built 154 720 versions for short/medium range short- to medium-range routes and for use on shorter

- July 1957, Boeing announced a derivative that was designed to fulfill a niche for United Airlines
- The 707-020 would be a shorter aircraft, designed for shorter routes from shorter runways
  - 131-156 passengers (137-174 passengers for 707)
  - 137 ft (145 ft for the 707)
  - 720 a modified wing and lighter structure
  - JT3C and JT3D P&W engines
- After input from United Airlines, Boeing decided to rename this derivative the 720
# A Bit of History  Boeing 707

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>First flight</td>
<td>Dec. 20, 1957</td>
</tr>
<tr>
<td>Model number</td>
<td>707-120</td>
</tr>
<tr>
<td>Classification</td>
<td>Commercial transport</td>
</tr>
<tr>
<td>Span</td>
<td>130 feet 10 inches</td>
</tr>
<tr>
<td>Length</td>
<td>144 feet 6 inches</td>
</tr>
<tr>
<td>Gross weight</td>
<td>248,000 pounds</td>
</tr>
<tr>
<td>Cruising speed</td>
<td>600 mph</td>
</tr>
<tr>
<td>Range</td>
<td>3,000 miles</td>
</tr>
<tr>
<td>Ceiling</td>
<td>41,000 feet</td>
</tr>
<tr>
<td>Power</td>
<td>Four 13,500-pound-thrust P&amp;W JT3C-6 turbojet engines</td>
</tr>
<tr>
<td>Accommodation</td>
<td>Up to 181 passengers</td>
</tr>
</tbody>
</table>
A Bit of History   SUD Caravelle

**Specification (Caravelle III)**

- **Type:** short/medium-haul jet airliner
- **Dimensions:** wing span 34.30m (112ft 6¾in), length 32.01m (105ft 1¼in), height 8.72m (28ft 7¾in)
- **Maximum take-off weight:** 46,000kg (101,411lb)
- **Powerplant:** two 51kN (11,400lb) thrust Rolls-Royce Avon RA.29/3 Mk 527 turbojet engines
- **Maximum cruising speed:** 805km/h (503mph)
- **Range with maximum payload:** 1845km (1153 miles)
- **Service ceiling:** 12,000m (39,370ft)
- **Flight crew:** 3
- **Passengers:** 65 - 100
A Bit of History  Douglas DC-8

- The **DC-8** was the first **Douglas** jet-powered transport
- It entered service with United Airlines and Delta Air Lines on Sept. 18, 1959
- Powered by four jet engines, the **DC-8** was capable of speeds of more than 600 mph
- The **DC-8** went through seven major variants, for a total of 556 aircraft
- The basic domestic version, the **DC-8 Series 10**, had increased fuel capacity for intercontinental flights, and the Series 30 and 40 were the first to use the 17,500-pound-thrust turbojet engines
- The **DC-8 Series 50** were the first **DC-8**s powered by new, more efficient **turbofan** jet engines with 18,000 pounds thrust and longer range
- The **DC-8 Series 60** extended the length of the fuselage
- Nearly 37 feet longer than the original model, an all-economy configuration, the **DC-8-61** could carry 259 people
- The **DC-8-62**, for extra-long routes, had a fuselage stretched 6 feet 8 inches longer than the original model and 3-foot wingtip extensions
- The **DC-8-63** could fly more than 4,500 miles nonstop, carrying 259 passengers because of its extended fuselage; aerodynamic improvements to nacelles, pylons and flaps; and increased wingspan and fuel capacity
- The **DC-8 Series 70** was a re-engined version of the **Super 60 Series**, substituting **CFM56** engines for **Pratt & Whitney** engines
- The aircraft that retained the **Super 60** operating weights but with a longer range due to the newer, more fuel-efficient turbofans
- The **Series 70** was also able to meet later, more stringent noise regulations that were implemented in the 1980s
# A Bit of History  Douglas DC-8

<table>
<thead>
<tr>
<th>First flight</th>
<th>May 30, 1958</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model number</td>
<td>DC-8</td>
</tr>
<tr>
<td>Wingspan</td>
<td>142 feet 5 inches</td>
</tr>
<tr>
<td>Length</td>
<td>150 feet 6 inches</td>
</tr>
<tr>
<td>Height</td>
<td>42 feet 4 inches</td>
</tr>
<tr>
<td>Weight</td>
<td>355,000 pounds</td>
</tr>
<tr>
<td>Speed</td>
<td>570 mph</td>
</tr>
<tr>
<td>Ceiling</td>
<td>35,000 feet</td>
</tr>
<tr>
<td>Range</td>
<td>4,773 miles</td>
</tr>
<tr>
<td>Power plant</td>
<td>Four 13,500-pound-thrust P&amp;W JT3C turbojets</td>
</tr>
<tr>
<td>Accommodation</td>
<td>3 crew, 8 attendants, 117 to 259 passengers</td>
</tr>
</tbody>
</table>
A bit of History Convair 880/990

- 1943, Consolidated and Vultee merged forming Consolidated Vultee - known as Convair
- Convair’s only commercial aircraft was the 1951 Convair 240 series of twin turboprops
- Delta Air Lines contacted Convair to design an aircraft that was faster than both the proposed Boeing 707 and Douglas DC-8
- Convair began development of the 880 in 1956 with goal of higher speeds than the 707 and DC-8
- GE offered a commercial version of their J-79 military turbojet, the CJ-805-3
- CV-880 first flight was January 1959 with EIS with Delta in May 1960 – passenger capacity of 110
- Six other airlines bought CV-880’s
- 65 CV-880s were built
A bit of History Convair 880/990

- **American Airlines** wanted a larger capacity **CV-880** for transcontinental routes
- **Convair** designed a variant –the **CV-990** with capacity of 149 passengers and range of 3800 miles and cruise sped of 557 mph
- It used a turbofan version of the **GE CJ-805** engine that had its fan section at the aft end of the engine
- The plane was the fastest commercial aircraft of its time
- Total of 37 **CV-990s** built
- The two **Convair** aircraft were commercial failures
- **Convair** emphasized speed at the expense of capacity
A Bit of History  Boeing 727

**Specification (727-200)**

<table>
<thead>
<tr>
<th>Type</th>
<th>short/medium-range airliner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>wing span 32.32m (106ft), length 46.69m (153ft 2in), height 10.36m (34ft)</td>
</tr>
<tr>
<td>Maximum take-off weight</td>
<td>95,027kg (209,500lb)</td>
</tr>
<tr>
<td>Powerplant</td>
<td>three 64,500N (14,500lbf) thrust Pratt &amp; Whitney JT8D-9A turbofan engines</td>
</tr>
<tr>
<td>Maximum cruising speed</td>
<td>964km/h (599mph)</td>
</tr>
<tr>
<td>Range with maximum payload</td>
<td>4392km (2729 miles)</td>
</tr>
<tr>
<td>Service ceiling</td>
<td>15,240m (50,000ft)</td>
</tr>
<tr>
<td>Flight crew</td>
<td>3</td>
</tr>
<tr>
<td>Passengers</td>
<td>up to 189 in single-class accommodation</td>
</tr>
</tbody>
</table>

**Role**  Narrow-body jet airliner

**National origin**  United States

**Manufacturer**  Boeing Commercial Airplanes

**First flight**  February 9, 1963

**Introduction**  February 1, 1964, with Eastern Air Lines

**Status**  In limited service for freighter and executive use

**Primary users**  Líneas Aéreas Suramericanas
                     Kalitta Charters
                     Total Linhas Aéreas

**Produced**  1962–1984

**Number built**  1,032

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B Boeing 727

A stretched 727-200 of Iberia
A Bit of History  Boeing 727

<table>
<thead>
<tr>
<th>Boeing 727 Characteristics[88]</th>
<th>727-100</th>
<th>727-200</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Variant</strong></td>
<td>727-100</td>
<td>727-200</td>
</tr>
<tr>
<td><strong>Flight crew</strong></td>
<td>three: pilot, copilot, and flight engineer</td>
<td>three: pilot, copilot, and flight engineer</td>
</tr>
<tr>
<td><strong>Two-class seats</strong></td>
<td>106: 16F@38&quot;, 90Y@34&quot;</td>
<td>134: 20F@38&quot;, 114Y@34&quot;</td>
</tr>
<tr>
<td><strong>One-class seats</strong></td>
<td>125@34&quot;</td>
<td>155@34&quot;</td>
</tr>
<tr>
<td><strong>Exit limit</strong></td>
<td>131</td>
<td>189</td>
</tr>
<tr>
<td><strong>Length</strong></td>
<td>133 ft 2 in</td>
<td>153 ft 2 in</td>
</tr>
<tr>
<td><strong>Height</strong></td>
<td>34 ft 11 in / 10.65 m</td>
<td>34 ft 11 in / 10.65 m</td>
</tr>
<tr>
<td><strong>Cabin width</strong></td>
<td>140 in</td>
<td>140 in</td>
</tr>
<tr>
<td><strong>Wingspan</strong></td>
<td>108 ft</td>
<td>108 ft</td>
</tr>
<tr>
<td><strong>Wing</strong></td>
<td>1,650 sq ft , 32° sweep</td>
<td>1,650 sq ft , 32° sweep</td>
</tr>
<tr>
<td><strong>MTOW</strong></td>
<td>169,000 lb</td>
<td>172,000 lb</td>
</tr>
<tr>
<td><strong>Fuel capacity</strong></td>
<td>7,680 gal</td>
<td>8,090 US gal</td>
</tr>
<tr>
<td><strong>Engines ×3</strong></td>
<td>Pratt &amp; Whitney JT8D-1/7/9</td>
<td>JT8D-7/9/11 (Adv.: -9/15/17/17R)</td>
</tr>
<tr>
<td><strong>Thrust ×3</strong></td>
<td>14,000–14,500 lb</td>
<td>14,000–15,000 lb (Adv. 14,500–17,400 lb)</td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td>2,250 nmi</td>
<td>1,900 nmi</td>
</tr>
<tr>
<td><strong>Take-off</strong></td>
<td>8,300 ft</td>
<td>8,400 ft</td>
</tr>
<tr>
<td><strong>Max Mach No</strong></td>
<td>Mach 0.9 (519 kn)</td>
<td>Mach 0.9 (519 kn)</td>
</tr>
<tr>
<td><strong>Cruise</strong></td>
<td>495–518 kn</td>
<td>467–515 kn</td>
</tr>
<tr>
<td><strong>Ceiling</strong></td>
<td>42,000 ft</td>
<td>42,000 ft</td>
</tr>
</tbody>
</table>
A Bit of History    Boeing 727

NOTE: CURRENTLY THIS INTERIOR IS BASIC ON THE 727-200 AND ADVANCED 727-200,
IT MAY BE RETROFITTED ON THE 727-100 AND 727-100C.

CABIN CROSS SECTIONS—SUPERJET-LOOK INTERIOR
MODELS 727-100, -100C, -200

20 JUNE 1978    D6-58324
A Bit of History  Vickers VC 10

- **Vickers VC10** is a mid-sized, narrow-body long-range **British** aircraft designed and built by **Vickers-Armstrongs Aircraft Ltd**
- Capacity 151 passengers
- Range 5,850 miles
- It was designed to operate on long-distance routes from the shorter runways and had excellent hot and high performance for operations from African airports
- First flight June 1962 EIS April 1964 with **BOAC**
- The VC10 made the fastest crossing of the Atlantic of 5 hours and 1 minute until a British Airways 747 crossed in 4 hours 56 minutes in 2020
- 54 **VC10**s were built from 1962 thru 1970
- **VC10**s were in service with **BOAC** and other airlines from the 1962 to 1981

Four aft mounted 22,500 lbf RR Conway turbofan engines
A Bit of History BAC 111

- **British Aircraft Corporation BAC-111** was originally conceived by **Hunting Aircraft** as a 30-seat jet, before its merger into BAC in 1960
- It was launched as an 80-seat aircraft with a **British United Airways** order May 1961
- First flight was August 1963, and it was first delivered to **BUA** January 1965
- A stretched 119-seat 500 series was introduced in 1967
- The BAC-111 was powered by aft-mounted **Rolls-Royce Spey low-bypass turbofans**
- It was operated by several US carriers, as well as multiple British, overseas and European airlines
- Noise restrictions accelerated its transition to African carriers in the 1990s, and the last BAC -111 was retired in 2019
- Noise restrictions accelerated its transition to African carriers in the 1990s, and the last BAC -111 was retired in 2019
- Total production was 244, until 1982
A bit of History Hawker Siddeley Trident

- Back in 1956 there was a fierce competition in the UK industry to produce a new medium/short haul jetliner for BEA.
- The winning contender was the De Havilland DH.121.
- A 111 seat trijet featuring three of the new 11,000lb thrust Rolls Royce Medway engines, mounted in a group around the rear fuselage and a T-tail.
- So good was the DH121 that not only were BEA very keen, but Pan Am also requested a meeting with De Havilland “as soon as it is possible to do so.”
- Based on traffic levels of the previous three years, BEA got cold feet and thought the 121 was going to be too big.
- It was quickly scaled down to only 97 seats and re-engined with the smaller R-R Spey.
- It then appeared in 1962 as the Hawker Siddeley Trident 1.

- In 1959 Boeing gave the full go ahead to the 727, its spec matching that of the original DH 121 almost exactly.
- The 727 was the clear winner every time and it ended up outselling the Trident by a factor of about 10 to 1.
A bit of History Hawker Siddeley Trident

- The **Hawker Siddeley Trident**, was the first three-engine commercial jet to fly
- First flight January 1962
- EIS with **BEA** April 1964 (2 months after 727)
- Capacity 101 to 180 (3 variants)
- The **De Havilland Aircraft** initially proposed the jet
- **Hawker Siddeley** took over the in 1960
- **American Airlines** had expressed interest in a three-engine aircraft
- **AA** eventually ordered 727s
- **De Havilland** adapted its design to meet the requirements of **British European Airways** (BEA) and the domestic **UK** market
- 117 Tridents were built from 1962 to 1978

To address hot and high conditions a **Rolls-Royce RB162** turbojet was installed into the tail
A Bit of History Douglas DC-9

- **Douglas DC-9** is single-aisle aircraft
- The **DC-9-10** first flight was in February 1965
- EIS with **Delta Air Lines** in December 1965
- The **DC-9** was an all-new design
- The **DC-9** has two rear-mounted Pratt & Whitney JT8D turbofan engines, relatively small, efficient wings, and a T-tail.
- Its takeoff weight was limited to 80,000 lb for a two-person flight crew by FAA regulations
- It had five abreast for 80 to 135 passengers
- 976 aircraft were produced from 1962 to 1982
A Bit of History Douglas DC-9

- The DC-9 was followed by the MD-80 series in 1980, a lengthened DC-9-50 with a larger wing and a higher MTOW.

- This was further developed into the MD-90 in the early 1990s, as the body was stretched again, with V2500 high-bypass turbofans and an updated flight deck added.

- The shorter, final version, the MD-95, was renamed the Boeing 717 after McDonnell Douglas's merger with Boeing in 1997, powered by Rolls-Royce BR715 engines.
A bit of History  Douglas DC-9  MD-80/90  and Boeing 717

- DC-9-10
- DC9-20
- DC-9-30
- DC-9-40
- DC-9-50
- MD80  1,196 1993-1999
- MD90  116 1993-2000
- MD95/B717  156 1998-2006
A bit of History Boeing 737-100/200

• In 1967, the smaller, short-range 737 twinjet was the logical airplane to complement the 707 and the 727

• There was increasing demand for transports in its category

• To save production time, and get the plane on the market as soon as possible, Boeing gave the 737 the same upper lobe fuselage as the 707 and 727 so that the same upper deck cargo pallets could be used for all three jets

• The 737 had *six-abreast seating* — a selling point, because this way it could take more passengers per load *(DC-9 seated *five abreast*)

• Mounting the engines under the wing also allowed for increased seating

• The 737 could operate self-sufficiently at small airports and on remote, unimproved fields

• The plane’s performance in these conditions led to orders in Africa, Central and South America, Asia and Australia
A bit of History Boeing 737-100/200

<table>
<thead>
<tr>
<th>Variant</th>
<th>737-100</th>
<th>737-200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cockpit crew</td>
<td>Two</td>
<td></td>
</tr>
<tr>
<td>2-class seats</td>
<td>85-12F 73Y</td>
<td>102-14F@38' 88Y@34'</td>
</tr>
<tr>
<td>1-class seats</td>
<td>103@34' - 118@30'</td>
<td>115@34' - 130@30'</td>
</tr>
<tr>
<td>Exit limit</td>
<td>124</td>
<td>136</td>
</tr>
<tr>
<td>Length</td>
<td>94 ft (29 m)</td>
<td>100 ft 2 in (30.53 m)</td>
</tr>
<tr>
<td>Span</td>
<td>93 ft (28 m)</td>
<td></td>
</tr>
<tr>
<td>Wing[211]</td>
<td>979.9 sq ft (91.04 m²), 25° swe</td>
<td></td>
</tr>
<tr>
<td>Height</td>
<td>37 ft (11 m)</td>
<td></td>
</tr>
<tr>
<td>Width</td>
<td>Fuselage 148 in Cabin 139.2 in</td>
<td>Fuselage</td>
</tr>
<tr>
<td>Cargo</td>
<td>650 cu ft (18 m³)</td>
<td>875 cu ft (24.8 m³)</td>
</tr>
<tr>
<td>MTOW</td>
<td>110,000 lb (60,000 kg)</td>
<td>128,100 lb (58,100 kg)</td>
</tr>
<tr>
<td>OEW</td>
<td>62,000 lb (28,000 kg)</td>
<td>86,300 lb (39,600 kg)</td>
</tr>
<tr>
<td>Fuel capacity</td>
<td>4,720 US gal (17,900 L)</td>
<td>5,970 US gal (22,600 L) [3]</td>
</tr>
<tr>
<td>Speed</td>
<td>Mach 0.745 – Mach 0.82 (430–473 km; 796–876 kn)</td>
<td></td>
</tr>
<tr>
<td>Takeoff[4]</td>
<td>6,099 ft (1,859 m)[211]</td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>1,540 nmi (2,850 km)[215]</td>
<td>2,600 nmi (4,800 km)[6][16]</td>
</tr>
<tr>
<td>Ceiling[212]</td>
<td>37,000 ft (11,300 m)</td>
<td></td>
</tr>
<tr>
<td>Engines (×2)</td>
<td>Pratt &amp; Whitney JT8D-71/-82/-151-17</td>
<td></td>
</tr>
<tr>
<td>Thrust (×2)</td>
<td>14,000 lbf (62 kN)[218]</td>
<td>14,500–16,400 lbf (64–73 kN)[218]</td>
</tr>
</tbody>
</table>
A bit of History Boeing 737-100/200

- The 737 launch customer was Lufthansa February 1965
- Boeing and Lufthansa agreed on a capacity of 100 prior to program launch
- United Airlines wanted a slightly larger capacity than the 737-100, so the fuselage was stretched 36 in ahead of, and 40 in behind the wing
- The longer version was designated the 737-200
- First flight was in April 1967
- It was the first aircraft to have, as part of its initial certification, approval for Category II approaches, which refers to a precision instrument approach and landing with a decision height between 98 to 197 feet
- EIS at Lufthansa was in February 1968

- The 737-100/200 variants were powered by Pratt & Whitney JT8D low-bypass engines
- Capacity was 85 to 130 passengers
- Production:
  - 737-100: 30
  - 737-200: 1,005
A bit of History Boeing 737-100/200

Three abreast seating  Two person flight crew  P&W turbojet engines
Boeing 737-Past and Future

737-100

737MAX 10
Next Session

- Douglas and McDonnell merger
- Boeing 747 and the Widebodies