

Bristol Britannia

Srs 102, Srs 310 and C.1

**Modelled for Flight Simulator X and
Flight Simulator 2004 (A Century of Flight)**

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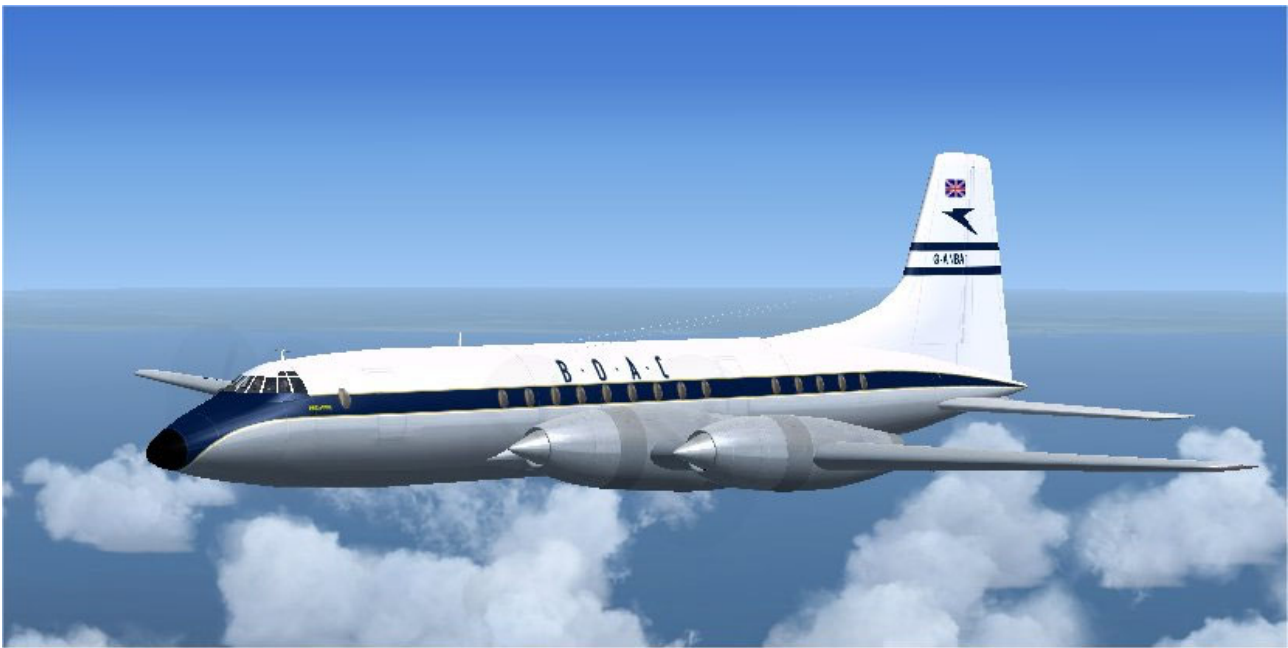
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Bristol Britannia

Introduction

The Britannia was projected as a medium-range airliner for BOAC's empire routes by the second Brabazon Committee during WW2. The prototype G-ALBO flew on the 16. August 1952, and the first production model, the Britannia 102, entered service with BOAC in 1957 on the routes from London to South Africa and Australia.



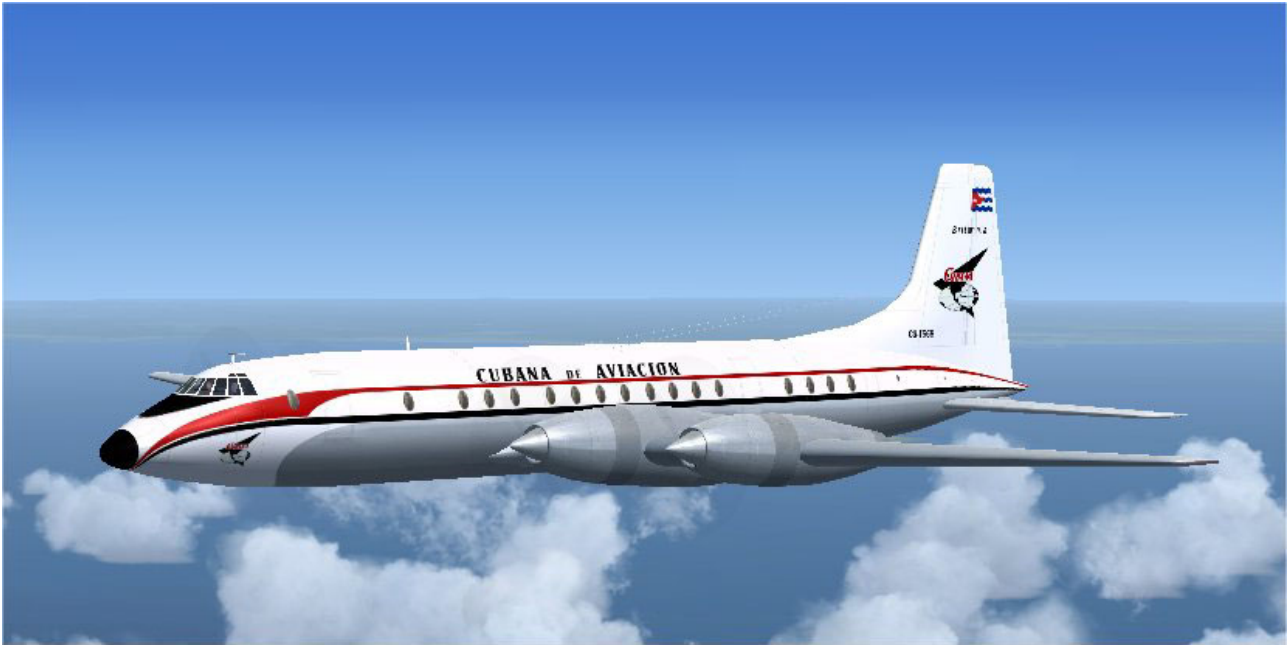
Bristol Britannia 102 of BOAC. 1957

BOAC had originally ordered 25 Britannia 102, but the order was reduced to 15, because BOAC wanted a larger version for its routes across the North Atlantic.

This became the Britannia 300, the first of which flew on 31. July 1956. The 300 had a longer fuselage for 133 passengers, more powerful engines, and carried more fuel. BOAC acquired 18 examples of the Britannia 312, and it entered service in December 1957 on the route from London to New York. Other Britannia 310s and 320s were sold to Canadian Pacific, El Al, Hunting Clan and Cubana.

The original Britannia 102 had a short career with BOAC, but the 15 aircraft gave good service with BOAC's associated companies like Ghana Airways and East African Airways, and independents like BKS and Britannia Airways.

BOAC retired their fleet of long-range Britannia 312s in 1965, most of these aircraft were then sold to other companies such as British Eagle.



Cubana had four Britannia 318 in service from 1958 to ca 1975



Another major user of the Britannia was the Royal Air Force, which had 23 Britannias in use from 1959 to 1975. The Britannia C.1 was basically similar to the Britannia 310, but had a large cargo door in the front fuselage.

Britannia Type 175 Series 102 Specification

Power Plant: Four 3,900 ehp Bristol Siddeley Proteus 705 turboprops driving D.H. Hydromatic constant-speed, feathering and reversing propellers; fuel capacity, 6,700 Imp gal (30 458 l).

Performance: Typical cruising speed, 328 mph (528 km/h) at 20,000 ft (6 096 m); no-allowance range with max payload of 25,500 lb (11 567 kg), 2,840 mls (4 570 km); max no-allowance range, 3,700 mls (5 955 km) with 12,900 lb (5 851 kg) payload.

Weights: Max, 155,000 lb (70 307 kg); max landing, 125,000 lb (56 699 kg); max zero-fuel, 113,000 lb (51 256 kg); typical empty, 88,000 lb (39 916 kg); max payload, 25,500 lb (11 567 kg).

Dimensions: Span, 142 ft 3 in (43,36 m); length, 114 ft (34,75 m); height, 36 ft 8 in (11,20 m); gross wing area, 2,075 sq ft (192,78 m²).

Britannia Type 175 Series 310/320 Specification

Power Plant: (Series 310) Four 4,237 ehp Bristol Siddeley Proteus 761, or (Series 320) four 4,450 ehp 765 turboprops driving D.H. Hydromatic constant-speed, feathering and reversing propellers; fuel capacity (Series 305, 310 and 320), 8,580 Imp gal (39 005 l).

Performance: Typical cruising speed, 357 mph (575 km/h) at 22,000 ft (6 706 m); no-allowance range with max payload of 26,600 lb (12 065 kg), 4,130 mls (6 646 km); max no-allowance range (Series 320), 4,430 mls (7 129 km) with 21,850 lb (9 911 kg) payload.

Weights: Max, 185,000 lb (83 914 kg); max landing, 137,000 lb (62 142 kg); max zero-fuel, 128,000 lb (58 060 kg); typical empty, 93,650 lb (42 479 kg); max payload, 26,600 lb (12 065 kg).

Dimensions: Span, 142 ft 3 in (43,36 m); length, 124 ft 3 in (37,88 m); height, 37 ft 6 in (11,43 m); gross wing area, 2,075 sq ft (192,78 m²).

References

- Scale drawing by G.A.G. Cox originally published in 'Aeromodeller'; acquired through Bob's Aircraft Documentation, www.bobsairdoc.com.

Books and magazines:

- F.G. Swanborough: Turbine-Engined Airliners of the World, London 1962
- H.A. Taylor: Britannia - End of the Bristol Line, Air Enthusiast Twenty 1982, pp31-46

Internet sources:

- www.airliners.net

Flight manuals acquired from www.flight-manuals-on-cd.com Ltd:

- Britannia 310 Crew's Notes (for the BOAC srs. 312)
- RAF Pilot's notes for the Britannia C.Mk.1 and C.Mk.2

Flying the aircraft

The main panel

The model is best flown from the virtual cockpit, but there is a 2D-panel as well. The panel represents a late-model Britannia 312, but other variants were basically similar.



Engine torque is controlled with the throttles (press F2 or F3 as necessary). Propeller RPM is easiest to set using the keyboard (press CTRL+F2 or CTRL+F3).

Most of the other instruments are self-explanatory, I hope. The stopwatch simple to use: Single mouse-click to start, then stop, and then reset. In this model, the AP trim indicator can be used to set elevator trim when the autopilot is off.

Auxiliary panels

The following panels can be accessed in the Virtual Cockpit (by looking around), by clicking the icons in the left side of the main panel, or by using the keyboard shortcuts.

SHIFT+2: Radios

This is borrowed from the stock Flight Simulator DC-3.

SHIFT+3: The GPS map

You can use the GPS as a convenient real-time map, but GPS did not exist in the 1950's! Think of the GPS map as a substitute for the maps and instructions you would get from your second pilot and the navigator.

SHIFT+4: The autopilot control panel.

This autopilot control is intended to represent the functions of a typical 1950's system. For detailed instruction, see the next page.

SHIFT+5: The starter panel.

To make a 'cold' start, first make sure the battery and the generators are 'on' (electrical panel). Then select one engine at a time (correct sequence is 3-4-2-1), and -

FS2004: Click and hold the starter pushbutton until the engine fires (ca 10 seconds).

FSX: Click the starter pushbutton. (If you do not have FSX SP2 you may have to click the button a few times)



SHIFT+6: Fuel panel.

Fuel gauges and Fuel flow meters.

SHIFT+7: Electrical panel.

The electrical panel of the Britannia was large and complicated, this is a simplified version.

Using the Autopilot

With autopilot turned 'on', changes in heading were made with the turn-button, changes in pitch with the wheel for the forefinger.

Read the instructions carefully if you are not used to old autopilots:

The standard autopilots of Flight Simulator typically control heading, climb rate, the desired altitude, and (sometimes) airspeed or MACH.

Instead, old autopilots could control bank and pitch, and hold the current altitude. *There is no way to pre-set the desired altitude, the desired climb rate, the desired heading or the desired speed.*

Bottom: Autopilot master switch. When engaged, the AP automatically holds the present heading and pitch.

Middle left: Pitch control. Use this wheel to change the pitch (and thereby the climb rate).

Top left: Altitude hold. Engage ALT HOLD when you are at the desired altitude – disengage to re-enter pitch-hold mode.

Top right: The AP mode selectors

1. HDG Hold: Normal autopilot operation as described above.
2. NAV Hold: VOR/Localizer hold mode
3. APR Hold: Approach mode

In the centre is the 'Turn button'. Click on the left side to enter left turn, on the right to enter a right turn, and in the centre to stop turning (i.e. select the current heading).



Wing views



You can get a passenger's view of the wings when you are in 2D or 3D panel view:

In FSX:

Press 'A' a couple of times. The views available are

- Captains' view (Virtual cockpit)
- Captains' instrument view
- Co-pilots' view
- Right and left passenger views of the wings (as shown)
- Left and right Pilots' views of the wings and engines
- 2D-panel

In FS2004:

Num Lock must be ON for this to work:

- CTRL+SHIFT+9 Rear view of the right wing
- CTRL+SHIFT+7 Rear view of the left wing (as shown)
- CTRL+SHIFT+3 Front view of the right wing
- CTRL+SHIFT+1 Front view of the left wing

Flying instructions (Britannia 102)

This information is available during your flight, just call up the electronic kneeboard, and select the reference tab. Note that torque settings for the Britannia 102 and 310 are different.

Limitations

Torque:

800 PSI or more permitted for max 20 seconds.

715 PSI maximum for takeoff only

680 PSI maximum sustained torque

Propeller:

Maximum 1000 RPM for takeoff

850-920 RPM for sustained flight

Before taxi

Engine starting sequence is 3-4-2-1

Taxi

Normally two engines are used for taxiing. Throttle back, press E23 to select engines 2 and 3, and start taxiing.

Before takeoff

Press E1234 to select all engines. Check that all four throttles are moving.

Flaps 15 degrees (press F7 once)

Elevator trim 1.0 degrees is useful, but not essential.

Landing lights extended and on.

Takeoff and initial climb (fully loaded)

Full throttle and RPM. Press F2 a few times to set engine torque to 715 PSI.

Rotate at 120 kts.

Retract undercarriage

At 150 KIAS, 500 ft AGL: Retract flaps.

Engine torque 680 PSI

Propeller RPM 920

Accelerate to 170 KIAS

En route climb

Climb speed around 170 KIAS.

Engine torque max. 680 PSI

Propeller RPM 850-920

Cruise

Max cruise: Engine torque 680 PSI, Propeller RPM 850-920.

Normal cruise at full load: 87% compressor rpm (ca 600 PSI), PRPM 850-920, altitude FL200-FL210.

Long range cruise: Reduce torque gradually to hold aircraft attitude of 0 degrees (Watch the autopilot pitch knob or the elevator trim wheels), airspeed around 200 KIAS at altitude.
On long flights, use a step-climb technique. Increase altitude by 2000 ft. every two hours or so.

Descent

Vertical speed -1200 to -1500 fpm.

Holding

Reduce speed to less than 210 KIAS

Flaps 15 degrees

Reduce speed to 160 KIAS

Approach and landing

Nearing glideslope: Extend undercarriage, flaps 30 degrees.

Reduce speed to 140 KIAS

Glideslope

Reduce speed to 130 KIAS.

At 1000 ft AGL: Full flaps (45 degrees).

After touchdown:

Propellers fully fine (CTRL+F4)

Apply brakes

Retract flaps

Reverse thrust can be used if the runway is short (press and hold F2)

Flying instructions (Britannia 310 and C.1)

This information is available during your flight, just call up the electronic kneeboard, and select the reference tab. Note that torque settings for the Britannia 102 and 310 are different.

Limitations

Torque:

900 PSI or more permitted for max 20 seconds.

815 PSI maximum for takeoff only

780 PSI maximum sustained torque

Propeller:

Maximum 1000 RPM for takeoff

850-920 RPM for sustained flight

Before taxi

Engine starting sequence is 3-4-2-1

Taxi

Normally two engines are used for taxiing. Throttle back, press E23 to select engines 2 and 3, and start taxiing.

Before takeoff

Press E1234 to select all engines. Check that all four throttles are moving.

Flaps 15 degrees (press F7 once)

Elevator trim 1.0 degrees is useful, but not essential.

Landing lights extended and on.

Takeoff and initial climb (fully loaded)

Full throttle and RPM. Press F2 a few times to set engine torque to 815 PSI.

Rotate at 120 kts.

Retract undercarriage

At 150 KIAS, 500 ft AGL: Retract flaps.

Engine torque 780 PSI

Propeller RPM 920

Accelerate to 180 KIAS

En route climb

Climb speed around 180 KIAS.

Engine torque max. 780 PSI

Propeller RPM 850-920

Cruise

Max cruise: Engine torque 780 PSI, Propeller RPM 850-920.

Normal cruise at full load: 88% compressor rpm (ca 700 PSI), PRPM 850-920, altitude FL200-FL210.

Long range cruise: Reduce torque gradually to hold aircraft attitude of 0 degrees (Watch the autopilot pitch knob or the elevator trim indicator), airspeed around 200-220 KIAS at altitude. On long flights, use a step-climb technique. Increase altitude by 2000 ft. every two hours or so.

Descent

Vertical speed -1200 to -1500 fpm.

Holding

Reduce speed to less than 210 KIAS

Flaps 15 degrees

Reduce speed to 160 KIAS

Approach and landing

Nearing glideslope: Extend undercarriage, flaps 30 degrees.

Reduce speed to 140 KIAS

Glideslope

Reduce speed to 130 KIAS.

At 1000 ft AGL: Full flaps (45 degrees).

After touchdown:

Propellers fully fine (CTRL+F4)

Apply brakes

Retract flaps

Reverse thrust can be used if the runway is short (press and hold F2)