

Aircraft data Empire flying boats, engines, hull, wings, etc.

Database

The Empire 'boat was the third Short Bros. design for a monoplane flying boat.

Mainplane (Wing)

Span (S. 23, S.30, S33)	114ft.0in.	(34.75metre.)
Area (gross, including hull)	1 720 sq. ft.	(160 sq. m.)
Area (nett, including flaps,ailerons, & nacelles)	1510 sq. ft.	(Usually quoted as 1 500 sq. ft.)
Aspect ratios	Gross wing area 7.56	Nett wing area 8.60
Aerofoil	Göttingen Gö 436 (modified by Short Bros.)	
Spar centre line	31% of chord, 3 deg. dihedral.	
Centre of gravity	4.56 ft. (1.4 m.) aft of hull datum point	
Centre of gravity range	11.3 in. (278 mm.) about spar centre line for standard S.23	
Datum chord	16 ft. 5.5 in. (5.018 m.)	
Hull datum point	Leading edge of datum chord	
Hull datum point	23 ft. 11.32 in (7.298 m.) from centre line at right angles to plane of symmetry	
Wing loading Standard S. 23	27 lb. per sq. ft.	

Ailerons

Ailerons	Frise form, mass balanced on 4 set back hinges.	
Aileron span	24 ft. 1.33 in. (7.35 m.).	
Aileron inboard chord	44.3 in (1125 mm.)	
Aileron levers, length	13.2 ft.(336 mm.)	
Aileron area	67 sq. ft. (6.23 sq. m.)	
Aileron volume	0.0462	
Mass balance weight	21 lb. (9.5 kg.) weight placed 47 ft. 4 1/2 ins. (14.44 m.) out from the aircraft's centre line.	
When correctly rigged, ailerons drooped slightly by	21/64 in. (8.5 mm.). Some had fixed trim tabs between ribs 13 and 15.	

Fin & rudder

Fin & rudder	Aerofoil RAF 30 symmetrical section thickness to chord ratio 13.75 %.
Rudder area	52.46 sq. ft. (4.87 sq. m.) with 2 inset tabs of 0.86 sq. ft. Volume 0.037.Tail plane
Rudder mass balance weight	16 lb. 10 oz. (7.5 kg.), situated in the leading edge, 7ft.2.76ins (2.356 m.) up from the junction with the hull.
Rudder tabs	Two tabs in the trailing edge. Upper tab, between Ribs 8 and 11, was a servo to help in moving the rudder. Lower trim tab, between Ribs 2 and 5. Both tabs were formed from solid mahogany on brass hinges.
Total area, fin & rudder	122 sq. ft. (11.34 sq. m.).
Elevator	RAF 30 symmetrical section .
Thickness to chord ratio	13.75%. Span 32 ft.1.3 in. (9.79 m.)
Chord	0 9 ft. (2.74 m.)
Area of elevator	39.75 sq. ft. (3.7 sq. m.) with inset trim tab of 1.26 sq. ft. (0.12 m. sq. m.).
Combined area of plane & elevator	92.5 sq. ft.
Volume	0.387

Flaps, control flaps, controller flaps

Flaps	Patent 443 516 7 Jan 36. for 'controller flaps'
Flap span	26 ft. (7.92 m.). Area 149 sq. ft. (7.67 sq m.)
Full flap	25 deg. 60 sec. to wind OUT. 75 sec. to wind IN.
Flap motor	Rotax split-field MT 14-N3DZ series-wound 373 W. (0.5 hp.) electric motor, directly coupled to a gearbox geared down 12.5 to 1
Flaps	common settings 1/3 or 8 deg. for take off 12 deg., 25 deg. for alighting.

Engines

Pegasus & Perseus air-cooled radial engines were supplied by Bristol as embodiment loan (free issue) items, complete with magnetos, carburettors and starters, supplied bonded & screened to TD GEL 125. & fitted by Short Bros. The exhaust collector rings, inter-cylinder cooling baffles, Record engine speed indicators, Marconi screened ignition harnesses and the auxiliaries, were supply and fit items by Short Bros.

Bristol Pegasus XCs. 28.7 litre, civil-rated, medium supercharged, poppet-valved engine, originally fitted to S.23, S.33 'boats and one of the S.30 aircraft - 'KZ CATHAY

Sea level, the maximum power was 885/920 bhp. (660/686 kW.) at 2 250 rev. per min.

Maximum economy cruise power was 510 bhp. (380 kW.).

Some S.23s & S.30s & 'KZ CATHAY had their Pegasus XC engines exchanged for Pegasus XXII during their service on the Horseshoe route during World War II. The XXII was rated at 753 kW. (1010 bhp.) at 2 600 rev. per min. with +6 lb. sq. in. for take off.

	<p>Bristol Perseus XIIC 24.9 litre, civil rated, medium supercharged, sleeve-valve engine, developing 715/745 bhp. (533/556 kW.) at the rated altitude of 6 500 ft. originally fitted to S.30 'boats except to 'ZK CATHAY</p> <p>The sea level maximum for take off was 815 bhp. (608 kW.) min.</p> <p>Maximum economy cruise power was 510 bhp. (380 kW.).</p> <p>Maximum power was 890 bhp. (664 kW.) at 2 750 rev. per min. with +2 1/2 lb sq. in. for 5 minutes level flight.</p>
Both types of engine were geared down to turn the airscrew at half crankshaft speed, through Farman type reduction gearing.	
Nacelles	The engine nacelles were designed so that either engine, Pegasus or Perseus, could be fitted without modification.
Cowlings	NACA long chord cowlings with attached cooling gills,
Magnetos , 2 per engine	Dual Rotax-Watford SP 9-6 magnetos with screened distributors, mounted on the rear casing and driven off the crankshaft at 9/8 of engine speed.
Spark plugs	Pegasus engines were 14 mm. diameter KLG RV 7/5 or RV 7/4 (preferred) Perseus engines had 14 mm. spark plugs, specially made by KLG, with an extended metal sleeve to protect the body of the plug, deep in the junkhead. Two plugs per cylinder for both engines
During World War II, Lodge RS 14/2R and Sphinx R2 14R plugs were sometimes substituted.	
Carburettors	Claudel Hobson Duplex Type ATV 85E with CH XXXB automatic boost and mixture controls, and slow-running cut-out.
Fuel pumps	Bristol vane-type Duplex pumps, driven at engine speed
Fuel pressure regulators	Amal 192/102/046 set to 4 to 10 lb per sq. inch.
Starters	Rotax-Eclipse E 160R direct-cranking starters geared 1:90, with hand turning gear
Airscrews (Propellers)	
Airscrews Pegasus engined 'boats	de Havilland 5000 series 2 position variable pitch units of 12 ft. 9 ins. (3.886 metres) diameter with a pitch of approximately 14 ft. (4.63 m.).
Airscrews Perseus engined 'boats	By 1943, the two TEAL S.30 'A' 'boats had been fitted with fully-feathering de Havilland Hydromatic constant speed airscrews - the only Empire 'boats to be so equipped.
Mass (Weight) 5000 series	365 lb. (166 kg.).
Floats	
Floats	Sprung panel bracing Patent 463 008 11 Feb. 36, replaced with simple un-sprung X shaped wiring plate.
Float Type 1 with buoyancy	6000 lb. (26.7 kN) fitted to 1 st generation S. 23 'Atlantic' aircraft.
Float Type 2 with buoyancy	5000 lb. (22.2 kN) fitted to S. 23 aircraft.
Float Untyped float with buoyancy	6000 lb. (26.7 kN) fitted to S. 30 & S. 33 aircraft.
Float block coefficient Type 1	0.49
Float block coefficient Type 2	0.47

Hull

Length (standard tail)	88ft. 3.115in. (26.90m.)	Usually quoted as 88ft. 0in. (26.82m.)
(flight refuelling tail)	87ft. 6.955in. (26.69m.)	
Beam (width)	10ft. 0in. (3.05m.)	
Skin plating	Approximately 300 sheets of five thicknesses of DTD 275 sheet were used for plating the hull and planing bottom about 3 000 sq. ft. (280 sq. metres). The thickness of 22 plates of the strengthened 'boats was increased from 20 SWG. to 18 SWG. About 3,000 stiffeners were used in a hull.	
Skin plating area	46 skin plates, 1 490 omega-shaped stiffeners, 15 frames and one half frame and 32 lb. (14.5 kg.) of rivets.	
Hull strengthening set	about 5 900 lb. (2 676 kg.) containing about 8 000 sq. ft. (744 sq.m.) of all gauges of sheet, fixed with 250 000 rivets of varying size weighing 180 lb. (81.6 kg.).	
Weight of a standard S.23 bare hull	Standard displacement 4 deg. 15 min. nose up	
Hull trim angle		

Drafts

Main step	4.1813 ft. (1.274 m.)	standard S.23 'boat at 40 500 lb. displacement. Salt water.
Main step	4.62 ft. (1.408 m.)	S.30 'boat at 53 000 lb. displacement. Fresh water.
Rear Step	Approximately half that of the main step.	

Dimensions

On the water	Height to top of rudder	25ft. 2ins. (7.671m.)
On beaching chassis tail down	Height to top of rudder	27ft. 9ins. (8.458m.)
Inside of float to hull		25ft. (7.620m.)

Aircraft weights (masses)

All-up tare standard S. 23	40 500 lb.(18 380kg.)
Empty standard S. 23	23 500 lb. (10 670kg.)
All up S.23 later	52 500 lb. (23 810kg.)
All up S.30	48 000 lb. (21 780kg.)
All up S.30 later	53 000 lb. (24 200kg.)
Empty S.30 .33	27kg.)

Weight breakdown 40 500 lb all up

Hull (bare)	12%
Mainplane	4.5%
Tail	2.5%
Controls	1.0%
Floats	1.2%
Engine nacelles	1.6%
Engines	10%
Airscrews	3.5%

Weights of individual aircraft

'CU CABOT (with armaments)

Tare 29 750 lb.
Fuel 15 710 lb.
Oil 275 lb.
Crew 6 1 000 lb.
Paying load 5 265 lb.
Total 53 000 lb.
Take off 46 840 lb. 800 gal. of fuel added by flight re-fuelling.

'CV CARIBOU (with armaments)

Tare 29 100 lb.
Fuel 15 710 lb.
Oil 1 275 lb.
Crew 6 1 000 lb.
Paying load 5 915 lb.
Take off 46 840 lb. 800 gal. of fuel added by flight re-fuelling.
Total 53 000 lb.

CLARE & CLYDE .

Tare 30 400 lb.
Fuel 18 916 lb.
Crew 510 lb.
Payload 1590 lb.
Total 53 000 lb.

CATHAY

Fuel 12 606 lb.
Oil 972 lb..
Crew 850 lb.. Total 48 000 lb.
Payload 3195 lb.

Performance

Speeds (maximum speed)	174 knots (200 miles per hr).	(322 km. per hr.)
(cruising speed)	143 knots (161 m. per hr).	(263 km. per hr.)
(stalling speed, no flaps)	63 knots (72 m. per hr).	(116 km. per hr.)
(getting off speed)	75-78 knots	(138 -144 km. per hr.)
(minimum getting off speed)	68 knots	(125 km. per hr.)
approach speeds	about 100 knots in good visibility	
maximum rate of climb for the first segment	90 knots (184 or 166 km. per hr.) in marginal conditions,	
usual rate of climb with passengers on board	725 ft. per min. for a fully loaded Mark I S.23 'boat climbing at 104 knots to 1 000ft.	
maximum rate of climb from 1 000 ft. to 10 000 ft.	400 ft. per min.	
	920 ft. per min. for a laden S.23, with airscrews in COARSE pitch, at an engine speed of 2 000 rev. per min.,	
	with +1¼ lb. sq. in. dropping to 600 ft. per min. at height.	
Climb to 10 000 ft.	12 1/2 minutes.	
maximum rate of climb all-up weight 43 000 lb.	775 ft. per min.	
ceiling (service)	20 000 ft. (6 100metres.)	
airscrew thrust	13 280 lb. (59 kN).fine pitch for take off .	
max. water resistance	8250lb. (67kN).take off at 40 500 lb. displacement, free to trim with deg flap,	
take off runs (still air)	40 500 lb.all-up weight 520 yds. (475 metres) time 25 sec.	
	41 500 lb. all-up weight 555 yds (507 metres) time 27.5 sec.	
	42 500 lb. all-up weight 625 yds. (572 metres) time 29 sec.	
	43 500 lb. all-up weight 690 yds (631 metres) time 31.5 sec.	

Fuel systems

Systems I	Fitted to 'HL CANOPUS only.
System ID.	Fitted to other Mark I S.23 short-range aircraft.
System IA	Fitted to 'UU CAVALIER. Durations 7 hours 30 minutes. Range (still air) 1 078 n.m. (1 998 km.). Range against head wind 814 n.m. (1 510km.).
System IC	Fitted to 'UT CENTAURUS Durations for System IC 7 hours 30 minutes. Range (still air) 1 078 n.m. (1 998 km.). Range against head wind 814 n.m. (1 510km.).
System MIC	Fitted to the three S.33 'boats .Durations for System MIC 7 hours 30 minutes. Range (still air) 1 078 n.m. (1 998 km.). Range against head wind 814 n.m. (1 510km.).
It is possible that some of the other 'boats operating the Horseshoe route were converted to MI C.	
System MiD	Same as MI A but with the inboard tanks locked off.
System MIB.	When the two Mark III S.23 long-range Atlantic boats 'HM CALEDONIA and 'UVCAMBRIA were converted to Mark I S.23 aircraft, the original I B fuel systems were modified to ID. Subsequently, both aircraft are recorded with MIB systems. Duration 10 hours 40 minutes. Range(still air) 1 520 n.m. (2 820 km.). Range against head wind 1148 n.m. (2 130 km.).
It is also possible that the other aircraft cited in the literature with non-standard capacities had MIB fuel systems.	
System MIA	Classed here as long-range. Fitted to the two Mark IV S.30 'A' boats for the Trans -Tasman sector, Possibly to 'CZ AUSTRALIA, and to 'KZ CATHAY. Duration 13 hours 23 minutes. Range (still air) 1 914 n.m. (3 551 km.) Range against head wind 1 446 n.m. (2 682 km.).
System IB	Long-range flight-refuelled system fitted to the two original Mark III S.23 'Atlantic' 'boats~ 'HM CALEDONIA and 'UV CAMBRIA. Duration 17 hours 41 minutes. Range (still air) 2 530 n.m. (4 694 km.). Range against head wind 1 911 n.m. (3 545 km.).
System MI	Long-range system flight-refuelled system fitted to the Mark III S.30 second generation 'Atlantic' aircraft 'UC CABOT, 'CV CARIBOU, 'CW CONNEMARA, 'CX CLYDE but not 'CZ CLARE (cx 'CZ AUSTRALIA).

Fuel tank contents gauges were Telelevel on 'boats to 'KZ CATHAY. At the request of Short Bros., 'KZ CATHAY was fitted with KDG Korect electrically-signalled floating-arm equipment. It is probable that 'PZ CLIFTON and 'RA CLEOPATRA, the two S.33 'boats that followed 'KZ, were also fitted with these gauges.

	Starboard wing			Port wing			Totals	
Litres	814	1482	1728	1728	1482	814	Gallons	Litres
Gallons	179	326	380	380	326	179		
Type 1 and 1D Type 1 on CANOPUS only. Type 1D on other S.23s.							652	2 964
Type 1A CAVALIER							1 010	4 592
Type 1C CENTAURUS			Hull				1 010	4 592
Type M1C			Litres 1273 1273 Gallons 280 280				1 010	4 592
Type M1D							1 010	4 592
Type M1B							1 412	6 419
Type M1A							1 770	8 047
Type 1B							2 330	10 592
Type M1							2 534	11 520

 204 gal.(927 litre) Top up tank on Control Deck

Ranges (still air)

Short range	684 nautical miles	(1 270 km.).	Duration 5hr..	Range against 35 knot head wind 517 n.m. (960 km.).
Medium range	1 078 n.m. (1 998 km.).	1 240 m.	Duration 7hr. 30min.	
Long range	1 914 n.m. (3 551 km.)	2 200m.	Duration 13 hours 23min.	
Long range flight refuelled	2 530 n.m. (4 694 km.).	2 900m.	Duration 17 hours 41 minutes	

Oil tanks

Bristol Pegasus engines				
Standard S.23	13 gals.(61 litres)	4	54gals.	(245 litres)
'UT CENTAURUS &'UU CAVALIER	22 gals. (99 litres)	4	88 gals.	(400 litres)
Medium range	13 gals.(61 litres)	8	108 gals.	(490 litres)
Long range	18 gals. (85 litres)	8	144 gals.	(654 litres)
Long range	22 gals. (99 litres)	4	88 gals.	(400 litres)
Bristol Perseus engines				
	21 gals.(97 litres)	4	84 gals.	(381 litres)

Oil cleaners & coolers

Tecalemit cleaners. Robertson oil coolers.

Heating systems

The heating systems used are identified by their diagram numbers in the Maintenance Manual. Muff boilers on starboard inner engines.

System 33 hot water system Mark I standard S.23 'boats.

System M33 hot water system S.30 'passenger aircraft' and 'mail aircraft'.

System 33 steam system 'MA AOTEAROA and 'MC AWARUA, the two S. 30 'A' 'boats were initially fitted with M33 systems.

Replaced with combustion heaters of US origin located at the aft end of the Control Deck in late 1944 or 1945.

Entries & hatches

Bow mooring hatch (Frames 1 & 2), observation hatch (upper deck top sides) (Frames 6 & &), Port passenger & crew forward entry door (Frames 10 & 11), port passenger & crew forward aft entry door (Frames 27 & 28), starboard pantry loading hatch (window) (Frames 9 & 10), starboard baggage loading hatch (upper deck) (Frames 12 & 13), starboard aft baggage & spare engine loading hatch (Frames 35 to 37) & escape hatches in hull topsides, starboard (Frames 14 &15), port (Frames 21 & 22), & starboard (Frames 27 & 28).

Radio equipment Leased from Marconi

Normal range S.23 'boats - 1937 equipment Fitted to 'HL CANOPUS and the Mark I aircraft of the first and second production batches of S.23 standard 'boats, up to Construction No. S.851 'UI COORONG.

The Mark II 'boats - 'UT CENTAURUS and 'UU CAVALIER - had extra equipment for the survey flight to Australasia and for the North American service.

Transmitter	AD 57A (HD 1011) Short wave
	AD 57A (HD 1012) Medium wave
Receiver	AD 5782 A (HD 1016) Short wave & Medium wave
Anode converter	(HD 1009)
Aerial switch Type 190	(HD 1044)
Earthing relay Type 190	(HD 1044)
Charging switchboard	(HD 1041) Type H 230A
Fixed aerial (single aerial in early aircraft, replaced by dual aerial with spreaders)	
Fixed di-pole aerial (on early aircraft only)	
D/F loop	
Double pole on-off switch	

For North American service

Radio telephone	AD 37K Medium & long range R/T
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Long range Mark III S.23 Atlantic boats 'HM CALEDONIA and 'UV CAMBRIA- 1937 equipment:

Transmitter	AD 73A (HD 1011) Short wave A.1 wave
	AD 73A (HD 1017) Medium wave A. 2 wave
Receiver	AD 5872 B (HD 1019)
Stand-by Receiver	AD 5062B (HD 1007) Medium wave D/F in USA
Anode converter	(HD 1009)
Barrater Unit filament heater	(HD 1030)
Visual D/F attachment Type 626B	(HD 1023)
D/F reversing hand switch	(HD 1010)
Aerial switch	
Earthing relay Type 190	(HD 1044)
Charging switchboard Type H 230A	(HD 1041)
Fixed single aerial	
Fixed di-pole aerial	
D/F loop	
Double pole on-off switch	

Normal range boats - 1938 equipment: on the S.30 and the S.33 'boats, except for the four Mark III long-range 'boats.

Transmitter	AD 67A Ed. A (HD 1083) Short and Medium wave
Receiver	AD 6872B Ed. H (HD 1138)
Transceiver (some aircraft)	Hermes 1050A/1051A D/F
ML converter	Type C (modified)
D/F reversing hand switch	Type 180A (HD 1010)
Voltage control unit	Type 580A
Aerial switch	Type H 130B
Charging switchboard	Type H 230A (HD 1041)
Fixed aerial	
D/F loop	Type 823/18
On-off switch	Type H 240A

Long range boats - 1938 equipment on the four S.30 Mark III long-range 'boats, 'CU CABOT, 'CV CARIBOU, 'CW CONNEMARA and 'CX CLYDE.

Transmitter	AD 67A Ed. A (HD 1083) Short and Medium wave
Receiver	AD 6872B Ed. H (HD 1138)
D/F receiver	AD 5062E Ed. H (HD 1145)
Telephone control unit	
ML converter	Type C (modified)
ML converter	Type C (with relay)
D/F reversing hand switch	Type 180A (HD 1010)
Voltage control unit	Type 580A
Aerial switch	Type H 130B (spec)
Charging switchboard	Type H 230A (HD 1041)
Fixed dual aerial	
D/F loop	Type 823/18
On-off switch	Type 240A

The following equipment was common to all 'boats:

Transmitting key
Head phones
Microphone
Marconi-Stanley 1 hp. motor generator set with self contained fuel tank in fire proof box.
Trailing aerial winch

Accommodation

Upper control deck

Pilot's seats, radio station, sometime Flight Clerk's station & mail stowage.

All passenger accommodation was on the lower deck.

Forward Cabin

The Forward Cabin, originally the Smoking Cabin, occupied the lower deck from the bulkhead at Frame 6, aft to Frame 11. The dimensions were about 9 ft. 10 ins. (3.0 metres) long with an average height - the floor sloped - of 6 ft. 10 ins. (2.1 metres). Cigarettes were allowed in the Smoking Cabins, pipes and cigars were not. In the original arrangement seven day passengers were seated - two two-seater and one three-seater. The one window was on the starboard side. Four bunks could be rigged for use by night. The six ports had pull-down blinds. The two bunk windows were fitted with flaps to close out the daylight. There were positions for a maximum of seven wall and bunk lights, with switches and Steward's call buttons incorporated, which could be interchanged for day and night use. All passenger cabins were fitted with light-weight hat racks and hold-alls.

Centre Cabin or Spar Cabin

Between the two main spar frames, about 6ft. 0ins. (1.8 metres) long, 9ft. 10 ins. (3.0 metres) wide and 8ft. 0ins. (2.5 metres) high, 6 windows and 2 bunk windows. . 3 IAL seats were fitted, 2 to starboard and one to port. 4 bunks could be rigged. The concealed bullion locker was under the floor approximately under the aircraft's centre of gravity. 7 light positions with a maximum of 4 lights and one 36 watt ceiling light. The entry to the Promenade cabin to the rear was one step up.

Promenade Cabin

From Frame 20/21 aft to Frame 28, about 19 ft. 8 ins. (6 metres) long, 9 ft. (2.7 metres) wide, about 7 ft. 9 ins. (2.36 metres) high. 6 or 8 adjustable seats were arranged in three groups of two on the starboard side of the cabin, with 2 doubtful single seats on the port side. The Maintenance Manual loading diagram shows these 2 seats but none of the interior photographs show them. The Promenade space was popular with passengers allowing them to stretch their legs during a flight and to stand and watch the unfolding panorama through the 4 windows. Tables were provided for each seat or pair of seats. A handrail below the windows enabled standing passengers to steady themselves, should a 'boat run into a patch of bumpy air. 4 windows on the starboard side were at the normal height for seated passengers, with 2 bunk windows above. 4 bunks could be rigged. Additional escape hatch was provided in the S. 30, and presumably, S.33 'boats. The aft passenger hatch between Frames 26 and 28, was on the port side of the aircraft, at the rear of the Promenade Cabin. The aircraft's registration plate was just inside the door. A step up through

Aft cabin	<p>the doorway led to the Aft Cabin.</p> <p>From Frame 28 to Frame 33 - a distance of about 9 ft. (2.8 metres). The cabin was about 8ft. 6ins.(2.6 metres) wide and 8ft. 6ins. (2.6 metres) high. The daytime seating was for 6 passengers, 2 pairs in IAL seats on the starboard side with tables and 2 single seats on the port side, each with a table. 6 windows & 2bunk windows 4 bunks could be rigged. There was access to the stowage room above the ceiling of the Promenade Cabin where the bunk fittings, mattresses, pillows, linen and blankets and top bunk access ladders were stowed. An escape hatch, with folding access ladder, was provided at the forward bulkhead. A door, offset to port in the aft bulkhead, led to the freight room. In the revised passenger seating arrangement, the Aft Cabin became the Smoking Cabin, a not altogether satisfactory arrangement as the forward airflow inside the aircraft in flight distributed the smoke through the Promenade and Centre Cabins. The Bermuda 'boat, 'UU CAVALIER, seems to have had two Smoking Cabins, fore and aft and the full complement of 24 passengers.</p>
Seats (chairs)	<p>Patent for an 'adjustable chair' 447 327 dated 13 November 1934, in the names of Imperial Airways Limited and Harold Burchall, the General Manager of IAL. Seats fabricated from light-gauge electron tubing, licenced to Accles and Pollock Ltd., Birmingham. Each complete seat weighed 21 lb.(9.54 kg.). Seats were embodiment loan (free issue) items.</p> <p>The actual number of seats supplied to the 'boats varied. The original specification called for 24 passenger seats, shown on Short Drawing S.23.C.29.013, accompanying the Type Record is of a Mark II S.23 'Bermuda' 'boat and shows a full complement of 24 passengers . With this complement, the Mark I and Mark II S. 23 'boats were fitted with total of 17 adjustable seats in the Centre, Promenade and Aft Cabins and 7 fixed seats in the Forward Cabin.</p> <p>When the Forward Cabin of the Mark I 'boats was taken over for the Flight Clerk's office, the passenger seating was reduced to the 17 adjustable seats, 3 in the Centre Cabin, 8 in the Promenade Cabin & 6in the Aft Cabin. In order to make up the 8 seats in the Promenade cabin, there should have been two seats on the port side, occupying part of the promenade space.</p>
Windows	<p>All the windows and ports were fixed on aircraft up to the 12th 'boat of the second batch - 'UG COOGEE. The windows were modified on the later 'boats so that all windows could be opened in emergencies. Instructions for use were fixed below each window explained that it could be opened with a sharp blow with the hand or foot towards an edge. Earlier aircraft were retro-fitted.</p>
Rigging	
Datum Point	Leading edge of datum chord 287.31 ins. 7297.67 mm. distant from plane of symmetry of aircraft
Datum chord	197.57 ins. 5018mm.
Datum plate in spar compartment (centre cabin)	19.65 ins. 499 mm.

