

AIRCRAFT CIRCULARS

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 54

JUNKERS COMMERCIAL AIRPLANE G 31

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JUNKERS COMMERCIAL AIRPLANE G 31.*

The three-engine Junkers commercial airplane, type G 31, is a further development of the well-known Junkers commercial airplane G 24, which has been in successful operation for two years and which it closely resembles in its external appearance.

Like all the Junkers commercial airplanes, the G 31 is an all-metal low-wing monoplane, the arrangement of the three engines and other equipment being practically the same as in the G 24.

The wing is divided into a middle section, which directly supports the fuselage with the middle engine and the tail group; two intermediate sections which support the two side engines and the fuel tanks; and the two end sections. As in the G 24, use is made of the directly loaded wing, with the distribution of the loads over a greater portion of the wing.

The fuselage is divided into a middle section containing the pilot room, baggage room, passenger cabin, and auxiliary apparatus; the rear section; and the front section containing the central engine.

All the parts are joined together by easily removed screw connections. This extensive subdivision naturally increases the weight, but has great advantages in the construction of such

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large airplanes and is important for practical operation, for handling, putting in hangars, shipping and repairing.

In the low-wing type, the pilot and passenger rooms are the most effectively protected, in the event of hard landings, by the strong tubular framework under them and by the baggage compartments which are also under them. This fact has been repeatedly demonstrated in more than six years of air traffic with Junkers low-wing airplanes. The side engines are so installed that, in case of a propeller break, the occupants and the vital parts of the airplane cannot be hit by the flying fragments of the propeller.

By far the largest portion of the material is duralumin. Cast electrum or silumin is used for the less stressed and very complicated form pieces, as likewise for the bearing housings and less important fittings.

The wing is built in the customary Junkers manner, having a tubular frame, bound together by a covering of corrugated sheet duralumin. The individual sections can be readily removed and replaced.

The central section of the fuselage, which rests directly on the central wing section, has a strong framework reinforced by bulkheads and transverse frames, the whole being covered with corrugated sheet duralumin. The pilot room is in front and is followed by the front freight room (a corner of which is partitioned off for the auxiliary apparatus), the three passenger

rooms, and the lavatory. All these rooms are connected by doors. From the passenger cabin, one door opens directly outside and another door opens into the baggage room which has two outside doors.

In the pilot room there are two pilot seats with hand wheels for operating the elevator and ailerons and pedals for operating the rudder. The instrument board is in the middle between the two pilots and is provided with keys for radiotelegraphy, in addition to the ordinary equipment. The stabilizer and rudder-adjusting devices with dial indicators, the hand pumps, etc., are located beside the pilots. If required, a compass and an inclinometer can be installed in front of each pilot. The right-hand pilot, after removing the back of his chair, can operate the radio switchboard suspended behind him in the auxiliary-apparatus room.

The auxiliary-apparatus room, which can be entered from the front freight room through a special door, contains, in addition to the radiotelegraphy apparatus, the starting motor with its compressor, as also the electric generator for all the lights.

The front freight room is accessible through a large outside door on each side. One corner is partitioned off by light removable lattice work for small packages, and can be used for mail bags.

The passenger cabin, with a door at each end, is divided by partial partitions into three compartments, leaving a free pas-

sage way through the middle. The lavatory is at the rear end. On each side wall two comfortable leather seats face each other. Between each pair of seats, there are two slide windows of non-breakable triplex glass, which can be operated by cranks. Each compartment is separately ventilated. Sufficient illumination is supplied at night by two electric ceiling lamps. When needed, the cabin is warmed by hot air, supplied by pipes under the seats. In addition to the eleven regular seats, four more can be installed. For night flights, the seats can be partly or entirely replaced by ten beds. For carrying sick or wounded, 15 beds can be accommodated. The wall coverings are drawn over thin metal frames and can be easily and quickly removed for cleansing or renewal.

Underneath the cabin, a channel, leading from the pilot room to the rear end of the fuselage, contains all the steering controls in duplicate. These controls are accessible through trap doors in the floor. On both sides of this channel, under the cabin, there are two baggage rooms, each one being accessible from the outside through a large trap door. Through the distribution of the freight between the front and the rear freight rooms, the airplane can always be kept well balanced, so that no great shifting of the center of gravity will be caused, even by great changes in the load. The rear end of the fuselage is accessible through a door behind the removable seats at the back end of the cabin.

The horizontal empennage is so large that the airplane remains stable, even when the cabin and freight rooms are fully loaded and the center of gravity is shifted toward the rear. The stabilizer is adjustable from the pilot room during flight. The elevator is balanced.

The vertical empennage consists of two fins and two rudders. The airplane can be easily held to a straight-ahead course with one of the side engines stopped. In flying for a long time with one side engine out of commission, the pilot can be relieved from the constant deflection of the rudders by a flexible adjusting device.

All the movable parts of the airplane including even the stabilizer, are mounted on adjustable ball bearings.

The landing gear has no continuous axle, but is exceedingly simple and strong. Each wheel has an axle, steering rod and shock absorber. The latter has a travel of 30 cm (11.8 in.) and is very strong. The disk wheels are made of cast electrum.

The G 31 has three engines with a total output of 1100-1200 HP. It can fly horizontally with one engine stopped. The engines have fireproof walls behind them. The six fuel tanks are located in the intermediate wing sections. The fuel is delivered by centrifugal pumps to the gravity tank suspended from the ceiling of the pilot room. In taking off, the fuel can also be delivered directly from the pumps to the carburetors. Junkers radiators are used for the water-cooled engines. The engines

are started by compressed air. The auxiliary and starting motor and the compressor are located in the auxiliary apparatus room. The total capacity of the fuel tanks is about 1300 liters (343 gallons).

Capacity of cabin (incl. lavatory)	21.0 m ³	(741.6 cu.ft.)
Plan of same	11.4 m ²	(122.7 sq.ft.)
Capacity of baggage and freight rooms	8.0 m ³	(282.5 cu.ft.)
Plan of same	5.6 m ²	(60.3 sq.ft.)
Capacity of apparatus room	1.45 m ³	(51.2 cu.ft.)
Plan of same	0.51 m ²	(5.5 sq.ft.)
Cross section of fuselage	5.2 m ²	(56.0 sq.ft.)

Characteristics and Performances*

Span	30.3 m	(99.4 ft.)
Length	16.2 "	(53.1 ")
Height	6.0 "	(19.7 ")
Wing area	94 m ²	(1011.8 sq.ft.)
Engines (3)	1200 HP	
Full load	7700 kg	(16975.6 lb.)

Weight distribution:- Service weight (equipment and crew of 2 persons):

	<u>B.M.W.</u>	<u>Jupiter</u>
Weight of engine	5635 kg (12423 lb.)	5295 kg (11673 lb.)
Fuel	950 kg (2094 lb.)	1050 kg (2315 lb.)
Payload	1115 kg (2458 lb.)	1355 kg (2987 lb.)
Total flying weight	7700 kg (16976 lb.)	7700 kg (16976 lb.)

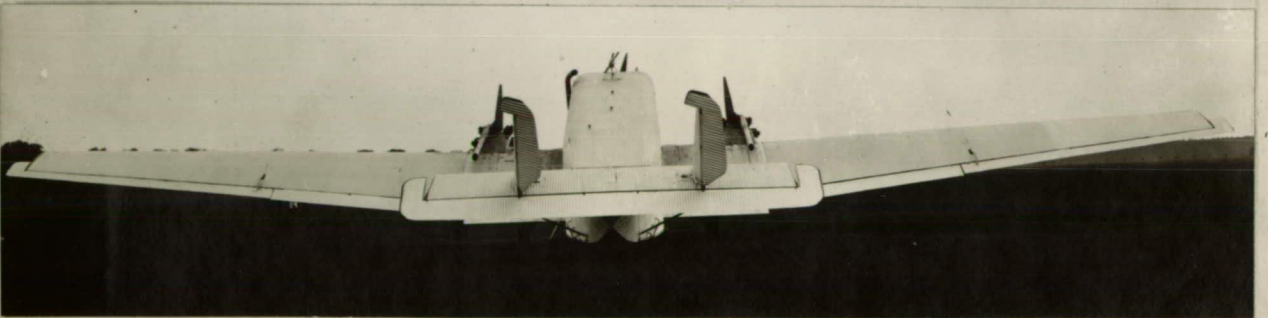
*Data furnished by the Junkers Company.

Characteristics and Performances*(Cont.)

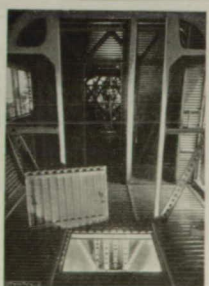
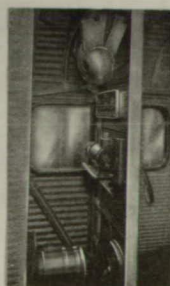
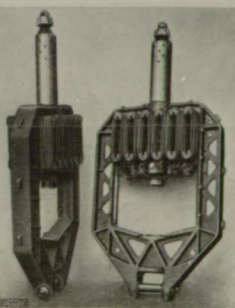
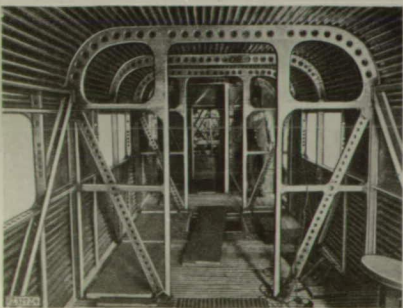
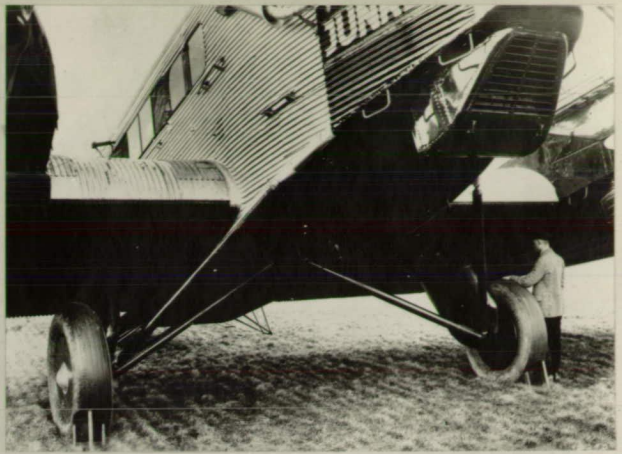
Wing loading	82 kg/m ²	(16.8 lb./sq.ft.)
Power "	6.4 kg/HP	(14.1 lb./HP.)
Power per unit area	12.8 HP/m ²	(1.2 HP./sq.ft.)
Maximum speed	185 km/h	(115 mi./hr.)
Cruising radius	1000 km	(620 miles)
Flight-speed coefficient	8.8	
Flight-distance "	4.4	

*Data furnished by the Junkers Company.

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Interior of fuselage under construction.

Shock-absorber

Auxiliary apparatus room

Fuselage under construction showing trap door.

Passenger cabin

Details and views of Junkers commercial airplane G31