



A JUNKERS MONOPLANE used for transporting gold from the goldfields of New Guinea to the coast. This picture was taken at Lae Aerodrome, near the mouth of the Markham River. In 1927 Lae was made the base for aeroplanes taking miners and machinery to Wau, where the first mining centre was established. The distance to Wau was only about 75 miles, but the intervening country was difficult to traverse.

NEW GUINEA GOLD

How Mining has been Rapidly Developed in Inaccessible Country by Air Transport

COMMERCIAL aviation has no romance greater than that of the opening up by aircraft of the goldfields in the Mandated Territory of New Guinea. During, skilful pilots, in collaboration with mining experts, defeated mountains, jungle, cannibal tribes and country that defied other means of transport. Weighty mining plant and hydro-electrical equipment were flown piece by piece across some of the wildest country in the world. Miners, native laborers, horses and cattle, as well as stores and material for new townships, were flown from the coast to aerodromes cut out of the jungle. A handful of experienced men demonstrated to the world the carrying capacity of aircraft and the speed and cheapness of air transport in virgin country.

Australian prospectors searching the Mandated Territory after the war of 1914-18 found gold in the interior mountains about seventy miles from the north-east coast, the nearest port being Salamaua. Although the distance was not great, the difficulty of the country made the goldfields—situated from 2,000 to 7,000 feet above the sea—inaccessible except to the most determined men. To reach the goldfields miners had to penetrate into the jungle

and cross mountains. The bush tribes were hostile and treacherous. To get through, the prospectors needed native carriers. The carriers were recruited from other islands and other tribes by professional recruiters who landed them at Salamaua, where they were hired at a profit to the recruiter.

A miner needed about ten carriers, and to engage them involved an initial outlay of up to £300. Then he had to pay their wages and provide food. Each carrier carried a load weighing up to 50 lb. Much of the total load comprised food and, as the trail took from one to three weeks to traverse, the net transport available for gear was small. Such was the cost that the authorities refused to allow any person to leave Australia for the new goldfields unless he had a minimum of £550.

This cash obligation prevented penniless individuals from joining in the rush and becoming a problem to the authorities. The natives in the bush were cannibals who murdered the carriers at every opportunity. The carriers had to be watched closely or they would desert before they had gone far into the hostile country. Sometimes they discarded part of a load, or stole food, and the miner arrived at the goldfields to find that he had only part of the stores.

In spite of the difficulties some miners won fortunes. Mining engineers arrived and made surveys to discover if the yield were sufficient to warrant the use of modern dredges and plant. They realized the potentialities of the area, but transport of heavy machinery appeared impossible by ordinary means. In those early days there were no aeroplanes in the Territory, but men who saw the need for them went to Australia to secure men and machines.

The first machine to reach the Territory—in 1927—was a D.H.37, powered by a 375 horse-power Rolls-Royce engine. The pilot was Captain E. A. Mustar, who had considerable war experience, and the engineer and mechanic was called Mallins. The machine was bought by the Guinea Gold Company and afterwards became the first of the fleet of aeroplanes operated by Guinea Airways, Ltd., a company formed to concentrate on the flying services to the goldfields.

About the same time another company, the Bulolo Goldfields Aeroplane Service, was formed which bought a second-hand D.H.4. A race from Australia followed. Mustar shipped his aeroplane first, but the vessel encountered a hurricane and the machine was damaged. When the machine was

unloaded at Rabaul, in New Britain, extensive repairs were needed. These were not completed when the ship arrived carrying the second aeroplane, her pilot, Ray Parer, and his partner.

Parer succeeded in assembling his aeroplane and took off for a trial flight. Engine trouble occurred and the machine was wrecked in landing, Parer's companion being badly injured. Then Mustar took off for a flight of 430 miles across the sea to Lae, near Salamana, where a landing ground had been prepared.

This first flight in the Territory was successful, but the stage from Lae to Wau, in the goldfields, where a landing ground had been prepared, offered formidable difficulties. Mountains had to be crossed and the tiny camp located. There were no trustworthy maps and all the pilot had to guide him were some rough sketches. He made two efforts, but mist and cloud veiled the tangle of mountain and jungle.

On the third flight a miner accompanied the pilot as guide and this time the D.H. 37 passed above the jigsaw of cloud-capped peaks, ravines, streams and gorges and the patch of ground on top of a mountain was seen. The "landing field" was on a slope so steep that Mustar needed all his skill to avert disaster as he brought the machine down on to the unpropitious ground.

This first flight from Lae to Wau on April 18, 1927, was the beginning of the development on a big scale of the whole of the goldfields. The one machine could carry only 600 lb. of freight, but this represented the average load of no fewer than 250 carriers. In two trips in one day it could carry as much as the human carriers in six weeks. The first passengers paid about £33 fare, and 1s. a lb. was charged for goods. In the first week of operation the aeroplane made fourteen trips, carrying fifteen passengers and 2,850 lb. of cargo.

Stamp Battery Transported

MEANWHILE Parer was not idle. He had flown from England to Australia with Macintosh in 1919, but had been beaten by Ross and Keith Smith (see pages 147-152). Parer was not the type that sits down under misfortune. He secured a partner and a little cash, and rebuilt the wrecked aeroplane at Rabaul. The patched-up machine crossed the sea to Lae, where stores and miners were waiting their turn to be flown to the goldfields, and was soon flying at a handsome profit.

The pioneer company, started by the late Cecil John Levien, supplemented the original machine with a Gipsy Moth. The company made Lae into a port, so that ships could unload there instead of

at Salamana, about twenty miles distant. Parer secured a D.H. 9 and a Bristol Fighter. Lae began to grow into an airport as well as a seaport, and inland Wau grew into a town as material was flown to it.

Levien saw that the immediate need was to obtain the biggest machine which would suit the requirements of the service and the country, and he sent Mustar to Europe to select one. Mustar ordered an all-metal Junkers W. 34 low-wing monoplane, powered by a Bristol Jupiter air-cooled engine of 429 horse-power. The aircraft carried three passengers and about a ton of freight. The aeroplane was shipped to Rabaul, where the parts were assembled.

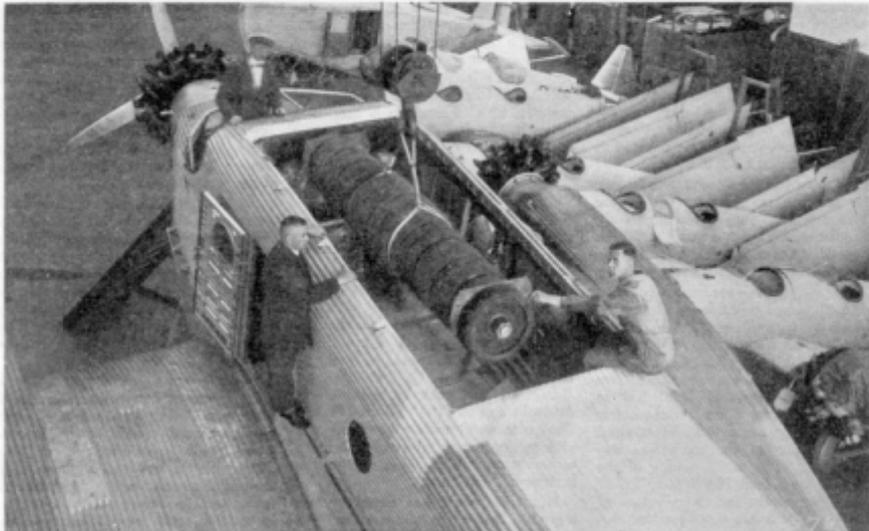
Mustar flew the Junkers to Lae, where it began service in April 1928, demonstrating the value of large machines. Then a mining company wanted to erect a stamp battery to crush the ore from the reef they were mining in the mountains beyond Wau. The machinery was built in Australia in sections, the heaviest of which weighed a ton. This load was shipped to the Territory, and then the sections were flown to Wau. Thence the sections were carried into the mountains by natives. The success of this feat of transport marked another stage in development.

The second Junkers all-metal aeroplane was shipped to Melbourne, where it was assembled and fitted with floats. Mustar flew the aeroplane via Sydney, Cooktown (Queensland) and Thursday Island (Torres Strait) to the Territory. This machine was powered by a 450 horse-power Bristol Jupiter Mark VI engine. The wing span was 62 feet and length 31 ft. 10 in. The weight, when empty, was 3,050 lb., and useful load 2,450 lb. Cruising speed was 100 miles an hour, the ceiling being 20,000 feet.

Soon three other machines of this W.34 type were added to the air fleet,

THE AERODROME AT LAE. In this picture the white roof of the hangar of Guinea Airways is visible next to the two large monoplanes. The first aeroplane at Lae was a D.H. 37, powered by a 175 horse-power Rolls-Royce engine. The pilot was Captain E. A. Mustar. The D.H. 37 was bought by the Guinea Gold Company, and became the first of the fleet of aeroplanes operated by Guinea Airways. After the establishment of the aerodrome at Lae, the settlement was made into a port, so that ships could unload there.





Photo, Junkers Flugzeug & Co.

LOADING MACHINERY THROUGH THE HATCHWAY in the fuselage of a Junkers G-31 three-engine monoplane. The hatchway was 11 ft. 10 in. long and 5 feet wide. The hatch was concave and provided an additional foot of headroom. The cargo compartment was 14 feet long and 4 ft. 5 in. wide and 5 ft. 9 in. high. A side door enabled small sections of machinery to be loaded in the compartment.

and also a number of Moths. Traffic increased to 600 tons of goods a month.

When the alluvial area in the region of the Bulolo River had been tested and surveyed by experts, it was proved to be sufficiently rich to warrant the ordering of large dredges and plant. The area acquired by the Bulolo Gold Dredging Company consisted of a stretch of the river bed and flats about 7° south of the Equator at an elevation of 2,250 feet, thirty-five miles in a direct line from the coast. Although there was no road, surveys were made for one.

It was found, however, that the lowest pass in the mountains that intervened between the Bulolo and the sea was some 4,000 feet high, and that the road would have to be more than ninety miles long. Construction was estimated at a cost of several hundred thousand pounds, and the time at between one year and eighteen months.

Successful as the aeroplanes had proved, the weight of the plant and its bulk were greatly in excess of the capacity of the machines in the Territory. Their success did, however, show that the huge task of transport might be accomplished, and the company decided to go into the question of ways and means. Hydro-electric plant and dredges weighing thousands of tons

were required for the site in the interior. At the end of 1929 conferences between representatives of the mining, engineering and aviation companies were held in Melbourne. Ultimately, models of the aeroplanes and of the machinery were made to scale, and these gave the clue to the puzzle.

Critical Load of 7,000 lb.

THE Junkers company had produced the standard three-engine G-31 passenger aeroplane, of which Major Berryman, their representative in Melbourne, had plans. The mining company calculated that two machines, each capable of carrying sections of the plant weighing up to 7,000 lb., would be required, and Guinea Airways agreed to buy a third machine as an auxiliary and standby, all three to be operated by Guinea Airways. Captain Mustar became aviation adviser to the dredging company.

To enable the machinery to be loaded and unloaded by cranes, a special cargo compartment was designed, first in model form. Into this model, models of the most difficult parts of the machinery were loaded. The most critical loads were the upper tumbler shafts for the dredges; these shafts weighed 7,000 lb. Tests with the models showed that it would be possible

to carry them. Then the time factor had to be calculated.

The total weight of all plant and machinery was estimated at 2,400 short tons of 2,000 lb., and this was scheduled to be transported by air in twelve months at the rate of 200 short tons a month. These figures were compared with the estimate for a road. It was calculated that a road could be built in about two years at a cost of some £300,000, towards which the Government would contribute £50,000.

It was decided to order the aeroplanes. From that moment success or failure depended upon whether the machines could do in service the work which the plans and the models had shown to be possible. When the decision was made, neither the aeroplanes nor the plant and machinery were in existence. Each part of the involved project had to be planned and then built in different countries. The Junkers machines were built in Germany and each was powered by American engines—three 525 horse-power nine-cylinder radial air-cooled direct-drive Hornet motors giving a total of 1,575 horse-power.

One reason for selecting all-metal machines was that the dredging company did not have to go to the expense of building hangars that would be

necessary for wooden aeroplanes. The standard payload of the G-31, allowing for a crew of two and petrol for three and a half hours' flying time, was 5,800 lb. As the average flying time from Lae to the dredging area at Bulolo and back to Lae was only seventy-five minutes, it was possible to reduce the petrol and increase the payload to the maximum of 7,000 lb.

There was sufficient power to sustain the machine in flight by two of the three engines. During test flights the aeroplanes, at altitudes up to 3,000 feet, climbed at the rate of 200 feet a minute on two engines and under full load.

This margin of power was an insurance against forced landings and loss of life, material and time. Also, it was essential to have power for rapid climbing in a country of high mountains and much cloud. In ordinary conditions the aeroplane reached 7,000 feet in thirty-five minutes on three-quarters throttle. The average height attained in the region of the mountains was 6,000 feet. The useful ceiling of the machine was about 12,000 feet.

Another reason for the selection of the type of aircraft was that the low-wing monoplane construction enabled heavy weights to be loaded over the centre of gravity of the machine by a

crane. The centre of gravity was located almost directly under the hatchway and about six feet from the front of the cargo compartment. The hatchway was 11 ft. 10 in. long and 5 feet wide; the hatch was concave and provided an additional foot of headroom below it, the cargo compartment being 24 feet long, 6 ft. 5 in. wide and 5 ft. 9 in. high.

Jungle Cleared for Aerodrome

THE interior was clear of obstructions except for the necessary stays. The stays, which reduced the width of the floor to 2 ft. 7 in., angled back to meet the sides of the compartment at their junction with the roof.

A side door was placed near the rear to enable small sections of machinery to be loaded and to afford entry to the cabin.

Part of the machinery was built in Australia and part in the United States. The parts were made in sections and each section was numbered to facilitate assembly on the dredging site in the interior of New Guinea.

Meanwhile, work was begun at Lae and at Bulolo to prepare for the aircraft and the machinery. A wharf was built at Lae and it was linked with the existing aerodrome by a

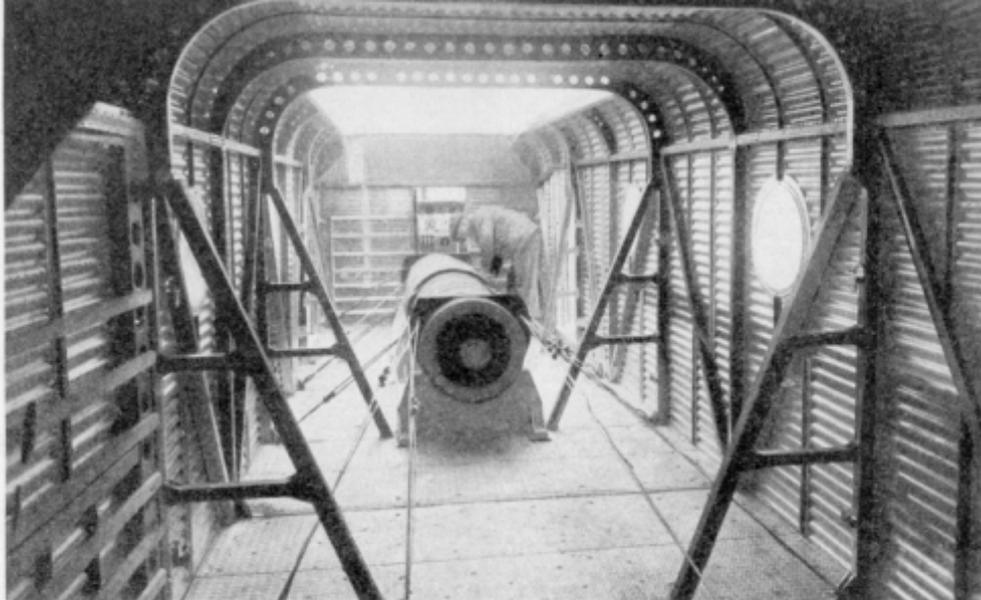
railway three-quarters of a mile long. The aerodrome was lengthened and improved ready for the heavy machines and the heavy loads of machinery, inland, on the Bulolo site, jungle and trees—some of the trees were four feet in diameter—were cut down to make a landing ground 4,000 feet long and 1,500 feet wide, and the trees were cleared from the end boundaries for a distance of 500 yards.

Vessels anchored off Lae, and their cargo was carried by lighters to the wharf, where a 10-ton locomotive crane landed them and transferred them to the aerodrome, three-quarters of a mile away by rail. By the beginning of 1931 the first aeroplane arrived by ship at Lae and was assembled. The second machine followed, and then the third.

Loading and unloading of the aeroplanes were at first rather slow, as it was realized that any accident might lead to damage and delay. The concrete loading platform at Lae was fitted with platform scales for weighing the tail of an aeroplane. The machine taxied on to this platform and the locomotive crane moved into position just behind the wing, ready to load the cargo. Loading and unloading were done from the rear, so that if an accident



A DREDGE AT WORK IN THE BULOLO GOLDFIELD. All the machinery and other materials required to establish this goldfield were transported by air from Lae. The aircraft used for this enormous task were three-engined Junkers. They were of G-31 type, normally intended for passenger-carrying, but specially built to be able to take large pieces of machinery. It was estimated that the use of aircraft enabled gold production to begin a year earlier than would have been possible if a road had been built to the goldfield.



Photo, Andrew Phangray, A.S.

CARGO COMPARTMENT OF A JUNKERS G-31, showing a heavy piece of gold-mining machinery being fitted into position. Because of its concentrated load, the machinery is braced in place with wires, so that there will be no chance of its moving during flight. The piece of machinery illustrated weighed 2½ tons, and the importance of careful and secure stowing of such a weight in an aeroplane is easily appreciated.

happened the weight would fall on to the back of the machine, this part being more easily repaired than the wing or front part.

At Bulolo the aeroplane was unloaded by a hand-operated stiff-leg crane. Unloading took from half to one hour, and was quicker than loading. Lashing the cargo into position took longer than unlashng it, and the unloading team could sometimes make one sling load of the entire cargo. Awkwardly shaped pieces of machinery were bolted to wooden frames, and rubber pads and even bags of rice were used as shock-absorbers to ease the jolts when the aeroplane landed or was taxiing. The tumbler shafts, steel girders, hull plates and sections for a steel latticed mast were the most difficult loads. A motor car presented no difficulties in loading.

As the aeroplanes were designed to carry long as well as heavy loads, it was not possible to fly them back empty from Bulolo to Lae. There were great quantities of gravel at Bulolo which could be used at Lae; so this was packed into bags as ballast and stowed to bring the tail weight up to about 2,000 lb. for the return trip.

The two machines owned by the dredging company were named Peter and Paul. Three pilots were assigned to them, each pilot making two, sometimes three trips daily. Two mechanics were allotted to each machine for engine

maintenance, and one for inspecting the engines after flight. A mechanic, generally a junior, accompanied the pilot on each flight to start the engines and maintain the aeroplane at Bulolo between the trips. Radio at both aerodromes ensured communication.

Various adjustments proved necessary soon after the aircraft had begun to operate. At Bulolo the white sandy patch of the aerodrome reflected the tropical sunshine, dazzling the eyes of the pilots as they landed. To overcome this disadvantage, the aerodrome was planted with couch grass, which grew swiftly into a carpet about a foot deep.

Landing Difficulties Overcome

At first trouble was encountered with the landing wheels. This was caused by the brake generating such heat as it operated on the rim of each wheel that the rim expanded and burst, but serious damage was averted. Generally the machine swung violently before it was stopped, and the only loss was that of the wheel and tyre. The design of the wheels was altered and the trouble ended. An extensive stock of spare parts, including complete undercarriages and engines, was carried.

Transport of the machinery from Lae to Bulolo began in April 1931. By the end of that month only 35 tons had been carried, as the weather was bad and the staff were learning the work,

but soon the monthly total rose ten-fold. By the end of March 1932 the dredges and the hydro-electric plant had been flown to the site.

The dredging company estimated that it had saved at least a year by using aeroplanes instead of building a road. The saving of this time enabled it to begin production of gold a year earlier. There were no accidents.

After this achievement civil aviation continued to increase, and in 1935 the approximate mileage flown was no less than 1,503,257. Most of this mileage was concerned with the short routes from Lae and from Salamaua to the goldfields. Even more remarkable were the weights carried. These came to 8,523 tons of goods and 108,654 lb. of mail. In that year 16,466 passengers were carried, the safety record being remarkable. Freight rates were reduced to fourpence a lb. from the original shilling rate.

The news of the achievements of the pioneers of New Guinea aviation urged others to emulate them. A wide variety of machines, wooden and all-metal, was introduced, including De Havilland, Ford, Fokker and Waco. With adequate attention, the wooden aeroplanes have proved efficient. In addition to Guinea Airways, the principal services are those of Holden's Air Transport Service, Ltd., and those of W. R. Carpenter, Ltd.