AIRCRAFT CIRCULARS

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

No. 195

THE BRITISH KLEMM "EAGLE" COMMERCIAL AIRPLANE

A Low-Wing Cantilever Monoplane

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A Low-Wing Cantilever Monoplane

The British Klemm "Eagle" is built almost entirely of wood and most of the covering is plywood except where fabric is more economical, as on the control surfaces. An exception to the wooden structure is the use of steel tube for the forward portion of the fuselage. This makes possible the layout of the cabin with its very conveniently placed and shaped doors.

The airplane (figs. 1, 2, and 3) with the 130 hp. Gipsy Major cruises at 125 m.p.h. with a pilot, two passengers, luggage, and enough fuel for 650 miles. Although the top speed is better than 145 m.p.h., the "Eagle" lands between 40 and 50 m.p.h. It can get off the ground in a very few seconds, actually it takes off in less than 200 yards.

The "Eagle" climbs steadily between 70 and 80 m.p.h. at 2,000 r.p.m. In a demonstration the pilot slowed the airplane down to 50 m.p.h. showing that there was still plenty of lateral control.

The pilot has a particularly good view. He sits on the front spar and can therefore see downward on each side, over the wings. The nose has been so shaped that the forward view is good, both from front and back seats. With the sliding windows shut the cabin is not drafty, and by two ingenious ventilating devices in the roof on each side of the pilot, the amount of incoming cool air can be adjusted (fig. 4).

The glazed lights in the roof of the cabin have been very well arranged. When the "Eagle" is on the ground these are so placed that both pilot and passengers can scrutinize the sky behind the airplane. Yet in the air, they do not allow the sun to annoy one, and the opaque patches of roof between them afford welcome shade.

The ease with which the landing gear is wound down is impressive, only a few turns of the handle on the

*From The Aeroplane, July 25, 1934.

right of the pilot being necessary. The mechanism locks itself so that all the pilot has to do is to slip the handle through a strap when he has finished with it. The position of the landing gear is shown on an indicator immediately in front of the Simmonds-Corsey throttle controls where such warning is most conspicuous.

The extended landing gear is, as such excrescences go, comparatively clean; pulling it into the wings adds 18 m.p.h. or so to the speed. It works so well that one cannot feel its motion. Only the tail wheel is at present audible in its working, and no doubt this will be silenced.

Unlike other British retractable landing gears in service, that of the "Eagle" works outward and the wheels when home are absolutely within the wings. The mechanism as it has been designed is along sound engineering lines. Each unit is mounted so that the shock absorber and the strut behind it are free to swing outward on universal joints. They are kept in position by lateral struts, the tops of which are free to move up and down inclined guides in the wings. When the wheels are down the lateral struts are at such an angle that they tend to push the crossheads at their tops harder against stops.

To pull the wheels up the crossheads are merely hauled up the guides by a neat adaptation of the Simmonds-Corsey control. The method of doing this can be clearly seen from figure 5.

Getting into and out of the airplane is easy. The door on each side opens right down to the wing and is so shaped that it forms part of the roof. When it is open, one can stand upright in the cabin before settling into one's seat (fig. 4).

From the aerodynamic aspect the "Eagle" is a low-wing cantilever monoplane over which every care has been taken to reduce drag by having the smallest number of external excresences and by laying out components to avoid interference. In this connection the arrangement and form of the fillets between the wings and fuselage are worthy of note. There are no signs of buffeting at any of the speeds or altitudes with a range from a dive well above top speed to slow glides.

A high aspect ratio has been adopted for both vertical and horizontal surfaces of the tail unit as well as for the wings. Another aerodynamic feature of note is the apparent smallness of the horn balance on the rudder. This is really an ingenious way of hiding the mass balance now considered necessary by those in authority.

A complete specification follows.

SPECIFICATION

Type.- Three-seat cabin monoplane.

Wings.- Low-wing cantilever monoplane. Dihedral angle 3°. Wings taper in chord and thickness and fold about rear spar. Single lever each side, normally locked shut by covering flap, withdraws bolts in upper and lower fittings. Wooden construction. Two built-up wooden box spars, plywood skin over stringers and ribs. Narrow tapered ailerons with mass balances working into undersides of wing. Wooden frame covered with fabric.

Fuselage.- Portion forward from rear spar, including engine mounting, of steel tube, mostly square. After portion plywood-covered structure of wood.

Tail unit.- Wire-braced plywood-covered fin and adjustable plywood-covered stabilizer. Wooden structure throughout. Elevator and rudder covered with fabric. Small horn balance on latter also conceals mass balance.

Landing gear.- Retractable type with Dunlop intermediate pressure wheels and Bendix brakes. British Klemm oleo shock absorbers with steel springs to absorb taxying shocks. Wheels are folded outward into wings by pulling tops of lateral bracing struts up along inclined slides within wing. Mechanism is self-locking in extended position. Wheels retained in retracted position by catch. Tracking tail wheel.

Power plant.- One 130-hp. Gipsy Major or 185-200-hp. Gipsy Six on welded steel tube mounting. One riveted duralumin tank of 20 gallons (91 liters) capacity on each side of fuselage in wings. One 2-1/2-gallon (11.4-liter) or 4-gallon (18.2-liter) oil tank, according to engine.

with left-hand end flush with cowling, so that it is cooled by slipstream. Two fuel pumps can be used together or separately.

Accommodation.- Pilot sits on adjustable seat over front spar. Normal controls. Brakes applied by lever in floor between rudder pedals, movement of latter gives differential application for steering. Handle for working retractable gear on starboard side. One seat right across back of cabin seats two in comfort. Luggage locker for three suit cases behind back seat. Rack for light luggage above. Door on each side of cabin. Controllable ventilation. Sliding glass panels in doors.

CHARACTERISTICS

Dimensions (either engine):

Length, over-all	7.9 m	26 ft. 0 in.
Height, over-all	2.05 "	6 " 9 "
Span	12.0 "	39 " 3 "
Width folded	4.52 "	14 " 10 "
Maximum chord	2.0 "	6 " 6.5 "
Aerodynamic chord	1.74 "	5 " 9 "
Wheel track	1.90 "	6 " 3 "
Aspect ratio	7.75	
Wing area	18.6 m^2	200 sq.ft.

Weights and loadings:	Gipsy Major 130-hp.	Gipsy Six 185/200-hp.
Weight empty, including standard fixed equipment	614 kg (1,350 lb.)	
Including " "		686 kg (1,510 lb.)
Pilot	73 kg (160 lb.)	73 kg (160 lb.)
Fuel, 162 liters (36 gal.)	126 kg (277 lb.)	
182 " (40 ")		140 kg (308 lb.)
Oil, 10 liters (2-1/4 gal.)	9 kg (22 lb.)	
12-1/2 " (2-3/4 ")		12 kg (27 lb.)
Pay load	224 kg (491 lb.)	179 kg (395 lb.)
Weight loaded	1,046 kg (2,300 lb.)	1,090 kg (2,400 lb.)
Wing loading	56.3 kg/m^2 (11.5 lb./sq.ft.)	58.5 kg/m^2 (12 lb./sq.ft.)
Power "	8.02 kg/hp (17.7 lb./hp.)	5.31 kg/hp (11.7 lb./hp.)
Performance:		
Maximum speed	236 km/h (148 mi./hr.)	272 km/h (170 mi./hr.)
Cruising "	208 km/h (130 mi./hr.)	237 km/h (148 mi./hr.)
Landing "	72 km/h (45 mi./hr.)	77 km/h (48 mi./hr.)
Take-off, with full load, in	178 m (195 yd.)	178 m (195 yd.)

Weights and loadings (cont'd.):	Gipsy Major 130-hp.	Gipsy Six 185/200-hp.
Initial rate of climb	3.56 m/s (700 ft./min.)	4.8 m/s (950 ft./min.)
Ceiling	4,850 m (16,000 ft.)	5,800 m (19,000 ft.)
Range	1,040 km (650 mi.)	960 km (600 mi.)

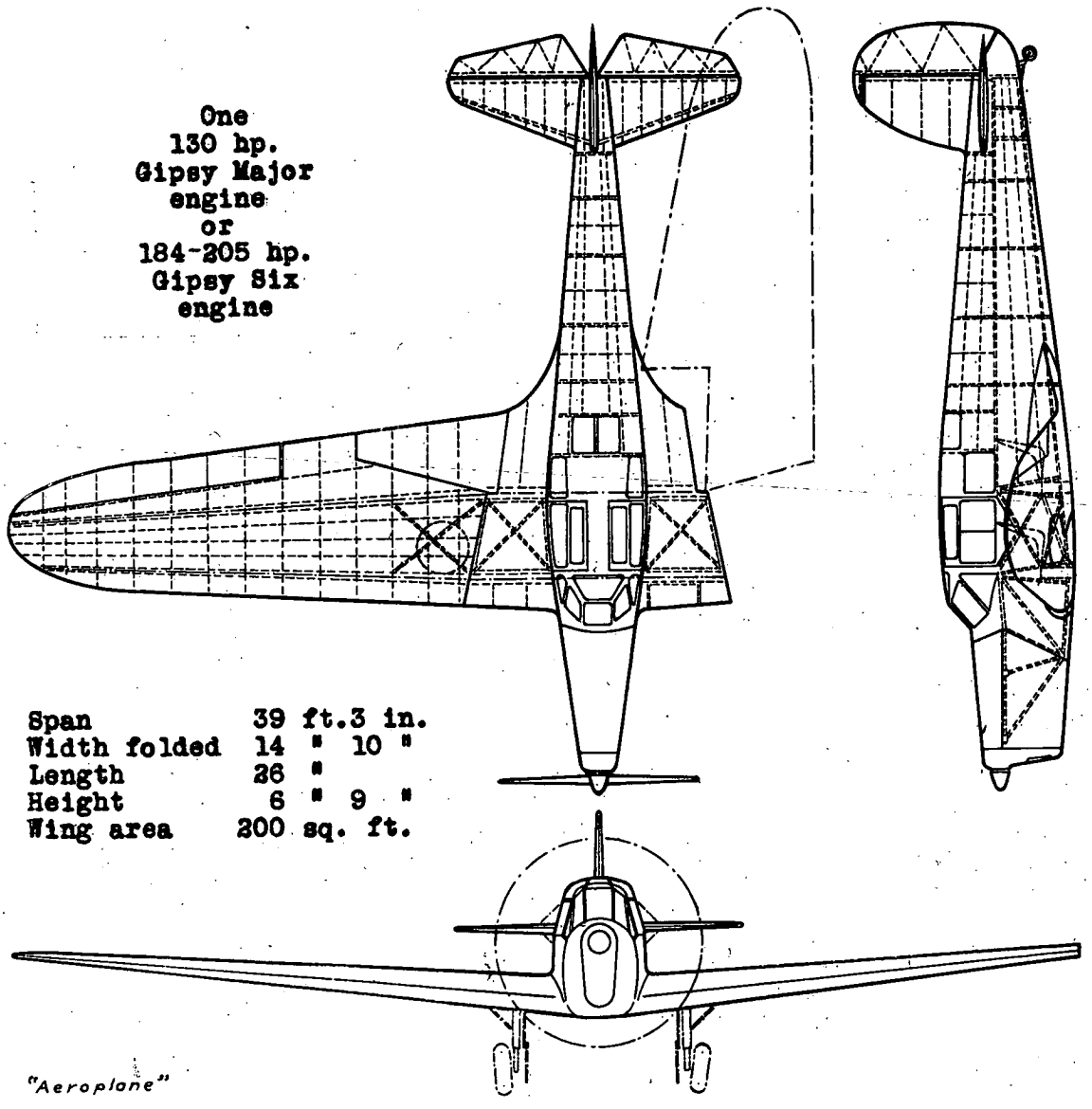


Figure 1.-General arrangement drawings of the British Klemm Eagle airplane.

Figure 2.-Three-quarter front view of the British Klemm Eagle airplane in flight.

Figure 3.-Three-quarter rear view of the British Klemm Eagle airplane.
(130 hp. Gipsy Major engine.)

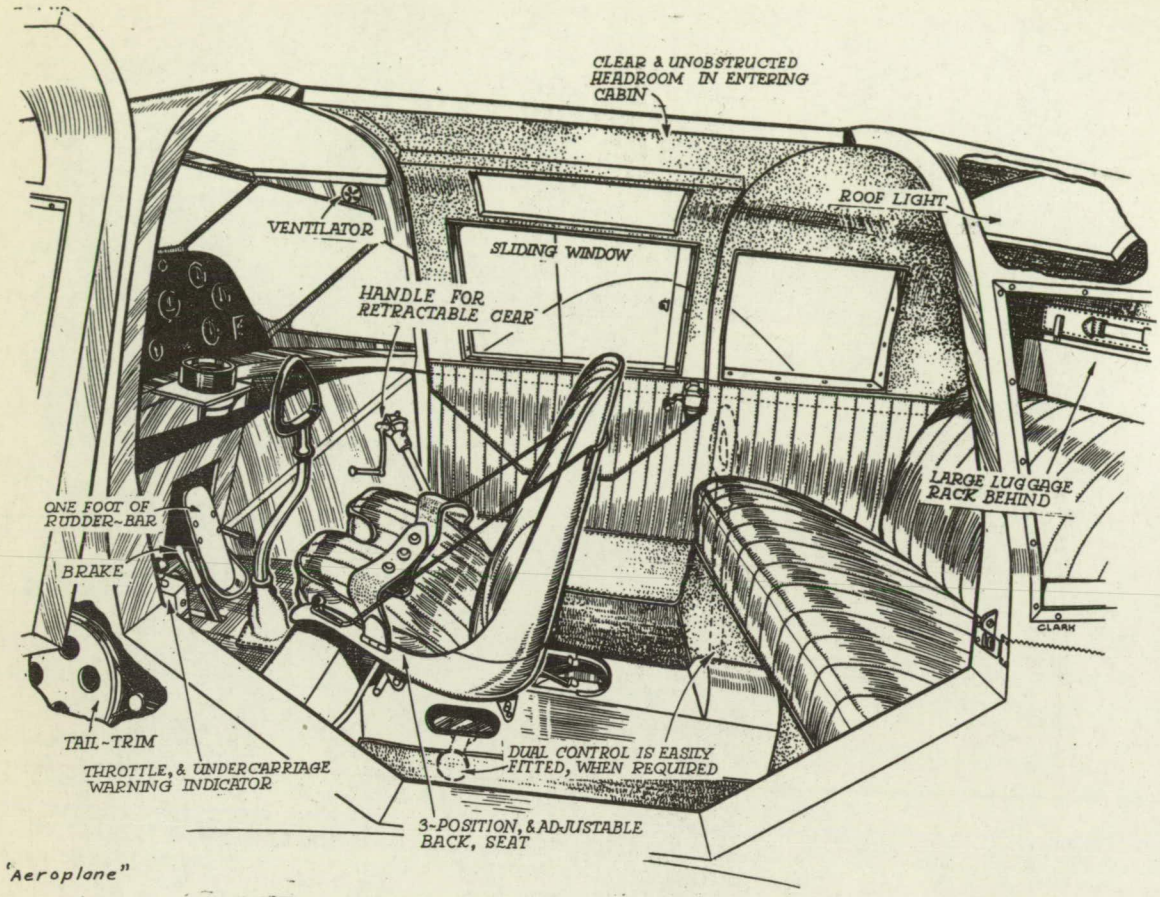


Figure 4.-The commodious layout of the cabin of the Klemm Eagle airplane. The back of the seat folds forwards and discloses a locker for three large suitcases.

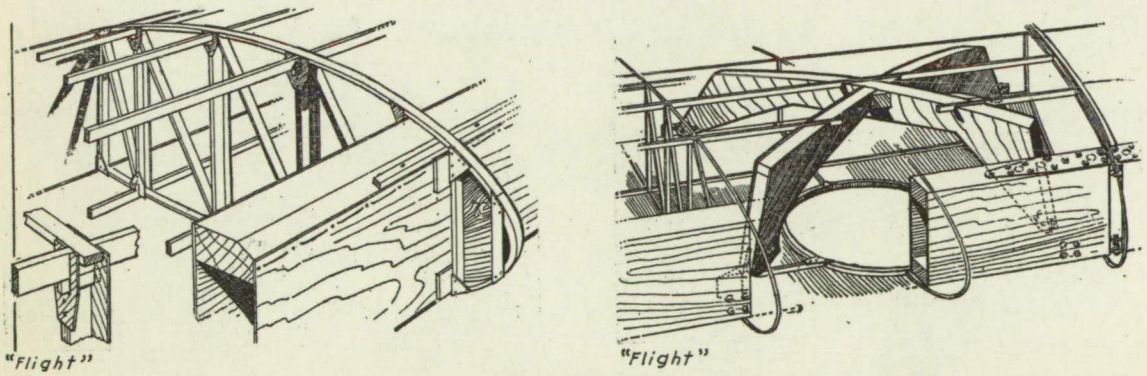
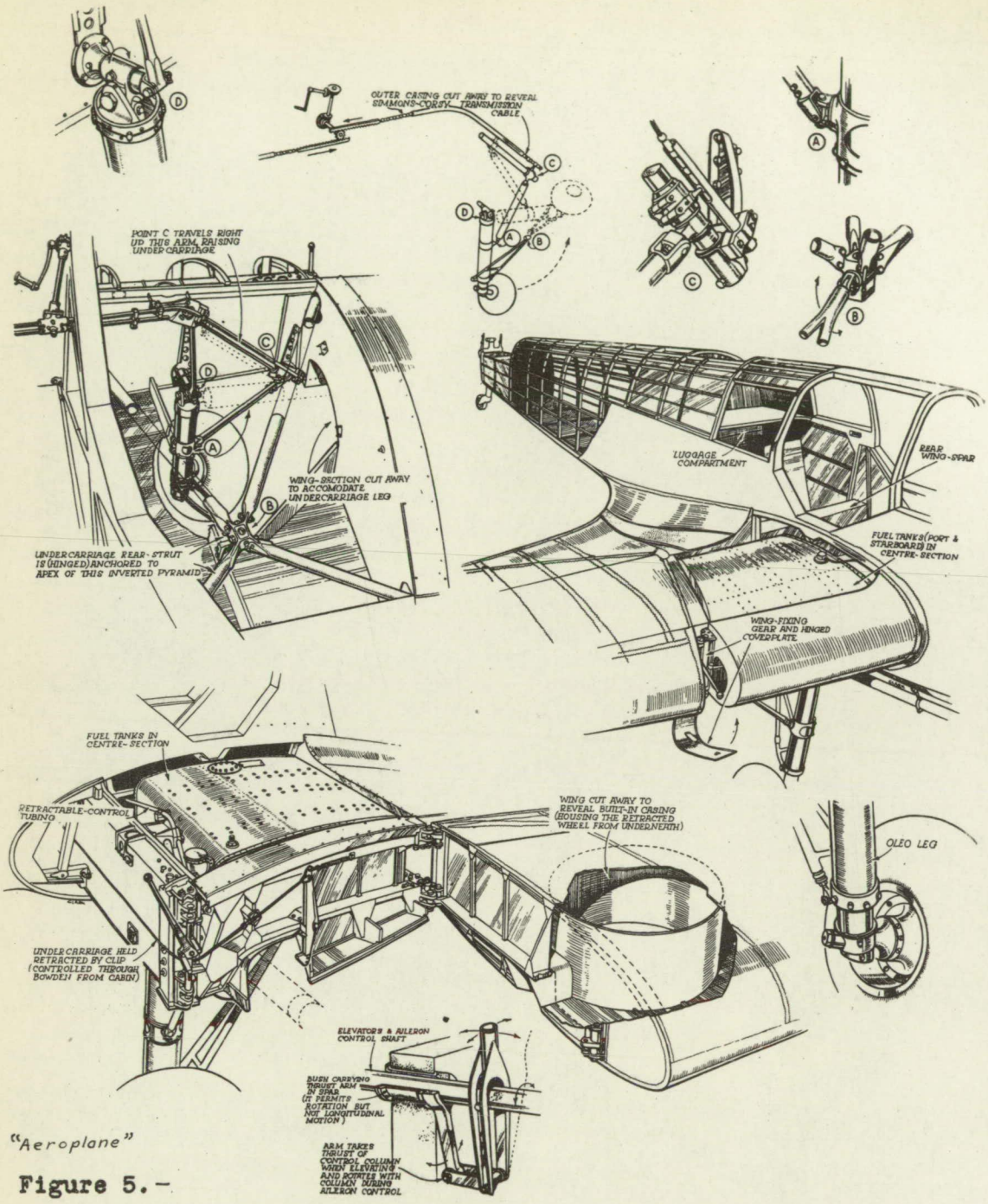


Figure 6.-British Klemm Eagle details. On the left is shown how the spruce ribs are stabilized with stringers and carried over the box spars. The right-hand sketch is a view of the special bracing over that portion of the wing into which the landing gear wheel retracts.



"Aeroplane"

Figure 5.–

STRUCTURAL DETAILS AND COMPONENTS OF THE BRITISH KLEMM EAGLE.—In the middle, on the left, is a sketch of the starboard side of the retractable undercarriage seen through the top of the wing. Along the top are sketches of various details of the gear and a diagram explaining how it works. The lettering is the same for the whole series of sketches. The application of the Simmonds-Corsey control gear is specially interesting. The sketch in the middle shows some of the main structural features. At the bottom, on the left, the method of folding the wings and the neat lever arrangement for withdrawing the locking bolts can be clearly seen. The catch for holding up one side of the undercarriage in the retracted position is also shown. Obviously, when the wing is in flying position the wheel fits into the cavity seen in the cutaway portion of the folded wing. Right at the bottom of the page, in the middle, is a sketch of the extremely ingenious method of mounting the control column. By this means, both a rotary and fore-and-aft sliding motion can be given to the tube, which forms the control shaft for elevators and ailerons.