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# THE MESSERSCHMIDT M.29 TOURING AIRPLANE (GERMAN)

## A Two-Seat Cantilever Monoplane

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NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

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# THE MESSERSCHMIDT M.29 TOURING AIRPLANE (GERMAN)*

## A Two-Seat Cantilever Monoplane

### INTRODUCTION

The announcement of the 1932 international European circuit flight led the Messerschmidt Airplane Company to develop a new sport and touring airplane especially adapted to the purpose in as many points as possible. This development simultaneously led to considerable enrichment of our building program, in that an airplane was produced with a range between the maximum and minimum speed greater than any previously attained. This airplane (figs. 1, 2, 3, 4, and 5) is therefore especially acceptable to the fastidious private individual, as well as to the business man, who is thereby enabled to shorten considerably his usual traveling time. Hitherto such fast airplanes had found little favor among private flyers, because high flying speed had always been accompanied by high landing speed. Exhaustive aerodynamic investigations at Göttingen have shown, however, that this airplane has a maximum speed of 260 km (161.6 mi.) and a landing speed of only 55 to 60 km (34 to 37 mi.) per hour.

The great power excess permits a strong throttling of the engine and consequently a saving of the driving gear. Special attention is called to the fact that, due to the increase in the flying speed, it is even more economical than other sport airplanes.

### FLIGHT CHARACTERISTICS

The controls and control forces are well balanced. The flaps with slots on the trailing edge of the wing afford a high degree of safety in slow flight, which is

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*From information furnished by the manufacturers, the Messerschmidt Flugzeugbau, G.m.b.H., Augsburg, Germany, and the Z.F.M., of October 14, 1932.

still further increased by the fact that the angle of attack of the ailerons lags somewhat when the angle of attack of the flaps is increased. With the flaps fully deflected the wing behaves like the Zanonia wing. Moreover, the wing tips are slightly warped, in order to prevent the separation of the air flow at large angles of attack. The properties of the flaps and ailerons render it possible to make a stalled landing without leveling off. The airplane is also distinguished by great maneuverability.

## CONSTRUCTION AND GENERAL EXECUTION

### Wing Structure

The wooden wing has a single spar and is wholly cantilever. It has a pronounced taper and a special profile of extraordinarily favorable dynamic properties. The lower side of the wing has a $6^\circ$ dihedral. The wing section is of medium thickness and so shaped that the drag coefficient at small angles of attack approaches that of a racing plane. In order to keep the landing speed low, the trailing edge of the wings is provided with flaps and slots. Each wing has a flap and an aileron. (Figs. 6, 7, and 8.) The flaps are controlled by a simple lever in the pilot's cockpit and return automatically, if the control pressure exceeds a certain amount. Thus the wing stresses are always kept within permissible limits. With these flaps the wing is equivalent to one that has a ratio of over 200 between maximum lift and minimum drag. There is no rigid profile which even approximates this value. This profile characteristic, in combination with the good aerodynamic design of the rest of the airplane, especially of the landing gear, explains the great difference between the maximum and minimum speeds.

With drawn-in flaps, and therefore at high speed, the wing profile is equivalent to a profile with a fixed center of pressure, so that the torsional stresses of the wing are small at high speeds.

The wing structure consists of a torsionally rigid leading edge formed by the single spar and the leading-edge planking. This has the advantage of an especially high critical speed as regards vibrations. The fabric-covered ribs are joined to the leading edge. Each wing is attached to the fuselage at three points.

## Fuselage

The fuselage has a triangularly braced tubular steel frame with fabric covering. Its cross section is practically rectangular. The covering is designed to give a favorable aerodynamic shape with an air-cooled vertical or radial engine. The fuselage frame to which the wing spars are attached is constructed of especially strong girders. Moreover, the frame to which the landing gear is attached, is likewise strongly braced. At the tail end of the fuselage, the tubular steel structure is continued in the vertical fin. (Fig. 9.)

The top of the fuselage is built up in cabin form, so as to enclose both pilot and passenger. It is so constructed as to provide good visibility, especially in landing. The semicircular covers can be tipped back from both cockpits as shown in Figure 10. Attention is called to the transparent side walls which help to illuminate the closed cabin and improve the view. In leaving the cabin these side walls are let down. In order to leave the airplane as quickly as possible in an emergency, the whole fuselage top can be quickly detached by a single handle. The seats are roomy and provided with arm rests. Articles can be passed from one seat to the other, and conversation is possible when the top is closed. Back-pack parachutes can be worn. Behind the seats there is a baggage compartment of about 0.1 $m^3$ (3.5 cu.ft.).

## Tail Surfaces

All the tail surfaces are made of wood and covered with fabric. The use of a mechanical stabilizer which can be operated by the pilot makes it possible to dispense with the horizontal stabilizer. With the mechanical stabilizer it is possible to stabilize the airplane at any desired speed, which has hitherto not been possible even for airplanes provided with adjustable stabilizers.

## Landing Gear

The "cantilever" landing gear consists simply of two pneumatic struts of strong material, which can absorb all landing shocks. (Figs. 11, 12, and 13.) The whole height of the fuselage is utilized for the installation of these struts. The shock absorbers have a stroke of 30 to 40 cm (12 to 16 in.). The wheels have low-pressure balloon tires and are provided with brakes. Struts and wheels are both faired.

The landing gear, including the tail skid, is made very strong, so that it can withstand a vertical drop of 3.5 m/s (11.5 ft./sec.), which is comparable to a stalled landing. The pneumatic damping is softer than oil damping. Moreover, this is supplemented by the low-pressure tires, so that the damping effect of the whole landing gear is comparable to that of a modern automobile. The metal skid is damped by rubber cords and is swiveled to facilitate taxying. The whole landing gear is designed to withstand abnormal stresses and offer as little resistance as possible to the air.

## Controls

All the controls are easily operated, and the several parts can be quickly replaced. They consist of cables and push rods. A control stick is used. (Fig. 14.)

The airplane can be fitted with dual controls, which can be disconnected by the pilot, simply by turning the head of his control stick, without removing his hand from the latter or from the throttle.

## Power Plant

The airplane is designed for air-cooled engines of 100 to 150 hp. Normally one of the following engines is installed:

a 130 to 150 hp Argus As 8 R 4-cylinder in-line, with inverted cylinders;

or a 130 to 150 hp Siemens Sh 14a 5-cylinder radial.

The engine is mounted on simple steel-tubing supports. On turning back the divided cowling, the engine (especially the magnetos and carburetor) is easily accessible. The cowling is made of smooth sheet elektron. The radial engine is covered with an N.A.C.A. cowling to reduce the drag. All the tubes are flexible rubber. The Argus engine is started by a hand crank; the Siemens by compressed air.

The fuel tank is in the front end of the fuselage behind the fire wall. The fuel is delivered to the engine by gravity. The tanks can be easily removed. The fuel tank holds 120 liters (about 32 gallons), which gives a radius of action of about 700 km (435 mi.).

With the Argus engine the oil tank is in the bottom of the fuselage, where it has the requisite cooling. With the Siemens engine the oil tank is on the upper side of the fuselage in front of the fire wall and is screened from the rest of the power plant.

## Instruments

The following instruments are provided: altimeter, compass, turn indicator, clock, speedometer, revolution counter, ignition and short-circuit switches, oil thermometer, oil manometer, fuel gauge, Athmos pump.

The instruments are so distributed in the pilot's cockpit, that one half serves for the power-plant control, while the other half is for navigating. The transparent front and sides of the cabin illuminate the instrument board and enable quick and accurate readings.

## Miscellaneous Details

Both seats are adjustable by means of a convenient lever. This adjustment is easily made by the person occupying the seat.

The rudder bar can be accurately adjusted to the reach of the pilot or his companion. The brake lever is connected with the rudder bar, so that the operation of the rudder can be supported by the braking action. The chairs are upholstered and provided with arm rests.

The strength of the various elements corresponds to the specifications of the aircraft committee.

Other views of this airplane taken prior to the 1932 International Air Tour are given in Figures 15, 16, and 17. This airplane, however, did not take part in this tour.

## CHARACTERISTICS

| | | |
|---|---|---|
| Engine | Argus | Siemons |
| Type | As 8 R | Sh 14 a |
| Kind | air-cooled in-line | air-cooled radial |
| Power normal | 130 hp | 130 hp |
| Power maximum | 150 hp | 150 hp |
| Weight empty | 390 kg (859.80 lb.) | 400 kg (881.85 lb.) |
| Pilot | 80 kg (176.37 lb.) | 80 kg (176.37 lb.) |
| Fuel | 110 kg (242.51 lb.) | 110 kg (242.51 lb.) |
| Useful load | 120 kg (264.55 lb.) | 110 kg (242.51 lb.) |
| Total | 310 kg (683.43 lb.) | 300 kg (661.39 lb.) |
| Weight loaded | 700 kg (1,543.23 lb.) | 700 kg (1,543.23 lb.) |
| Maximum speed | 262 km/h (162.8 mi./hr.) | 254 km/h (157.8 mi./hr.) |
| Crusing speed (throttled 15%) | 225 km/h (139.8 mi./hr.) | 220 km/h (136.7 mi./hr.) |
| Landing speed (with full load) | 60 km/h ( 37.3 mi./hr.) | 60 km/h ( 37.3 mi./hr.) |
| Landing speed (fuel exhausted) | 55 km/h ( 34.2 mi./hr.) | 55 km/h ( 34.2 mi./hr.) |
| Climbing speed (at sea level) | 6.5 m/s (21.3 ft./sec.) | 6.5 m/s (21.3 ft./sec.) |

| | Argus | Siemens |
|---|---|---|
| Climbing time to 1,000 m (3,280 ft.) | 3 min. | 3 min. |
| " " " to 2,000 m (6,562 ft.) | 6.5 " | 6.5 " |
| " " " to 3,000 m (9,842 ft.) | 11 " | 11 " |
| " " " to 4,000 m (13,123 ft.) | 17 " | 17 " |
| " " " to 5,000 m (16,404 ft.) | 26 " | 26 " |
| Practical ceiling | 6,000 m (19,685 ft.) | 6,000 m (19,685 ft.) |
| Theoretical " | 7,000 m (22,966 ft.) | 7,000 m (22,966 ft.) |
| Fuel | 120 liters (31.7 gal.) | 120 liters (31.7 gal.) |
| Oil | 12 liters (3.2 gal.) | 12 liters (3.2 gal.) |
| Fuel consumption | 230 g/hp/h (.51 lb./hp/hr.) | 230 g/hp/h (.51 lb./hp/hr.) |
| Oil " " | 12 g/hp/h (.026 lb./hp/hr.) | 12 g/hp/h (.026 lb./hp/hr.) |
| Flight duration (15 per cent throttled) | 3.2 h | 3.2 h |
| Flight range (15 per cent throttled) | 700 km (435 mi.) | 700 km (435 mi.) |
| Span | 11 m (36.09 ft.) | 11 m (36.09 ft.) |
| Length | 7.75 m (25.43 ft.) | 7.75 m (25.43 ft.) |

| | Argus | Siemens |
|---|---|---|
| Height | 2 m (6.56 ft.) | 2 m (6.56 ft.) |
| Wing area | 14.5 $m^2$ (156.08 sq.ft.) | 14.5 $m^2$ (156.08 sq.ft.) |
| Wing loading | 4.8 $kg/m^2$ (.98 lb./sq.ft.) | 4.8 $kg/m^2$ (.98 lb./sq.ft.) |
| Power loading | 4.7 kg/hp (10.36 lb./hp) | 4.7 kg/hp (10.36 lb./hp) |
| Power per unit area | 10.4 $hp/m^2$ (.97 hp/sq.ft.) | 10.4 $hp/m^2$ (.97 hp/sq.ft.) |

All numerical data carry tolerances of ± 5 per cent; take-off, climbing and landing performances, 10 per cent. All performance data refer to the normal day (C.I.N.A.). A reduction of 15 per cent in the r.p.m. corresponds to about 40 per cent reduction in the power output.

Translation by Dwight M. Miner, National Advisory Committee for Aeronautics.

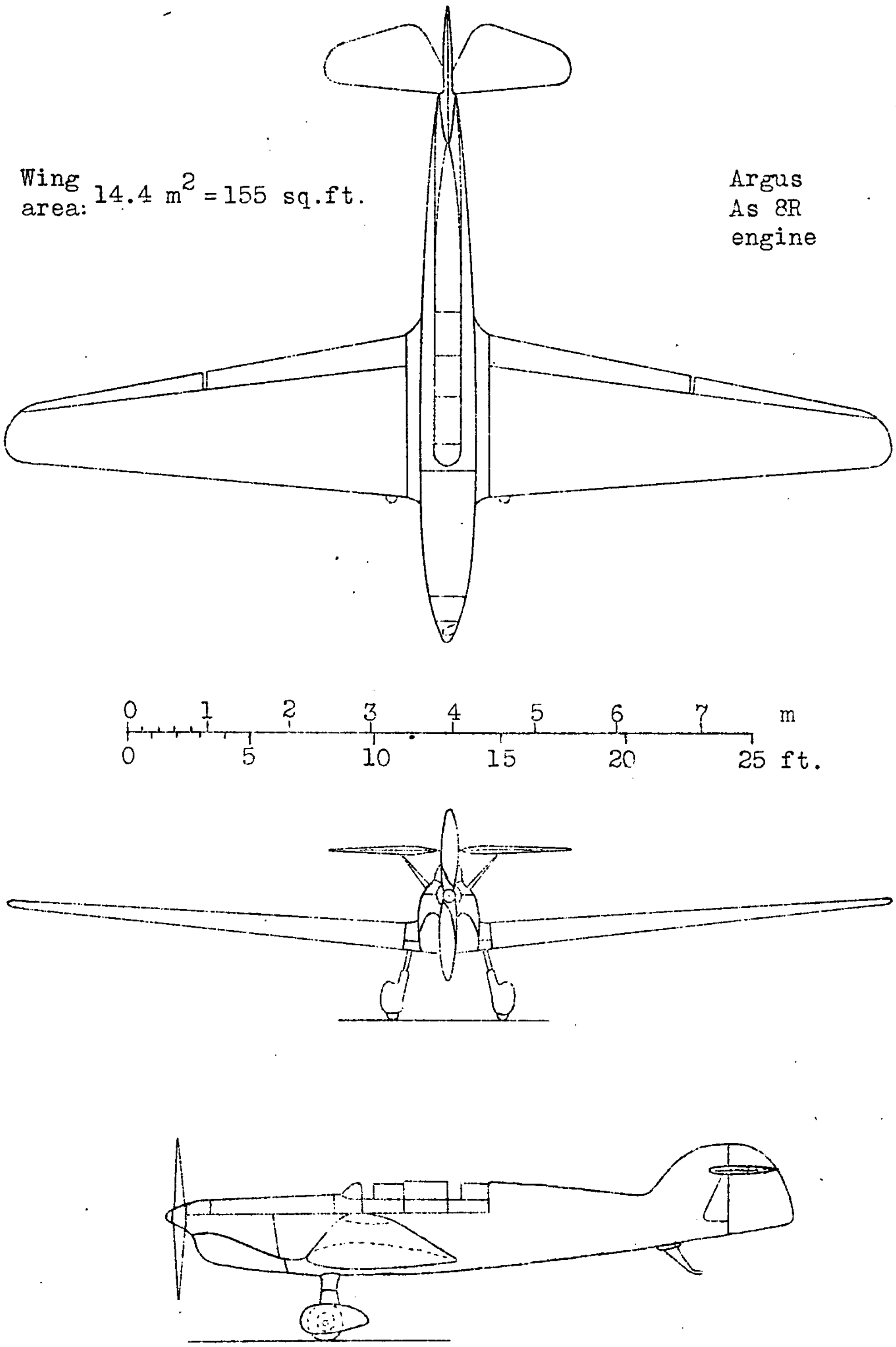



Fig. 1 General arrangement drawing of the Messerschmitt M29 airplane.


Fig. 2

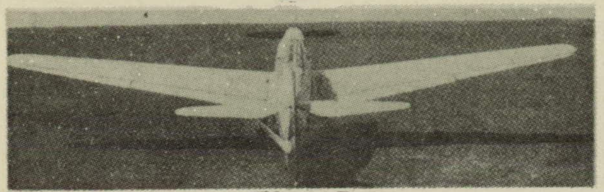


Fig. 3

Fig. 4

Fig. 5

Figs. 2,3,4,5 The Messerschmitt M29 airplane with the Argus As 8R in-line air-cooled and the Siemens Sh 14a radial air-cooled the latter equipped with the N.A.C.A. or Townend cowling.

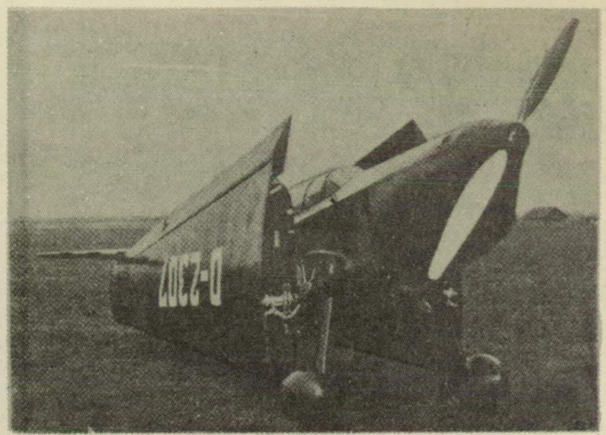


Fig. 6

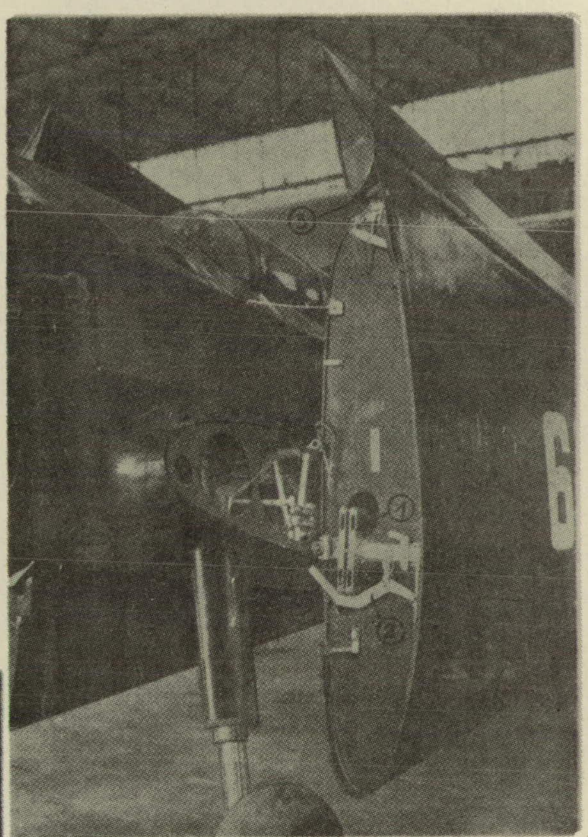



Fig. 7

Figs. 6,7 Messerschmitt M29 with wings folded. The necessity of disconnecting and connecting the controls (push rods) is avoided by sliding levers (1) at their free ends. The correct position of the operating lever (2) secures the ailerons and flaps in their middle position. The slot (3) is very carefully designed.

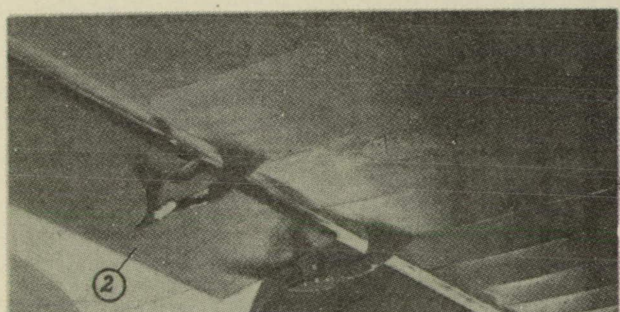



Fig. 8 Wing of M29 showing landing flap, (1) deflected with slot open and aileron (2).

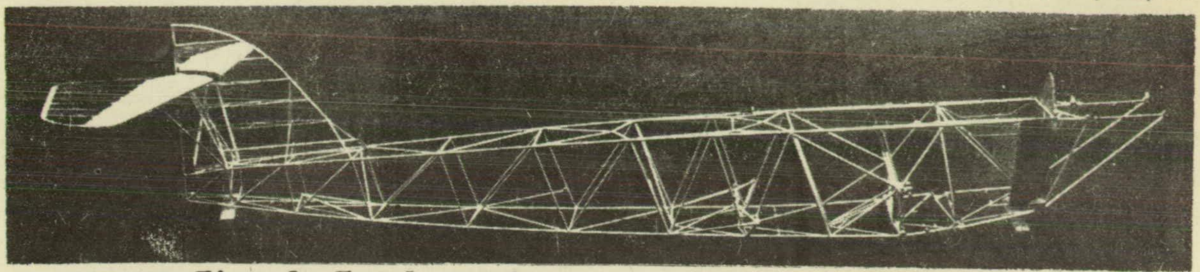


Fig. 9 Fuselage structure of Messerschmitt M29

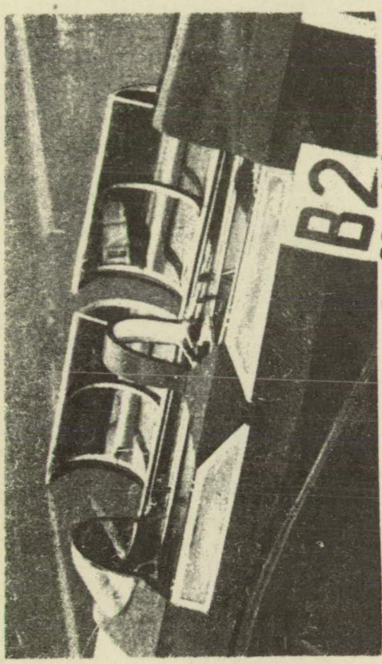



Fig. 10 Cockpits of M29 with covers open.

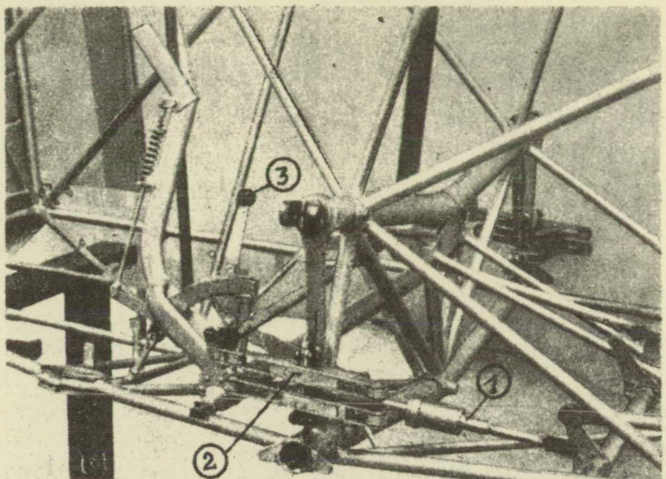



Fig. 14 Steering gear of M29. (1) Spring for insuring stability with controls released. (2) Double lever with rollers for ailerons and flaps. (3) Lever for actuating the stabilizing spring.

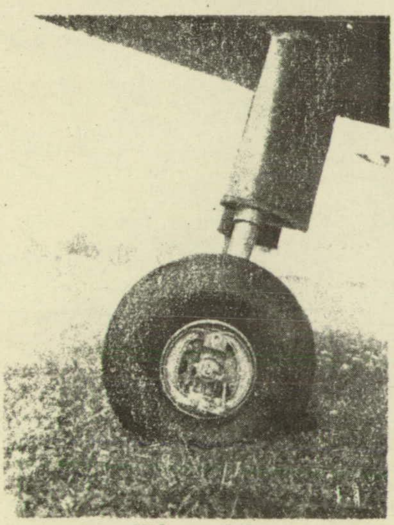


Fig. 11

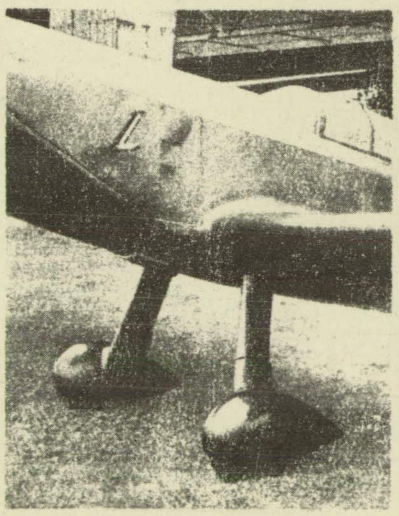


Fig. 12

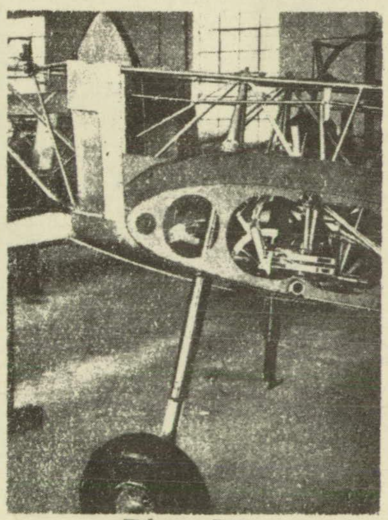


Fig. 13

Figs. 11,12,13 Landing gear of M29, The brake drums are on the outside of the wheels for better accessibility.


Fig.16

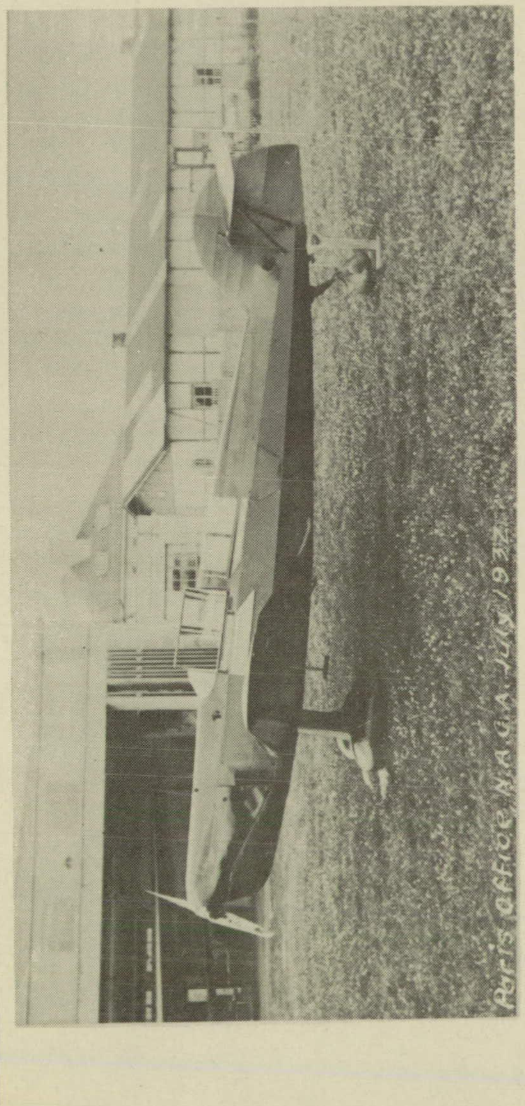
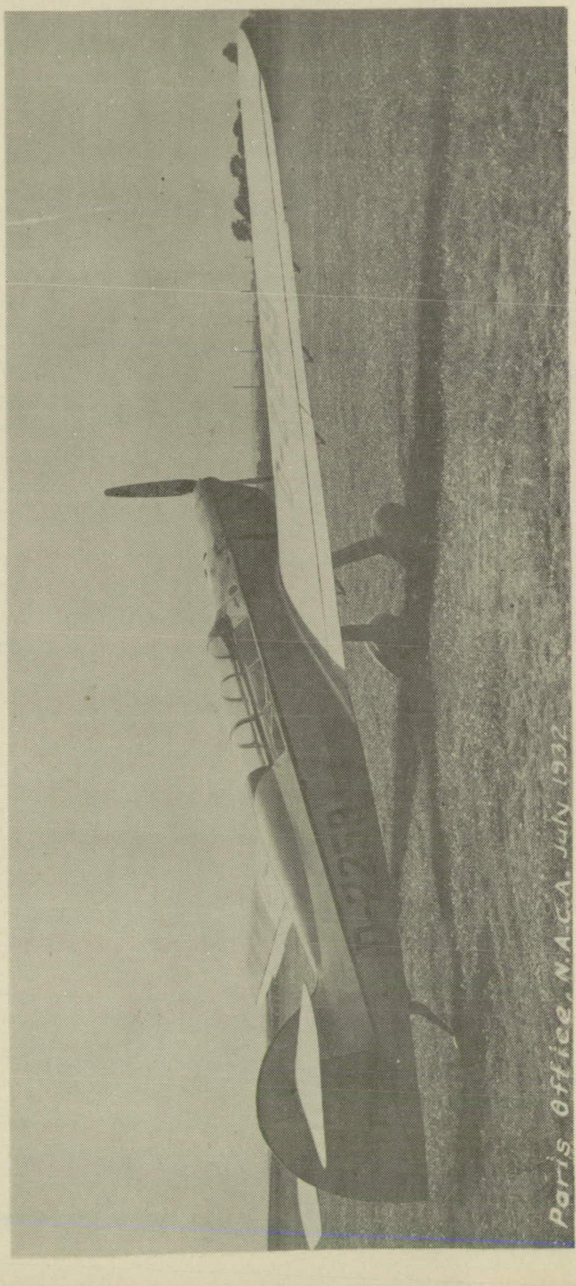



Fig.15




Figs.15,16,17 Views of the B.F.W. M.29 monoplane for 1932 International Air Tour. (Argus As 8R engine.)