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ARROW GROUND SERVICING EQUIPMENT

USE OF GIRAFFE - MODEL IG. 40T

Report No. 70/GEQ/3-2

July 1958.

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J. H. PARKIN
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ANNEXE
J. H. PARKIN
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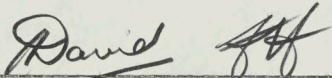
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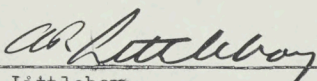
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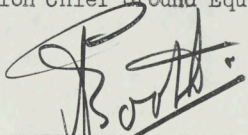
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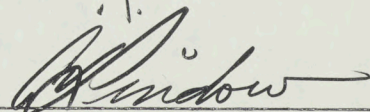
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ENGINEERING DIVISION

AVRO AIRCRAFT LIMITED, MALTON, ONTARIO

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ARROW GROUND SERVICING EQUIPMENT

USE OF GIRAFFE - MODEL IG. 40T

1. INTRODUCTION

It was agreed at the 14th meeting of the Arrow G.S.E. sub committee that Avro would investigate the suitability of a Giraffe Model IG-40T, for the removal and replacement of certain Arrow airframe components which require the use of a lifting device or light crane.

For this purpose, a trailer mounted model IG-40T (RCAF reference 4G/2868) was loaned to Avro for a period of one month, commencing 2 July 1958.

2. CONCLUSIONS

A full demonstration of all applications to Arrow servicing was not made due to non-availability of a production Arrow, and various component slings, but it is concluded from handling trials and cockpit seat removal and replacement in the mock-up, that the Giraffe is eminently suitable as a light crane. However the usefulness of the trailer model is limited, as it is not propelled.

3. RECOMMENDATIONS

- (a) That a modification consisting of an hydraulic drive to permit self mobility at 2 mph. plus hydraulic steering be incorporated.
- (b) That certain refinements be made to the platform controls and that other minor modifications be made as in chapter 4.4.
- (c) That electrical sockets for 550V and 110V external supply to the vehicle be standardized to RCAF specification GHE 94-4 Issue 1 (Jan. 13/58).
- (d) That Avro Malton be supplied with a modified unit for further evaluation. If this can be arranged in time, it is proposed that the subject equipment be demonstrated at the G.S.E. demonstration to be held week commencing 29 September 1958.

4. REPORT ON TESTS AT MALTON

4.1 Description

The model tested was the Trump Giraffe, Serial Number 9452-56 (RCAF reference 4G/2868) manufactured by Trump Ltd. of Oliver B.C. Canada.

The unit consists of two hydraulically operated booms capable of lifting men or material to a working height of 40 feet. The equipment can be mounted on either truck or trailer. The unit tested was mounted on a 4 wheeled trailer.

4.1 Description (Cont'd)

The chassis unit houses a dual pump system; one is operated by a 550 volt 60 cycle motor and the other by a 16 HP Wisconsin gasoline engine.

Hydraulically operated outriggers can be extended to provide stability during operation.

The Giraffe can be controlled in elevation and rotation from either the platform on the end of the boom, or from the chassis.

The jib shown in the illustrations was provided with the Giraffe. The maximum load from the jib with a man on the platform is 500 pounds. Alternatively 1000 pounds may be lifted on the platform, throughout the complete range of movement.

The range of movement and loading dimensions are shown in Fig. 1.

4.2 Proposed Uses

Using the Giraffe as a light crane with suitable component slings, it will be possible to remove and replace the following:

Aileron	168 lbs.
Aileron control box	330 lbs.
Elevator	232 lbs.
Elevator control box	410 lbs.
Rudder	124 lbs.
Rudder control box	245 lbs.
Turbine - Air Conditioning	87 lbs.
Heat exchanger air conditioning	184 lbs.
Boiler air conditioning	120 lbs.
Seat - Pilot and navigator	114 lbs.
Cockpit canopy (clamshells)	75 lbs. each

In addition, the Giraffe may be used as a servicing platform for rudder, rudder control box and infra-red installation inspections or as a platform for washing; painting or de-icing.

4.3 Extent of Tests

Preliminary handling trials were made on 10th July 1958, using a 500 pound test weight suspended from an Avro supplied 1 ton chain hoist connected to the jib by an Avro supplied U-shackle. On the 14th July 1958, a dummy cockpit seat was installed, removed and replaced in the Arrow wooden mock-up, with the RCAF maintenance appraisal team in attendance. The time taken from the seat on the hangar floor to installed was $2\frac{1}{2}$ minutes and similar for removal.

This was the limit of the tests possible at the present time.

4.4 Observations

4.4.1 Capability

The platform has a working height ranging from $2\frac{1}{2}$ feet to 36 feet in the case of a truck mounted unit, and 6 inches to 34 feet in the case of the trailer mounted unit. The maximum horizontal extension from the centre of the turn table to the front edge of the platform is $23\frac{1}{2}$ feet.

With this elevation and horizontal reach, the complete aircraft can be covered by the working platform.

The jib height is 8 feet above the base of the platform making an overall head room of 44 feet necessary for full range operation.

However, only 25 feet head room is required for Arrow seat removal. This dimension will also cover rudder and rudder box removal.

The 500 pounds capacity on the jib is adequate for all proposed uses.

4.4.2 Mobility

Considerable difficulty was experienced in positioning the trailer alongside the aircraft by reversing with a tractor as prime mover, as the trailer weighs about 10,000 lbs. This will certainly be a hazard when manoeuvring in a hangar, amid other aircraft and ground equipment. The collision and aircraft damage risk is high.

This may be obviated by providing a degree of self mobility by hydraulic drive and hydraulic steering for which a modification kit is believed to be available. This is priced at about \$1,500. i.e. about 9% of the total price. The alternative is to mount the unit on a truck which in itself would tend to forfeit mobility within the hangar on account of its size.

4.4.3 Sensitivity

Infinite fineness of control is possible in elevation and azimuth within the limitation of the operator's ability to move his selector. An improvement in selectors is desirable. This may be achieved by increasing the mechanical advantage of the selector levers. The foot operated selectors on the platform are coarser than the hand operated selectors on the chassis and shudder is apparent on cut-off. However, a high degree of skill is not necessary to obtain satisfactory control.

4.4.3 Sensitivity (Cont'd)

It is recommended that safety stops be fitted for placement under the foot and knee controls on the platform to prevent inadvertant operation, and that identification be provided for each control.

4.4.4 Accessories

- (a) The present 550 volt and 110 volt 60 cycle inlets and outlets are non-standard. These should be to RCAF specification G.H.E. 94-4 Issue 1.
- (b) A 100 foot extension cable is required for 550 volt with suitable stowage on the vehicle.
- (c) The tow arm should incorporate a standard ring hitch for RCAF tractors. It presently has a hole for a one inch diameter pin.
- (d) Stowage is necessary on the chassis for the jib when not in use.
- (e) A 1 ton chain hoist was supplied by Avro for use on the jib for cockpit seat removal. A chain hoist is necessary as the seat withdraws at an angle and damage to the slipper rail is to be avoided.

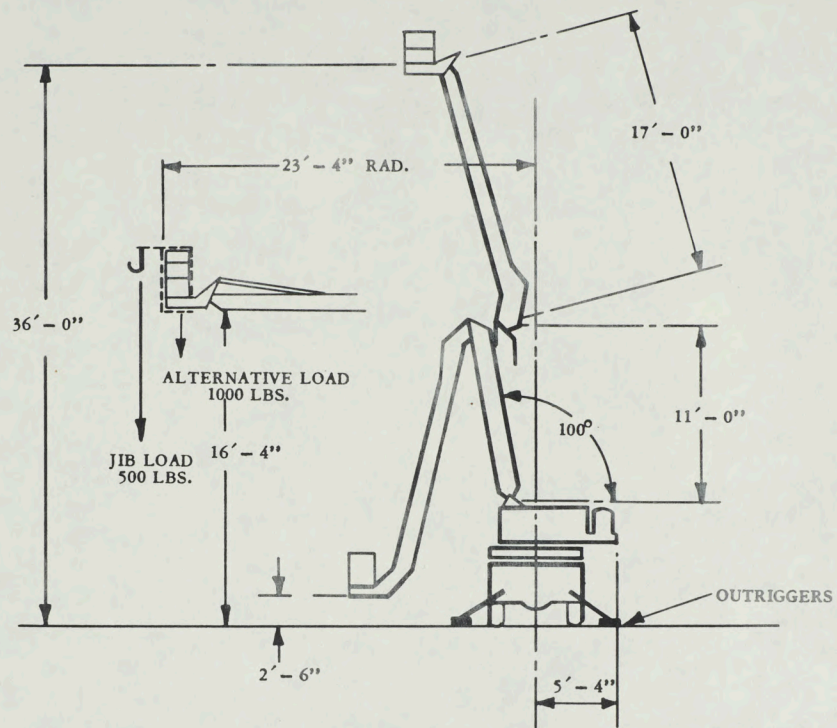
The hoist was a Cyclone model "M" (DND item 1574 R60) with an 8 foot chain. At this length, the base of the platform just fouls the open cockpit clamshells. A 10 foot chain is recommended to avoid this situation.

4.4.5 Safety

Positive hydraulic locks in the elevating mechanism in the form of flow control valves are essential to prevent collapse in the event of hydraulic failure.

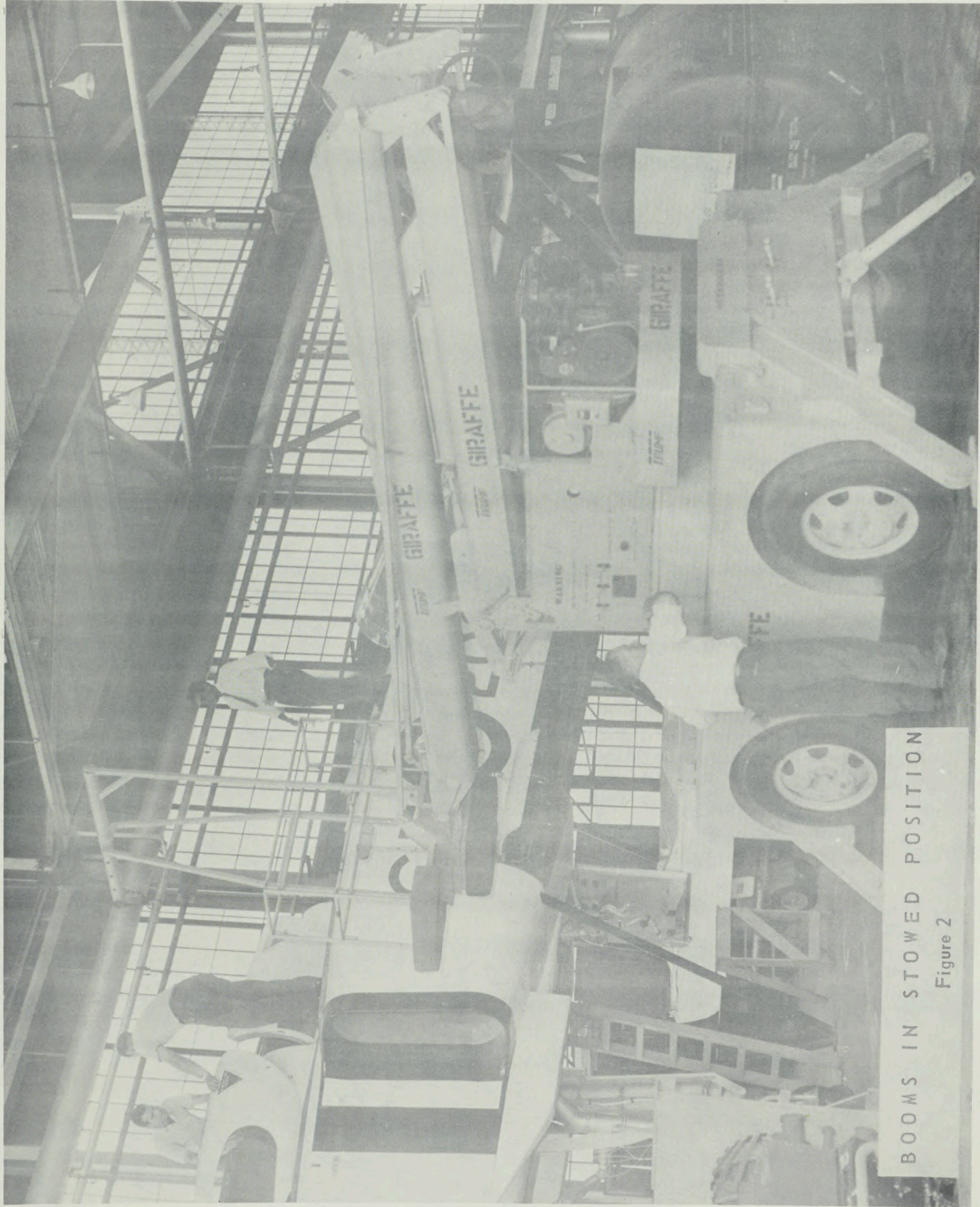
These were fitted on the Giraffe loaned to Avro but no tests made on them.

The alternative form of safety device, a metering orifice is not acceptable for aircraft work as even a controlled rate of descent in emergency might well impose a load on some part of the aircraft on which the platform might come to rest.



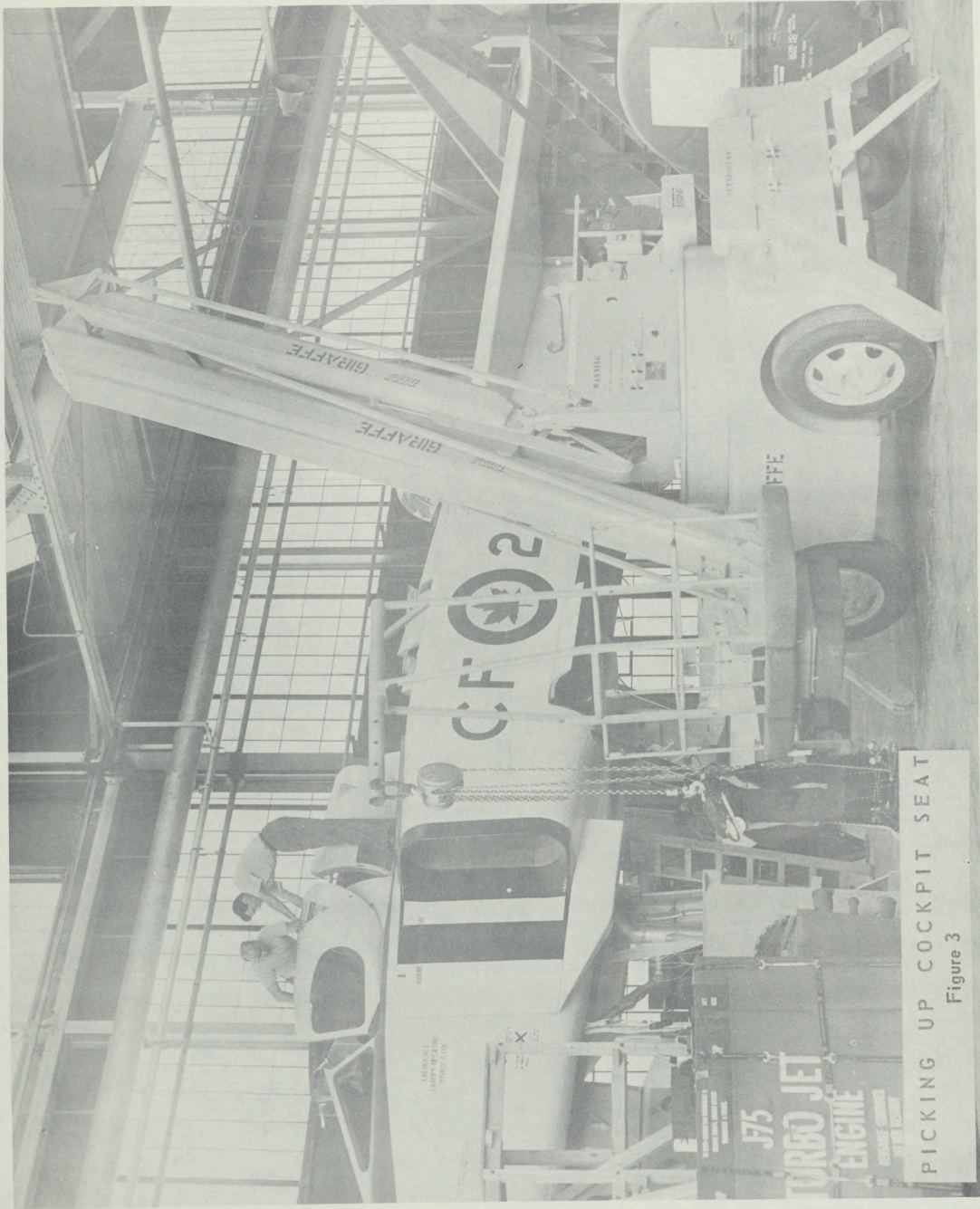
GIRAFFE MODEL IG - 40 T
 OVERALL DIMENSIONS
 MAX LOAD OF 1000 LBS AT 23' - 4" RAD
 WITH OUTRIGGERS

Figure 1



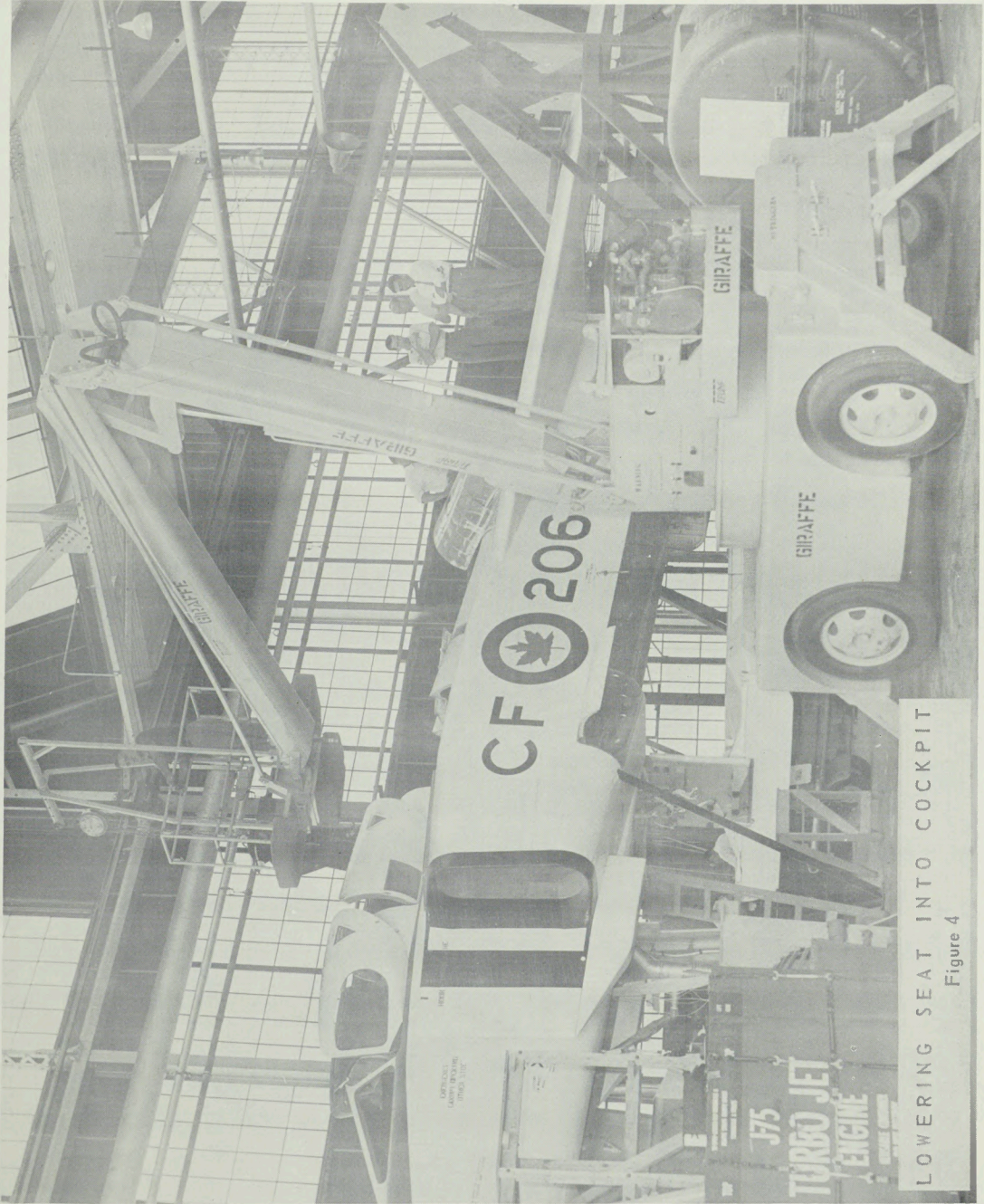
BOOMS IN STOWED POSITION

Figure 2

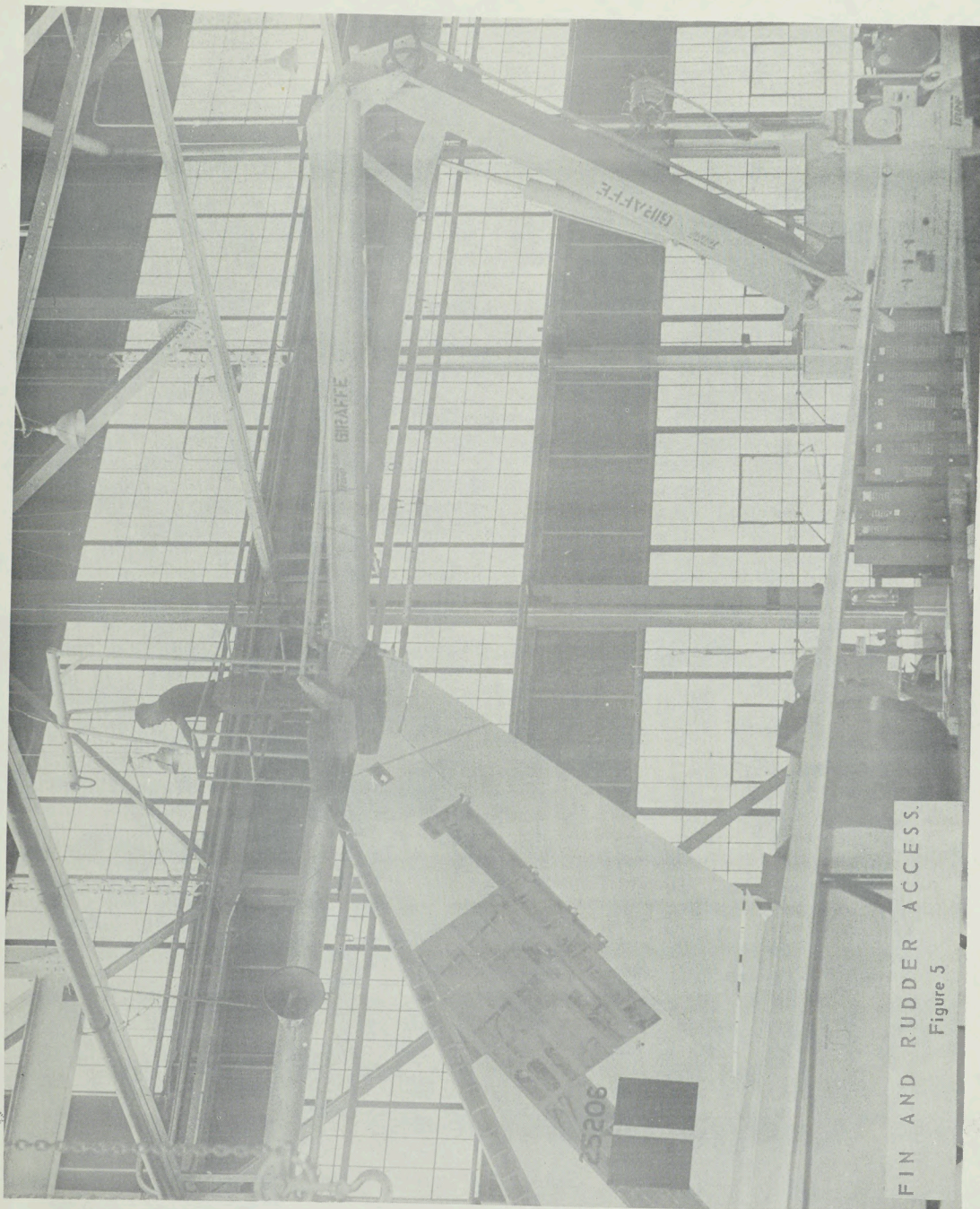


PICKING UP COCKPIT SEAT

Figure 3



LOWERING SEAT INTO COCKPIT
Figure 4



FIN AND RUDDER ACCESS.

Figure 5

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MADE IN U.S.A.