AR-007-179 (2)

DEPARTMENT OF DEFENCE

ROYAL AUSTRALIAN AIR FORCE

AIRCRAFT RESEARCH AND DEVELOPMENT UNIT

FORMAL REPORT - TASK 0127

HANDLING QUALITIES EVALUATION OF THE RAAF MUSEUM FOKKER TRIPLANE

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TASK ORIGINATOR: DOAT

 AR-007-179 JUN 93

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SUMMARY

A Commonwealth-owned Fokker Triplane replica is currently flown by RAAF Museum aircrew. An accident involving the RAAF Museum Tiger Moth had raised a number of concerns relating to the lack of corporate knowledge of the flight and ground handling characteristics of the RAAF Museum Fokker Triplane. Consequently, the Aircraft Research and Development Unit was tasked to produce a comprehensive and authoritative document describing the ground and flight characteristics of the Fokker Triplane replica.

Five sorties consuming 4.3 flight hours were flown during the evaluation. Sequences covered included ground operations, takeoff and landing, stalling, engine failures, manoeuvring flight and formation procedures. The aircraft was found to possess a poor forward field of view in the ground attitude, and exhibited directional instability across the entire flight envelope. The combination of these two deficiencies during the landing phase requires a high degree of pilot skill to maintain directional control. The deficiencies of the aircraft can be overcome, however, with adequate pilot preparation.

This report provides information, in the form of Pilot's Notes, describing the characteristics of the aircraft, its limits, and techniques necessary to safely fly the Triplane.

TABLE OF CONTENTS

ANNEXES

1. INTRODUCTION

1.1. Background

1.1.1. A Commonwealth-owned Fokker Triplane replica is currently flown by RAAF Museum aircrew. It is generally flown in company with a Sopwith Pup replica at a number of airshows each year. The 1991 accident involving the RAAF Museum Tiger Moth had raised a number of concerns relating to the lack of corporate knowledge of the flight and ground handling characteristics of the RAAF Museum Fokker Triplane. Consequently, the RAAF Museum had requested that the existing handling techniques employed by Fokker Triplane pilots be validated.

1.2. Task

1.2.1. OC ARDU was tasked to produce a detailed and authoritative document describing the flight and ground handling characteristics of the RAAF Museum Fokker Triplane.

1.3. Definition of Terms, Abbreviations and Symbols

1.3.1. All terms used in the conclusions and recommendations of this report are defined at Annex A. All abbreviations and symbols used in this report are defined at Annex B.

2. RELEVANT CONDITIONS

2.1. Description of Test Aircraft

2.1.1. The RAAF Museum Fokker Triplane replica was a fabric-covered, single-seat triplane with fixed conventional (tailwheel) undercarriage. The aircraft was powered by a single Continental W-670-6A seven cylinder air-cooled radial engine coupled to a twin blade wooden fixed pitch airscrew, and developed 220 HP at 2100 RPM. Wheel brakes were provided on the mainwheels, and a castoring self-locking tailwheel was fitted for ground steering. A conventional control column and rudder pedals were provided, however no trim system was provided for any axis. The general arrangement of the aircraft is depicted at Annex C. A comprehensive description of the aircraft is presented at Annex D to this report.

2.2. Weight and Balance

2.2.1. The aircraft was flown within the allowable weight and centre of gravity envelope during the evaluation. A Civil Aviation Authority Weight and Balance summary performed on 7 November 1991 is presented at Annex E.

2.3. Instrumentation and Test Equipment

2.3.1. No special instrumentation was fitted to the aircraft for the tests. On the ground, control column deflections were measured with a tape measure. Control surface deflections were measured with a digital protractor. Airborne, all forces and deflections were estimated. Data was recorded on kneeboard cards in flight. All flight parameters were derived from cockpit instrumentation.

2.4. Weather, Time and Place

2.4.1. Five test sorties (4.3 flight hours) were flown at the RAAF Museum, Point Cook during the period 13-15 April 1993. Weather conditions were satisfactory for the assessment.

2.5. Aircraft Condition and Modification State

2.5.1. The aircraft was in excellent condition and was finished in an all-over red colour scheme similar to that flown by Manfred von Richthofen in 1917. The wing leading edges were clean and free from any damage which may have influenced the stall characteristics of the aircraft. The aircraft was built in the USA in 1973 by W. W. Redfern, who liaised with the original designer when drawing up his plans for the replica aircraft. The RAAF Museum example differs from the Redfern plans, having modified aileron hinges to reduce wear and ease maintenance. These modifications are described at Annex F. No other modifications were relevant to the assessment.

3. TESTS MADE

3.1. Scope of Tests

3.1.1. Test Limitations

3.1.1.1. The aircraft was prohibited from performing aerobatics and spinning exercises for structural reasons; these aspects were therefore not evaluated. Stall tests were conducted above 3000 ft AGL. Takeoff and landing evaluations were conducted with a maximum of 15 knots crosswind. All tests were conducted within the known limitations of the aircraft.

3.1.2. Test Configurations and Loading

3.1.2.1. No pilot-selectable configurations were possible; all tests were performed in the standard configuration. Takeoff fuel weight varied from full to one quarter (the minimum allowable for takeoff) during the five test sorties.

3.2. Method of Test

3.2.1. The tests conducted were largely qualitative in nature, supported where required by specific performance data. Tests were conducted as described in the Empire Test Pilot School Notes dated 1990.

4. RESULTS AND DISCUSSION

4.1. Handling Qualities of the RAAF Museum Fokker Triplane

4.1.1. The handling qualities of the RAAF Museum Fokker Triplane were evaluated during each test sortie. Aircraft takeoff weights varied from 918 kg (maximum allowable) to 840 kg (25% fuel). The aircraft was evaluated at various conditions throughout the entire flight envelope, including takeoffs and landings in crosswinds of up to 15 knots. The aircraft exhibited directional instability throughout the flight envelope, and was particularly prone to directional divergence during the landing roll. The poor Field Of View (FOV) in the tail-down attitude and the directional instability made the takeoff and landing the most difficult phases of flight in the Triplane. The directional instability of the aircraft is unsatisfactory but acceptable. However, the aircraft can be safely flown if the pilot is aware of the deficiencies of the aircraft and the control techniques necessary to overcome these deficiencies. Annex D to this report presents Handling Notes for the RAAF Museum Fokker Triplane Replica, a document which presents the limitations of the aircraft, describes the handling deficiencies and techniques to overcome these deficiencies. The Triplane should be operated in accordance with the limitations and techniques described in this document.

4.2. Suitability of the Tiger Moth as a Lead-In to the Triplane

4.2.1. Historically, the Tiger Moth has been used as a vehicle to prepare pilots for flight in the Triplane. The Tiger Moth represents an aircraft with similar construction and control response, and is generally good preparation for the in-flight characteristics encountered in the Triplane. The Tiger Moth exhibits control-free neutral static stability in the directional axis, which requires the pilot to physically centre the skid ball with rudder. This technique is mandatory in the Triplane. However, the ground handling characteristics of the Tiger Moth (if the aircraft has a tail*skid* as is usually the case) are quite different to those of the Triplane. During the landing roll, aircraft with a tailskid *generally* become directionally stable once the tail is lowered, as a retarding force is applied behind the Centre Of Gravity (CG), which damps any directional divergence. The Tiger Moth is normally operated from grass surfaces where the retarding force is quite strong, minimising directional divergence. The Triplane, however, does not become directionally stable when the tail is lowered, as the tailwheel offers little retarding force. Additionally, the wings tend to disturb the airflow over the rudder, further reducing directional stability. After the tail is lowered in the Triplane, directional control is achieved through a combination of tailwheel steering and differential braking. Pilot preparation for landing the Triplane would be best achieved by training on a tail*wheel* aircraft which has a poor FOV over the nose and requires differential braking during the landing roll. It is understood that the RAAF Museum is seeking to acquire its own Tiger Moth to replace the aircraft lost in an accident; if this aircraft were to possess mainwheel brakes, and a tail*wheel* rather than a tailskid, it may be satisfactory as a lead-in to the Triplane. Unless the Tiger Moth used as preparation for the

Triplane is fitted with a tailwheel and brakes, takeoff and landing practice in another tailwheel aircraft (such as a Winjeel, Pitts Special or Chipmunk) should be obtained if possible.

4.3. Requirements for Pilots Converting to the Triplane

4.3.1. The closure of No. 1 Flying Training School has reduced the available pool of qualified military pilots at Point Cook. This has resulted in a number of civilian pilots who do not have a military flying background being selected to fly Museum aircraft. Pilots selected to fly the Triplane at the RAAF Museum should have a solid background in tailwheel aircraft, and be aerobatic and formation endorsed. The aerobatic endorsement will prepare pilots for display flying, and will be required to demonstrate manoeuvres such as wingovers which the Triplane is quite capable of flying but which are considered as 'aerobatic' by the Australian Civil Aviation Authority. The formation endorsement will be necessary to demonstrate the aircraft in company with other Museum types such as the Sopwith Pup. No specific criteria for the selection of a Triplane pilot is warranted; each case will need to be considered in isolation, taking into account the individual pilot's currency, proficiency and background. It should be noted, however, that the Triplane should not be flown by a pilot with poor recent currency or with minimal tailwheel flight time.

5. CONCLUSIONS

5.1. General Conclusions

5.1.1. The RAAF Museum Fokker Triplane can be safely flown if the pilot is aware of the deficiencies of the aircraft and the control techniques necessary to overcome these deficiencies (paragraph 4.1.1).

5.2. Specific Conclusions

5.2.1. The directional instability of the Triplane is unsatisfactory but acceptable (paragraph 4.1.1).

5.2.2. Pilot preparation for landing the Triplane would be better achieved by training on a tail*wheel* aircraft which has a poor FOV over the nose and requires differential braking during the landing roll (paragraph 4.2.1).

5.2.3. The Triplane should not be flown by a pilot with poor recent currency or with minimal tailwheel flight time (paragraph 4.3.1).

6. RECOMMENDATIONS

6.1. Highly Desirable Actions

6.1.1. The aircraft should be flown in accordance with the Handling Notes for the RAAF Museum Fokker Triplane, presented at Annex D.

6.2. Desirable Actions

6.2.1. Unless the Tiger Moth used as preparation for the Triplane is fitted with a tailwheel and brakes, takeoff and landing practice in another tailwheel aircraft (such as a Winjeel, Pitts Special or Chipmunk) should be obtained if possible.

6.2.2. Pilots selected to fly the Triplane at the RAAF Museum should have a solid background in tailwheel aircraft, and be aerobatic and formation endorsed.

7. ACKNOWLEDGMENTS

7.1. The assistance of the Commanding Officer and staff of the RAAF Museum is acknowledged.

8. TASK PERSONNEL

8.1. The Task Officer and test pilot for this task was FLTLT A. J. Morris, tp.

DEFINITION OF TERMS

Table A-1: Terms Used in Conclusions and Recommendations

DESCRIPTION OF DEFICIENCY	CONCLUSION	RECOMMENDATION TERMINOLOGY	RECOMMENDATION LEVEL
Prevents aircraft performing operational task or liable to cause accidents - restrictions needed to prevent occurrence are considered intolerable.	UNACCEPTABLE	Something must be done.	ESSENTIAL
Restricts aircraft's operational capability or is liable to cause accidents unless restrictions, considered tolerable, are imposed.	UNSATISFACTORY	Something should be done.	HIGHLY DESIRABLE
Should be improved to make a safer or more capable aircraft.	UNSATISFACTORY	Something should be done.	DESIRABLE
Could be improved but is acceptable because it can be compensated for by the operator, is used infrequently, or would only provide minimal improvement of safety or capability for the required expense, thus making modification of current equipment unnecessary (should be avoided in future designs.	UNSATISFACTORY BUT ACCEPTABLE	No action or avoid in future designs.	No action or avoid in future designs.
Satisfactory without improvement.	SATISFACTORY	No action.	No action.
Characteristic which improves the operational capability or safety of the design.	ENHANCING CHARACTERISTIC	Should be incorporated in future designs.	Desirable to incorporate in future designs.

LIST OF ABBREVIATIONS AND SYMBOLS

1. Table B-1 lists all abbreviations and symbols used in this report.

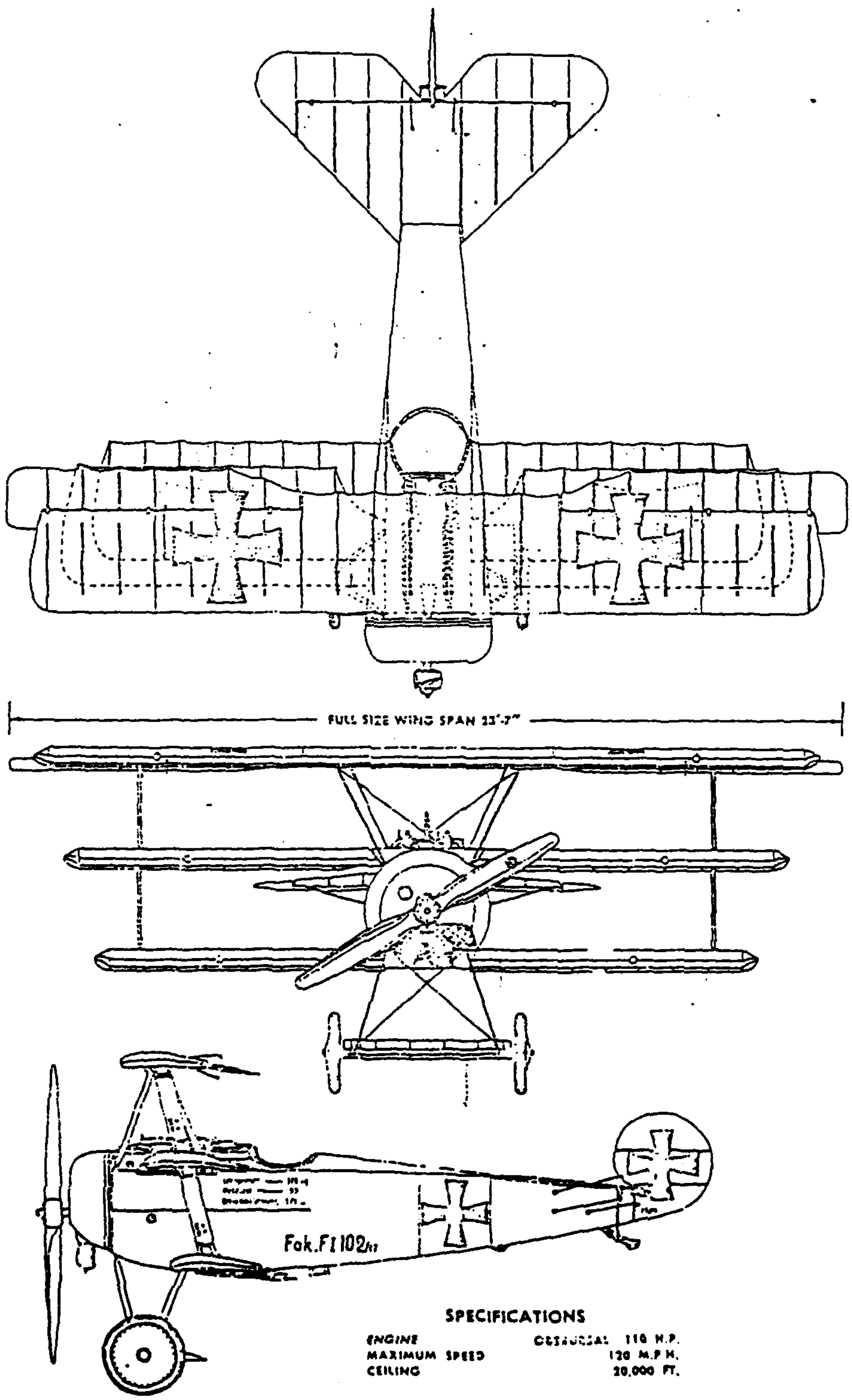
Table B-1: List of Abbreviations and Symbols

ABBREVIATION OR SYMBOL	DEFINITION	UNITS
ARDU	Aircraft Research and Development Unit	
FOV	Field of View	
RAAF	Royal Australian Air Force	

ANNEX C
TO ARDU FORMAL REPORT
TASK 0127

GENERAL ARRANGEMENT

FOKKER TRIPLANE REPLICA



ANNEX D
TO ARDU FORMAL REPORT
TASK 0127

PILOTS NOTES

RAAF MUSEUM

FOKKER TRIPLANE

SECTION 1

DESCRIPTION AND OPERATION

THE AIRCRAFT

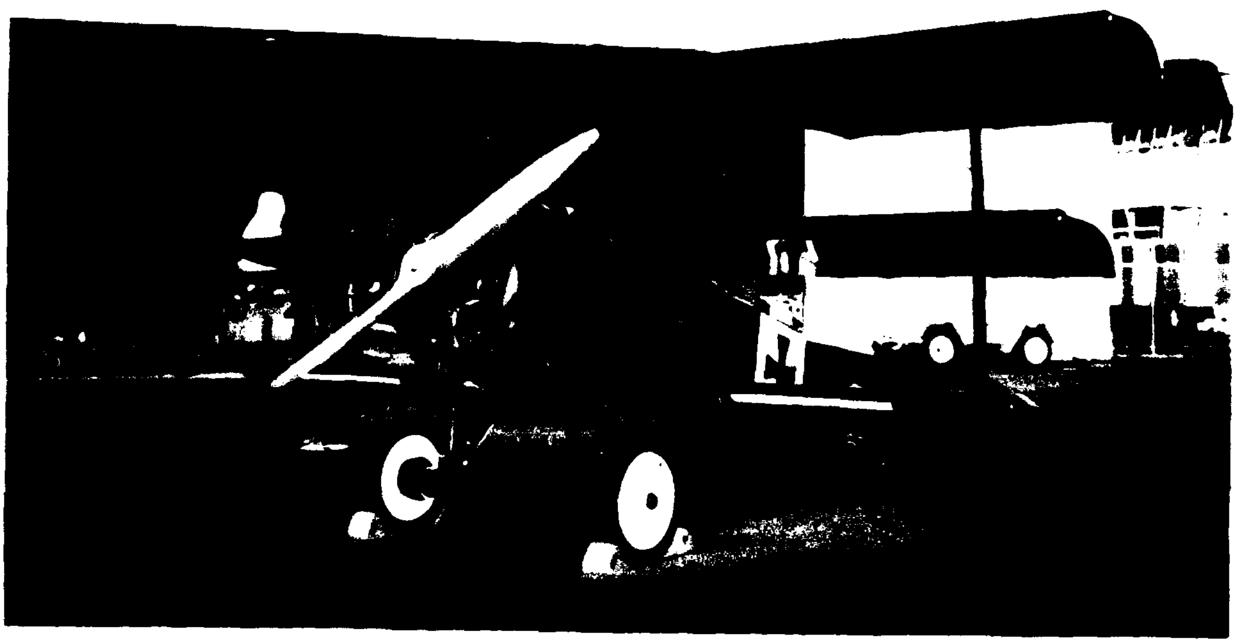
INTRODUCTION

The Fokker Triplane replica is a fabric covered, single-seat triplane with fixed conventional (tailwheel) undercarriage. The general arrangement of the aircraft is depicted at Figure 1. The example owned by the RAAF Museum was manufactured in the United States in 1973 by W. Redfern. This document describes the RAAF Museum Fokker Triplane only.

HISTORICAL BACKGROUND

The Fokker DrI (Triplane) will be forever associated with the World War One ace Manfred Von Richthofen, and most replica Triplanes, including the RAAF Museum example, are painted in the red colour scheme of his personal aircraft (and the one in which he met his death), serial 425/17. The Triplane was originally conceived as a counter to the successful Sopwith triplane, which at the time had quite a fearsome reputation on the Western Front. In an effort to duplicate the Allied success, the wreckage of a Sopwith machine was delivered to the Fokker factory at Schwerin in an attempt to copy the design. The original Fokker design was produced in 1917 and did not have interplane struts at the wingtips, however these were quickly introduced when an unacceptable and dangerous wing vibration evidenced itself in-flight. Unfortunately these struts significantly reduced the intended performance of the aircraft. Richthofen was given the first service test aircraft in August 1917, but was not impressed and continued to fly the Albatross, in which most of his 80 'kills' were achieved. When another German ace, Werner Voss, obtained 21 kills in the DrI in 24 days, Richthofen reconsidered the aircraft's potential. Obtaining a number of Triplanes, Richthofen gaudily painted them and formed the now-familiar 'Flying Circus'. The Triplane, although extremely manoeuvrable, lacked the speed necessary to combat the newer Allied machines. 320 examples of the DrI were ultimately built. Unfortunately quality control at the Fokker Schwerin factory was extremely poor, and the Triplane was grounded due to poor workmanship for a period, although eventually it continued fighting until the Armistice, when 69 Triplanes were still in service. Manfred von Richthofen, nicknamed the 'Red Baron', was not in fact a Baron at all. Interestingly, the circumstances surrounding his death continue to create debate. Claims were submitted by a Canadian pilot and a member of an Australian field artillery unit. Credit for the 'kill' was originally given to the Canadian pilot, however later this was discredited by other agencies. Richthofen was killed by a single bullet which pierced his heart; unfortunately the science of forensic ballistics was not, in World War One, sufficiently advanced to determine from whose gun the fatal shot was fired.

FIGURE 1 - GENERAL ARRANGEMENT FOKKER TRIPLANE



AIRCRAFT DIMENSIONS

The principal dimensions of the aircraft are as follows:

a. Span - 27 ft 6 ins.

b. Length - 19 ft.

c. Height (tail down) - 9 ft 6 ins.

AIRCRAFT WEIGHTS

Empty weight (including unusable fuel and full oil) - 730 kg.

Maximum weight - 918 kg.

Normal taxy weight (full fuel, 77 kg pilot) - 913 kg.

AIRCRAFT CONSTRUCTION

The Fokker DrI replica has a fuselage frame constructed of welded chrome molybdenum steel tubing, covered with fabric. The wing spars and ribs are constructed of wood and covered with fabric. The ailerons, elevators and rudder are fabric covered over a metal structure. The engine cowling is constructed of sheet metal. The fixed landing gear is aerodynamically faired with a fibreglass cover, which provides 7.2 % of the aircraft's total lift.

THE ENGINE

The aircraft is powered by a Continental W670-6A seven-cylinder, air cooled static radial type engine, producing 220 BHP at 2075 RPM. A wooden, fixed pitch, twin-blade Sensenich propeller is coupled to the engine.

ENGINE CONTROLS

The engine throttle and mixture controls are mounted on a quadrant located on the left cockpit wall, and are depicted at Figure 2. The engine throttle lever (outboard) is used to select engine speed, and incorporates a radio transmit button at the top of the handle. A mixture control (red handle labelled "M") is positioned inboard of the throttle. At the full forward position the mixture is set at FULL RICH. The IDLE CUTOFF position is obtained by moving the mixture lever to the full aft stop. The aircraft is provided with a 28 Volt DC standard NATO 3-pin external power receptacle located on the left side of the fuselage immediately behind the cockpit. A starter motor, which is employed when external power is available, is controlled by the magneto/start switch located on the left side of the aft instrument panel.

Note

When external power is not available the engine must be started by hand swinging the propeller. This procedure is inherently dangerous and should only be attempted as a last resort, and by suitably qualified personnel.

A carburettor heat control is located on the right cockpit wall and is shown at Figure 3. A knob at the top of the control must be depressed to move the lever between the COLD (forward) and HOT (aft) positions. The carburettor heat can be selected to any intermediate position between COLD and HOT. A marked power loss from the engine is experienced with the carburettor heat in the HOT position. The engine should be operated with the carburettor heat in the COLD position whenever possible. When carburettor icing conditions demand, use the smallest amount of heat necessary to ensure smooth engine operation.

FIGURE 2 - ENGINE CONTROLS

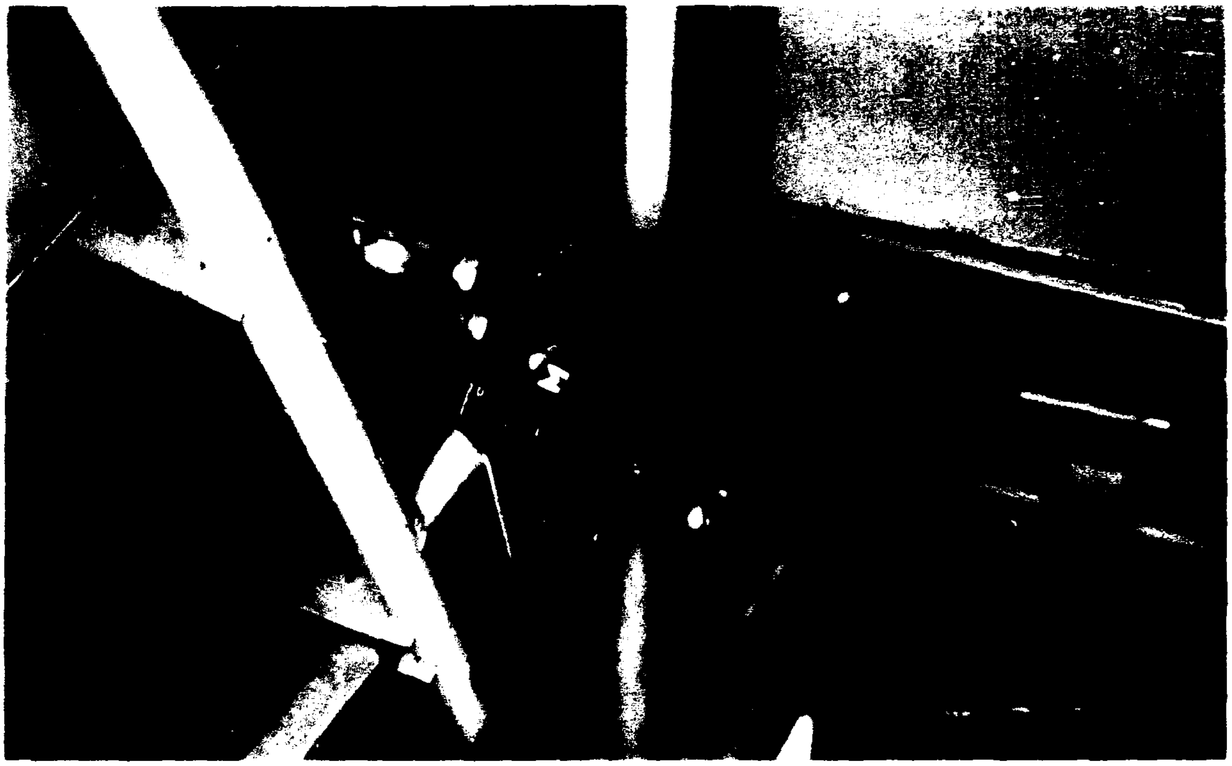


FIGURE 3 - CARBURETTOR HEAT

CAUTION

Do not use the carburettor heat when the ambient temperature is above 37 degrees centigrade.

An engine priming pump is located on the right side of the aft instrument panel and incorporates a locking facility when not required.

ENGINE OIL SYSTEM

A five-gallon oil tank is located directly behind the firewall in front of the main fuel tank. The correct grade of oil for the W670-6A is Aeroshell W100 or its equivalent. The oil level is measured by a dipstick attached to the filler cap located on top of the engine cowling. The filler cap for the oil tank is coloured YELLOW. The minimum safe quantity of oil is three gallons, although normally the level should be full prior to engine start.

FUEL SYSTEM

A single fuel tank with a 33 US gallon capacity (125 l) is located in the fuselage forward of the pilot. The filler cap for the fuel tank is coloured RED. A fuel cock is located on the lower right cockpit wall and is depicted at Figure 4. Turning the selector anti-clockwise to the vertical position turns the fuel ON. Moving the selector clockwise to the horizontal position turns the fuel OFF. Fuel flows from the tank by gravity to the carburettor. Although a fuel pressure indicator is located on the triple gauge on the aft instrument panel, it is inoperative. A fuel drain is located under the engine cowling on the right side of the fuselage under a semi-spherical cover secured by a quick release fastener, and is shown at Figure 5. The fuel tank quantity is shown on a direct-reading rotary gauge located at the rear of the tank, below the instrument panels, and is in a difficult position to read in flight. The sector shaded red represents a fixed reserve fuel of approximately 45 minutes at cruise power. Takeoff should not be attempted when the fuel level is in the red sector (ie below one-quarter full).

ELECTRICAL SYSTEM

In addition to the external power receptacle (which is connected to the engine start motor), two rechargeable batteries are located under the pilots seat and power the radio located on the left cockpit wall beside the pilot. The batteries deplete in flight and can only be recharged on the ground using the receptacle located on the bulkhead behind the pilots left shoulder. When fully charged the batteries provide a minimum of four hours operation of the radio. The batteries cannot be used to start the aircraft engine.

Note

Before deploying the aircraft over long distances ensure the batteries are fully charged.

RADIO

The aircraft is fitted with a single VHF transceiver located on the left cockpit wall adjacent to the pilot. An "in-use" and "standby" frequency are presented. A rotary selector changes the "standby" frequency. A switch flip-flops the "in-use" and "standby" selections. An ON/OFF volume control and squelch facility are also provided.

Note

The Battery Master Switch located on the rear cockpit bulkhead (adjacent to the recharging receptacle) must be in the ON position for the radio to function.

FIGURE 4 - MAIN FUEL COCK

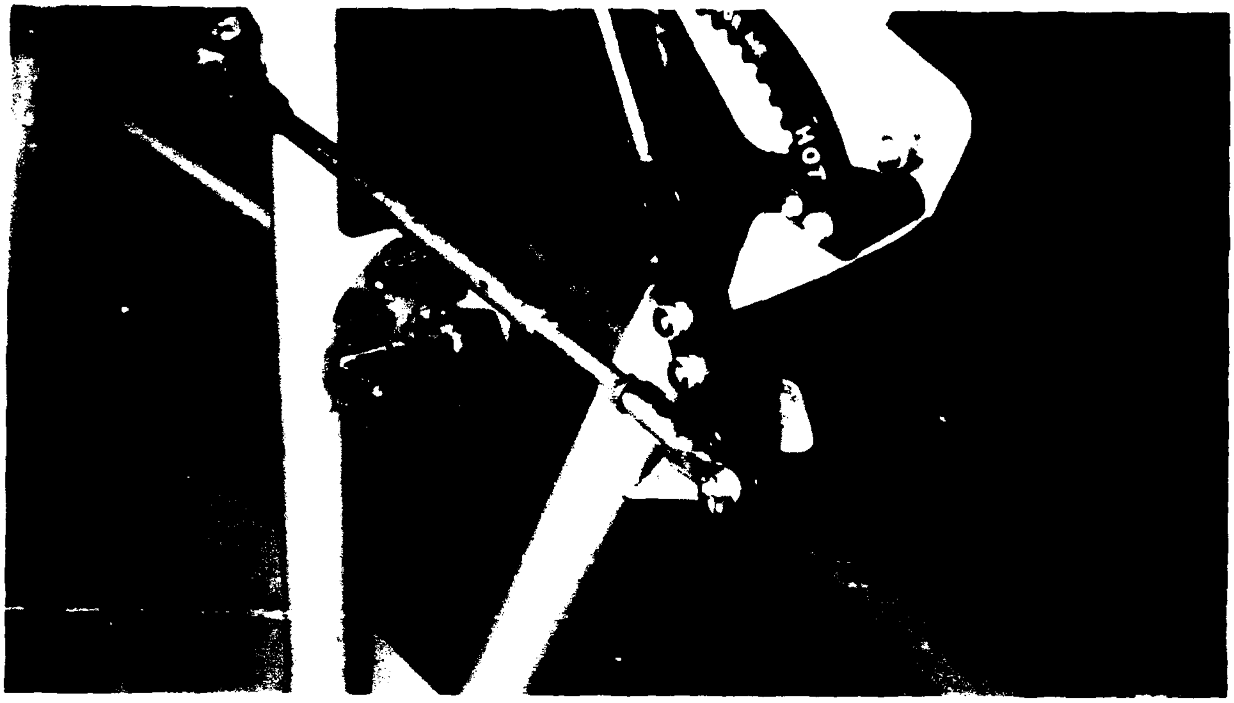


FIGURE 5 - FUEL DRAIN

LANDING GEAR

MAIN LANDING GEAR

The main undercarriage comprises two wheels linked by a fixed axle. Suspension is provided by "bungy" cords wound around the axle, as depicted at Figure 6. The suspension system can be accessed by removing an inspection cover adjacent to each wheel, on the upper surface of the axle fairing. Pneumatic tyres (with a correct inflation of 35 psi) are provided. Automotive drum brakes are fitted to each wheel and are actuated through conventional brake pedals located on top of each rudder pedal.

TAILWHEEL

A self locking, fully castoring tailwheel is provided for directional control on the ground, as shown in Figure 7. The tailwheel is normally locked to the rudder axis, and use of rudder and differential brake is normally adequate for taxying without unlocking the tailwheel.

Note

Before engine start ensure the tailwheel is locked in the trailing position.

FLIGHT CONTROL SYSTEM

The primary flight controls consist of conventional aileron (on the upper wing only), elevator and rudder surfaces which are operated by a system of bellcranks and cables connected to a control column and rudder pedals. Reduced control forces in the aileron and elevator circuits are provided by aerodynamic balances on the control surfaces. The all-moving rudder is hinged behind the leading edge, providing an aerodynamic balance and reducing control forces. No adjustment of control position to suit individual pilot size is available. No in-flight trim facility is available for any axis. The range of movement for the flight controls (measured from a datum of all surfaces neutral) are as follows:

Control Column
(measured from the stick top) -

70 mm forward (11 degrees)

140 mm aft (14 degrees)

100 mm laterally (10 degrees)

Rudder Pedals
(measured from the pedal top)

75 mm fore and aft

Ailerons

15 degrees up and down

Elevator

36 degrees up

22 degrees down

Rudder

50 degrees right, 40 degrees left (approx)

Note

A small amount of bearing freeplay exists in the elevator circuit. This is normally evidenced as a "notching" felt in the control column at full deflection but does not pose an in flight hazard.

PILOT ACCOMMODATION

SEAT

A non-adjustable pilot seat is provided. Any requirement to adjust the pilot eye height is

FIGURE 6 - MAIN UNDERCARRIAGE SUSPENSION

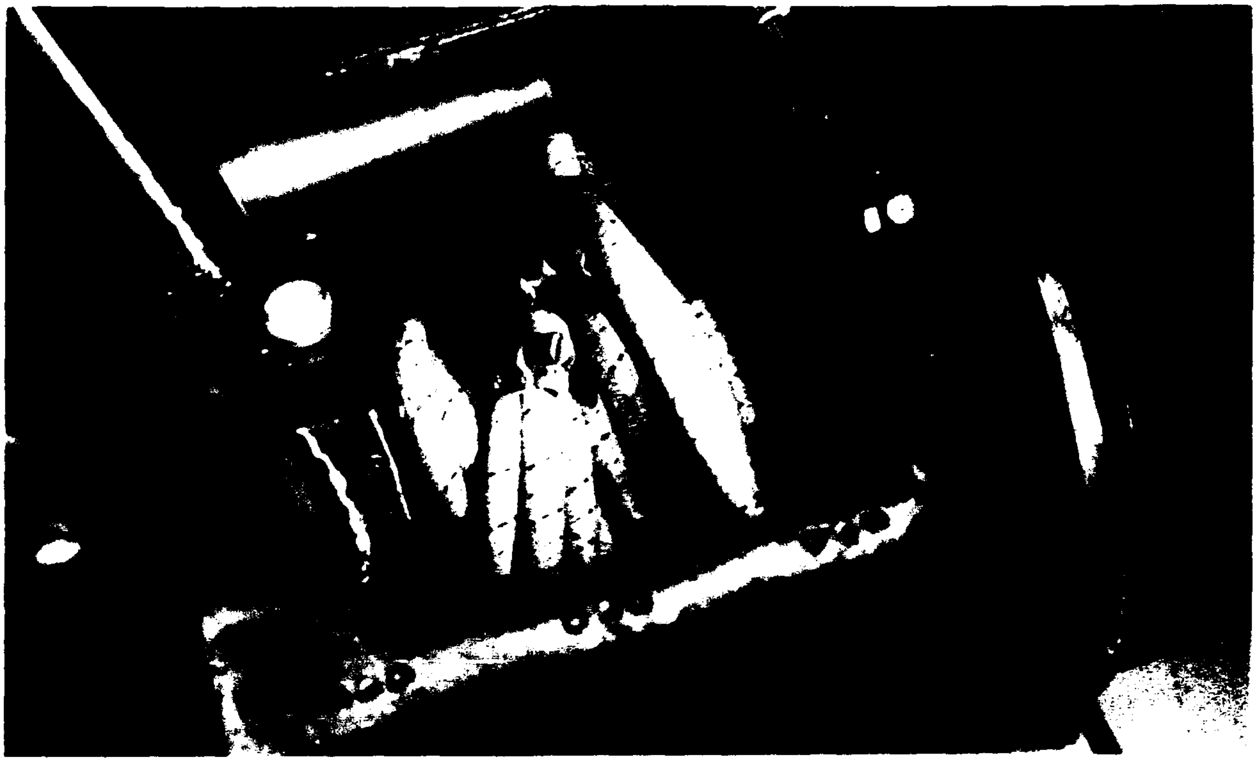
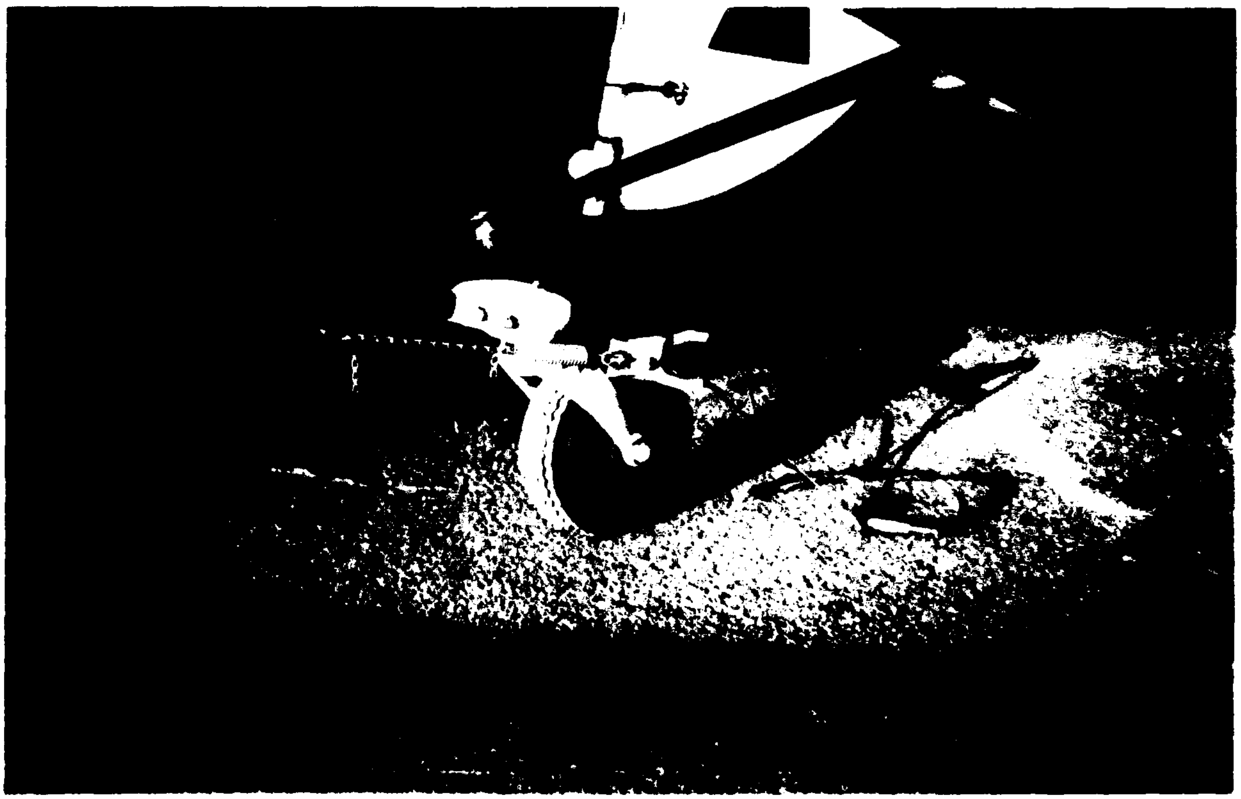


FIGURE 7 - TAILWHEEL



performed by placing cushions on the seat as required.

Note

Establishing an adequately high eye point is imperative to the safe operation of the aircraft during the takeoff and landing phases of flight due to the poor forward Field-Of-View (FOV). Shorter than average pilots will require a seat cushion to achieve this eye point.

A pilot harness incorporating a lap belt and shoulder straps is provided and is adequate for all flight manoeuvres performed in the Triplane.

PILOT EQUIPMENT

The pilot is provided with a cloth helmet, mask (which incorporates a microphone) and goggles. The equipment is quite comfortable, and the mask ensures that radio transmissions from the aircraft are clear and unaffected by the wind blast from the open cockpit. The mask also has the additional benefit of providing some windblast protection to the pilot.

COCKPIT ENVIRONMENT

The cockpit design of the Triplane, with a staggered instrument panel layout, allows a significant amount of freestream air to enter the cockpit. In cruise flight, any document not physically restrained will be blown about the cockpit and quite possibly out of the aircraft. This means that storage of maps and other equipment needs to be carefully considered pre-flight. No purpose-built map or publication case is provided, and the lack of a trim system in any axis means that the controls must be restrained at all times to maintain straight and level flight.
Pilots are advised to procure a kneepad and ensure that all information required for the intended flight is contained within this. In addition to the windblast effect, the open design of the cockpit requires the pilot to ensure that his clothing is sufficiently warm to avoid hypothermia during long cruise flights at altitude. As a guide, the cockpit windblast and wind-chill factor of the Triplane are considerably more harsh than those of the Tiger Moth. Only a small perspex windshield is provided to alleviate the windblast; to obtain an adequate FOV the pilot's head will be well above this screen.

COCKPIT INSTRUMENTS

The cockpit instruments are divided between two panels staggered longitudinally. The arrangement of the cockpit instruments is depicted at Figures 8, 9 and 10.

PITOT - STATIC INSTRUMENTS

Pitot pressure is supplied to the aircraft instruments from a pitot head mounted on the interplane strut between the centre and upper wings on the port side of the aircraft. An altimeter, airspeed indicator (ASI) and vertical speed indicator (VSI) are provided.

ENGINE INSTRUMENTS

Engine instruments are provided on both the forward and aft instrument panel. In addition to a tachometer and Cylinder Head Temperature (CHT) instruments, a triplex gauge indicates oil pressure and temperature. The fuel pressure indicator on the triplex gauge is inoperative; fuel is gravity-fed to the engine.

FIGURE 8 - COCKPIT LAYOUT

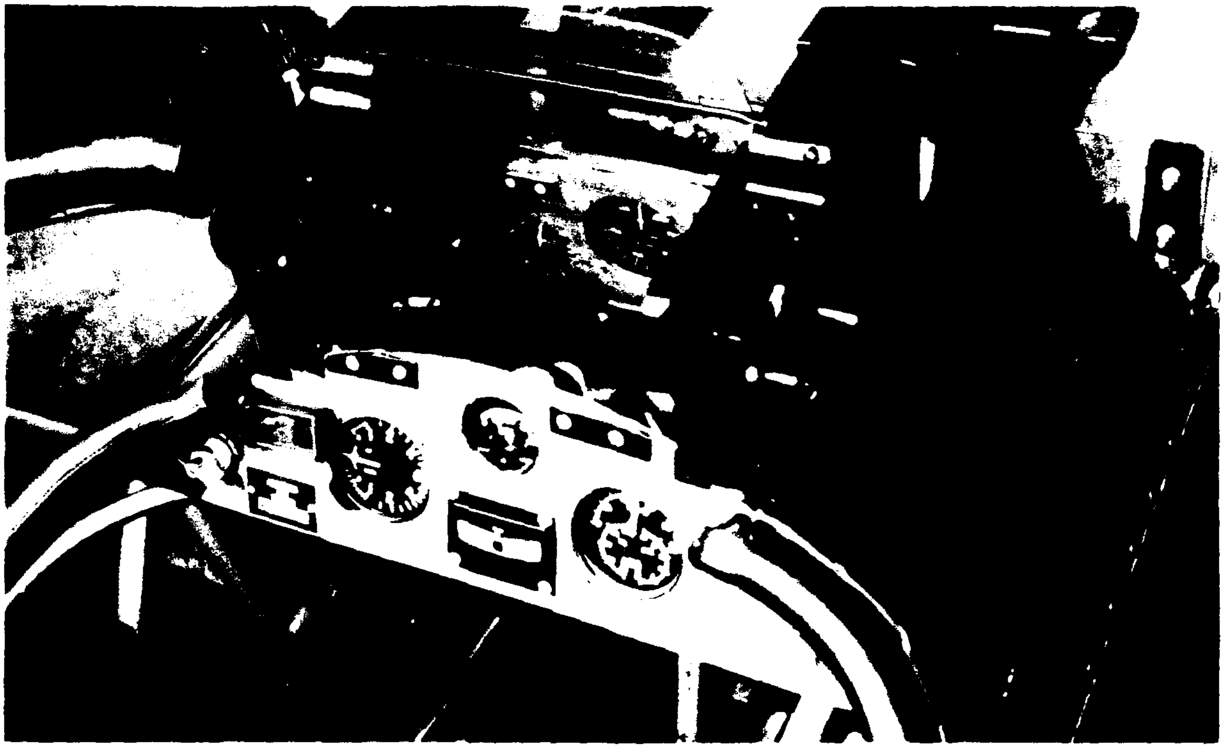


FIGURE 9 - AFT PANEL

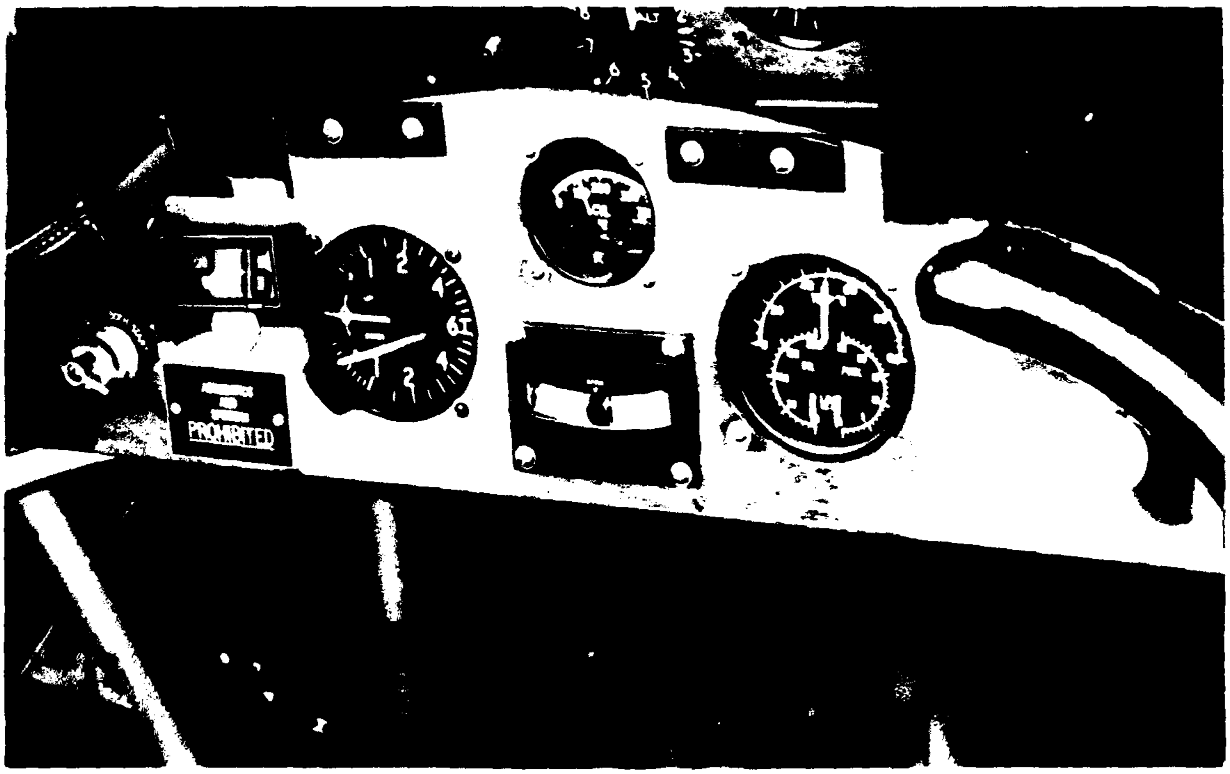


FIGURE 10 - FORWARD PANEL

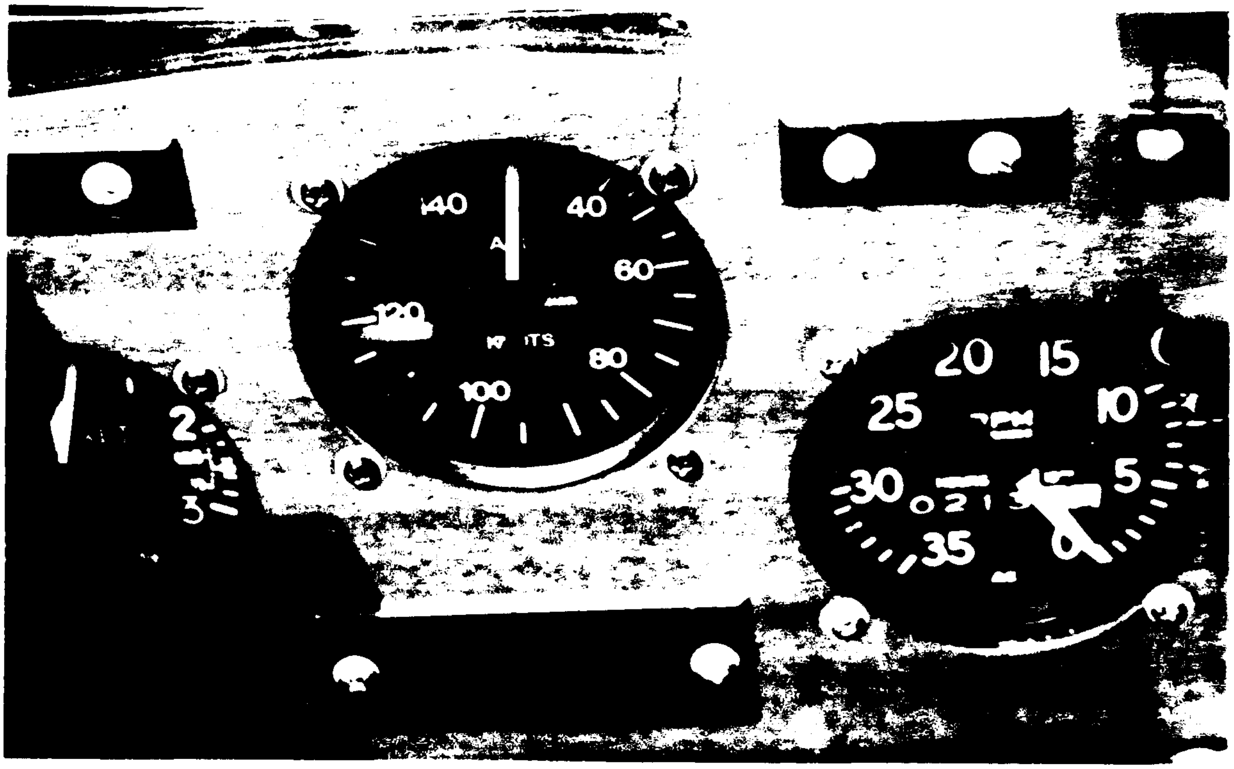
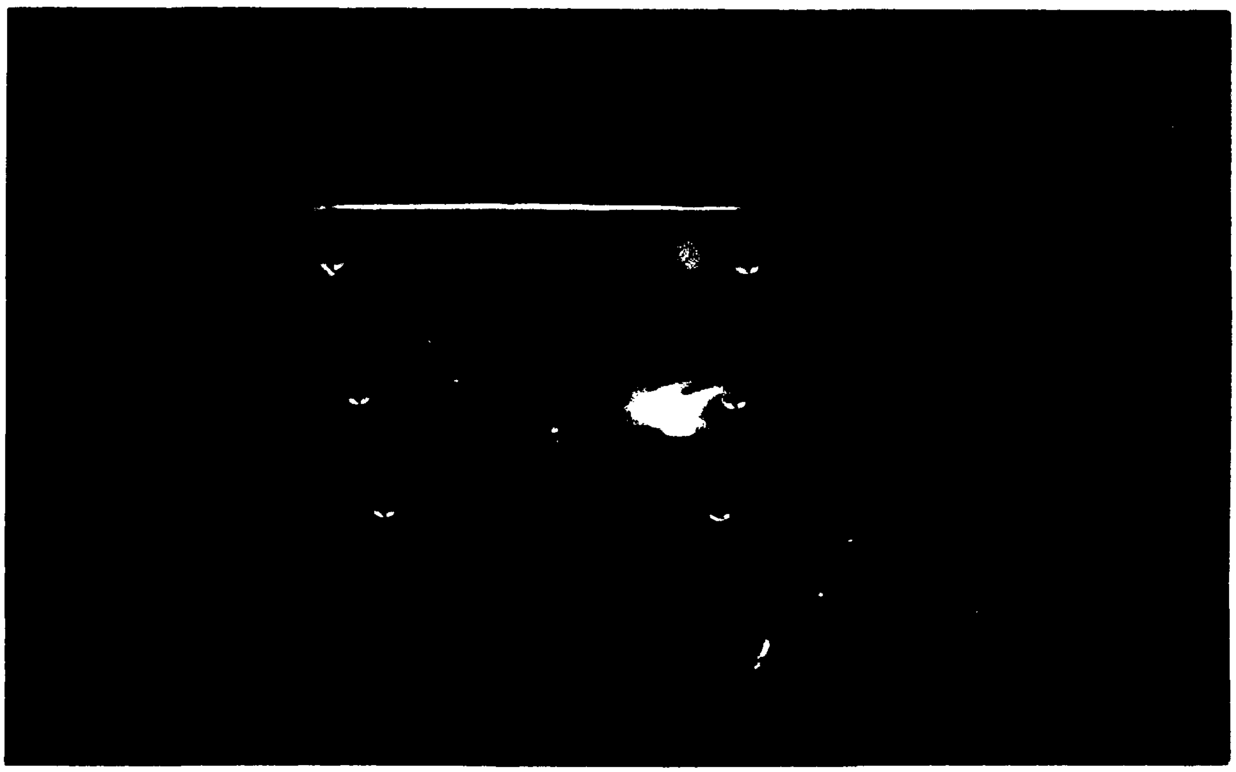


FIGURE 11 - AIRCRAFT COMPASS



OTHER INSTRUMENTS

A skid ball is provided on the aft instrument panel. An E2 series compass is embedded in the lower surface of the upper wing and viewed through a perspex panel, requiring the pilot to look 45 degrees up from his normal line of sight. The E2 compass is depicted at Figure 11.

Note

The ability of the pilot to read the compass is affected by ambient light reflections and insect residue on the perspex cover. In some lighting conditions, the compass may not be readable. When planning a cross-country flight, ensure that sufficient visual features will be available en-route to cater for the loss of heading information. When possible travelling in company with other aircraft is advised.

SECTION 2

OPERATING PROCEDURES

PREPARATION FOR FLIGHT

FLIGHT RESTRICTIONS

The operating and engine limitations of the Fokker Triplane are presented at Section 3.

WEIGHT AND BALANCE

With full fuel and oil, and with a pilot weight of 80 kg, the aircraft will be at the maximum allowable weight. Any fuel loading (provided the maximum allowable weight of 918 kg is not exceeded) will keep the aircraft Centre of Gravity (CG) within the allowable range.

PRE-FLIGHT CHECKS

BEFORE EXTERIOR INSPECTION

1. Maintenance Release/EE500 checked.

2. Magneto switch - OFF.

3. Ensure aircraft position is suitable for start, warm-up and taxy.

4. Conduct fuel water drain check (operating the drain for approximately 5 seconds will remove any water or sediment that may have accumulated in the line).

5. Pitot cover - Removed.

6. Check fuel and oil quantities are adequate for the length of the intended flight.

7. Static earth lead - Removed.

8. Wheels - Chocked

EXTERIOR INSPECTION

The exterior inspection follows a standard clockwise route from the cockpit checking the following items:

1. Condition of the aircraft covering fabric, particularly tears, stone damage and distortion.

CAUTION

Avoid excessive handling of the aircraft control surfaces and fabric to avoid damage.

2. Security, condition and tension of all control cables.

3. Interplane strut condition and security.

4. Wingtip "broomhandle" condition and security.

5. Pitot head - condition.

6. Leading edge condition on all wings.

7. Propeller security and condition, checking for stone damage.

8. Engine and nacelle condition, check for fuel and oil leaks.

9. Oil and fuel filler caps secure.

10. Tyre condition, inflation and wear. Check underneath the brake units for hydraulic fluid leaks.

CAUTION

Avoid directly handling the teflon brake lines as internal damage to the unit will result.

11. Axle fairing cover condition, access covers secure.

12. Oil drain pipe security.

13. Fuel drain line cover - Secure.

14. Engine exhaust condition.

15. Right fuselage and wings - as for left side.

16. Tailplane - condition.

17. Tailwheel condition and inflation, ensure locked in the trailing position.

COCKPIT ENTRY

The cockpit is entered from the left-hand side using the two foot rests provided. The pilots weight may be supported by holding the interplane strut from the fuselage to the upper wing.

CAUTION

Use extreme care when deplaning from the aircraft; the footrests are not visible from the cockpit and damage to the fabric surfaces can easily result from a misplaced foot. Use ground assistance to alight from the aircraft when available.

BEFORE ENGINE START

1. Strap-in - Complete.

2. Headset lead - Connected.

3. Carburettor Heat - COLD.

4. Fuel cock - ON (vertical).

5. Mixture - FULL RICH.

6. Throttle - Closed.

7. Magneto switch - OFF.

8. External Power - Connected and ON.

9. Battery Switch - ON

10. Radio - ON, correct frequency selected.

ENGINE START

1. Ground Crew turn propeller through four revolutions.

Note

This step is performed to ensure that the cylinders are not loaded with engine oil sufficient to restrict rotation of the propeller.

2. While the groundcrew member turns the propeller, pump the throttle from closed to full for five strokes. This actions provides sufficient prime for starting except in extreme cases. If conditions require, three to four strokes of the primer may be used.

CAUTION

The correct amount of priming required will be dependent on the condition of the engine and on the ambient temperature. Over-priming the engine washes the lubricating oil from the cylinder walls, increasing engine wear.

Note

Priming is not normally required when the engine is hot.

3. Open throttle approximately 2 cm.
4. Brakes - Apply.
5. Control column - hold back.
6. Starter switch to START, release when engine reaches 500 RPM.

Note

If the engine fails to start due to flooding, turn the magneto switch OFF and rotate the propeller backward through 10-14 revolutions with the throttle full open.

HAND START PROCEDURE

WARNING

Hand swinging the propeller is an inherently dangerous procedure. Two personnel will be required; one groundcrew will need to restrain the other. Ensure that the groundcrew member swinging the propeller is adequately experienced and briefed. Handstarting the Triplane should be attempted as a last resort only.

1. Groundcrew member turns the propeller through 10 rotations.
2. While the propeller is being turned pump the throttle five times and the primer three times.

Note

For a hot start, little or no prime will be required.

3. The groundcrew member positions the propeller at a convenient position.
4. Throttle - open 1 cm.
5. Brakes - Apply.
6. Control column - Hold back.
7. When the groundcrew member calls "CONTACT", set the magneto switch to BOTH.
8. The groundcrew then swings the propeller, while the extra member restains the prop swinger.

AFTER START

1. Throttle - set 600-800 RPM.
2. Oil pressure - Check minimum 15 psi.

CAUTION

If the oil pressure indicator does not register pressure within 30 seconds after start the engine should be shut down and the cause investigated.

3. External Power - Disconnect.
4. Engine Primer - Locked.

5. Mixture - FULL RICH.

6. Instruments - Check, set QNH.

7. Magneto switch - check for dead magneto, then BOTH.

8. Carburettor heat - COLD.

9. Flight controls - Check full and free movement in all axes.

RUN-UP

The initial engine run-up is performed with the aircraft chocked after the engine has been warmed-up for a minimum of four minutes and with a minimum CHT of 150 degrees centigrade. Additionally, minimum oil temperature for run-up is 10-15 degrees centigrade.

1. CHT - Check minimum 150 degrees centigrade, oil pressure min 10 degrees.

2. Wheels - Chocked.

3. Control column - Hold back.

4. Brakes - Apply.

5. Throttle - Set 1500 RPM.

6. Magneto - Check LEFT and RIGHT (drop not to exceed 100 RPM).

7. Throttle - IDLE.

8. Chocks - Remove.

WARNING

The idle thrust produced by the powerplant is sufficient to taxy the aircraft on sealed surfaces. Ensure the brakes are applied during the removal of the chocks.

TAXY

With the aircraft in the tail-down attitude, the pilot Field-Of-View is extremely poor. When taxying in confined areas use groundcrew direction whenever possible. Weaving during taxy and looking through the middle wing trailing edge cut-outs will assist the pilot FOV. Ample directional control is available through the use of the tailwheel (controlled through the rudder pedals), combined with differential brake when required. The idle thrust of the powerplant is sufficient for a fast taxy on sealed surfaces; gentle braking will be required to maintain walking pace. The breakout force on the brake pedals is high, and only a small movement of the pedal is necessary to effect braking. Used alone (ie without chocks), the brakes will hold the aircraft stationary at up to approximately 1200 RPM. Taxying at an excessive speed (particularly on rough surfaces) will result in an uncomfortable longitudinal and lateral oscillation due to the continuous axle of the mainwheels. Applying aileron into a prevailing crosswind may assist directional control. The engine should not be operated at idle speed for excessive periods on the ground.

BEFORE TAKE-OFF

1. Harness - Locked and secure.

2. Mixture - FULL RICH.

3. Magneto switch - BOTH.

4. Fuel - ON, quantity sufficient.

5. Engine temperatures and pressures - Check.

6. Carburettor heat - COLD.

7. Flight controls - Check full and free movement in the correct sense.

TAKEOFF

Before commencing the takeoff roll ensure the tailwheel is centred and locked by rolling forward a short distance. Note the wind direction and strength and apply aileron into wind as required. Open the throttle smoothly and slowly, introducing progressive forward control column (slightly forward of neutral) simultaneously. Control effectiveness is achieved early in the ground roll, and the tail should be allowed to fly off using a smooth application of forward control column. Raise the tail sufficiently to achieve a satisfactory Field Of View over the aircraft nose, but not more than the level attitude. Any directional swing which develops during the ground roll can be easily corrected with rudder. At 65 KIAS a gentle application of aft control column will lift the aircraft from the ground. The ground roll in nil wind conditions is less than 750 feet. Climb with full power at 80 KIAS, maintaining balanced flight. Monitor the engine instruments during the climb. Once clear of obstacles, reduce power to 1800 RPM if operationally acceptable, to reduce engine wear.

ENGINE FAILURE AFTER TAKEOFF AND FORCED LANDING

The triplane configuration induces extremely high drag, therefore an engine failure after takeoff will require a prompt lowering of the pitch attitude to maintain a minimum of 75 KIAS in the glide. With power off, the rate of descent at 75 KIAS is in excess of 1500 ft/min. Below 750 ft, a turnback will not be possible and a forced landing ahead should be performed. As a general rule, a turnback should not be attempted unless the pilot has had considerable practice in the manoeuvre. Do not reduce speed below 70 KIAS in an attempt to stretch the glide. During the initial phase of conversion to the Triplane pilots are advised to conduct several practice forced landings to become accustomed to the sight picture and rate-of-descent of the aircraft. If time permits, check the following items:

1. Ignition - BOTH.
2. Mixture - FULL RICH.
3. Fuel cock - ON.

If a forced landing is inevitable, perform the following actions:

1. Ignition - OFF.
2. Mixture - IDLE CUTOFF.
3. Fuel cock - OFF.

CLIMB

At 70 KIAS, the aircraft averages approximately 700 ft/min rate of climb up to 5000 ft. With an 80 KIAS/1800 RPM climb, approximately 300-400 fpm rate of climb is achieved at normal weights. The lack of a longitudinal trimming facility requires continuous aft control column force during the climb to maintain climb speed. Shallow turns during the climb will assist pilot Field Of View. Large angles of bank should be avoided near the ground.

CRUISE

Below 5000 ft, the engine should be run with a FULL RICH mixture. Above 5000 ft, the mixture should be hand-leaned to obtain the highest RPM available at a fixed throttle setting. Carburettor heat should only be used when icing conditions demand, and then only the smallest amount of heat necessary to maintain smooth engine operation should be used. A power loss will occur with application of carburettor heat. For normal cruise flight the throttle should be set to 1800 RPM, giving a cruise speed of approximately 80-85 KIAS below 5000 ft. Fuel consumption at this power is 13 US gallons per hour. The cruise power may be increased to a maximum of 1900 RPM (approximately 90 KIAS), ensuring that all other engine parameters remain within the limits presented at Section 3. Fuel consumption at 1900 RPM is significantly higher than at 1800 RPM. Using one-quarter fuel (red sector) as a fixed reserve, the aircraft has a usable range (at 1800 RPM, 80 KIAS) of approximately 150 nm.

HANDLING CHARACTERISTICS

Information concerning the handling characteristics of the Triplane is presented at Section 4.

DESCENT AND REJOIN

1. Harness - Secure.

2. Mixture - FULL RICH.

3. Fuel - ON, sufficient.

4. Instruments - Check, set QNH.

Any descent profile appropriate to the situation may be flown. A standard descent is flown at 75 KIAS, 1600 RPM. Avoid a prolonged descent with idle power. As a guide, maintain 1000 RPM minimum during the descent and circuit. This action will prevent shock cooling of the cylinders. Periodic short applications of power will keep the cylinders clean and ensure instantaneous power is available. When reducing power for the circuit, introduce carburettor heat as required.

CAUTION

Carburettor heat should not be used when the ambient temperature is above 37 degrees centigrade.

The spacing and engine power used in the circuit can be altered to suit individual preference and experience. The following parameters are a compromise between keeping the aircraft sufficiently close to the runway to effect a landing in the event of power failure, and keeping sufficient margin to cater for crosswind, other circuit traffic and pilot comfort. On downwind, at 1000 ft AGL set power to achieve 80-85 KIAS (approximately 1700 RPM). Keeping the wingtip of the middle wing on the runway will provide comfortable spacing. When the landing threshold is two chords behind the middle wing (nil wind), reduce power to not less than 1200 RPM and turn base, ensuring the carburettor heat is selected to HOT. Maintain 75 KIAS around the base turn and onto final. During the turn onto final, the pilots feet should be placed on the rudder pedals such that brake may be applied without further moving the feet. Although this action contradicts the techniques taught in other aircraft, it is necessary in the Triplane due to the directional instability of the aircraft on the ground with the tail up. The action of removing the pilots feet from the pedals to transfer them to the brakes, even for an instant, may result in a dangerous directional divergence. The force required to actuate the brakes is very high when compared to the force required to move the rudder, allowing the rudder to be safely controlled through the brake pedals without applying inadvertent brake. In the Triplane, keeping the intended landing point fixed in the field of reference until touchdown will result in landing short. As the aircraft approaches the ground, allow the touchdown point to drift below the aircraft. Beware an excessive rate of descent on final, as the poor

Field Of View from the cockpit reduces the peripheral cues available to the pilot to judge his rate of descent. Initially, pilots should aim to touch down approximately 750 ft from the landing threshold until familiarity is obtained with the sight picture at landing. Ensure that the carburettor heat is selected to COLD on short final. Aim for 70 KIAS at the flare. To achieve a smooth landing, a positive flare is required, reducing the power to idle simultaneously. Until experience in landing the Triplane has been gained, the aircraft should be landed on the mainwheels, keeping the tail in the air. The aircraft suspension is quite firm. Ample directional authority is available through the rudder, although large inputs may be required at slow speed. With the aircraft safely on the ground, keep the tail sufficiently high (using progressively more forward control column as airspeed decreases) to allow a good Field Of View over the nose, but do not raise the tail excessively. Gentle braking may be applied with the tail in the air; ensure the pedal application is equal on the left and right side. Anticipate a slight pitch forward with brake application; this is easily opposed with aft control column as required. Keep the tail in the air as long as possible (the tail can be kept up until the ASI is not reading); directional control is much easier using the rudder when the tail is up. When the control column is almost at the forward stop, cease braking action and gently but smartly lower the tail to the ground. The directional control power available as the tail lowers to the ground is poor, therefore ensure the aircraft is tracking straight before the tail is lowered. Once the tailwheel is on the ground, a positive simultaneous application of both brake pedals will bring the aircraft speed down to that required for taxy. Unless the pilot is sitting high enough to see over the middle wing, directional control cues during the final landing roll must be taken from peripheral sources such as the runway edge. Differential brake and coarse use of rudder will assist directional control during the deceleration. As previously described, the aircraft is directionally unstable after the tail is lowered due to the wings disturbing the airflow over the small rudder, and numerous pilot inputs to the rudder and brake will be required. Large directional divergences (and possibly a ground loop) will result if positive control of the aircraft is not maintained during the landing roll. The aircraft is generally easier to land on sealed surfaces; although smooth grass runways are satisfactory (and preferable for tyre wear considerations). Operations from rough grass surfaces tend to amplify the directional instability on the ground and make directional control more difficult. If any doubt exists as to the suitability of a grass runway, use a sealed surface if available. Once comfortable in the aircraft, three-point landings will be possible and will reduce the landing ground roll. Some pilots prefer three-point landings as their primary landing technique, however, the mainwheel procedure outlined above may assist pilots in gaining confidence with landing the Triplane.

GO-AROUND

In the event of a large bounce during landing, apply full power and execute a go-around. Make no attempt to re-flare the aircraft, as a pilot-induced oscillation may result, leading to a heavy landing and possible damage. If a go-around is required at any time ensure the carburettor heat is selected to COLD before applying power. Introduce power smoothly, and anticipate a torque-induced roll to the left. Climb at 70-80 KIAS.

CROSSWIND LANDING

The demonstrated safe crosswind limit of the Triplane replica is 10 KIAS. Either of the'wing-down' or 'crab' techniques may be employed. Remember that at the point of touchdown the aircraft will be effectively sideslipping, and the inherent directional instability of the Triplane may result in directional divergence which will require prompt attention. In moderate crosswinds (up to 10 KIAS), the level of difficulty in performing a crosswind landing is not significantly higher than for a normal landing.

SHUTDOWN

Before stopping the engine, throttle to a low enough speed to permit the cylinders (as indicated by the CHT) to cool to approximately 150 degrees centigrade. Run at idling speed, with the aircraft faced into wind, if necessary.

When CHT below 175 degrees:

1. Throttle - Set 1200 RPM for two seconds then IDLE.

Note

This action is performed to remove oil deposits which may have accumulated around the spark plugs, avoiding subsequent fouling and making starting easier.

When the RPM returns to idle:

2. Mixture - IDLE CUTOFF.

As the engine stops:

3. Throttle - Slowly open fully.

Note

This method of stopping the engine leaves the cylinder walls and pistons in a well-lubricated condition, by allowing the oil to cool which prevents run-off. It also scavenges excess fuel and creates a positive engine shutdown. If the engine is shut down at a high CHT the hot oil runs off the cylinder walls quickly, increasing engine wear and increasing warm-up time after start.

When the propeller stops:

4. Magneto switch - OFF.

5. Fuel cock - OFF.

6. Carburettor heat - COLD.

7. Radio - OFF.

8. Battery switch - OFF.

SECTION 3

OPERATING LIMITATIONS

ENGINE LIMITATIONS

Maximum CHT

Takeoff and Climb	290 degrees C
Cruise (1800 RPM)	235 degrees C

Oil Pressure

Cruise	60 - 90 psi
Minimum at idle	15 - 20 psi

Oil Temperature

Normal maximum	70 degrees C
Absolute maximum	93 degrees C

Engine RPM Limitations

Takeoff Maximum	2075 RPM
Normal Cruise	1800 RPM
Maximum Cruise	1900 RPM

FLIGHT LIMITATIONS

Vne

110 KIAS

Maximum Crosswind Limit

10 KIAS

Prohibited Manoeuvres

The following manoeuvres are prohibited in the Triplane:

a. Intentional spinning (erect or inverted), and

b. Aerobatics.

These manoeuvres are prohibited for ultimate design and stress loadings on the aircraft wings. A 99% probability of safety will be obtained by flying the aircraft at normal acceleration factors below 2.5 'g'.

SECTION 4

HANDLING CHARACTERISTICS

INTRODUCTION

The Triplane has acquired a reputation as an aircraft to be feared; this is not the case. The aircraft exhibits a number of characteristics which would not be acceptable in an aircraft undergoing certification today; however the aircraft is quite controllable throughout the flight envelope *as long as the pilot understands these characteristics and the control inputs necessary to overcome them.* There is no doubt that the aircraft should not be flown by those with little tailwheel experience; most accidents in the original Triplane occurred during takeoff and landing. Prepatory flying should include experience in the Tiger Moth (if available), particularly if the aircraft is fitted with a tailwheel (as opposed to a skid). Any light tailwheel aircraft which has a poor Field Of View over the aircraft nose and differential braking on the mainwheels (such as a Pitts Special, Chipmunk etc) would prepare a pilot for the Triplane.

TAKEOFF AND LANDING

As described in Section 2, the poor Field Of View over the aircraft nose coupled with the directional instability of the Triplane make takeoff and landing the most difficult phases of flight. Numerous directional control inputs will be required during the takeoff and landing rolls. During the conversion phase, take the opportunity to conduct a sortie of stop-and-go circuits. Merely conducting touch and go circuits does not adequately provide experience for the most critical phase of the landing, ie the period between commencing lowering the tail to the time the aircraft is at a safe taxy speed. The additional benefit of performing a number of consecutive full-stop landings is that the pilot learning curve is increased, and the pilot's confidence in his ability to safely operate the aircraft is achieved in less time. Historically, some Triplane pilots have taken the view that landing the aircraft was an event that they should only have to attempt once per flight, and if they walked away from it was satisfactory! They did not take the time to become familiar with the aircraft's peculiarities and were always wary of it as a result. With practice and experience, landing the Triplane smoothly, accurately and safely (not an exceptionally difficult task with practice) is something which will give you great satisfaction and enjoyment.

STABILITY AND CONTROL

Longitudinal Axis

Elevator authority throughout the flight envelope is satisfactory. Stick force per 'g' is constant and predictable throughout the allowable range. Control forces during manoeuvring flight are moderate but not excessive or tiring. The lack of a longitudinal trim requires continuous aft control column force in level flight, decreasing as airspeed approaches Vne. The exact magnitude of this force, and the speed at which hands-free straight and level flight is achieved (ie no longitudinal stick force) is dictated by individual pilot weight. The aircraft Short Period Pitch Oscillation (SPPO) is quick but well damped, allowing the aircraft to be confidently and predictably manoeuvred in pitch.

Lateral Axis

The aircraft ailerons are quite powerful, although large stick forces and displacements are necessary for aggressive roll manoeuvres. Although the ailerons are powerful, the aircraft response to a lateral control deflection (roll mode time constant) is quite slow. Significant adverse yaw is generated with lateral control deflection, and the ailerons have no differential deflection (ie they are not Frise ailerons) to counter this characteristic. Using full lateral control column, a 60 degree Angle-Of-Bank (AOB) change takes approximately 2 seconds. The ailerons remain effective to the point of stall. The aircraft is rigged correctly and no wing heaviness is apparent during flight.

Directional Axis

The aircraft is directionally unstable throughout the entire flight envelope, as the short fuselage and small rudder provide insufficient stabilising force behind the aircraft Centre-Of-Gravity. This means that if the aircraft is disturbed directionally (as a result of turbulence, rough runway surface or inadvertent application of rudder), the resultant sideslip angle tends to become divergent rather than convergent as would be the case in a conventional aircraft. Fortunately, the Triplane exhibits good sideforce characteristics (lateral cockpit forces generated when the aircraft is in a sideslip condition) and detecting a gross out-of-balance (sideslip) condition is straightforward without reference to the skid ball. The skid ball can be used for precise balance as required. Although quite small, the rudder is quite powerful throughout the flight envelope and any directional divergence can be controlled with rudder. Even with idle power after landing, the rudder alone can control the aircraft directionally until the tail is lowered, at which point the rudder becomes blanked by the wing planforms and differential brake is required to assist directional control. During flight, a moderate right pedal force is required to keep the aircraft balanced. Significant pedal co-ordination is required during turns to keep the aircraft balanced, as adverse aileron yaw tends to generate sideslip which becomes divergent if not corrected. Due to the directional instability and lack of appreciable lateral stability, sideslipping the aircraft is not recommended. The Triplane exhibits no Dutch Roll tendency as positive static direction stability is required for this condition.

STALLING

Approach to the Stall

During the approach to the stall no significant airframe or control buffeting above that observed in normal flight is apparent. During the deceleration the flight controls remain effective in all axes, and increasing aft control column force is required to maintain level flight. The impending stall can be averted at any time by relaxing the applied aft stick force.

The Stall

The stall is evidenced by a small pitch down accompanied by a left wing drop which is easily arrested with rudder. With power off, at maximum AUW (918 kg), the aircraft stalls at approximately 53 KIAS. The ailerons remain effective at airspeeds well below the stall and can be used to assist in arresting the wing drop if necessary. As power increases, the stall airspeed decreases such that with full power set the aircraft can be flown at speeds below 40 KIAS with an extremely high nose attitude. This reduction in stall airspeed is due to the high-speed propeller slipstream decreasing the effective angle-of-attack of the middle and lower wings. The stall behaviour is generally quite docile and the aircraft will not enter autorotative flight with normal control inputs.

Recovery from the Stall

Relaxation of the applied stick force will produce an immediate recovery from the stalled condition; smoothly applying full power at the same time will minimise altitude loss. Recovery to level flight is easily achieved without re-stalling the aircraft. Total height loss from the point of stall to wings-level, climbing flight at 70 KIAS with full power set is less than 100 feet.

SPINNING

Introduction

The RAAF Museum Fokker Triplane replica is not cleared for spinning; the information presented here is for reader interest only. No formal spinning evaluation of the RAAF Museum Triplane replica has been conducted, as spinning flight is prohibited for stress considerations. Triplane replicas in the United States have been spun; however the specific details of these aircraft may be different to the Museum aircraft. In the US, the empty weight of the aircraft is lighter than the RAAF Museum example. Additionally, at least three engine types are known to be fitted, which may affect the aircraft Centre-of-Gravity and hence spinning characteristics of the aircraft.

Out-of-Control Flight

The aircraft is extremely reluctant to depart controlled flight, even when large control inputs are applied near the stall angle of attack. If control of the aircraft is lost or the pilot is unsure of a manoeuvre or aircraft response, the flight controls should be centralised and the throttle selected to IDLE. This action should result in the aircraft reaching a condition from which recovery to controlled flight can be effected, and will prevent spin entry. Anecdotal information suggests that if the Triplane enters a fully-developed spin, the rotation rate will be rapid after two turns, and will increase further after the third turn. Standard recovery actions (full rudder in the direction opposite to the spin, control column centrally forward) should effect recovery after two further turns.

FORMATION FLIGHT

As a historical aircraft, and as a widely recognised fighter, the Triplane is often expected to fly displays in company with other historical aircraft of the same vintage. Formation flying in the Triplane is quite safe and simple to perform, provided the pilot understands and respects the limitations of the aircraft. The Triplane has a relatively low wing loading, making it particularly susceptible to the wake turbulence of a preceding aircraft. When conducting formation flying or display in company with another aircraft, avoid flying directly behind the other aircraft. Flying in the wake turbulence from even a small aircraft such as the Tiger Moth may require a lateral control deflection of up to 50-75% (with high lateral control forces) to maintain wings-level flight. The combination of this characteristic and the slow lateral control response of the aircraft necessitate a relatively 'loose' formation position when flying in company with another aircraft. The poor Field Of View from the cockpit also limits the positions in which other aircraft can be seen; aim to fly at the same altitude as other aircraft in the formation, behind and to one side. Make no attempt to land immediately behind another aircraft on the same runway; wake turbulence notwithstanding, keeping sight of the preceding aircraft will be extremely difficult when the tail is lowered. Be extremely conscious of the performance differential between the Triplane and other aircraft in the formation; compared to other light aircraft the Triplane has quite a high stall speed (and consequently a high downwind and approach speed) yet has a relatively low Vne of 110 KIAS. As a comparison, the Tiger Moth has a takeoff and landing speed of approximately 50 KIAS, yet has a Vne well in excess of the Triplane. In addition to the takeoff and landing speed differential, consideration must be given to differences in the cruise and manoeuvre speeds of the other aircraft. Before flying a display, practice formation flying should be conducted with the other intended aircraft if possible.

ANNEX E
TO ARDU FORMAL REPORT
TASK 0127

WEIGHT AND BALANCE SUMMARY

RAAF MUSEUM FOKKER TRIPLANE REPLICA

VH-ALU

AUSTRALIA

DEPARTMENT OF TRANSPORT

AIRCRAFT WEIGHING SUMMARY

(Reference: Department of Transport Publication No. 17)

AIRCRAFT TYPE (JONES) FORKER DRI TRIPLANE REPLICA (SER Nº 1864DR)

AIRCRAFT REGISTRATION VH-ALU

OWNER OR OPERATOR RAAF MUSEUM

AIRCRAFT DATUM L.E. CENTRE WING

SCALES No EFM 16-400

PLACE PT. COOK

AIRCRAFT WEIGHT CONTROL OFFICER OR ORGANISATION RESPONSIBLE FOR WEIGHT CONTROL M.W. HOCKIN (AW15)

DETERMINATION OF EMPTY WEIGHT

NOTE 1: The difference between the two gross weights must not exceed 0.2% or 10kg (whichever is the greater) otherwise further weighings must be carried out until two consecutive weighings agree within this tolerance

NOTE 2: Readings should be made to the nearest 1 kg

Jack point	Cell colour	Scale reading	Zero set	Correction	Actual weight	Jack point	Cell colour	Scale reading	Zero set	Correction	Actual weight
PORT	YEL	370		-4	366	PORT	RED	360		-3	357
STBD	BLUE	360		-4	356	STBD	YEL	360		-4	356
TAIL	RED	30		0	30	TAIL	BLUE	30		0	30
NOSE						NOSE					

FIRST WEIGHING – Gross total 752 kg

SECOND WEIGHING – Gross total 743 kg

AVERAGE – Both weighings 747 kg

DEDUCTIONS

Fuel, oil and other fluids

OIL tanks 19 l at .9 kg/l 17 kg

tanks l at kg/l kg

tanks l at kg/l kg

tanks l at kg/l kg

tanks l at kg/l kg

Removable equipment

Moment arm ± kg

kg

kg

kg

Weighing gear

Moment arm ± kg

kg

TOTAL DEDUCTIONS 17 kg

ADDITIONS

Moment arm ± kg

kg

kg

TOTAL ADDITIONS 0 kg

GROSS TOTAL (average of both weighings) 747 kg

NET ADJUSTMENT (±) -17 kg

EMPTY WEIGHT OF AIRCRAFT 730 kg

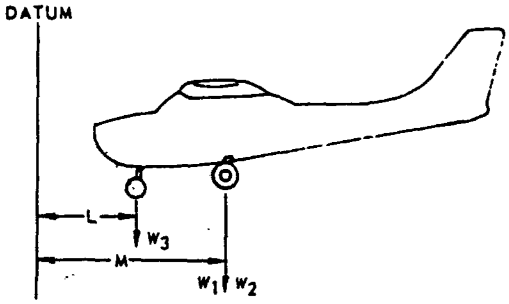
Configuration at time of weighing (refer also to equipment list) UNUSABLE FUEL, FULL OIL.

REMARKS

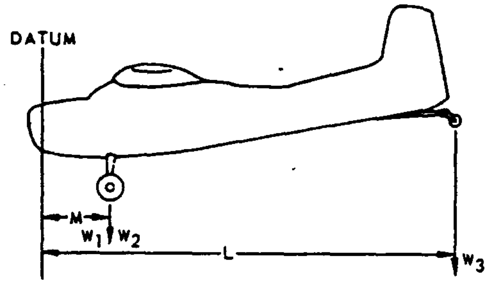
Supervised by [signature] 7/11/91

Weight Control Officer

NOSEWHEEL AIRCRAFT



TAILWHEEL AIRCRAFT



	FIRST WEIGHING	SECOND WEIGHING	AVERAGE
Horizontal distance from datum to main jack point (M)	-8 mm	-8 mm	-8 mm
Horizontal distance from datum to nose or tail jack point (L)	4138 mm	4138 mm	4138 mm

NOTE: Distances measured aft of the datum are positive (+). Distances measured forward of the datum are negative (−)

W1- kg	W2- kg	W3- kg
361	356	30

NOTE: W1, W2 and W3 are the average values of the reaction point weights for the two weighings recorded on page 2

ITEM	WEIGHT kg		MOMENT ARM	INDEX (MOMENT (Kg-mm) / C) (C= 1)	
	+	−	± mm	+	−
W_1	361		(M) -8		2888
W_2	356		(M) -8		2848
W_3	30		(L) 4138	124140	
OIL		17	-159	2703	

ADDITIONS AND DEDUCTIONS (Refer page 2)

MOMENT TOTALS 126843 ① 5736 ②

AIRCRAFT EMPTY MOMENT INDEX 121107 (①-②)

AIRCRAFT EMPTY WEIGHT (from page 2) 730 kg

AIRCRAFT EMPTY WEIGHT C of G $\left(\frac{\text{empty moment index x C}}{\text{empty weight}}\right)$ 166 mm ~~fwd~~ / aft of datum

LOAD DATA SHEET DETAILS

Issue No 2 Date of expiry INDEFINITE

Empty weight 730 kg Arm 166 mm

Index units 121107

Prepared by [signature] / /

LIST OF EQUIPMENT INCLUDED IN THE EMPTY WEIGHT OF AIRCRAFT

AIRCRAFT REGISTRATION VH-ALU TYPE (JONES) FOKKER MODEL DrI REPLICA Issue No 2

Date 7/11/91

DETAILS OF CONFIGURATION

PASSENGER	FREIGHTER
—	—
AGRICULTURAL	**OTHER PURPOSE**
—	FLYING REPLICA.

ITEM	QTY	ITEM	QTY
ENGINE(S) (Type)		INSTRUMENTS	
CONTINENTAL W670-6A	1	Altimeters	1
		Ammeters	
		Clocks	
PROPELLER (S) (Type)		Propeller Synchroniser	
SENSENICH WOODEN	1	Voltmeters	
S/N° 49538			
AGRICULTURAL EQUIPMENT			
OTHER SPECIAL PURPOSE EQUIPMENT		GAUGES	
		Brake Pressure	
		Engine Oil Pressure TRIPLEX	1
		Fuel Contents	
COMPASSES		Fuel Pressure TRIPLEX	1
Magnetic	1	Hydraulic Oil Pressure	
Remote Indicating		Manifold Pressure	
		Oil Contents	
		Oxygen Pressure	
		Suction Pressure	
		Torque Meter	

ITEM	QTY
THERMOMETERS	
Carburettor Air Temp	
Engine Temp (CHT)	1
Oil Temp TRIPLEX	1
Outside Air Temp	
Turbine Temp	
INDICATORS	
Airspeed	1
Cabin Rate of Climb	
Compressor RPM	
Directional Gyro	
Exhaust Gas Analyser	
Flight Hour	
Fuel Flow	
Gyro Horizon	
Stall Warning	
Tachameter Non-Recording	
Tachameter Recording	1
Trim Indicator	
Turn and Bank	
Turn Co-ordinator (BALL ONLY)	1
Undercarriage Position	
Vertical Speed (rate of climb)	1
Wing Flap Position	

ITEM	QTY
LIGHTS	
Anti-Collision	
Instrument	
Landing	
Map Reading	
Navigation	
Signal	

ITEM	QTY
RADIO EQUIPMENT (Type)	
A.D.F.	
Auto Pilot	
Cabin Speakers	
D.M.E.	
Flight Director	
Glide Slope Receiver	
Head Phones	
MF/HF Tx/Rx	
V.A.R.	
V.H.F. Tx/Rx KY97A	1
V.H.F. Nav. Receivers	
FLUID TANKS	2
Fuel, auxilary	
Fuel, wing tip	
Fuel, other	

ITEM	QTY
FLUID QUANTITY	
Fuel, Main 33 US Gal (125 l)	1
Fuel, Auxilary	
Fuel, Other	
Oil, Hydraulic	
Oil, Lubricating 5 US Gal (19 l)	1
RESTRAINT EQUIPMENT	
Cargo Restraint Cordage/Webbing	
Freight Restraint Nets	
Inertia Reels	
Lap-sash Assemblies	1
ELECTRICAL EQUIPMENT	
Alternators	
Electric Storeage Batteries (MINIATURE)	2
Generators	
Starters	1

ITEM	QTY	ITEM	QT
MISCELLANEOUS EQUIPMENT		DISPOSABLE LOAD LIST	
Dual Controls		Crash Axes	
De-icer Boots		Flight Control Locks	
Fire Extinguisher (Engine)		First Aid Outfits	
Fire Extinguisher (Portable)		Disposable Ballast	
Fixed Ballast		Signalling Apparatus	
Hydraulic Pumps		Torch	
Landing Gear Warning Horns		V.S. Beacon	
Oxygen Equipment			
Pilot Heaters			
Vacuum Pumps			

WEIGHT CONTROL OFFICER

Signature M W Hake

7/11/91

FROM PREVIOUS W&B DATA / FOKKER D.I N864DR

	kg	mm	IU (kg mm)
A/C Empty	730	166	121107
oil	17	-159	-2703
Pilot.	77	1092	84084
	824	246	202488
	(1817 lb)	(9.7") aft of LE centre wing	
+ Fuel (125 l @ .71)	89	229	20381
	913	244	222869
	(2013 lb)	(9.6")	

AILERON HINGE MODIFICATION

RAAF MUSEUM FOKKER TRIPLANE REPLICA

VH-ALU

CIVIL AVIATION AUTHORITY
~~XXXXXXXXXXXXXXXXXXXXXXXXX~~
NOTIFICATION OF APPROVAL OF DESIGN
~~APPLICATION FOR APPROVAL OF DESIGN~~

FOR MODIFICATION : REPAIR : REPLACEMENT PART

APPLICANTS NAME & ADDRESS (Registered Business Name if applicable)	APPLICANTS REF.
A JELLIFFE PTY LTD 73 HOLMES ROAD MOONEE PONDS · VIC 3093	AJ 006

APPLICATION IS HEREBY MADE FOR APPROVAL OF THE DESIGN DESCRIBED BELOW & DEFINED BY THE DRAWINGS & DOCUMENTS LISTED BELOW (If insufficient space, attach list)

DESIGN TITLE: Modification to Fokker Dr1 Replica VH-ULA – Redesign of Aileron Control Surface

PRODUCT	MAKE	MODEL	PART NO. (if applicable)	REPLACING PART NO.	FOR USE ON AIRCRAFT REGISTERED AS:
Modification	–	Fokker Dr1 Replica	–	–	VH- ALU

LIST DRAWINGS, REPORTS, REVISIONS TO AIRCRAFT FLIGHT MANUAL, MAINTENANCE INSTRUCTIONS & OPERATING INSTRUCTIONS.

DOCUMENT IDENTITY/OR DRAWING NUMBER	ISSUE	DOCUMENT TITLE & SECTIONS OF MANUALS AFFECTED
AJ 006	1	Aileron Hinge Modification VH-ALU

APPLICABLE DESIGN STANDARDS (REF. ANO 100.6 – SUB-SECTION – 4)

CAO 101.22

SIGNATURE OF APPLICANT OR REPRESENTATIVE (IN BLOCK LETTERS ALSO)	DATE

DEPARTMENTAL USE

Approval of design subject to inspection of travels, clearance and free movement of aileron surfaces.

DATE ...25.6.90...............

Delegate of Secretary

FORWARD TO REGIONAL OFFICE

~~DEPARTMENT OF AVIATION~~ STANDARD DRAWING SHEET FOR AIRCRAFT PARTS

APPROVAL STAMP	HEAT TREATMENT	PROTECTIVE TREATMENT	MATERIAL SPEC. when one part only	ORGANISATION
CIVIL AVIATION AUTHORITY APPROVED pursuant to regulation ...35.... of the CIVIL AVIATION REGULATIONS. .... Delegate of the Authority Date .25-6-90.......	—	ETCH PRIME AND PAINT	—	A. JELLIFFE PTY. LTD.

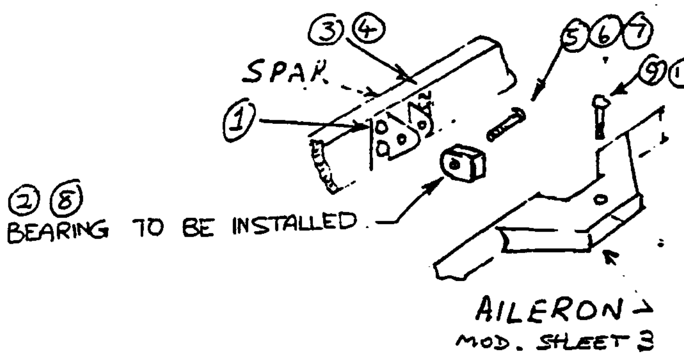
LIMITS WHERE NOT STATED		SURFACE FINISH	REPLACING PART No.	AIR
Fractional	±		—	Fo
Decimal	±			
Angular	±			
BREAK SHARP EDGES :010 to :015		BEND RADII	BEND RELIEF	
STAMP PART No. WHERE SHOWN ☒				

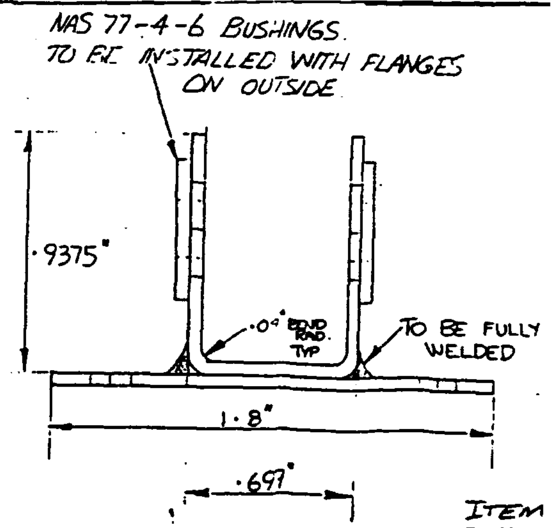
SCHEDULE OF ISSUES

Issue	Alteration	Drawn	Ch'k'd	Auth'd	DATE
1	—	G.S.	LB		25-6-90

ITEM REF.	Description of Part
1	HINGE
2	BEARING
3	BOLT
4	NYLOC NUT
5	SPLIT PIN
6	BOLT
7	CASTELATED NUT
8	BLOCK
9	BOLT
10	NUT NYLOC
11	GREASE NIPPLES

CERTIFICATION -
DESIGN INSPECTED & SATISFACTORY
....
DESIG. .... DATE ....





ASSEMBLY OF HINGE

TYPICAL of SIX PLACES.

ITEM

MAT: ·050" CHROMOLLY. MILS 18729

RAWING SHEET FOR AIRCRAFT PARTS

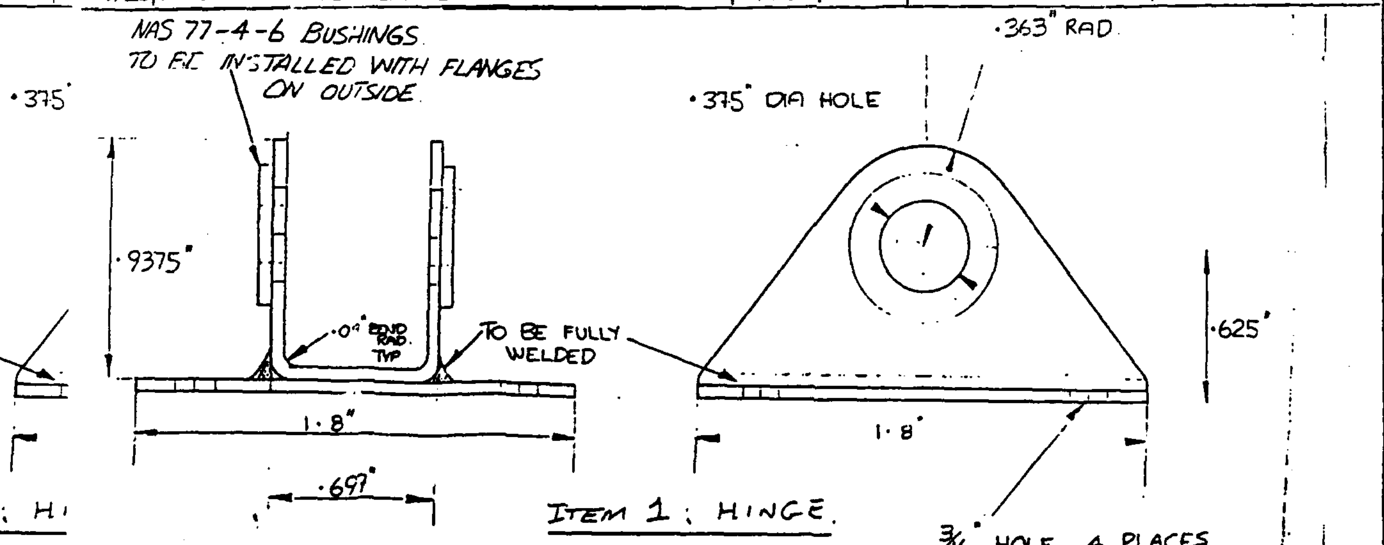
MATERIAL SPEC. when one part only	ORGANISATION	TITLE	DRAWING NUMBER
—	A. JELLIFEE PTY. LTD.	AILERON HINGE MODIFICATION VH-ALU	AJ 006 Sheet 1 of 3

SURFACE FINISH	REPLACING PART No.	AIRCRAFT OR ENGINE TYPE	No. REQ'D PER A/C	NEXT ASSEMBLY No.
	—	FOKKER DR 1 REPLICA.		

BEND RADII	BEND RELIEF	SCALE	WEIGHT CHANGE	NEGLIGABLE
			DIST. FROM A/c DATUM	—

SCHEDULE OF PARTS

ITEM REF.	Description of Part	NUMBER OFF As Drawn	NUMBER OFF Opp. Hand	Material	Part No. or Spec.
1	HINGE	6		·050" STEEL	MIL-S-18729
2	BEARING	6		BAC B10-CG4	D 40974
3	BOLT	24		STEEL	AN3A TO SUIT
4	NYLOC NUT	24		STEEL	AN 365-3
5	SPLIT PIN	6		STEEL	AN 380
6	BOLT	6		STEEL	AN 6 - TO SUIT
7	CASTELATED NUT	6		STEEL	AN310-6
8	BLOCK	6		ALUM 2024-T351	QQ-A-250/5
9	BOLT	6		STEEL	AN 4A - TO SUIT
10	NUT NYLOC	6		STEEL	AN 365-4
11	GREASE NIPPLES	12			COMM'L



ITEM 1: HINGE.

MAT: ·050" CHROMOLLY. MILS 18729

3/16" HOLE 4 PLACES TO SUIT EXISTING HOLES IN SPAR

STANDARD DRAWING SHEET FOR AIRCRAFT PARTS

DEPARTMENT OF AVIATION

APPROVAL STAMP

CIVIL AVIATION AUTHORITY
APPROVED pursuant to regulation .35....... of the CIVIL AVIATION REGULATIONS.
....
delegate of the Authority
Date 25-6-90.......

HEAT TREATMENT	PROTECTIVE TREATMENT	MATERIAL SPEC. when one part only	ORGANISATION
—	ETCH PRIME AND PAINT	—	A. JELLIFFE PTY. LTD.

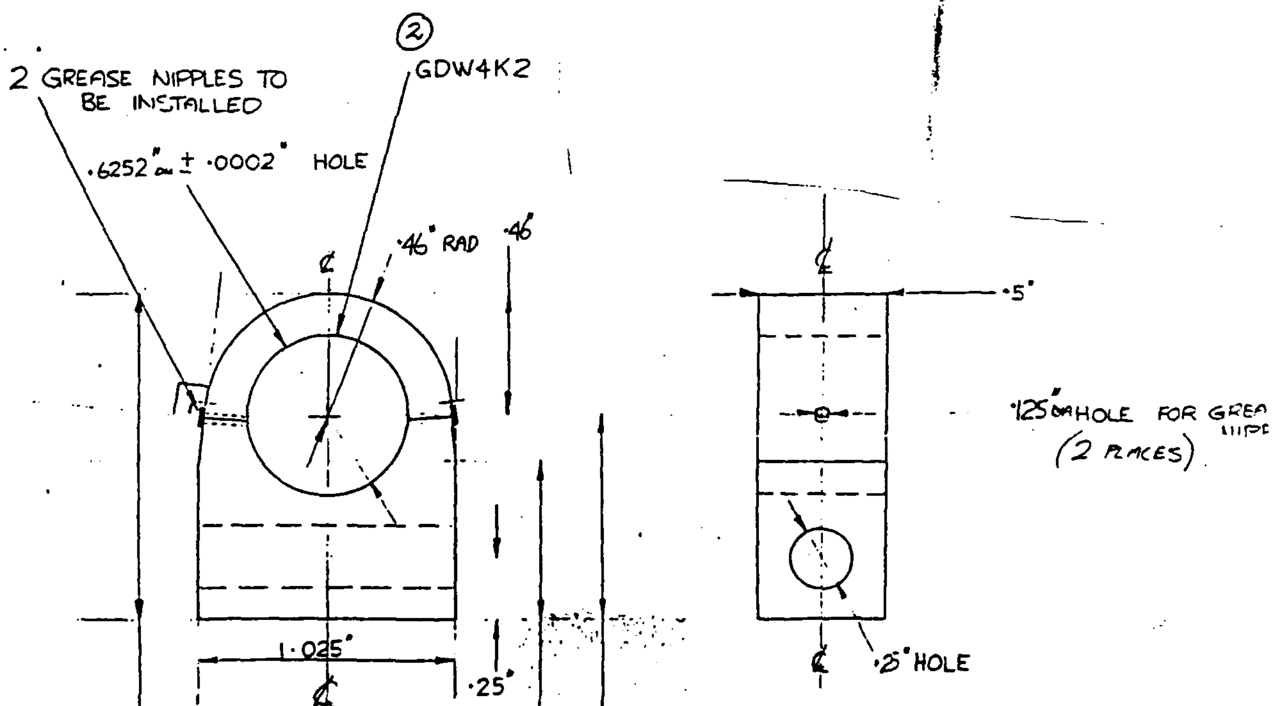
LIMITS WHERE NOT STATED		SURFACE FINISH	REPLACING PART No.	AIRCRAFT O
Fractional	±			
Decimal	±			
Angular	±			
BREAK SHARP EDGES :010 to :015		BEND RADII	BEND RELIEF	S
STAMP PART No. WHERE SHOWN				

SCHEDULE OF ISSUES

Issue	Alteration	Drawn	Ch'k'd	Auth'd	DATE
1	———	GS	LB		25-6-90

SCHE

ITEM REF.	Description of Part



PLEASE REMOVE ALL SHARP EDGES.

Item 8

MAT. : .5" 2024 - T351

DA2610, Formerly DA78C (Rev. 8/84)

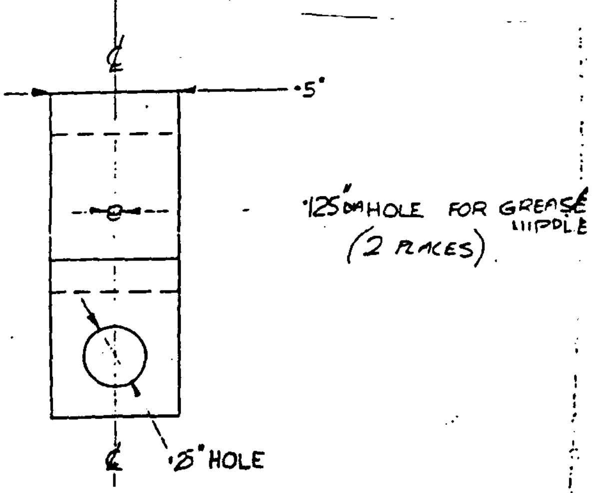
AWING SHEET FOR AIRCRAFT PARTS

MATERIAL SPEC. hen one part only	ORGANISATION	TITLE	DRAWING NUMBER
–	A JELLIFFE PTY. LTD.	AILERON HINGE MODIFICATION VH-ALU	AJ 006 Sheet 2 of 3

CE FINISH	REPLACING PART No.	AIRCRAFT OR ENGINE TYPE	No. REQ'D PER A/C	NEXT ASSEMBLY No.
				SHEET 1
BEND RADII	BEND RELIEF	SCALE	WEIGHT CHANGE	
			DIST. FROM A/c DATUM	

SCHEDULE OF PARTS

TEM REF.	Description of Part	NUMBER OFF As Drawn	NUMBER OFF Opp. Hand	Material	Part No. or Spec.



PLEASE REMOVE ALL SHARP EDGES.

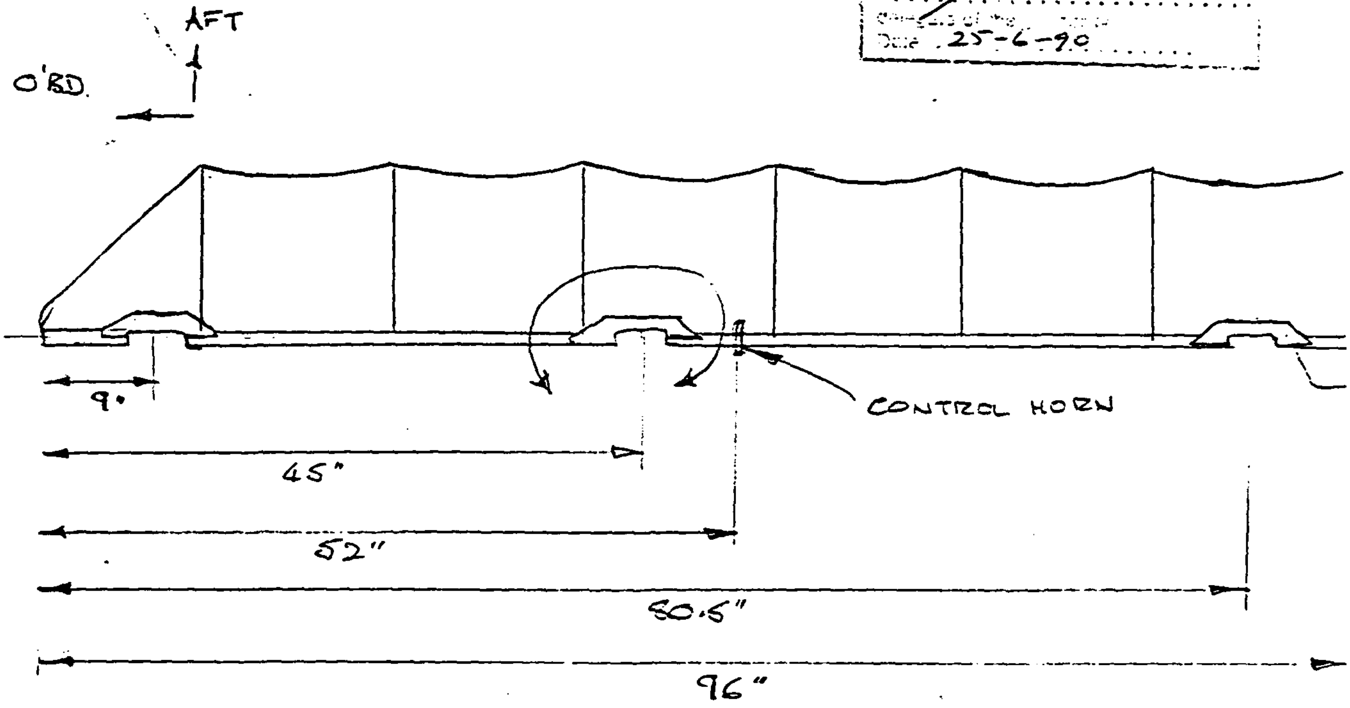
BLOCK. BEARING HOUSING
FOKKER TRI-PLANE AILERON HINGE MODIFICATION.

A. JELLIFFE

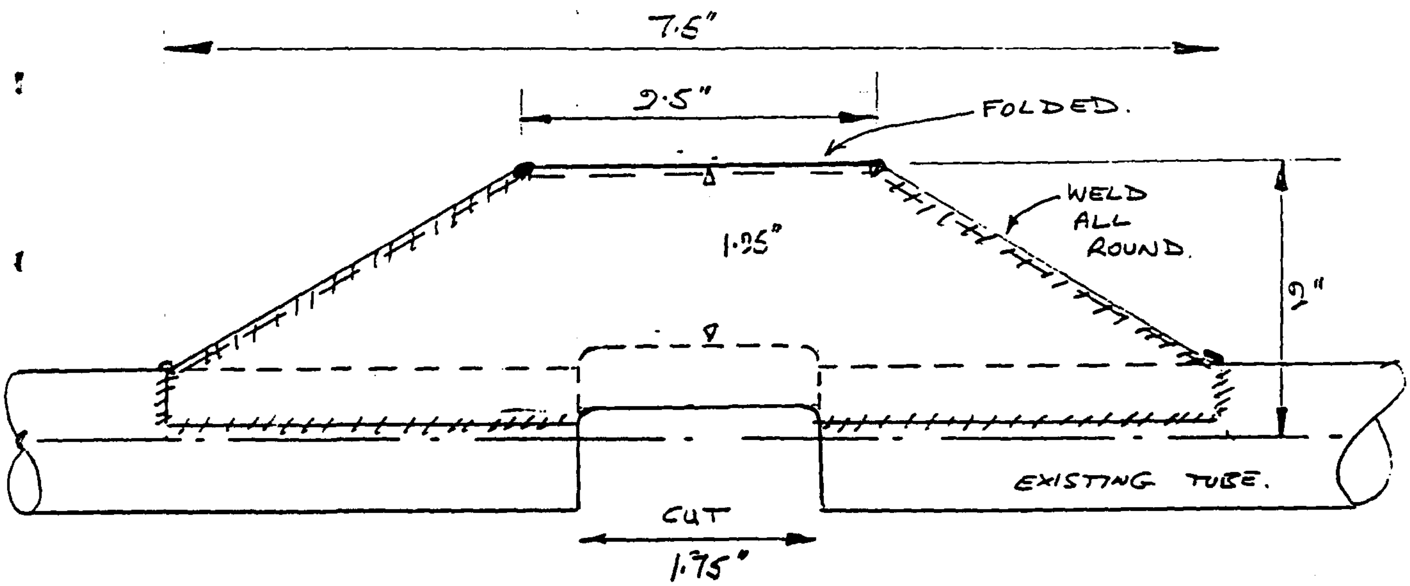
PTY. LTD

APPROVED ... 35 ... OF THE CIVIL AVIATION REGULATIONS

Date 25-6-90



AILERON LOCATION (TYPICAL BOTH)



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.036" STEEL SHEET MIL-S-98575

DWG. No. AJ 006 SHEET 3 of 3

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DOCUMENT CONTROL DATA

CLASSIFICATION OF DCD PAGES	UNCLASSIFIED
AR NUMBER	AR-007-179
REPORT NO	0127
TITLE	HANDLING QUALITIES EVALUATION OF THE RAAF MUSEUM FOKKER TRIPLANE
REPORT DATE	JUNE 1993
SECURITY CLASSIFICATION	
Complete Document	UNCLASSIFIED
Title in Isolation	UNCLASSIFIED
Summary in Isolation	UNCLASSIFIED
NO OF PAGES	56
AUTHOR	FLTLT A. J. Morris, tp
CORPORATE AUTHOR AND ADDRESS	AIRCRAFT RESEARCH AND DEVELOPMENT UNIT, RAAF BASE EDINBURGH, SA 5111, AUSTRALIA
COMPUTER PROGRAMS	NIL
SECONDARY DISTRIBUTION	Approved for Public Release
ANNOUNCEMENT LIMITATIONS	NO LIMITATIONS
DESCRIPTORS	
Thesaurus Terms	Airplanes, Evaluation, Aviation History
Non-Thesaurus Terms	Fokker Drl Triplane, Fighting Scout
DRDA CAT	010303
ABSTRACT	Task 0127 required the Aircraft Research and Development Unit to determine the handling characteristics of the RAAF Museum Fokker Triplane Replica. This report documents the results of that task.