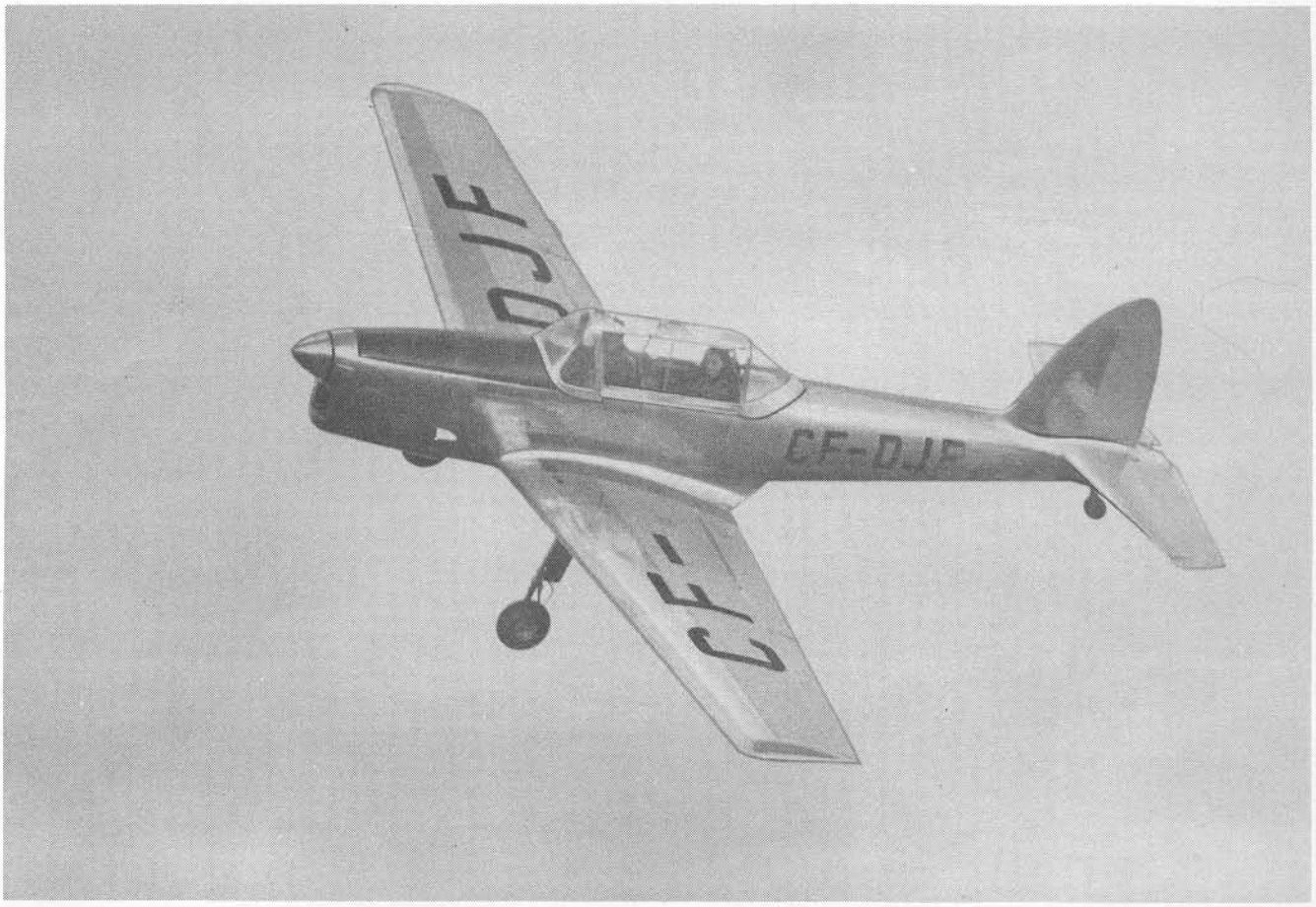
CHIPMUNK

DHC-1

OPERATION AND MAINTENANCE MANUAL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OPERATION AND MAINTENANCE MANUAL

DHC-1 - CHIPMUNK

FOREWORD

This Manual is published and issued for the guidance of all concerned with the operation and maintenance of the de Havilland "Chipmunk", Model DHC-1.

Amendments will be distributed, when issued, to all persons whose names appear on the company list as holders of copies of this Manual.

THE DE HAVILLAND AIRCRAFT OF CANADA LIMITED
Postal Station "L"
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AMENDMENTS

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OPERATION AND MAINTENANCE MANUAL

DHC-1 - CHIPMUNK

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INTRODUCTION and DESCRIPTION

1.1 Description (Plates 1.1, 1.2, 1.3)

The DHC-1 Chipmunk is an all-metal single engined low-wing monoplane with fixed conventional undercarriage. It accommodates two in tandem arrangement with duplicate controls and instruments at each position. In this manual reference will be made to the various versions of the Chipmunk which are classified as follows:

a) DHC-1A-1
Licensed in the A.R.B. acrobatic (i) category at 1930 lb. all-up weight and fitted with the de Havilland Gipsy Major 1C engine.

b) DHC-1A-2
Licensed in the A.R.B. acrobatic (i) category at 1930 lb. all-up weight and fitted with the de Havilland Gipsy Major 10 engine.

c) DHC-1B-1
Licensed in the A.R.B. acrobatic (ii) category at 1930 lb. all-up weight and fitted with the de Havilland Gipsy Major 1C engine.

d) DHC-1B-2
Licensed in the A.R.B. acrobatic (ii) category at 1930 lb. all-up weight and fitted with the de Havilland Gipsy Major 10 engine.

All versions may be equipped with a wood or metal fixed pitch propeller.

1.2 Fuselage

The all-metal stressed skin fuselage consists of two major sections bolted together. The joint, which provides a means of disassembling the fuselage for repairs or replacements, is reinforced by a lap strip riveted to front and rear sections. The forward section which contains the cockpits comprises four main longerons, pressed formers and a series of modified "Z" section stringers which distribute the loads over the skin. The firewall forms the front of this section. The engine mounting is attached to the forward ends of the longerons. The main wing attachment fittings are supported by a built-up "U" shaped belt frame located beneath the front cockpit seat. This frame transmits the spar loads across the fuselage. The wing leading edge attachment point is joined to a similar built-up frame forward of the front instrument panel.

The cockpit enclosure includes a fixed plexiglas windscreen carried on a tubular steel structure which serves as a crash pylon to protect the occupants in the event of overturning. The balance of the canopy, which is fitted with breakout panels, slides rearward to clear both cockpits.

1.2 Fuselage (cont'd)

The top surface of the rails on which the canopy slides can be used as levelling pads both longitudinally and transversely.

The rear fuselage is a straight tapered conical section, the skin of which is single curvature throughout. It is a semi-monocoque structure consisting of pressed formers, modified "Z" section stringers and a stressed skin.

A transverse tube is built into the rear fuselage through which a rope or bar may be passed to facilitate handling the machine.

The rear bulkhead of this section is strengthened to take the tailplane front attachment, the rudder post and the tailwheel strut fittings.

A detachable tailcone fairs in the junction of the rudder, tailplane and elevators and completes the lines of the rear fuselage.

1.3 Wings

The wings are cantilever structures incorporating an all-metal "D" nose box beam, which arries flight and landing loads, and a fabric covered rear section which supports the flaps and ailerons on a false spar.

The "D" nose consists of the single main spar, nose ribs and the leading edge skin which is reinforced with spanwise stringers. The wing root attachment points are located at the top and bottom of the main spar and on a short dummy spar fitted near the leading edge. The under-carriage legs are attached to special nose ribs, inboard of which are the fuel tank compartments.

The ribs aft of the main spar are attached to the "D" nose and are fabric covered except for a walkway area adjacent to the fuselage, which is metal skinned and rubber covered.

Flaps and ailerons are fabric covered metal structures. The ailerons are internally mass-balanced. A metal trailing edge tab, adjustable on the ground, is fitted to the starboard aileron as required. The wings are fitted with detachable pressed metal tips. Wing fillets fair each wing into the fuselage and when removed provide access to the attachment points, brake lines and electrical services.

1.4 Tail Assembly

The tail unit consists of a tailplane built as a single unit, with divided aerodynamic-and mass-balanced elevators having coupled torque tubes and a single control lever, a single fin and an aerodynamic-and mass-balanced rudder.

1.4 Tail Assembly (cont'd)

The tailplane is an all-metal cantilever structure with front and rear flanged spars. The front spar is bolted to the rear bulkhead of the fuselage, and two brackets fixed to the rear spar are connected by struts to the bottom of the bulkhead.

The elevators each comprise a metal spar to which a preformed leading edge, horn balance and ribs are riveted. The elevator is fabric covered. An all-metal tab, which is adjustable in flight, is provided on the starboard elevator.

The fin, which is attached to the fuselage at two points, is an all-metal cantilever structure. The front fitting is made accessible by the removal of a fillet at the base of the fin. This fillet is carried forward to meet the centre canopy rail forming a dorsal fin. The rudder post, which is the rear spar of the fin, is bolted to the rear face of the aft bulkhead to provide additional stiffening for the attachment of tailplane struts and the tailwheel yoke.

The rudder is of similar construction to the elevators and is fitted with a trailing edge tab which may be adjusted on the ground.

1.5 Landing Gear

The landing gear consists of two main undercarriage units, one attached to each "D" nose and a castoring tailwheel unit. All undercarriage units are fixed.

The main (6.00-6) undercarriage unit consists of a Goodyear wheel and brake assembly, and a single cantilever leg contains the compression rubber shock absorber unit. The hydraulic brakes are differentially controlled from the rudder bar. Parking brakes are applied by means of a brake lever in each cockpit.

The tailwheel assembly is attached to the rear fuselage bulkhead and to fittings on the front spar of the tailplane. It consists of a flattened tubular steel yoke, a fully castoring fork fitted with a friction damper and shock strut.

1.6 Flying and Engine Controls.

Standard flying controls consisting of a stick type control column and pivoted rudder bar are fitted in each cockpit. The control movements are transmitted by connecting rods and cables running over pulleys. Either control column is readily detachable for passenger flying.

Longitudinal, lateral and directional trim is obtained by the tabs on the movable control surfaces.

1.6 Flying and Engine Controls (cont'd)

Access to the flying control cables in the fuselage is obtained by means of detachable panels on the control box located centrally on the cockpit floor, and by removal of the tailcone. In the wings the aileron controls are accessible by means of hand holes and zippered openings in the fabric on the lower side of the wing, and by removal of the wing root fillets.

The engine controls are fitted in each cockpit on the port side of the fuselage. Motions are transmitted by means of push-pull rods.

1.7 Power Unit

The power unit which is attached to the front fuselage by four bolts, comprises engine and mounting, propeller, fireproof bulkhead, oil tankand cooler system, cowling and accessories.

Air intake scoops on the engine cowlings provide air for the carburetter, oil cooler and generator cooler, the latter being required on only the Major 10 installation.

1.8 Fuel System

The fuel supply is actuated from either cockpit by a lever on the control box. Filler necks and fuel contents gauges are located on the inboard wing upper surface, easily visible from the cockpits.

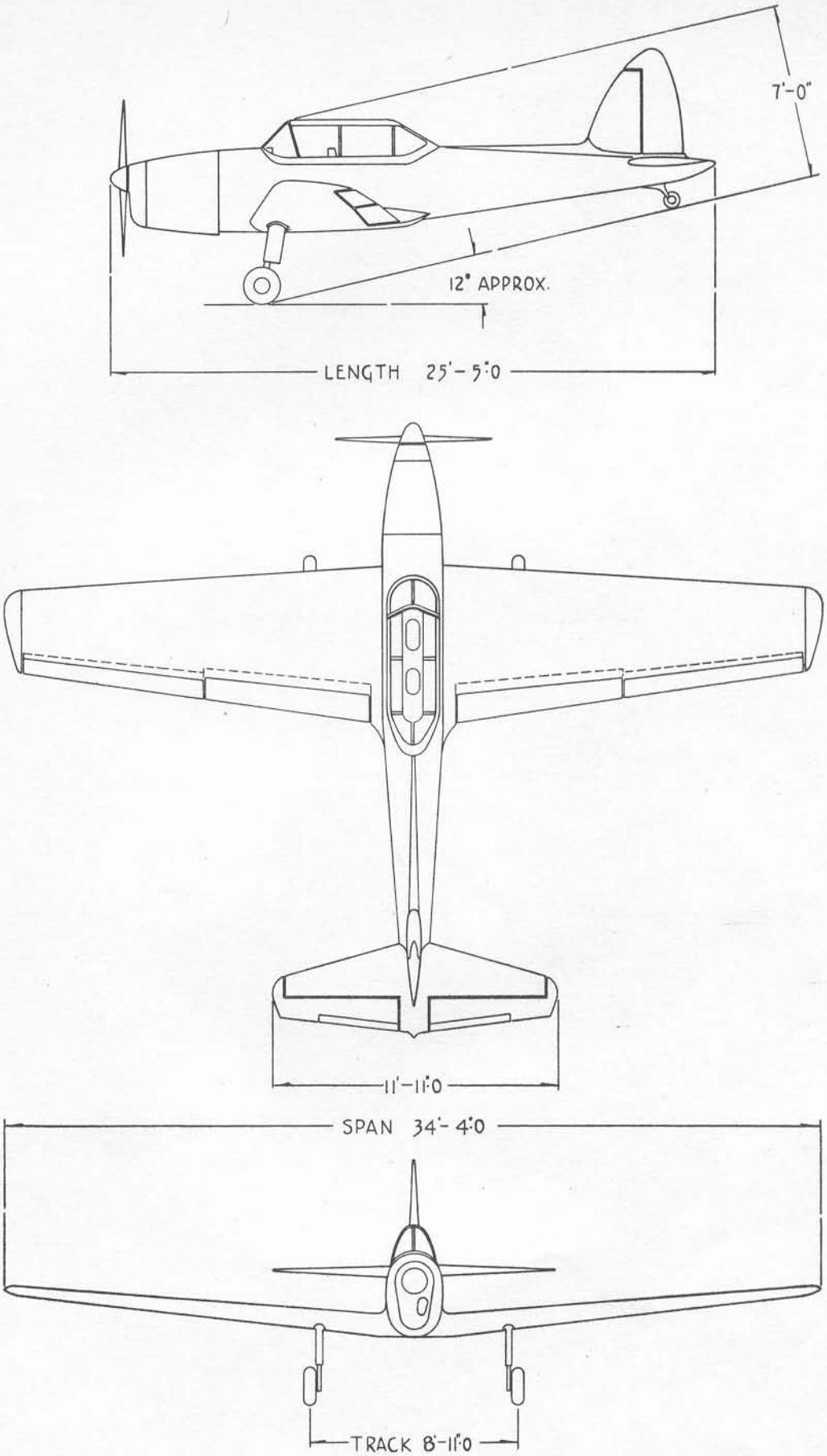
1.9 Power Services

All types are equipped with a vacuum service supplied by Venturi tubes with the Gipsy Major 1C installation, and by a vacuum pump when the Gipsy Major 10 is installed.

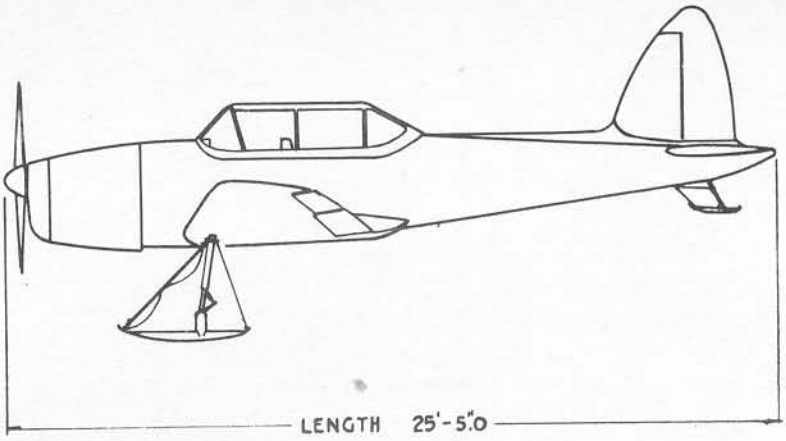
With the Gipsy Major 10 a 24 volt electrical service is provided by two 12 volt batteries in series and an engine-driven generator. On Gipsy Major 1C installation a battery-operated electrical system may be fitted as special equipment.

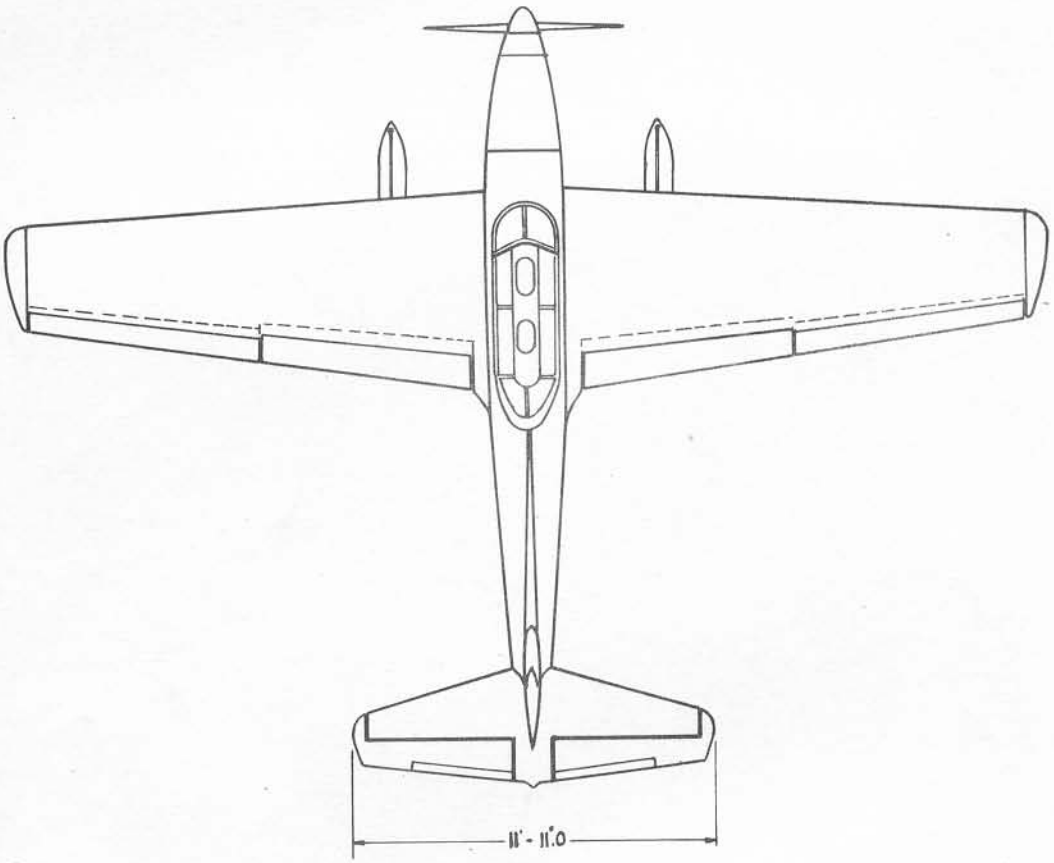
1.10 Strength - Load Factors

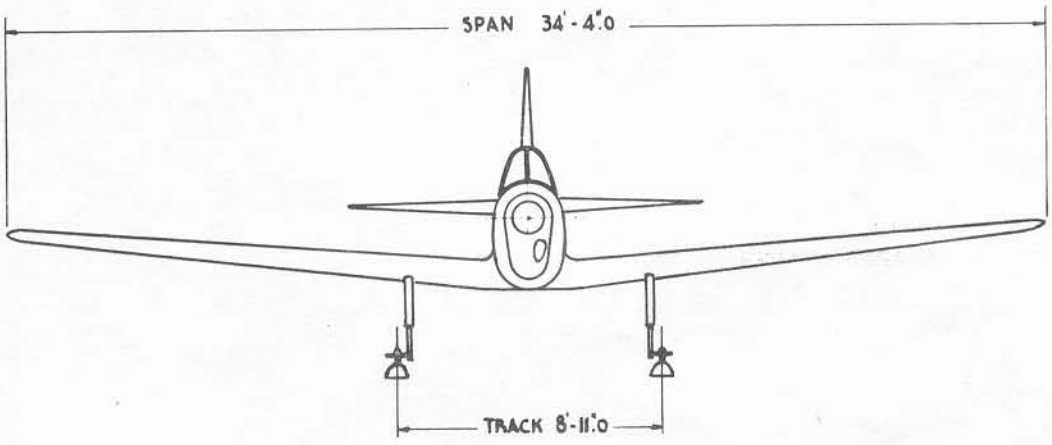
The minimum airframe strength is to the Requirements of the Air Registration Board (Great Britain) as specified in B.C.A.R. Vol. 1, Section D.3, Issue 3. To provide factors adequate to the exigencies of primary training, certain components have strengths well in excess of the Requirements.



DHC 1 - CHIPMUNK . . . ON WHEELS PLATE Nº 1.1

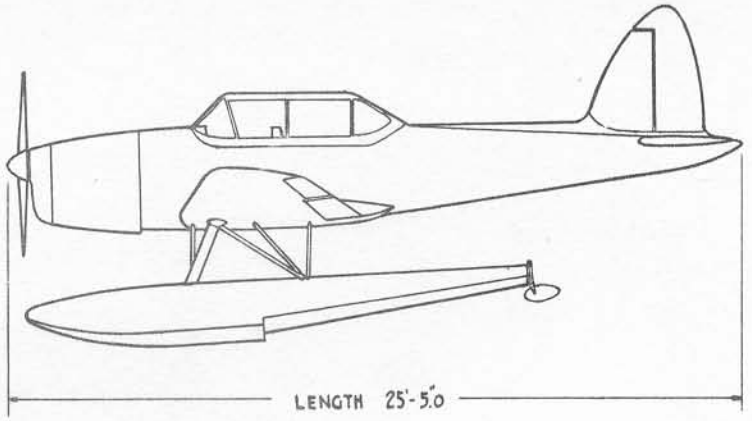


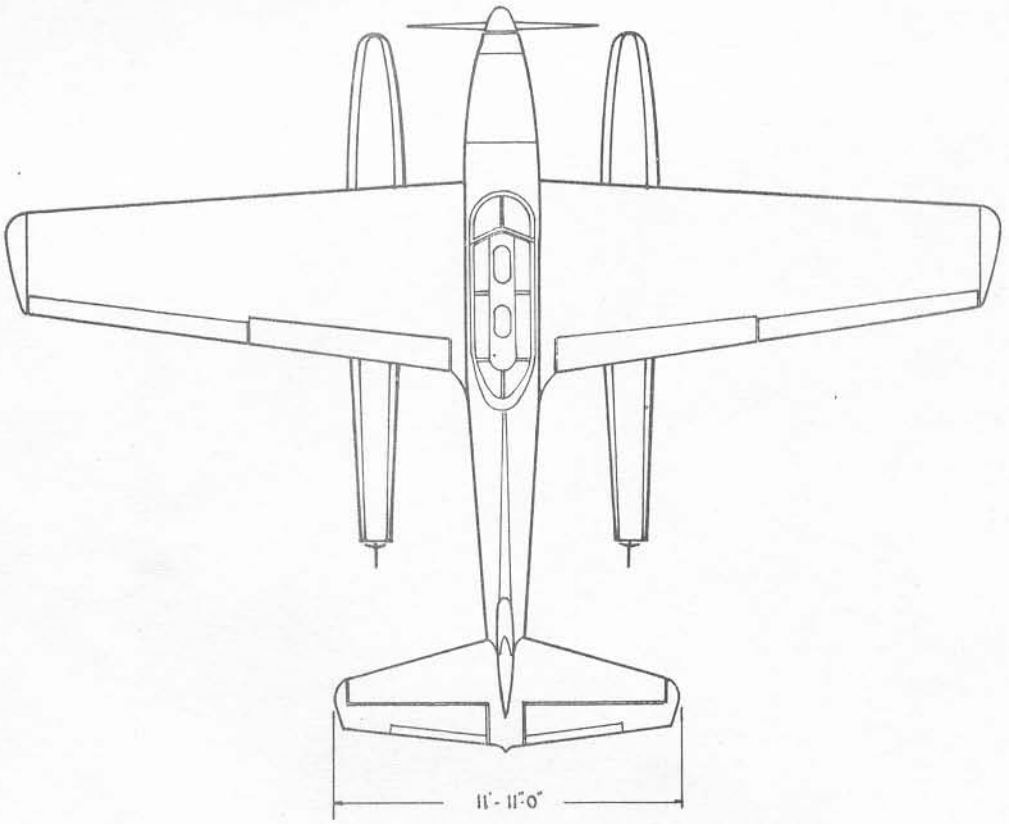


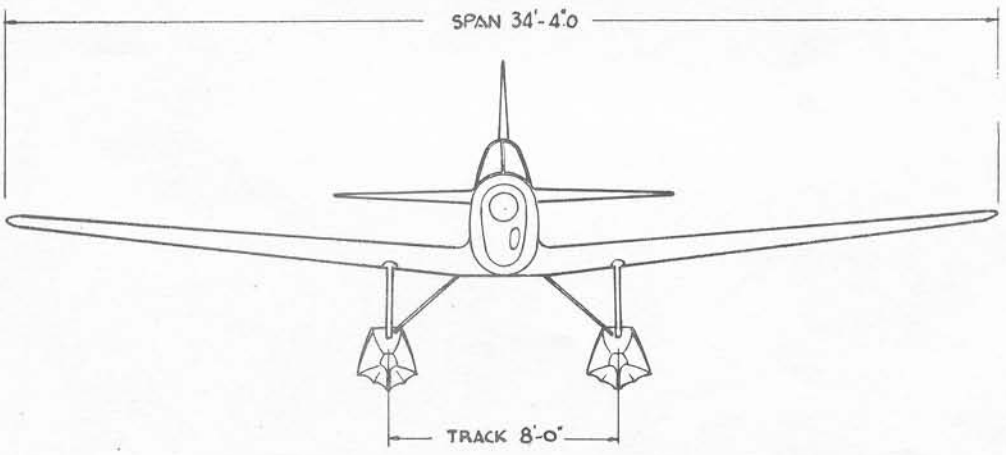


DHC 1 - CHIPMUNK . . . ON SKIS

PLATE № 1-2







DHC 1 – CHIPMUNK ••• ON FLOATS PLATE Nº 1.3

- CHAPTER 2 -

LEADING PARTICULARS

2.1 Dimensions

	English	Metric
Wing Span	34 ft. 4 in.	10,46 m.
Length	25 ft. 5 in.	7,75 m.
Height	7 ft.	2,13 m.
Wing Area	172.5 sq.ft.	16,03 $m.^2$
Undercarriage Wheel Track	8 ft. 11 in.	2,72 m.

2.2 Weights

Weight Empty - See Chapter 5

Disposable Load - See Chapter 5

	Type 1A-1		Type 1B-2	
Maximum gross weight	1930 lb.	(875 kg)	1930 lb.	(875 kg)
Wing Loading	11.2 psf	(55 kg/m)	11.2 psf	(55 kg/m)
Power Loading	13.8 lb/bhp	(6.1 kg/CV)	13.3 lb/bhp	(5.9 kg/CV)

2.3 Performance

2.3.1 General Data

	English	Metric
Maximum true level speed at Sea Level	140 mph	225 km/hr
Maximum true level speed at 5,000 ft. 1524 m.	134 mph	215 km/hr
Economical True Cruising Speed (2100 rpm) at Sea Level	124 mph	200 km/hr
Economical True Cruising Speed (2100 rpm) at 5000 ft.-1524 m.	121 mph	194 km/hr
Stalling Speed Indicated - Flaps Up	52 mph	83 km/hr
Stalling Speed Indicated - Flaps Down 30°	44 mph	70 km/hr

2.3.1 (cont'd)

	English	Metric
Take-off to clear 50 ft. (15,24 m.) Still air - Distance	290 yds	265 m.
- Time	17 sec.	17 sec.
Landing Distance over 50 ft. (15,24 m.) Still air - With Brakes	310 yds.	284 m.
- No Brakes	624 yds.	570 m.
Landing run, still air - With Brakes	155 yds.	141 m.
- No Brakes	466 yds.	430 m.
Maximum Rate of Climb		
- at Sea Level	900 ft/min.	4,57 m/sec.
- at 5,000 ft. - 15,24 m.	650 ft/min.	3,30 m/sec.
- at 10,000 ft. - 30,48 m.	410 ft./min.	2,10 m/sec.
Service Ceiling	17,200 ft.	5200 m.
Absolute Ceiling	19,400 ft.	5900 m.
Endurance at Economical Cruising Power (25 Imp. Gal.)	3.9 hrs.	3.9 hrs.
Range, still air	485 mi.	780 km.
Air miles per gallon at cruising	19.4	
Air kilometers per litre at cruising		6,87 km/litre
Cruising consumption	6.4 gph	29 litres/hr.
Maximum indicated Flap Speed	85 mph	136 km/hr
Maximum indicated Diving Speed (V_{ne})	200 mph	319 km/hr

- Chapter 3 -

DESCRIPTION OF COCKPIT CONTROLS and EQUIPMENT

3.1 Canopy (Plate 3.1)

The one piece canopy slides on three rails and can be locked in any one of several positions. The lock is operated by two handles which are accessible from either inside or outside the aircraft and located in the roof of the canopy.

A flap with an emergency release is provided in the roof to assist in opening the canopy at high speeds. This is on early aircraft.

A "break-out" panel is provided for each cockpit on the starboard side of the canopy.

3.2 Instrument Panel (Plate 3.2)

The duplicate instrument panels are shock mounted and in addition to flight and engine placards, each contains the following standard instruments: airspeed indicator, altimeter, turn and bank indicator, compass, tachometer, oil pressure gauge. An oil temperature gauge is provided on the front panel only.

Additional items listed in Chapter 5 may be installed as required.

3.3 Control Column

A standard type of removable joy-stick is provided in duplicate. A locking pin is provided at the base of the column.

3.4 Rudder Pedals

Rubber covered pedals are mounted on a rudder bar with a parallel link arrangement. Ground adjustment is provided to accommodate pilots of various leg lengths.

3.5 Brakes (Plate 3.3)

The brakes are operated by a hand lever on the port side of each cockpit. The differential action is controlled by the rudder pedals.

3.6 Flaps (Plate 3.4)

The flap lever is located on the starboard side of the cockpit. Three settings are provided.

3.7 Elevator Trimming Tab Control

The control wheel is on the port side and rotates in the correct sense, i.e. a nose-down change in trim is produced by pushing the top of the wheel forward.

3.8 Seats

The bucket type tandem seats accommodate seat pack parachutes. The seats may be removed to provide access to the rear fuselage or to the structure below the floor level in the front cockpit.

3.9 Control Locks

Control locks are provided as special order equipment.

3.10 Safety Harness

An adjustable Borden, Sutton or "QL" type harness is attached to each seat.

3.11 Luggage Compartment

A compartment in the rear fuselage is accessible from the rear cockpit and provides space for small items of baggage or a battery if the latter is supplied. A tray for small items of baggage is also provided in the front cockpit. Standard equipment includes a map case.

3.12 Fire Extinguisher

A hand operated Pyrene extinguisher of one pint capacity is mounted on a quick release bracket on the front seat diaphragm.

3.13 Engine Controls

Throttle and altitude controls are on a quadrant on the port side of each cockpit. An adjustable friction damper is included in each quadrant.

There are two sets of magneto switches, one on the front instrument panel or on the front fuselage deck, the other on the port side of the fuselage deck between the two cockpits.

3.14 Carburetter Heating

Warm, sheltered air is supplied to the carburetter by an automatically controlled shutter at engine speeds below 1850 rpm.

3.15 Electrical Equipment

Aircraft may be equipped with an electrical system as required. A typical installation has a 24-volt system with master control panels in the front cockpit, and provision for cockpit and navigation lamps, landing light and radio.

3.16 Intercommunication Systems

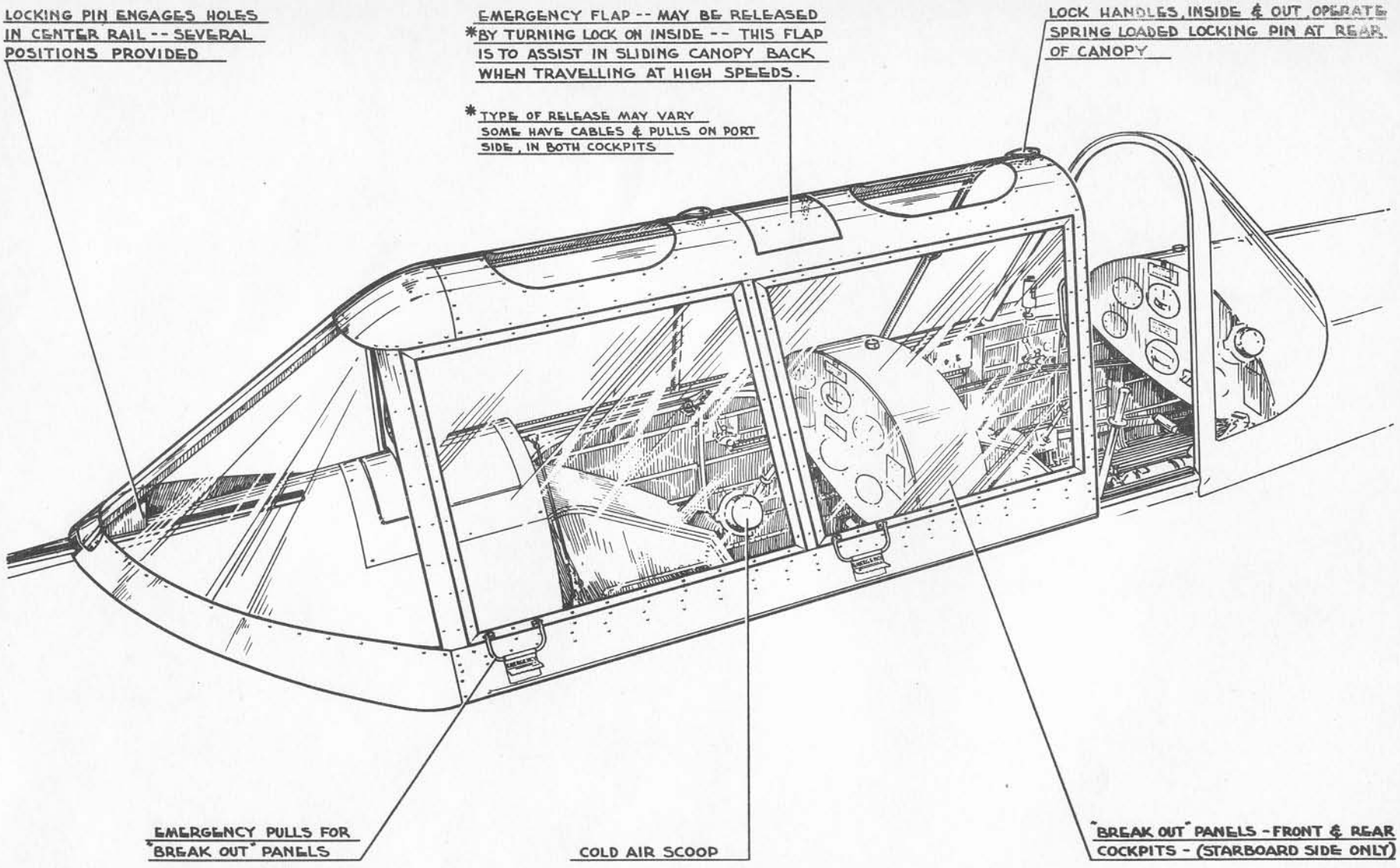
The electrical intercommunication system, for carbon or magnetic microphone, as specified, may be installed on the starboard side of the fuselage.

3.17 Day-Night Two-Stage Equipment

Two-stage equipment for day-night flying training can be provided to meet special order requirements.

3.18 Heating and Ventilation

An exhaust muff type heater can be installed if required, with an "on-off" cockpit control. Ventilation is provided by controllable scoops in the windscreen and canopy.



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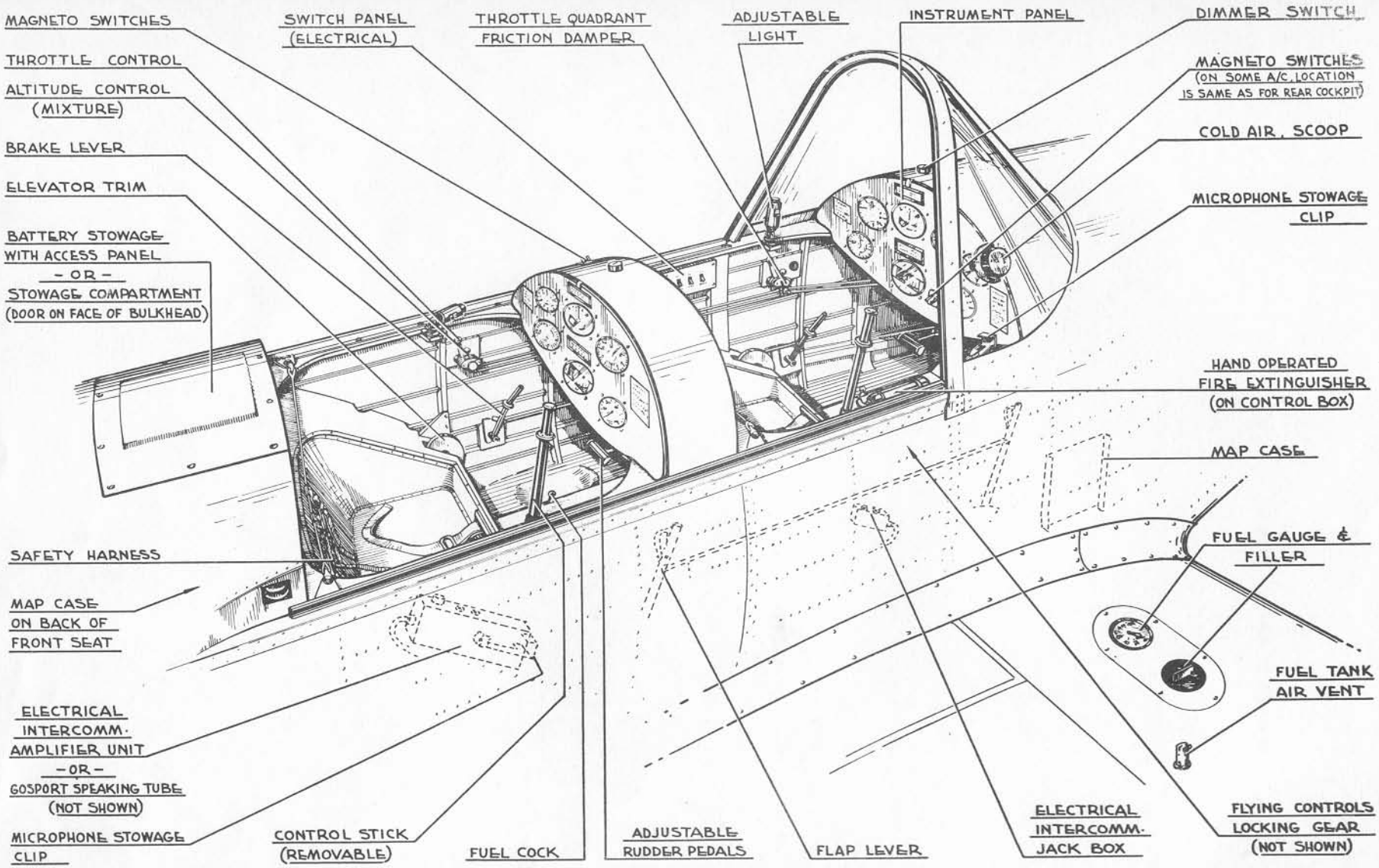
DHC 1 - CHIPMUNK ··· COCKPIT CANOPY PLATE Nº 3.1



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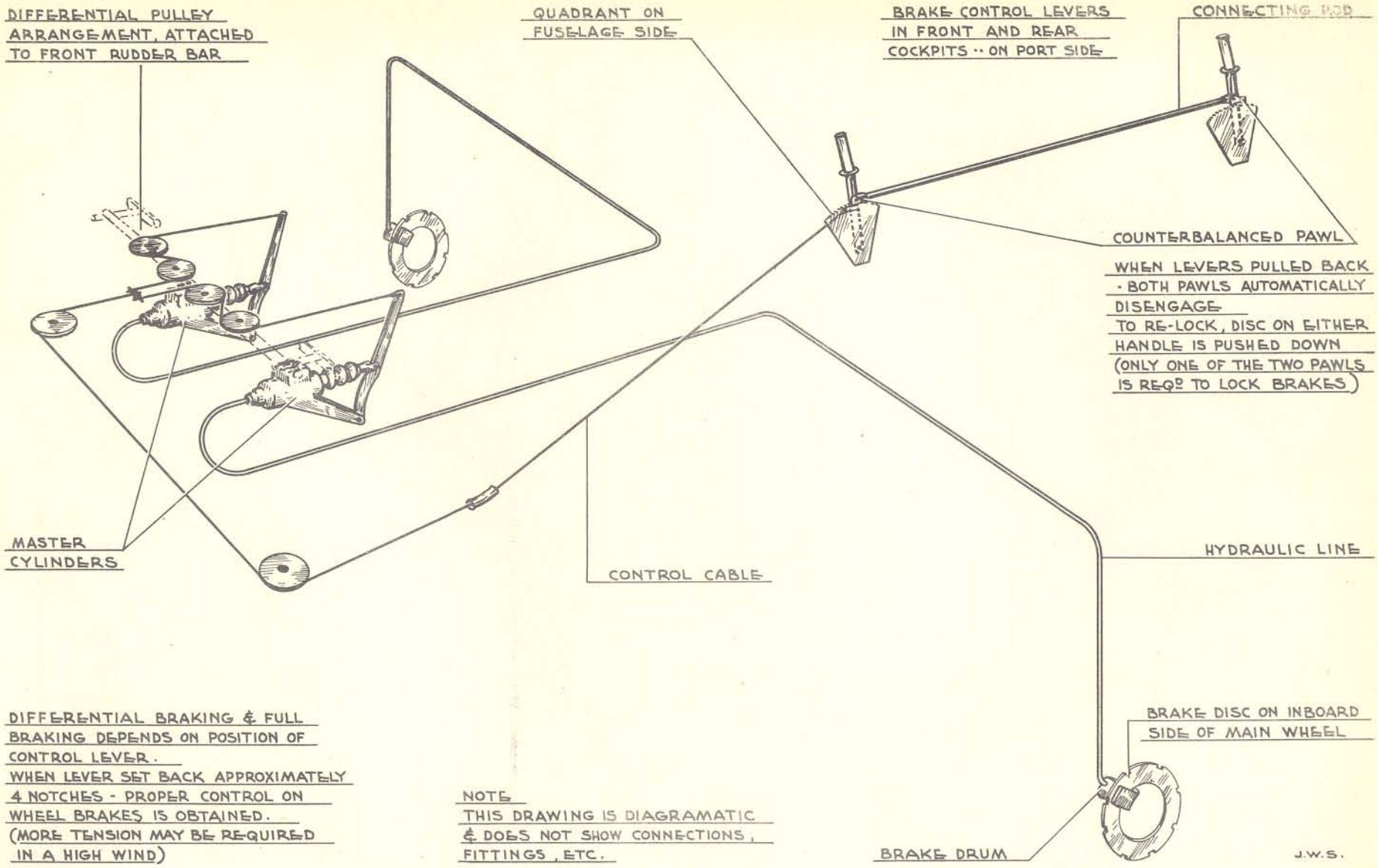
DHC 1 - CHIPMUNK ··· COCKPIT LAYOUT PLATE Nº 3.2

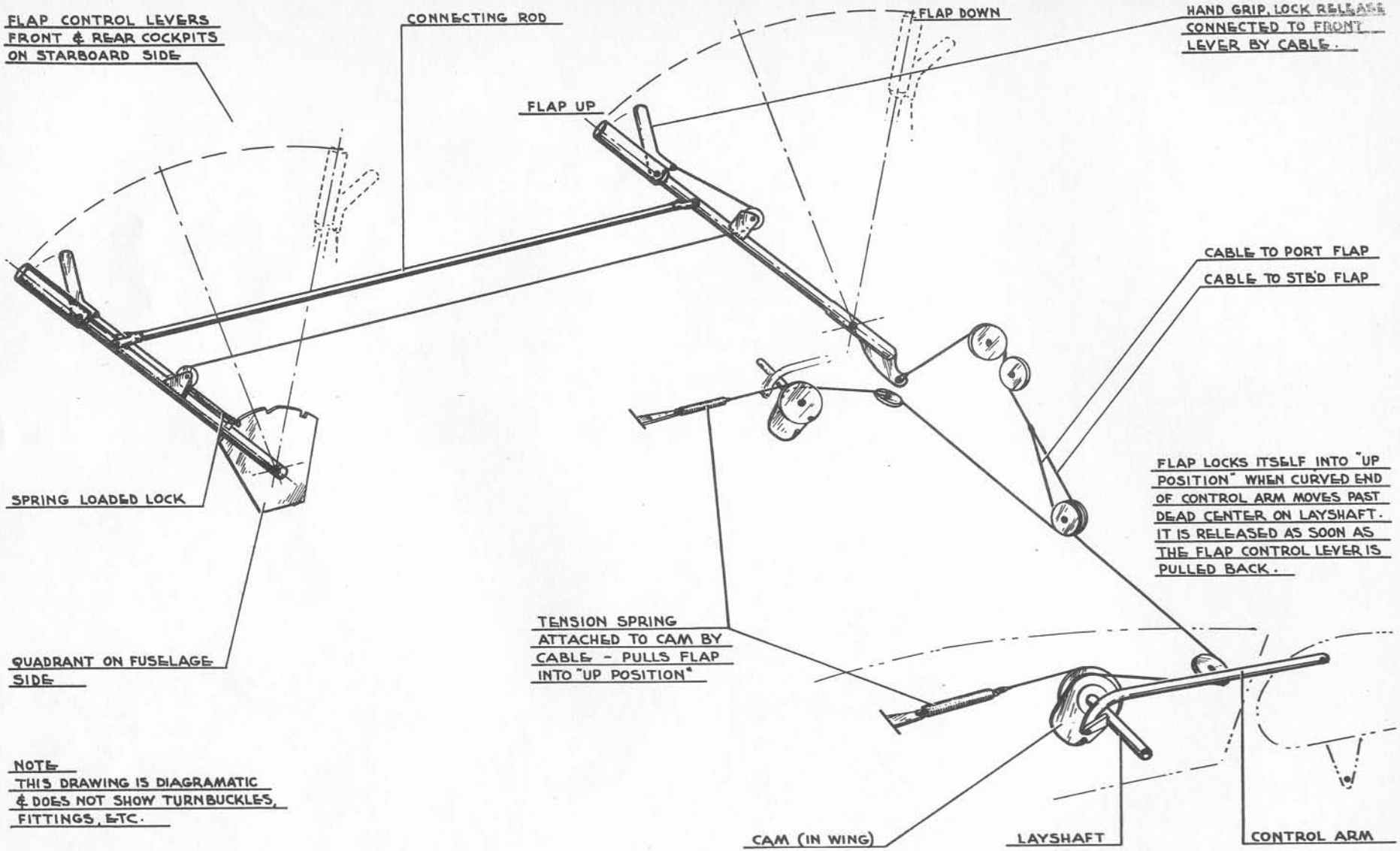


DIFFERENTIAL BRAKING & FULL BRAKING DEPENDS ON POSITION OF CONTROL LEVER.
WHEN LEVER SET BACK APPROXIMATELY 4 NOTCHES - PROPER CONTROL ON WHEEL BRAKES IS OBTAINED.
(MORE TENSION MAY BE REQUIRED IN A HIGH WIND)

NOTE
THIS DRAWING IS DIAGRAMATIC & DOES NOT SHOW CONNECTIONS, FITTINGS, ETC.

J.W.S.

DHC 1 - CHIPMUNK ... BRAKE SYSTEM PLATE Nº 3.3



NOTE
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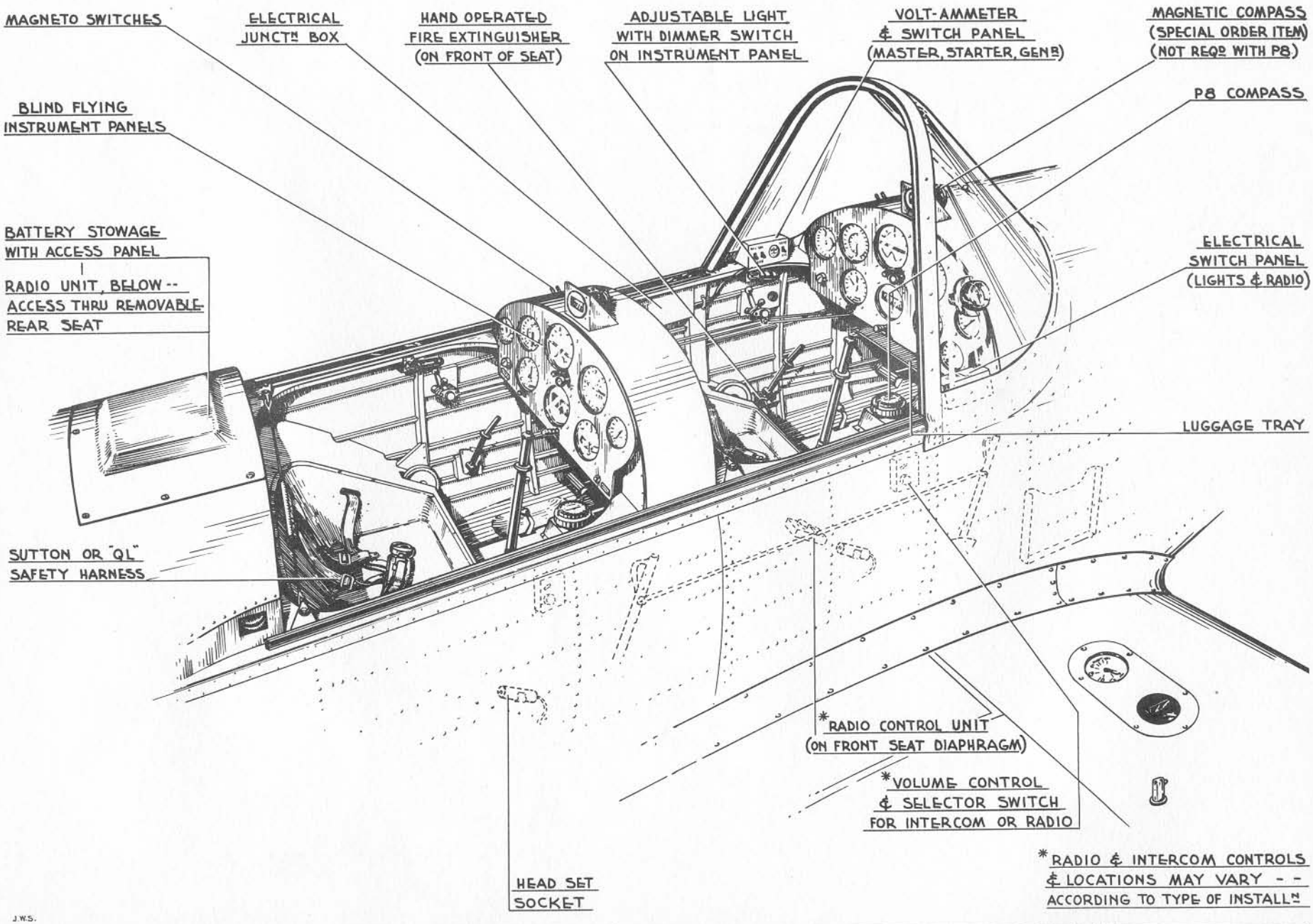
DHC 1 - CHIPMUNK ... FLAP SYSTEM - PLATE Nº 3.4



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DHC 1B - CHIPMUNK ··· COCKPIT LAYOUT PLATE 3.5

ISSUED WITH A.L. 1

- CHAPTER 4 -

PILOT'S NOTES AND OPERATING DATA.

4.1 Ground Handling.

4.1.1 Starting Engine.

4.1.1.1 Hand Starting.

a). Chock the wheels or put handbrake hard on.
b). Set elevator trim to "Nose Up".
c). Move the fuel cock control lever fully forward to the ON position. Alternatively, select port or starboard tank.
d). Switches OFF. Only one set of switches need be moved to the OFF position in order to break the ignition circuit.
e). Pull carburetter flooder control, which is located on the port side of the engine, and operate the fuel pump hand levers until fuel runs out of the collector box at the bottom of the firewall.
f). SUCK IN, only after fuel has ceased to run from collector box, by turning over the engine by hand at least three "pull-throughs" of the propeller. Rotation is anticlockwise viewed from cockpit.
g). Open throttle 1/2 inch.
h). Set all switches ON.
i). Pull propeller cleanly through the compression stroke until the engine starts.
j). If the engine fails to fire, probably due to excess floodings:

i). Switch OFF.
ii). Open the throttle wide.
iii). Back up the engine by hand at least six complete rotations of the crankshaft.
iv). Repeat starting procedure from "f" above.

4.1.1.2 Electric Starting.

The same instructions apply as with hand starting, but instead of swinging the propeller, the electric starting switch on the left hand electrical panel in the cockpit is operated.

When an engine starter is fitted, no SUCKING IN is required. This of course is after the carburetter has been flooded with the hand control.

Ground starting is best accomplished by using an external 24 volt supply plugged into a receptacle on the port side of the fuselage just aft of the engine cowling. The plug must just enter the holes, then after a partial turn to the right be pushed "home".

4.1.1.3 Possible Causes of Failure to Start.

a). Carburetter Slow Running Jet Choked - This can be cleared by following directions given below. Remove slow running jet holder from carburetter. This holder has a hexagon head and screws down on top cover of float chamber. The slow running jet, which is a restriction in the small tube screwed in the lower end of holder, can be cleared by blowing through it.

4.1.1.3 (cont'd)

b) Water in Carburetter:- Remove main and power jets and flush carburetter through by turning gasoline tap "ON."

c) Impulse Starter Not Working Properly.- When the propeller is turned over slowly, there should be an audible click from the impulse mechanism on the starboard magneto. The most frequent cause of trouble with this part is that the toggle mechanism becomes rusty. This can be cured by squirting out with kerosene and re-oiling with thin oil. Should this not effect a cure, magneto should be removed and impulse starter dismantled to find cause of failure.

d) Contact Breaker Rocker Stuck.- This is generally caused by swelling of the bush owing to damp atmosphere. In this case the rocker should be removed, after the return spring is disconnected, and the bush should be rubbed down carefully with a fine grade of emery cloth. Oil very lightly on replacement with sewing machine or other similar type of thin oil.

If the engine has been standing in a damp atmosphere, it may be necessary to wipe the insulators of the spark plugs and the distributors of the magnetos before a start can be made, owing to the surface leakage of electricity which takes place under these conditions.

4.1.2 Warming Up

4.1.2.1 Engine started from cold.- To be run slowly at first, approximately 600 - 800 revolutions. Observe oil pressure which should be between 30 and 40 psi (20 and 30 kg/cm^2) when cold. If the oil pressure gauge does not show this reading the engine is to be stopped and the reason investigated. (See Chapter 12.5.1)

4.1.2.2 Subject to satisfactory oil pressure having been obtained, the engine is to be run at 850 - 900 rpm in order that the oil may be warmed up to give a free circulation. Continue until the oil temperature reaches a minimum of 30°C (86°F).

Check oil pressure:
Normal - 40-45 psi (30 kg/cm^2)
Minimum - 30 psi (20 kg/cm^2)

4.1.3 Running Up

a) Check elevator trim tab NOSE UP and hold the control column fully back.
b) Open throttle to 1600 rpm and check each magneto in turn. Drop should not exceed 50 rpm on either magneto.
c) Open throttle fully and check rpm which should be approximately 1925. Check oil pressure.
d) If a drop of more than 50 rpm was indicated on the initial magneto check, throttle back to 1600 rpm and check magnetos a second time before fully throttling back.

4.1.4 Cockpit Check

a). Ensure that sliding canopy is functioning properly.
b). Check that hand fire extinguisher, in front cockpit, is fastened down properly.
c). Check all flying controls for freedom of movement, sense of direction and travel.
d). Check full travel on elevator trim.
e). Check that hand brake lever functions properly.
f). Check flap lever for proper functioning.
g). Check fuel contents.

Note.
The quantity of fuel which can be carried in each tank when the B series aircraft is operated with a crew of two, may be limited in order to not exceed the gross weight approved for the fully acrobatic category. The precise value is stencilled on the wing at the filler opening and will depend on the equipment provided. With full military equipment, for example, the value is approximately 10 I.G. in each tank.

4.1.5 Taxiing.

Set hand brake lever approximately four notches from front to obtain proper control on wheel brakes. More tension may be required for taxiing in high winds.

Taxi with control column fully back, particularly over rough ground.

4.2 Flight Handling:

4.2.1 Check List before Take-Off.

T - Trimming Tab - Elevator	- Set to neutral when both cockpits occupied. Set slightly tail heavy for solo flying from front cockpit.
G - Gas	- Fully ON.
S - Switches.	- Both sets in ON position.
F - Flaps.	- Fully UP (or 15° position if taking off from a very short strip)
B - Brakes.	- Fully OFF.

4.2.2 Take-Off.

a). Open the throttle slowly to the fully forward position. The tail can be raised into the flying attitude by a slight forward pressure on the control column.
b). Keep straight initially by coarse use of the rudder and then gentle use as speed increases. There is a tendency to swing to starboard if the throttle is opened too quickly.
c). Climb when a speed of 80 mph (130 km/hr) is indicated.
d). Raise flaps, if used, and adjust elevator trim.

4.2.3. Climbing

A speed of 80 mph (130 km/hr) IAS gives the maximum rate of climb, at sea level, and also provides the most comfortable climbing attitude of the aeroplane. Climbing should be carried out at full throttle.

4.2.4. General Flying

The controls are all light and provide good manoeuvrability in the air.

4.2.5 Performance

See 2.3.1

4.2.6 Position Error Correction

At 140 mph (225 kph) IAS	- subtract	2 mph (3 kph).
At 120 mph (193 kph) IAS	- add	0 mph.
At 100 mph (161 kph) IAS	- add	3 mph (5 kph).
At 80 mph (129 kph) IAS	- add	6 mph (10 kph).
At 60 mph (97 kph) IAS	- add	7 mph (11 kph).

4.2.7 Stalling

The stalling speeds (engine off) IAS are:
Flaps down 30° - 44 mph (70 km/hr)
Flaps up -52 mph (85 km/hr)
This is for an all-up weight of 1930 lb. (875 kg).

The stall with flaps up is very gentle. The control column must be moved fully back in order to demonstrate the nose drop at the point of stall. With flaps fully extended the stall is more positive. In both cases recovery is quite normal. There is a slight tendency for a wing to drop during the stall.

4.2.8 Diving

Although the aircraft is stressed to withstand higher diving speeds, the engine "over-revs" at speeds above 200 mph IAS even when the throttle is fully closed. At no time in any dive should a maximum rpm of 2550 be exceeded.

4.2.9 Spinning

Entry into a practice spin may be achieved in the normal manner, i.e. the aircraft is stalled with engine off by moving the control column fully back and applying full rudder, in the direction it is desired to spin the aircraft.

The aircraft spins in a normal manner. The first turn is very slow, the rate of turn then increases for the next two turns, after which the speed of rotation diminishes and becomes constant.

4.2.9 (contd)

For the first three turns the attitude of the aircraft is fairly steep; from then on it assumes an attitude of about 45° to the vertical. The initial dive after recovery is quite steep.

Providing positive recovery action is taken (full opposite rudder), then control column moved steadily forward until the spinning stops), full recovery may be effected in a maximum of 1-1/2 turns, regardless of the previous number of turns.

During practice, full rudder in the direction of the spin and control column fully back should be maintained until the recovery is commenced.

The pilot should not be misled by the low wing loading and docile handling qualities of the Chipmunk into assuming that the rate of descent will be leisurely during a spin and recovery. In this respect the characteristics of the Chipmunk are similar to those of a modern service aircraft with a moderately high wing loading, and the pilot should exercise judgement in the altitude at which the spin is initiated.

If entry is slow with c.g. forward (flying solo in the front cockpit) and the control column fully back, it may be necessary to apply opposite aileron as the stall is reached.

It should be noted that with c.g. forward, there is a tendency at the stall to develop a tight spiral dive which is sometimes mistaken for a spin. Under these circumstances, a prompt recovery may be effected with considerably less loss of height than in a true spin. Experiences of this kind with a spiral dive must not be permitted to mislead a student into assuming that spins may be conducted with impunity at low altitude.

During a spin the altimeter does not give a true indication of height above the ground due to a time lag in the instrument reading.

4.2.10 Acrobatics

The following indicated air speeds are recommended:

Roll	- 120 mph to 130 mph
Loop	- 130 mph to 140 mph
Half roll off the top of a loop	- 140 mph to 150 mph

Elevator trim should be left at neutral for all acrobatic manoeuvres.

The sliding canopy should be kept fully closed while carrying out acrobatic practice.

4.2.11 Approach and Landing

The recommended approach speed is 70 mph IAS for all conditions.

With no flaps the approach angle is long and flat, whereas full flaps provide a fairly steep gliding angle, giving an excellent view of the runway.

Lowering of full flaps produces a slight nose heavy tendency which can easily be corrected by means of the tail trim.

4.2.12 Balked Landing

The aircraft will climb away easily with the flaps fully extended. If the aircraft has been trimmed for the glide with full flaps, it will then need retrimming as soon as the throttle is fully opened. The flaps may be raised with little loss of height.

4.3 Switching Off

When switching off the engine after running, the following procedure must be adhered to:

a) Idle at approximately 800 rpm for at least 30 seconds under normal circumstances or at least one minute when operating under extremely hot summer conditions.
b) Switch ignition "OFF".
c) Immediately open throttle wide.

This sequence of switching off will remove any tendency to backfire and will also eliminate running-on due to pre-ignition.

4.4. NOTE

In hot weather, due to the possibility of vapour forming in the fuel section line, it is not advisable to fly for extended periods at heights greater than 10,000 ft. If during climb or altitude tests the engine should show any signs of power loss due to vapour formation, descending to an altitude below 10,000 ft. will enable the fuel system to resume normal operation.

Flight tests have not indicated any tendency toward power loss above 10,000 ft. from this cause. This note is included in order to comply with British Civil Airworthiness Requirements.

4.5 Engine Limitations

4.5.1 Maximum Speeds and Fuel Consumption Limits

Condition	Major 1C	Major 10-3	Fuel Consumption Upper Limit 1G/hr	Fuel Consumption Upper Limit Litres/hr
Maximum for take-off	2400 rpm (Full throttle)	2400 rpm (Full throttle)	11.25	51
Maximum for climbing	2400 rpm (5 min.limit)	2400 rpm (60 min.limit)	11.25	51
Maximum for emergency	2400 rpm (5 min.limit)	2550 rpm (5 min.limit)		
Maximum for cruising	2100 rpm	2300 rpm (-1.5 in.Hg.)	10.75	49
Maximum for weak mixture cruising	2050 rpm	2300 rpm (-4.0 in.Hg.)	8.5	38.5
Maximum for diving	2550 rpm (20 sec.limit)	2550 rpm (5 min.limit)		

4.5.2 Cooling

Maximum Cylinder Temperature for take-off and emergency (5 minute limit)	- 240°C	(465°F)
Maximum Cylinder Temperature for climbing and emergency cruising (60 minute limit)	- 230°C	(450°F)
Maximum Cylinder Temperature for cruising	- 210°C	(410°F)

4.5.3 Oil

Maximum Temperature for take-off and emergency (5 minute limit)	- 90°C	(195°F)
Minimum Temperature for opening up (cold)	- 30°C	(85°F)
Maximum Temperature for climbing and emergency cruising (60 minute limit)	- 80°C	(175°F)
Maximum Temperature for cruising	- 70°C	(160°F)
Minimum Pressure in Flight	- 30 psi	(2 kg/cm^2)
Normal Pressure	- 40-45 psi	(3 kg/cm^2)

4.6 Emergency Exit in the Air

At speeds in excess of 120 mph (193 kph) it is difficult to open the canopy by normal methods. To assist the canopy rearwards in an emergency, a manually operated flap was provided in the roof of the hood on early production aeroplanes. It was subsequently found that the canopy will open easily at high speeds when a cockpit ventilator is in the open position or a knock-out panel is removed. Consequently, the emergency flap has been omitted from current production.

- CHAPTER 5 -

LOADING AND C. G. DATA

(See Plate No. 5.1)

5.1 General

The centre of gravity (c.g.) of the aeroplane is determined with the aircraft in the rigging position, the location being found by taking moments about a fixed point called the c.g. Datum. This point has been arbitrarily selected and lies 42.0 inches aft of the engine firewall, as shown in Plate No. 5.1.

The loads are measured in pounds and the moment arms in inches. If the load is forward of a vertical line through the datum point its moment arm is taken as negative, while loads behind the vertical line have positive moment arms. The position of the c.g. above or below the horizontal datum line is of minor importance under normal conditions and is not considered here.

The c.g. position is determined from the following expression:

$$\frac{\text{(Tare weight x Tare Moment Arm) + (Weights of Loads x their Moment Arms)}}{\text{Tare Weight + Total Weights of Loads}}$$

$$= \frac{\text{Tare Moment + Load Moments}}{\text{Total Weight}}$$

As shown in the accompanying example, the calculation gives the distance of the c.g. fore or aft of the datum point. If the c.g. position lies within the specified limits of c.g. travel, the aircraft loading may be considered satisfactory for safe flight.

The approved limits of travel of the c.g. for the aircraft are as follows:

Forward Limit 8.91 inches ahead of datum (-8.91)

Aft Limit 0.72 inches ahead of datum (-0.72)

The c.g. must always be within this range, even when the load, fuel and oil are wholly or partially expended.

Before attempting to calculate the c.g. position of a loaded aircraft, reference should be made to Part D of the Weight and Balance Certificate, for the empty weight and a list of items of equipment which are included in this weight.

5.1.1 Typical Loading Example

A sample loading calculation is shown below. Note that items forward of the datum have negative moment arms, and items aft have positive moment arms.

Item	Weight Pounds	Moment Arm Inches	Moment lb.in.
Weight Empty	1,277	- 6.24	-7,970
Oil (2-1/2 Imp. Gal.)	23	-44	- 990
Fuel (25 Imp. Gal.)	180	-11.7	-2,106
Pilot and parachute forward	190	- 0.75	- 143
Pilot and parachute aft	190	+32.6	+6,194
Gross	1,860	- 2.70	-5,015

With minimum fuel and oil, as at the end of a flight, the following would apply:

Item	Weight Pounds	Moment Arm Inches	Moment lb.in.
Weight Empty	1,277	- 6.24	-7,970
Oil (1/2 Imp. Gal.)	4	-44	- 176
Fuel (1 Imp. Gal.)	7	-11.7	- 82
Pilot and parachute forward	190	- 0.75	- 143
Pilot and parachute aft	190	+32.6	+6,194
Gross	1,668	- 1.31	-2,177

Since the maximum gross weight is less than 1930 pounds (Chapter 1.1) and both centre of gravity positions are within the permissible limits, the above loading is satisfactory for flight.

5.1.2 Method of Weighing

To determine the centre of gravity position, the aircraft must be weighed with the tops of the canopy rails level laterally and longitudinally. It is important that the canopy be closed after levelling the aircraft and before weighing.

Mechanical or electrical scales with a capacity in excess of 1000 pounds are satisfactory for the measurement of the load at each of the mainwheels or mainwheel jacking points. For the tailwheel measurement, an accurate small scale with a capacity of about 250 pounds is necessary, since a small error in the weight reading at the tail will introduce a considerable error in the estimated c.g. location.

5.2 Weight and Balance Certificate

Aircraft Type - DHC-1 - CHIPMUNK Nationality and Registration Mark_____

PART "A"

The undermentioned items are included in the tare figure of _____lb., painted on the outside of the aircraft. The tare moment is_____ lb.in.

Quantity	Item	Weight Pounds	Moment Arm Inches	Included
1	Engine - de Havilland Gipsy Major 1C, complete with carburetter, magneto, cylinder cooling deflectors, spark plugs, dual fuel pumps and unscreened ignition harness.	315	-68.1	_____
1	Engine - de Havilland Gipsy Major 10-3, complete with carburetter, magneto, cylinder cooling deflectors, spark plugs, dual fuel pump and screened ignition harness.	330	-67.5	_____
1 set	Ignition Harness - unscreened (Included in Item 1)	3	-55	_____
1 set	Ignition Harness - screened (Included in Item 2)	7.5	-55	_____
1	Propeller - de Havilland, 2 blade fixed pitch wood, Specification PROP-5-1002, Issue 12.	14	-90.0	_____
1	Propeller - Fairey, 2 blade, fixed pitch, metal No. A66661X2 or 94103A/X11.	28.5	-90.0	_____
2	Engine Mounts, rubber			_____
2	Engine Mounts, rubber			_____
1	Main undercarriage, less wheels, tires, tubes and brake units.	28.2ea.	-16.5	_____

5.2 Weight and Balance Certificate - Part "A" (cont'd)

Quantity	Item	Weight Pounds	Moment Arm Inches	Included
1	Tail undercarriage, less wheel, tire and tube	5.9	+178.5	_____
1	Main wheel, tire, tube and brake unit - Goodyear, Model No. PD-127, Size 6.00-6	16.9 ea.	- 19.5	_____
1	Tailwheel - Otaco, tire and tube - Firestone, Size 2.50-4	4.1	+186.5	_____
1 or 2	Instrument Panel	0.9	- 14 or + 19.7	_____ _____
1	Tachometer - Pioneer 22A02-2E1-1-A1	0.8	- 14	_____
	or			
1 or 2	Tachometer - Kollsman 218-011-60°	1.1	- 14 or + 19.7	_____ _____
	or			
1 or 2	Tachometer - Pioneer 2010-3A3-A3	0.8	- 14 or + 19.7	_____ _____
1 or 2	Airspeed Indicator - Pioneer 14A01-6E1-1-A3	0.5	- 14 or + 19.7	_____ _____
	or			
1 or 2	Airspeed Indicator 6A/282	0.5	- 14 or + 19.7	_____ _____
	or			
1 or 2	Airspeed Indicator - U.S.Gauge AW 2-3/4 - 16D or W	0.7	- 14 or + 19.7	_____ _____
1 or 2	Compass - Pioneer 18A01-1E-A1	0.6	- 14 or + 19.7	_____ _____
	or			
1 or 2	Compass - Pioneer 1821-2A with compensation and mounting	3.5	- 14 or + 19.7	_____ _____
	or			
1 or 2	Compass - Pioneer 1828-2A	1.7	- 16 or + 18	_____

5.2 Weight and Balance Certificate - Part "A" (cont'd)

Quantity	Item	Weight Pounds	Moment Arm Inches	Included
1 or 2	Altimeter - Pioneer 15A03-1E1-1-A1	0.5	- 14 or + 19.7	_____ _____
	or			
1 or 2	Altimeter - Kollsman Mk. XIV A (6AA/3 or 6A/685)	1.5	- 14 or + 19.7	_____ _____
	or			
1 or 2	Altimeter - Pioneer 1528-2E-B	1.2	- 14 or + 19.7	_____ _____
1 or 2	Oil Pressure Gauge - Pioneer 24A01-1E1-1-A1	0.3	- 14 or + 19.7	_____ _____
	or			
1 or 2	Oil Pressure Gauge - Kollsman	0.5	- 14 or + 19.7	_____ _____
	or			
1 or 2	Oil Pressure Gauge - U.S.Gauge AW-1-7/8 - 14K or 14AD	0.4	- 14 or + 19.7	_____ _____
1 or 2	Turn and Bank Indicator - Pioneer 17A01-1E1-1-A1	1.4	- 14 or + 19.7	_____ _____
	or			
1 or 2	Turn and Bank Indicator Pioneer - 1718-1A-A1	1.6	- 14 or + 19.7	_____ _____
	or			
1 or 2	Turn and Bank Indicator Pioneer 1700 - 1A-C1	1.4	- 14 or + 19.7	_____ _____
1	Oil Temperature Gauge Pioneer 24A05-1E1-1-B1	0.4	- 14	_____
	or			
1 or 2	Oil Temperature Gauge U.S. Gauge AW 1-7/8 - 20J	1.0	- 14 or + 19.7	_____ _____
1 or 2	Artificial Horizon, Sperry AN-5736-1	5.0	- 14 or + 19.7	_____
1 or 2	Directional Gyro, Sperry AN-5735-1	4.5	- 14 or + 19.7	_____ _____
1 or 2	Rate of Climb, Pioneer 1610-1B-C1	1.2	- 14 or + 19.7	_____ _____
	or			
1 or 2	Rate of Climb Indicator Mk. 1B* (6A/942)	0.5	- 14 or + 19.7	_____ _____
1	Pitot - Static Head - Kollsman 373 D	0.8	+ 8.0	_____

5.2 Weight and Balance Certificate - Part "A" (cont'd)

Quantity	Item	Weight Pounds	Moment Arm Inches	Included
1 or 2	Venturi, Sperry 640600	1.0 ea.	- 37.0	_____
1	RPM Drive	1.3	- 22.5	_____
1	Aluminum tubing for instruments	2.1	- 10.0	_____
1	Brake controls and cables	3.8	- 10.0	_____
1	Brake levers and connecting rod	2.7	+ 9.0	_____
1	Front rudder bar	4.4	- 31.0	_____
1	Rear rudder bar	4.4	+ 3.0	_____
1	Rudder bar connecting tube	0.5	+ 5.0	_____
1	Miscellaneous connections for instruments	3.0	0	_____
1	Pilot's Safety Harness, QL type, front	1.5	+ 4.5	_____
1	Pilot's Safety Harness, QL type, rear	1.5	+ 37.0	_____
1	Front control column	1.0	- 10.0	_____
1	Rear control column	1.0	+ 23.0	_____
1	Hand fire extinguisher, Pyrene, 1 pint	5.0	- 8.0	_____
1	Canopy with break-out panels	26.5	+ 28.7	_____
1	Map Case	0.6	- 20	_____

5.2 (cont'd)

PART "B"

The undermentioned items, at the weights shown against each item, comprise the total weight of _____ lb. of removable equipment, excluding radio apparatus and radio parts. The moment is _____lb.in.

Quantity	Item	Weight Pounds	Moment Arm Inches	Included
1	Electric starter, Rotax Eclipse Type 756-5	18	- 47	_____
1	Electric starter, Bendix 397/5	18	- 45	_____
1	Fuel Filter, Type C-1A	1.5	- 53	_____
1	Solenoid	2	- 45	_____
1	Hand starter, Rotax Eclipse Type 4.H.4	8.5	- 43	_____
1	Ground starter Socket	1	- 39	_____
1	Generator Cooling Duct	0.5	- 55	_____
1	Vacuum pump	3.5	- 47	_____
1	Vacuum relief valve	0.5	- 45	_____
1 or 2	Battery - Exide 6Ts-9F	28 ea.	+ 54	_____
1 or 2	Battery - Exide 6AC7-1	17 ea.	+ 54	_____
1 or 2	Battery - Willard - AW-12-25	23.5 ea.	+ 54	_____
1	Battery Mount	1.5 ea.	+ 54	_____
1	Wiring for battery	7	+ 10	_____
1	Generator, Rotax B1804	11.5	- 45	_____
1	Set wiring for generator	3	+ 10	_____
1	Voltage regulator - Rotax F.0406	4.5	- 27	_____
1 set	Navigation Lights (Wing Tip) - Grimes - Model E.	0.4	- 7	_____
1	Navigation Light (Tail) - Grimes - A2064	0.2	+208	_____

5.2 Weight and Balance Certificate - Part "B" (cont'd)

Quantity	Item	Weight Pounds	Moment Arm Inches	Included
1	Wiring for wing tip lights	1	- 1	_____
1	Wiring for tail light	0.2	+120	_____
1	Cockpit lighting	2	+ 5	_____
1	Electrical panel and switches	3.5	+ 4	_____
1	Electrical Panel LH	1.0	- 7.5	_____
1	Electrical Panel RH	0.7	- 7.5	_____
1	Electric Intercommunication installation, dry cell operated	5.0	+ 28	_____
1	Electric Intercommunication installation, 24 volt operated	2.8	+ 00	_____
1	Set wiring for electric intercommunication set	1.0	+ 10	_____
1	Instrument flying hood	0.9	+ 20	_____
1	First Aid Mounting	0.5	+ 26	_____
1	First Aid Kit	2.8	+ 26	_____
1	Ballast in tailcone, as necessary (note amount)			_____
1	Landing Lamp, Rotax H-2601 with 350 Watt 2-filament bulb and mount	7.0	+ 8	_____
1 or 2	Landing Lamp, Grimes ST-250 and wiring	4.4 or 8.8	+ 8	_____
1	Landing Lamp, Grimes G3200 or G3001	6.0	+ 8	_____
1	Starter switch, Spencer Klixon C6363-3-8	0.1	- 14	_____
1	Master switch, Cutler-Hammer 8701 DPST	0.2	+ 4	_____
1	Master switch relay, Leach 5058	2	+ 54	_____

5.2 Weight and Balance Certificate - Part "B" (cont'd)

Quantity	Item	Weight Pounds	Moment Arm Inches	Included
1	Circuit Breaker Switch, Navigation Lights, Spencer Klixon C-6363-1-10	0.1	+ 4	_____
1	Landing light switch, Cutler-Hammer 8200	0.1	+ 4	_____
1	Filament Switch, Cutler-Hammer 8210	0.1	+ 4	_____
1	Circuit Breaker, Landing Light, Spencer Klixon, D-6751-1-5	0.2	+ 4	_____
1	Circuit Breaker, Landing Light, Spencer Klixon, D-6751-1-20	0.2	+ 4	_____
1	Luggage tray	0.5	- 33	_____
1	Wind Driven Generator, Champion W1520	16.0	- 22	_____
1 set	Blind Flying Screens	4.0	- 14	_____
1	Tail Pipe for Heater	7.0	- 18	_____

5.2 (cont'd)

PART "C"

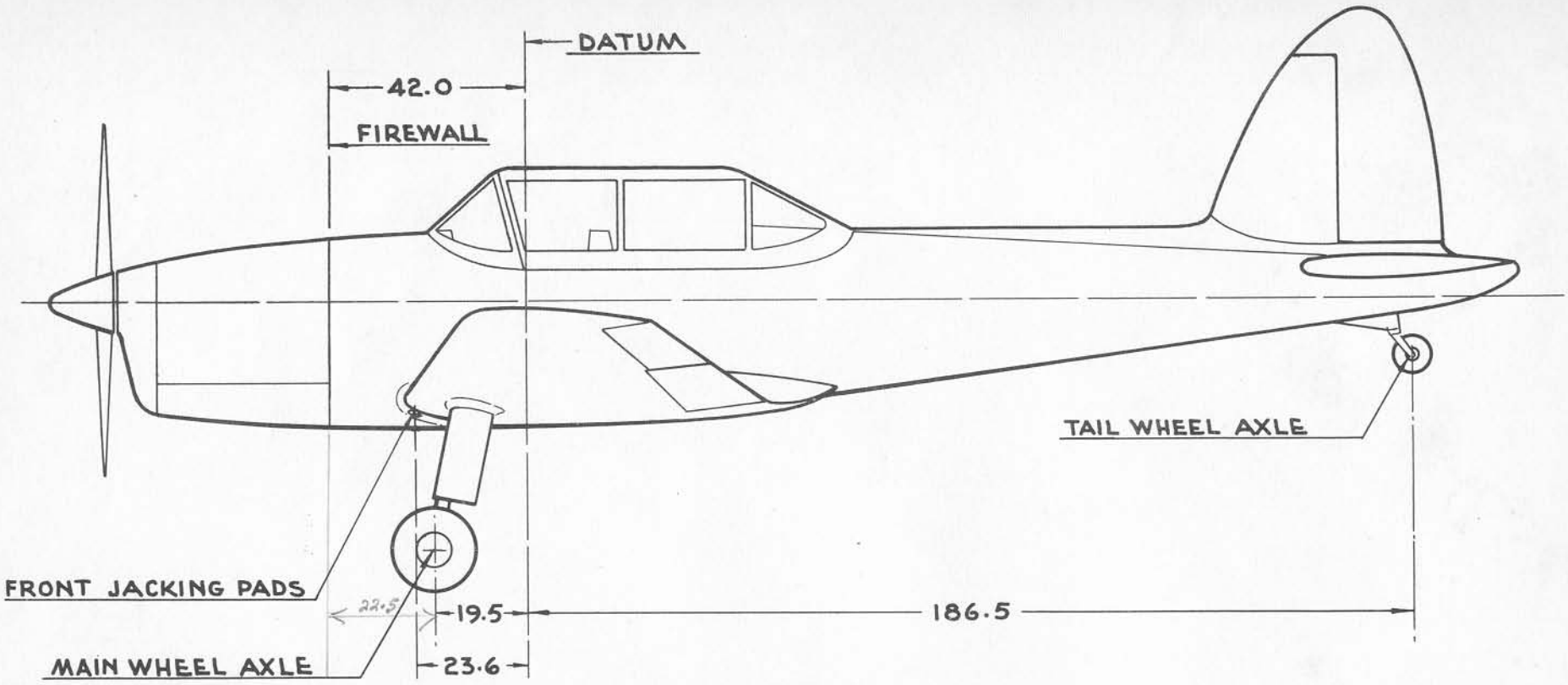
The undermentioned items, at the weights shown against each item, comprise the total weight of _____lb. of removable radio apparatus and radio parts. The moment is _____lb.in.

Quantity	Item	Weight Pounds	Moment Arm Inches	Included
1	Murphy Radio	16.5	+ 52	_____
1	Mount for Radio	1.0	+ 52	_____
1	Set wiring for Radio	1.0	+ 30	_____
1	S.T.R.-9 Radio	24.0	+ 52	_____
1	General Electric AS-1-C and Mount			
	including:			
1	Receiver	6.0	- 22	_____
1	Transmitter Power Supply	10.0	+ 14	_____

5.2 (Cont'd.)

PART "D"

Summary of Weights		Weight	Moment lb.in.
1.	Aircraft tare (from Part "A")	_____lb.	_____
2.	Fuel (Tank Full)____gallons at 7.2 lb. per gal.	_____lb.	_____
3.	Oil (Tank Full)_____gallons, at 9.0 lb. per gal.	_____lb.	_____
4.	Removable equipment (excluding radio apparatus and radio parts) (from Part "B")	_____lb.	_____
5.	Removable radio apparatus and radio parts (from Part "C")	_____lb.	_____
6.	Aircraft empty (Items 1 & 4 & 5)	_____lb.	_____
7.	Maximum payload authorized (Instructor, pupil, baggage etc.) (Item 8 minus Items 1 to 5)	_____lb.	
8.	Maximum total weight authorized	_____lb.	



STANDARD DIMENSIONS

TO BE USED WHEN DETERMINING CENTER OF GRAVITY
WITH PLATFORM SCALES OR ELECTRONIC WEIGHING UNIT

J.W.S.

DHC 1 CHIPMUNK ··· LOADING & C.G. DATA PLATE Nº 5.1

- CHAPTER 6 -

INSTRUCTIONS FOR GROUND CREW

6.1 Tanks

6.1.1 Fuel

Not inferior to 80 octane and not having more than 4 c.c. T.E.L. per Imp. Gal.

CAUTION: Do not use alcohol blended fuel.

The fuel cells are located in each wing root at the leading edge. Each fuel tank has a capacity of approximately 13.5 Imp.Gal. (61 litres) but is normally filled to the 12-1/2 gallon (57 litres) mark to give a total supply of 25 Imp.Gal. (114 litres). The quantity which may be carried in each tank when Major 10 equipped aircraft are operated with a crew of two and full military equipment, may be limited as indicated in para. 4.1.4 (g). Each tank has a filler cap and contents gauge on the upper surface of the wing leading edge and the tanks are filled independently.

The fuel gauges are graduated with two scales, the larger white figures showing the contents when the aircraft is in the flying attitude and the smaller green figures indicating the contents in the tail-down attitude.

6.1.2 Oil

Condition	Viscosity	Specification
Tropical	120	3-GP-120 or D.E.D. 2472 C/O
Temperate	100	3-GP-100 " " B/O
Winter (Moderate)	80	3-GP- 80 " " A/O
Winter (Arctic)	60	3-GP- 60 " " D/O

The tank has a capacity of 2-2/3 Imp.Gal. (12.0 litres) for oil plus a 1 gallon (4.5 litres) air space. The tank cannot be overfilled. It is mounted on the firewall and access to the combined filler cap and dip stick is gained through a quick release panel in the oil tank cooling shroud at the starboard side.

6.2 Prior to Starting the Engine

i) Remove control-locking devices.
ii) Chock wheels.
iii) Check switches and instruments.
iv) Check location of hand fire extinguisher in front cockpit.

6.3 Picketing

Picketing eyes are provided under the wing; the tailwheel yoke provides a point of attachment at the rear. A rope size of 3/4" diameter is recommended.

6.4 Parking

i) Lock all main flight controls (Chapter 3).
ii) Tether aircraft and chock wheels.
iii) Fit engine, propeller, windscreen and pitot-head covers. A wing cover is advantageous under winter conditions.

6.5 Jacking and Slinging

Jacking and slinging points are indicated in Plate 6.1.

6.6 Cleaning the Aircraft

If the potential life of the airframe is to be achieved, it must be maintained scrupulously clean. The exterior fuselage should be cleaned approximately once every day or at least every three days of service.

The landing gear, flap cut-outs, areas behind the exhaust stacks, battery compartment and the like should be cleaned daily.

The engine and engine installation should be cleaned at least as often as every major inspection to remove accumulated oil and other soil.

Cleaning agents containing abrasive compounds must not be used in any circumstances.

6.6.1 The exterior may be cleaned with a recognized proprietary aircraft cleaning compound, and if performed frequently, only polishing will be required.

6.6.1.1 For example, the proprietary material "Klad Polish" (See references at end of Chapter) can be applied by hand with a rag, sponge or mechanically operated tool. The sponge can be used repeatedly, rags should be changed as often as they become dirty. Rubbing should be continued in application until polish turns black and surface feels smooth and free from drag. The polish is then allowed to dry. The dry powder is then easily whisked off with clean cloths.

6.6.1.2 It is desirable to apply wax to the polished surface in order to avoid oxidation and to reduce the required frequency of polishing. "Klad Wax", for example, may be applied with a soft cloth. Use sparingly and do not rub in. Merely spread a thin coat and rub lightly with a clean cloth when it starts to dry.

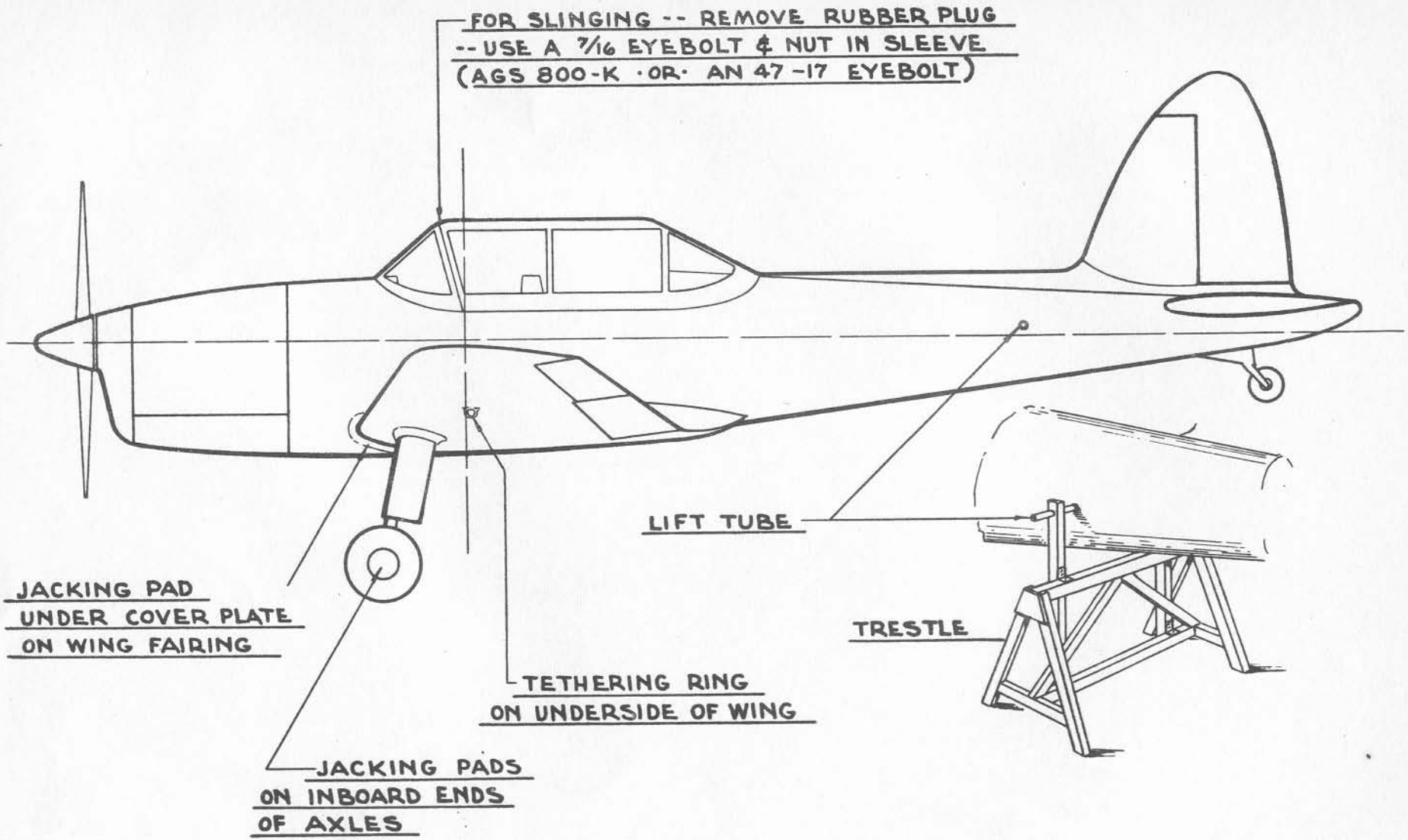
One operation may be saved by spraying Klad Wax on the gray powder left after the polish dries. Then as the powder is wiped off, the Wax spreads and produces a hard coating.

6.6.2 For cleaning the engine, a number of proprietary compounds are suitable. These can be dissolved in a petroleum base solvent and applied as a spray or mopped on the surface, allowed to remain for 10-15 minutes, and then hosed down with water or blown off with compressed air, followed by wiping with a clean rag. The engine should be grounded and all electrical accessories masked to prevent their saturation with water.

6.6.3 The windshield and canopy should be cleaned with mild soap and water. A clean grit-free soft cloth, sponge or chamois may be used. Grease and oil may be removed with a soft cloth saturated with kerosene, white gasoline or hexane. Do not use aviation or ethyl gasoline, acetone, benzine, carbon tetrachloride, fire extinguisher fluids or lacquer thinners.

CHAPTER 6 PUBLICATIONS and REFERENCES

Item	Manufacturer	Canadian Agent	Reference
Cleaning Compounds, etc.	R.M.Hollingshead Corp., Camden, New Jersey.	R.M.Hollingshead Corp., 1130 Bay Street, Toronto, Canada	Catalogue entitled "Aviation Chemicals" also Mort Gooch Maintenance Manual #1 Polish



J.W.S.

DHC 1 CHIPMUNK ··· TETHERING, SLINGING, JACKING PLATE Nº 6.1

-CHAPTER 7 -

FUEL AND OIL SYSTEM

7.1 Fuel System (Plate 7.1)

7.1.1 Description

Fuel is contained in two "Pliocel" synthetic rubber fuel cells located in the "D" nose at the wing root. Each cell has a capacity of 13-1/2 Imperial Gallons (61 litres). The maximum which may be carried in Series -2 aircraft with two crew, and full military equipment is limited to a value stencilled on the aircraft.

Each cell has a filler cap and a float type, mechanically operated fuel contents gauge, flush mounted on the upper surface of the wing. The gauges show in large white figures the tank contents when the aircraft is in flying position and in smaller green figures the contents in the "tail down" attitude. The cells are filled independently and cannot drain into one another. Each tank contains a sump and drain plug, the latter projecting below the lower surface of the wing for accessibility.

The fuel tank vent orifices are located on the upper surfaces of the wings. These ensure that the fuel cells are always pressurized to the extent of the dynamic pressure on the orifice created by the airspeed of the machine. The fuel cells are thus distended to prevent any possibility of collapse. A ball check valve is incorporated in the vent assembly to seal the vent when the aircraft is inverted.

The complete fuel system is shown diagrammatically on Plate No. 7.1 with alternative methods of control. Both systems are manually operated by interconnected levers which project from the control box in front of each control column. In the current production aircraft the control levers operate a selector valve, which allows fuel to be drawn from the selected tank to the engine-driven DH.AC fuel pumps, Type A-10-1A. Alternatively, on early models fuel may be drawn from the tanks simultaneously. In the latter case, an "on-off" cock is operated by the pilot's control lever, and fuel leaving the tanks passes through non-return valves to a common "T" junction, then via the cock to the pumps on the engine. In either system an additional fuel filter, Type C-1A may be installed in the pipe line to the dual pumps.

7.1.2 Servicing

It is recommended that fuel having a rating not inferior to 80 octane, and not having more than 4 c.c. T.E.L. per gallon be used.

Caution: Do not use alcohol blended fuel. Alcohol is a solvent of the material from which the "Pliocel" fuel cells are made.

7.1.2 (cont'd)

The fuel cell sump is drained by removing the wire locked plug, AGS 566/B (1/4 BSP), with DHC 55/2 aluminum gasket. This plug is located immediately outboard of the wing root fillet and just forward of the spar. If it is not desired to drain the fuel cell completely, it should only be necessary to allow a small quantity (about 2 or 3 fluid ounces) of fluid to drain out before replacing the plug. The plug must be wire locked using 18 SWG locking wire.

Only the fuel cells can be drained at these points. To drain the fuel in the pipe lines it is necessary to disconnect the Hose A1516 at the banjo joint to each sump (when a fuel selector valve is fitted) or the DHS.36/12 coupling to each non-return valve (when the system employs an "on-off" cock). Wing fillets must be removed to accomplish this.

A fuel filter, if installed, will be mounted on the port engine bearer. It is drained by opening the drain valve in its lower casing. This valve rotates left hand to open and right hand to close. It must be wire locked. For cleaning or replacement slacken off the wing nut and clamp and remove the lower casting. The wing nut must be wire locked on reassembly of the unit.

The fuel flow through the fuel system should be at the rate of at least 19 Imperial Gallons (86 litres) per hour.

It is important that the fuel cell vent assembly be clear. It is possible to check this by blowing through the vent air intake orifice.

In the event of damage to the Pliocel fuel cell, repairs can be made by using the Pliocel Field Repair Kit which is available either from the de Havilland Aircraft Co. or the Goodyear Tire & Rubber Co.

7.1.3 Dismantling Procedure

To remove Pliocel flexible Fuel Cell from wings:

a) Drain fuel cell by removing the AGS 566/B drain plug and DHS 55/2 gasket.
b) Remove wing root fillet.
c) Remove the special banjo fitting part number 01850, from the fuel cell sump, part number 01849. This is done by removing the AGS 1135/C banjo bolt and the two DHS 55/4 gaskets. One gasket is fitted to each face of the banjo.
d) Remove the four AS 1885/5B (4 BA) bolts which secure the sump to the bottom skin of the wing.
e) Remove the fuel tank filler opening cover plate, part number 01913, by removing the six AS 1885/5B (4BA) button head bolts.
f) Remove the eight AGS 249/22 (4BA) countersunk head screws surrounding the wing opening for the cover plate. This allows the cell to partially collapse into the tank bay.
g) Remove the cover mounting plate, part number 01912, wide gasket, part number 01911, and narrow gasket, part number 01909. These will be left loose by operation "f"

h) In order to support the filler opening sump to assist further disassembly, replace temporarily the screws removed in operation "f".
i) Remove the fuel gauge, General Electric number 57697-3, and the gasket, part number 01914, by removing the five AGS 247/17 (2 BA) cheese head bolts and three AGS 247/15 (2BA) cheese head bolts. The shorter bolts are for the three holes adjacent to the filler neck.
j) Remove the eleven AGS 247/22 (4 BA) cheese head bolts and AGS 162/B spring washers, and the four AGS 249/22 (4 BA) countersunk head bolts which retain the filler neck and cap assembly, part number 01907, and remove this assembly together with gasket, part number 01906.
k) Remove the screws replaced temporarily in operation "h".
l) Remove the four AGS 249/22 (4 BA) countersunk head screws retaining the fuel tank vent air intake to the upper surface of the wing. Support the vent body from inside the fuel cell during this operation taking care to remove and retain the check ball from the vent body and the two gaskets, part number 03203, which are located between the vent body and wing skin and between the wing skin and air intake.
m) Unfasten the four dome fasteners holding the fuel cell to the roof of the tank bay.
n) Push the fuel cell drain sump up into the tank bay until it is well clear of the root rib.
o) Withdraw the fuel cell, part number 01920 (left hand) and part number 01930 (right hand) complete with drain sump, vent body and filler opening sump, through the filler assembly wing opening.

NOTE

On reassembly, all contacting surfaces of gaskets, etc. and all screw threads should be coated thinly with Parker "Sealube" or a similar approved sealing compound.

To remove fuel cock assembly:
a) Drain complete fuel system.
b) Remove the portion of the control box cover immediately forward of the front control column. This panel, part number 01282, is retained by eleven AGS 245/22 (4 BA) round head screws with AGS 160/B washers. The Parker Kalon screws securing the control column sock to this panel should also be removed.
c) Disconnect the rod assembly, part number 01859, from the fuel cock lever arm by removing the AGS 166/2 split pin and SP4/D6 pin.

IMPORTANT

Do not disturb the length of this rod assembly. In the event that a new rod assembly is installed, it must be adjusted so

7.1.3 (cont'd)

c) (cont'd)
that the fuel cock is fully off when the cockpit levers are in the "Off" position.

d) Remove the six AGS 605/00 (Jubilee type) clips at the fuel cock. The two clips adjacent to the fuel cock secure the cock to the mounting bracket, part number 01883, and should be removed last.

e) Slide the hose couplings, part number 01894/2, away from the cock and remove the fuel cock assembly, part number 01890, complete with two pipe assemblies, part number 01888.

7.2 Oil System (Plate 7.2)

7.2.1 Description

The oil tank, of 2-2/3 Imperial Gallons (12.0 litres) oil capacity, plus 1 gallon (4.5 litres) air space, is mounted on the forward face of the firewall. Cooling air is scooped in on the port side cowling, ducted around the oil tank and exhausted through a louvre on the starboard side.

Access to the combined filler cap and dip-stick is gained through a quick release panel in the oil tank cooling shroud at the starboard side.

A Koehler drain cock, part number K.16258, is fitted under the port side of the tank. This cock is spring loaded open or closed and does not require wire locking.

An Auto-Klean pressure oil filter and a suction filter are incorporated in the engine. These components are described in detail in the Gipsy Major 1C or Major 10 Handbook.

7.2.2 Servicing

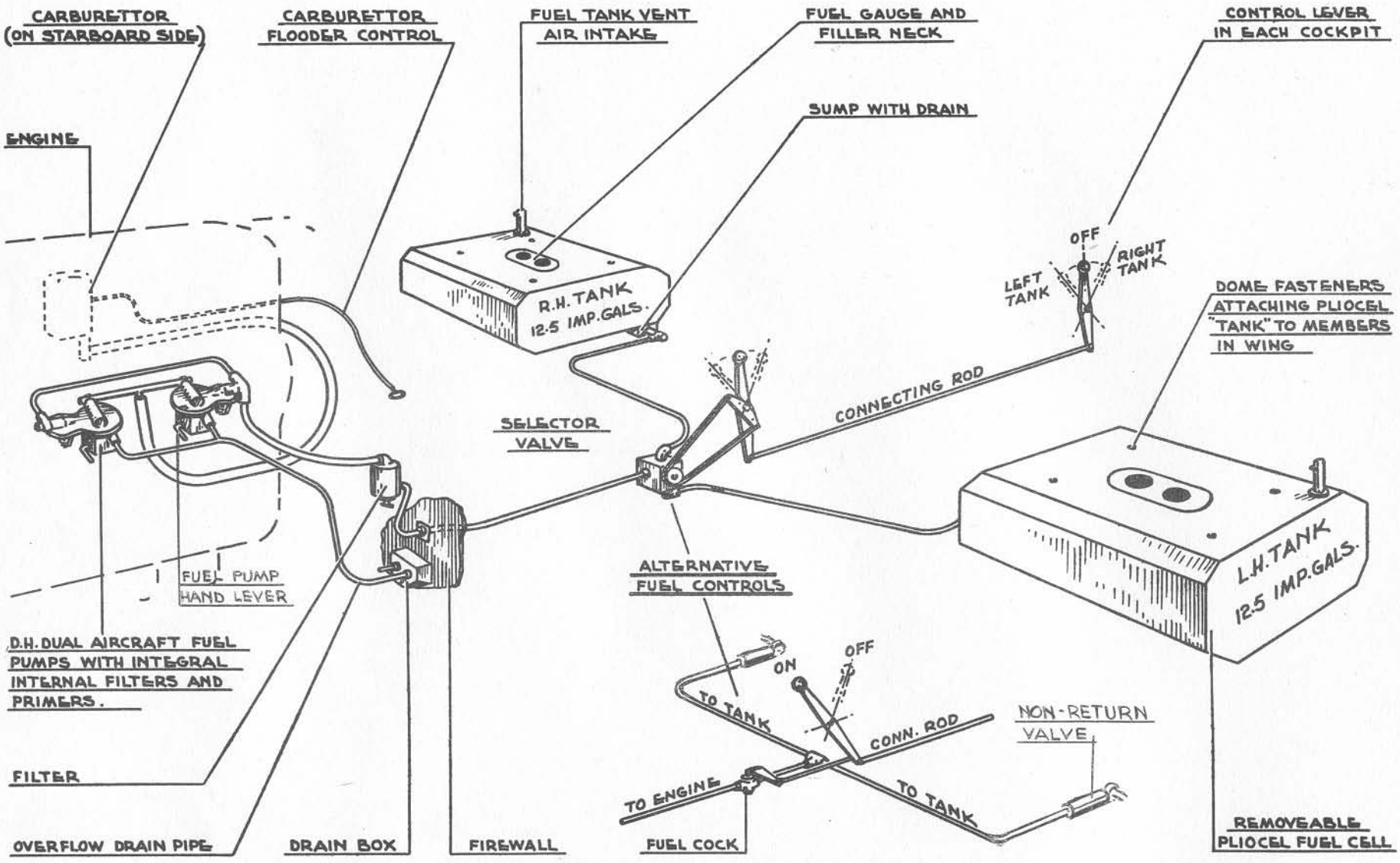
Engine oil conforming with Canadian Government Purchasing Standards Committee Specifications 3-GP - Series, British D.E.D. 2472 or AN-O-8 (Reference - Chapter 11, para. 11.3.5) may be used. The following grades are recommended under the conditions stated:

Condition	Viscosity
Tropical	120
Temperate	100
Winter	80
Arctic	60

7.2.3 Dismantling Procedure

To remove Oil Tank:

a) Drain oil tank, remove lower engine cowling panel.
b) Disconnect the oil return pipe, part number 01108, at the oil tank by removing one of the two AGS 605/1 (Jubilee type) clips at that point.
c) Disconnect the oil inlet pipe, part number 01107, at the oil tank by removing one of the AGS 605/1 (Jubilee type) clips at this point.
d) Disconnect the oil tank vent, part number 0601, at the oil tank by removing one of the AGS 605/0 (Jubilee type) clips at this point.
e) Disconnect the crankcase lower breather pipe, part number 01099, at the drain box (below the oil tank) and at the first joint forward of the drain box, by removing one of two AGS 605/1 (Jubilee type) clips at each point, and remove the pipe.
f) Remove the induction drain pipe, part number 01716, by removing one of the two AGS 605/00 (Jubilee type) clips at the drain box and undoing the union nut at the induction manifold on the engine.
g) Remove the fuel pump lower drain pipe, part number 02841, by removing one of the two AGS 605/00 (Jubilee type) clips at the drain box and also at the first joint forward of the drain box.
h) Unfasten the two safety pins, part number H20387, and withdraw the two hinge pins, part number 0519, from the piano hinges at the top and bottom of the oil tank cooler cover. Remove this cover, part number 0501.
i) Remove the six AGS 245/21 (4 BA) round head screws, with AGS 160/B washers, which retain the inlet and shroud assembly (port side) to the firewall.
j) Detach the bracket from the DHS 31/39 clip on the engine bearer, by removing the S400/BA1 (4 BA) stop nut, AGS 160/B washer and 6A1/1B bolt, and remove the oil cooler inlet and shroud assembly, part number 0522.
k) Slacken off the oil tank mounting cables, part number 0563, by removing the lower pair of A16Y/CS (2 BA) slotted nuts with AGS 166/3 split pins and AGS 160/C washers. These are located on the aft face of the firewall in the cross support channel.
l) The oil tank, part number 0550, can now be withdrawn downward and forward and removed from the aircraft.



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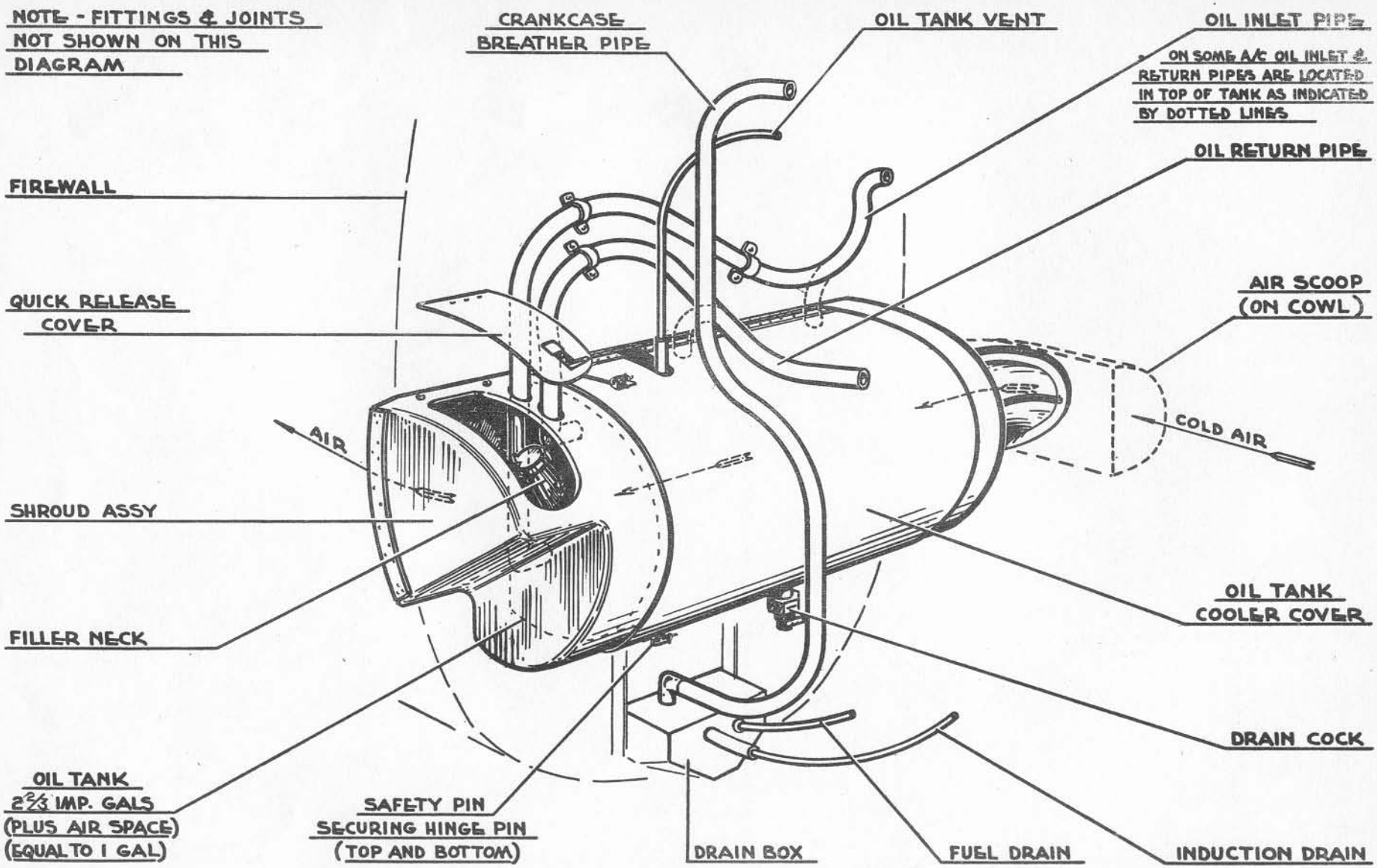
DHC 1-CHIPMUNK··· FUEL SYSTEM PLATE Nº 7.1

AMENDMENT Nº 1



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DHC 1-CHIPMUNK ··· OIL SYSTEM

PLATE Nº 7.2

- CHAPTER 8 -

UNDERCARRIAGE

8.1 Description (Plates 8.1, 8.2, 8.3)

8.1.1 The landing gear consists of two main undercarriage units and a fully castoring tailwheel.

8.1.2 Each main wheel is supported by a single cantilever leg which contains the shock strut. The shock absorbing medium is rubber. A series of rubber blocks are compressed by the landing loads and the rebound is absorbed by similar blocks at the bottom end of the stroke. The wheel is maintained in alignment by a hinged torque link.

The Goodyear single disc hydraulic brakes are differentially controlled from the rudder bar. Simultaneous operation for parking or running-up can be obtained by means of a brake lever in each cockpit.

A light metal fairing is attached to each leg by two AGS (Jubilee type) clips and can be readily removed.

Each undercarriage leg is retained in a wing housing by a single nut. The top edge of the outer cylinder is serrated and engages with a mating part in the wing housing. This fitting has been engineered to withstand all possible twisting loads with an ample reserve. The wing housing is a built-up unit which spreads the undercarriage loads through the wing "D" nose structure.

The wheels are standard Goodyear type and are fitted with 6.00-6 tires and tubes.

8.1.3 The tailwheel is mounted on a levered suspension. The flattened tubular steel yoke is attached to the aft face of the fuselage rear bulkhead by a horizontally hinged mounting. The strut which contains compression rubbers or an oleo shock absorbing unit is attached to a hinged fitting on the tailplane front spar. The tailwheel landing loads are thus taken into the fuselage through the main tailplane attachments. The tailwheel fork, of welded steel tube, rotates in a bushed cylinder which forms the aft end of the tailwheel yoke.

The Otaco tailwheel is fitted with a 2.50-4 tire and tube.

8.1.4. The undercarriage has been designed to accommodate an installation of skis. Alternatively a float chassis may be fitted.

8.2 Maintenance

8.2.1 Tire pressures should be maintained at 20 to 22 psi (1.4 to 1.5 kg/cm^2) for the main wheels and 35 psi (2.5 kg/cm^2) for the tailwheel.

8.2.2 The main shock absorber struts require very little servicing. Tecalemit grease fittings are provided where necessary. Lubrication instructions are given in Chapter 11.

8.2.2 (cont'd)

The compression rubbers in time lose resiliency. This can be compensated for by the addition of an extra compression rubber when the space in the cylinder becomes sufficient.

In order to determine when this is required, the measurement between the centres of the upper and lower torque link bolts should be checked periodically. This dimension should be approximately 9.0 inches with the aircraft sitting on its wheels at about its normal all-up weight less crew. When this dimension is reduced to 8.0 inches, one additional compression rubber, part number 01433, together with spacer, part number 01415, should be inserted. This will restore the leg to its normal length. The maximum number of extra rubbers that can be added is two. When two additional rubbers and spacers have been inserted, making a total of 30 compression rubbers per leg, the next sequence requires the complete replacement of all compression rubbers and also all rebound rubbers, part number 01479. This will require 28 compression rubbers and 3 rebound rubbers per leg. The complete cycle can then be repeated.

8.2.3 Three versions of tailwheel shock strut are in service as follows:

8.2.3.1 Shock strut, part number 01440 incorporating six compression rubbers, part number 01433, one compression rubber, part number 03905, and two rebound rubbers, part number 01434.

8.2.3.2 Shock strut, part number 03907, incorporating seven compression rubbers, part number 01433, one compression rubber, part number 03905, and one rebound rubber to part number 01434.

The rubber blocks in the shock strut may in time lose some of their resiliency and require replacement. This condition can be determined by taking the weight off the tailwheel and attempting to rotate the compression rubbers or spacers. If these can be turned by hand it is an indication that the rubbers should be replaced.

8.2.3.3 Shock strut, part number 03915. This unit uses hydraulic fluid to Specification AN-VV0-366 or DTD-585. The filling procedure is as follows:

a) With casing end up and piston extended, fill with fluid through plug hole.
b) Shake out any trapped air.
c) Screw in plug and compress strut.
d) Loosen plug and fully compress strut to allow excess fluid to flow out plug hole.
e) Replace plug tightly.
f) (Insert valve body) and inflate to 200 psi.

8.2.4 Wear in the tailwheel castoring action can be compensated for by tightening the A16Y/JS (3/8 BSF) slotted nut at the top of the fork housing. This nut bears on a DHS 33 Mk.4 shrinkage washer and draws the fork bearing plate more tightly against the lower bushing. Care should be exercised so as not to flatten this spring washer. The tailcone must be removed in order to gain access to the tailwheel strut assembly.

8.3 Dismantling Procedure

8.3.1 Main Undercarriage Unit

8.3.1.1 To change a tire:

a) Remove valve fittings and completely deflate tube.
Note: Tube must be deflated before wheel is split.
b) Remove nuts from bolts holding wheel sections together.
c) To provide even wear mark sidewall with chalk so tire may be reversed when replaced.
d) Loosen beads of tire from wheel flange.
e) Force tire iron well under wheel rim and pry wheel section free. Remove other section in same manner.
f) Remove tube from tire.

Fitting Tire to Wheel:

a) Sprinkle tire talc into casing.
b) Place deflated tube in tire and inflate sufficiently to fill casing.
c) Replace outer half of wheel, putting valve stem through hole in wheel.
Note: If used tire is being replaced, it should be reversed from previous position.
d) Replace other half of wheel, fit nuts to wheel bolts.
Note: Use a torque wrench value of 50 - 70 in. lb.
e) Inflate the tube with sufficient pressure to force the beads into the taper of the rim.
f) Deflate tube so the beads will settle into place on the wheel.
g) Reinflate to proper pressure and fit valve cap.

8.3.1.2 To remove wheel:

a) Jack up aircraft using jack pads provided at the inboard end of each stub axle.
b) Remove hub cover plate by removing the three retaining screws.
c) Remove the AGS 166/31 split pin and special axle nut, part number 01467.
d) Release brake disc by bending down clips.
e) Slide wheel off axle.

8.3.1.3 To remove brake unit:

a) Remove wheel.
b) Slip brake disc from between friction pads.
c) Disconnect brake line at bottom fitting.
d) Remove four 22E (1/4 BSF) elastic stop nuts (or Aerotight EA1), washers AGS 160 D and 6A1/6E (1/4 BSF) bolts.

8.3.1.4 To remove axle and jack pad:

a) Trestle aircraft.

b) Remove wheel.

8.3.1.4 (cont'd)

c) Remove spacer tube, part number 01466.

d) Remove AGS 167/59 taper pin, from the undercarriage leg bottom fitting.
e) Axle, part number 01468 and jack pad, part number 01419, can now be withdrawn from the bottom fitting. The brake unit does not have to be removed.

NOTE: The jack pads, when drilled, are not interchangeable port and starboard and care must be taken to ensure that each jack pad is reassembled so that the flat is approximately parallel to the ground when the aircraft is in a tail down position.

The taper pin must be replaced when reassembling axle and jack pad. Pean after assembling.

8.3.1.5 To remove undercarriage leg fairing:

a) Remove the five AGS 245/21 (4BA) machine screws and 22TM/4BA stop nuts joining the rear edges of the fairing.
b) Remove the six AGS 245/21 (4BA) machine screws at the bottom of the fairing retaining the rib, part number 02797.
c) Remove the two AGS 605/3 (Jubilee type) clips which secure the fairing to the undercarriage leg.

Note: When replacing the fairing make sure the fore and aft alignment is correct.

8.3.1.6 To remove complete undercarriage leg:

a) Trestle aircraft.
b) Remove undercarriage leg fairing.
c) Disconnect brake line at upper fitting.
d) Remove the cover plate, part number 01496, located on the top surface of the wing directly above the undercarriage leg housing.
e) Remove the AGS 166/12 split pin, A16Y/LS (7/16 BSF) slotted nut and AGS 160/H Washer exposed by the removal of the cover plate. The complete undercarriage leg can now be withdrawn downward from the housing. This requires approximately 10 inches clearance beneath the wheel. This distance may be reduced by removing the wheel first.

8.3.1.7 To dismantle main undercarriage leg for replacement of compression and rebound rubbers:

a) Remove complete undercarriage leg from aircraft.
b) Disconnect brake line at the lower fitting.
c) Separate torque link halves at centre joint by removing the AGS 166/3A split pin, A16Y/GS (5/16 BSF) slotted nut, two AGS 160/E washers, 2A15/10G (5/16 BSF) high tensile bolt and bush, part number 01416.

8.3.1.7 (cont'd)

d) Remove plug end, part number 01476, from the top end of the undercarriage leg. This plug end is retained by means of a 3/8 inch diameter pin, part number 01418. This pin is identified by a shallow drilled hole in the end. The other pins visible around the top of the leg are used to hold the top piston in the cylinder and no attempt should be made to remove these at this stage.

e) Compress the leg slightly in a suitable fixture in order to take the initial loading off the rebound rubbers.

f) Remove the 42E (3/8 BSF) stop nut from the top end of the guide rod, part number 01411. This guide rod projects up into the top piston tube and the nut can be reached by a socket wrench of the spark plug type with an extension handle.

g) Remove the AGS 605 /4Y (Jubilee type) clip located immediately above the torque link upper hinge fitting.

h) Remove the two plugs, part number 01475, positioned under this AGS clip. These plugs are tapped for a 4 BA screw to assist withdrawal.

i) Allow the leg to extend itself gradually until the initial loading is expended.

j) Piston assembly with the compression rubbers can now be withdrawn from the cylinder assembly. The rebound rubbers will remain loose in the top piston. Additional compression rubbers may be added as detailed under "Servicing".

Note: Lubricate the rubbers and spacers with powdered graphite on assembly. Contacting surfaces of sliding metal parts should be lightly greased on assembly.

Important: When reassembling the undercarriage leg, the 42E (3/8 BSF) stop nut at the top end of the guide rod should be tightened until a dimension of 11.70 inches plus or minus 0.10 inch is obtained between the centres of the upper and lower torque link bolts.

8.3.2 Tail Undercarriage Unit

8.3.2.1 To remove tailwheel:

a) Trestle tail of aircraft.
b) Remove the AGS 784/12 split pin, A16Y/NS (1/2 BSF) slotted nut and 6A1/29N (1/2 BSF) axle bolt.

8.3.2.2 To remove tailwheel fork:

a) Trestle tail of aircraft.
b) Remove rudder fairing.
c) Remove tail cone.

8.3.2.2. (cont'd)

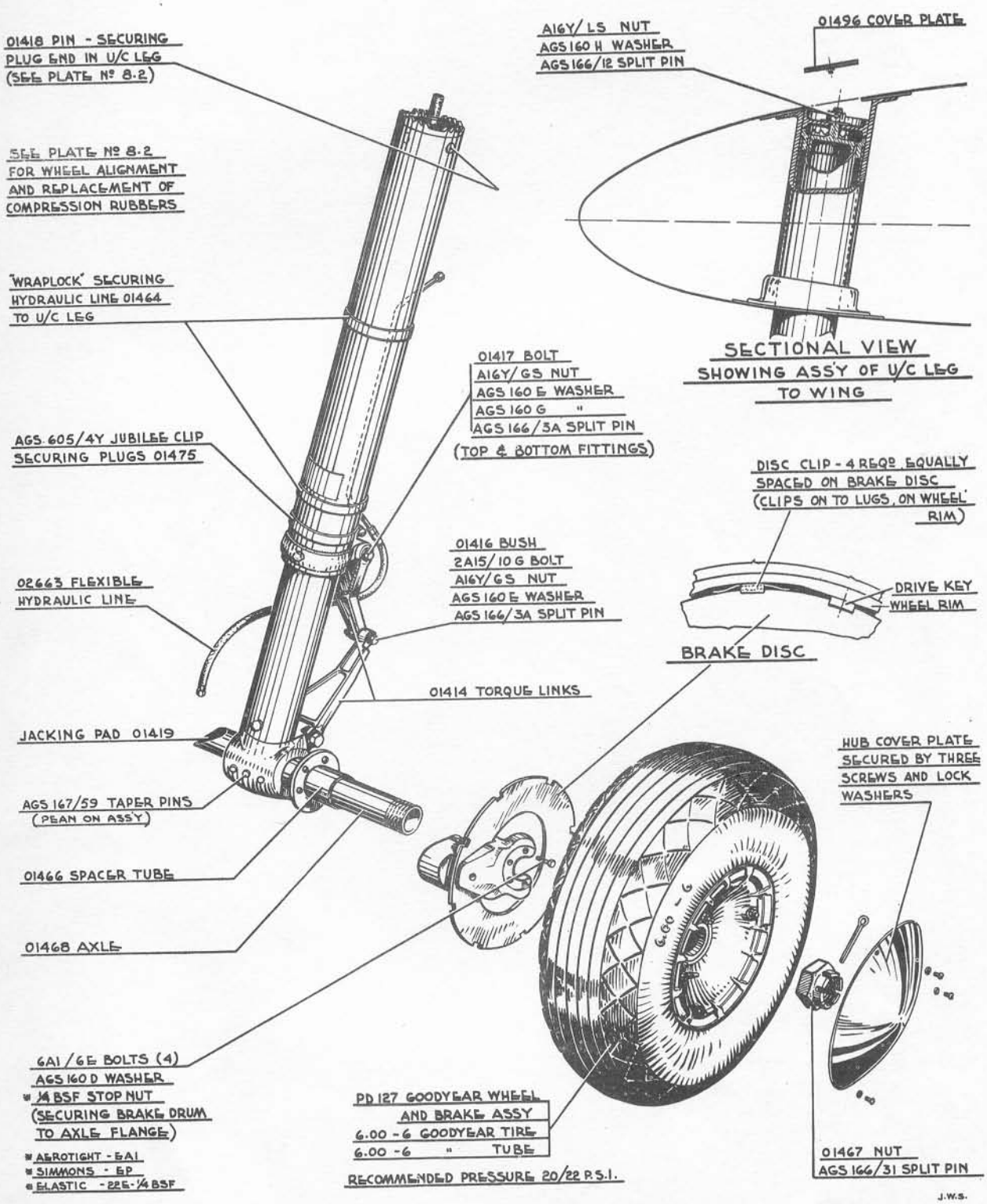
d) Remove the AGS 784/3A split pin, A16Y/JS (3/8 BSF) slotted nut and DHS 33 Mk.4 shrinkage washer from the top of the fork housing.
e) Remove the AGS 247/10 (2 BA) cheese head machine screw from the top of the friction washer, part number 01438, and remove this friction washer.
f) Tailwheel fork, part number 01430, can now be withdrawn from the housing.

8.3.2.3 To remove tailwheel assembly:

a) Trestle tail of aircraft.
b) Remove rudder fairing.
c) Remove tail cone.
d) Disconnect the top shock strut attachment from the fitting on the underside of the tailplane front spar by removing the AGS 160/E washer and 6A1/10G (5/16 BSF) bolt.
e) Disconnect the tailwheel yoke from the fitting on the rear face of the aft bulkhead by removing the AGS 784/3A split pin, A16Y/GS (5/16 BSF) slotted nut, AGS 160/E washer and 6A1/60G (5/16 BSF) bolt.

8.3.2.4 To remove and dismantle shock strut for replacement of rubbers:

a) Trestle tail of aircraft.
b) Remove rudder fairing.
c) Remove tail cone.
d) Disconnect lower end of shock strut by removing the AGS 784/3A split pin, A16Y/JS (3/8 BSF) slotted nut and 6A1/8J (3/8 BSF) bolt.
e) Disconnect upper end of the shock strut at tailplane fitting by removing the AGS 784/3A split pin, A16Y/GS (5/16 BSF) slotted nut, AGS 160/E washer and 6A1/10G (5/16 BSF) bolt.
f) Remove the leather boot, part number 03918. This is secured with three turns 16 SWG locking wire at each end.
g) Compress the shock strut slightly in a suitable fixture in order to take the initial loading off the rebound rubbers.
h) Remove the EB1 (1/4 BSF) Aerotight stop nut and 6A1/9E (1/4 BSF) bolt retaining the flanged slide, part number 01428.
i) Allow the shock strut to extend gradually until the initial loading is expended. The tube assembly can now be withdrawn from the slotted tube.
j) Unscrew retaining disc, part number 03922. This will permit the rebound rubbers to be replaced. The retaining disc must be locked in position on reassembly by means of staking.



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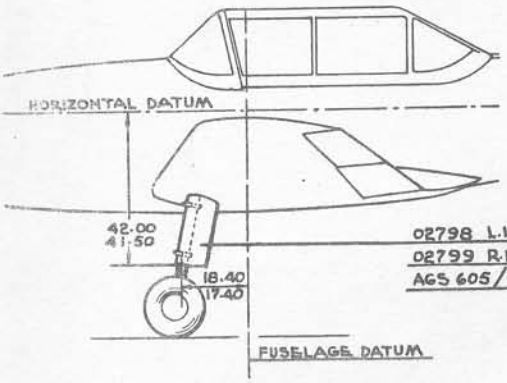
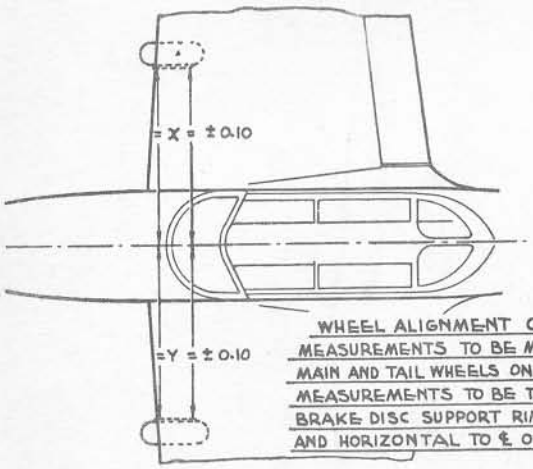
DHC 1-CHIPMUNK ··· MAIN U/C PLATE Nº 8.1



02798 L.H. FAIRING
02799 R.H. "
AGS 605/3 JUBILEE CLIPS.



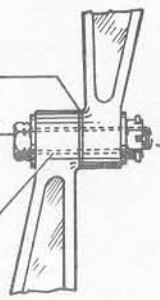
WHEEL ALIGNMENT CHECK
MEASUREMENTS TO BE MADE WITH MAIN AND TAIL WHEELS ON GROUND
MEASUREMENTS TO BE TAKEN FROM BRAKE DISC SUPPORT RIM - AS SHOWN AND HORIZONTAL TO ℄ OF AXLE

WHEEL ALIGNMENT ADJUSTMENT OBTAINED BY SHIMMING BETWEEN TORQUE LINKS AT CENTER BOLT - MAXIMUM ALLOWABLE SHIMMING AT THIS POINT IS 0.18

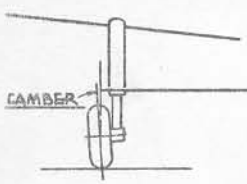
TORQUE LINKS MAY BE CHANGED OR REVERSED IF NECESSARY

03539 WASHERS (SHIMMING)
AGS 160/E WASHERS
A1S/2G BOLT (H.T.)
A1GY/GS NUT
AGS 784/3 SPLIT PIN

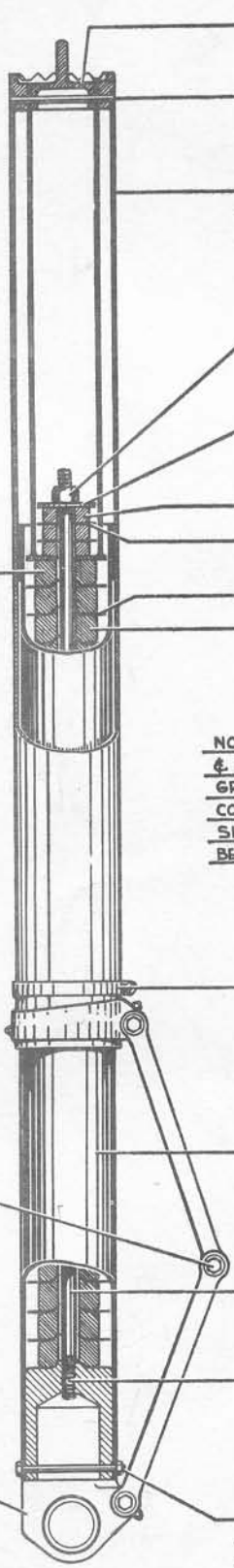
03540 BUSHING
SHORTEN BUSH ON ASSY AS REQ'D TO PROVIDE 0.01 / 0.03 END FLOAT ON BOLT



THESE PARTS ARE ONLY REQ'D. FOR WHEEL ALIGNMENT ADJUSTMENT FOR STANDARD ASSY - SEE PLATE Nº 8.1



SOME A/C HAVE AN "AXLE END FITTING" TO GIVE WHEEL A 3°±45' CAMBER - OTHERS PERPINDICULAR -- BOTH TYPES ARE INTERCHANGEABLE IN THE PISTON TUBE



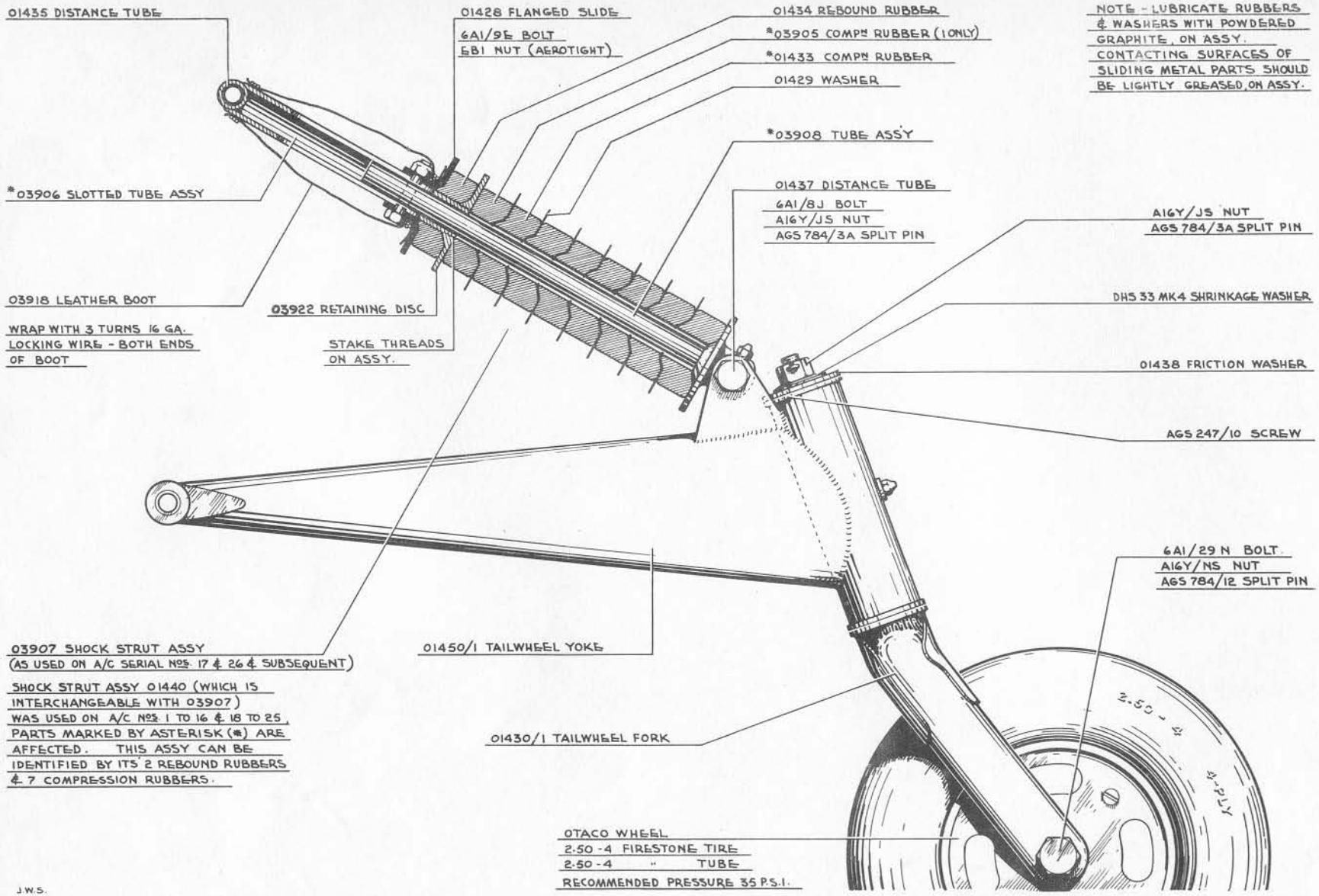
01476 PLUG END
01418 PIN (IDENTIFIED BY SMALL HOLE IN END)
01470 CYLINDER ASSY COMPRISING -- TOP PISTON, CYLINDER, TOP FITTING & LOCK PINS.
42 E-5/8 BSF STOP NUT (ELASTIC)
01477 WASHER
01479 REBOUND RUBBER
01478 WASHER
03905 COMP. RUBBER (1 ONLY)
01415 SPACER
01433 COMP. RUBBER

NOTE - LUBRICATE RUBBERS & SPACERS WITH POWDERED GRAPHITE, ON ASSY. CONTACTING SURFACES OF SLIDING METAL PARTS SHOULD BE LIGHTLY GREASED ON ASSY.

01475 PLUGS (UNDER JUBILEE CLIP)
01401 PISTON TUBE
01411 GUIDE ROD
01412 PIN - LOCKING GUIDE ROD IN END FITTING
BOLT SECURING "AXLE END FITTING" ASSY TO PISTON TUBE

J.W.S.

DHC 1 - CHIPMUNK · · · MAIN U/C PLATE Nº 8.2



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DHC 1 – CHIPMUNK • • • TAILWHEEL PLATE Nº 8.3

- CHAPTER 9 -

BRAKE SYSTEM

9.1 Description (Plate 3.3)

Hydraulic brakes are fitted to the main undercarriage wheels of the Chipmunk. These are Goodyear "Single disc" type and are operated simultaneously for parking by means of a brake lever in each cockpit, or differentially for ground manoeuvring by the rudder bar. The hand brake lever is set "half on" for differential action and "full on" for parking.

The hydraulic brake system consists of a master cylinder and reservoir for each wheel, a single hydraulic line from each master cylinder and the brake unit itself mounted on each wheel hub. When the brakes are applied, hydraulic pressure forces a friction pad against the face of a floating annular disc keyed to, and revolving with, the wheel. This annular disc is backed up by a second fixed friction pad. The clamping action provides the necessary wheel braking.

A cable linkage is used between the rudder pedals and the master cylinders and is arranged to transmit differential or simultaneous action referred to above.

While the brakes can be applied simultaneously for parking, it is not desirable to leave the brakes so applied for long periods because of the pressure established in the hydraulic brake system.

9.2 Servicing

9.2.1 No adjustments to the brake disc are necessary during the life of the lining. Access to the hydraulic brake master cylinders and reservoirs is gained by removing the forward top panel from the front cockpit control box. These reservoirs should be kept filled with hydraulic fluid. An approved mineral base hydraulic fluid, to Specification AN-VV0-366B, DTD-585 or 3-GP-26-1947, is to be used.

9.2.2. Bleeding the Brakes

Air in the hydraulic system results in ineffective brake action. This requires bleeding of the hydraulic system.

Each hydraulic brake line can be bled by means of a bleeder plug located within the wing fillet, immediately behind the spar and also by a bleeder screw on the inboard face of the brake housing. In order to bleed the brake chamber effectively, the cylinder head into which this bleeder screw is tapped must be located so that the bleeder screw is in the highest position.

9.2.2.1 Pressure Bleeding - Pressure Tank or Hydraulic Pump

a) Connect tank or pump to the bleeder connection of the brake.

9.2.2.1 (cont'd)

b) Connect a hose to the master cylinder reservoir filler plug and insert free end into a glass jar.
c) Apply pressure and run fluid through the system until the fluid is completely void of air bubbles.
d) Remove bleeder hose and replace filler plug in reservoir.
e) Remove tank or pump connection, replace bleeder screw and tighten.

9.2.2.2 Gravity Bleeding - Without Air Pressure

a) Remove the top bleeder screw from the brake and insert in its place a standard bleeder hose. Place the free end of the hose in a clean glass receptacle.
b) Permit system to fill by gravity from the supply tank. This will require a few minutes.
c) When the fluid starts to flow from the bleeder hose, apply the brake pedal rapidly and force fluid through the hose into the receptacle. The bleeder hole in the brake must be closed during the return of the brake pedal fo "OFF" position. Pinching the bleeder hose with the fingers will accomplish such closing. Then allow pedal to return slowly to full "OFF" position. This draws new fluid into the system from the supply tank.
d) Release finger pressure on bleeder hose and push brake pedal on rapidly again. While fluid is flowing restrict bleeder hose as described above before allowing brake pedal to return slowly to brake "OFF" position.
e) Repeat this operation until no more air bubbles come from bleeder hose. System is then properly bled and hose should be removed.

- CHAPTER 10 -

CONTROLS AND RIGGING

(Plate No. 10.1)

10.1 Flying Controls (See Cockpit Layout - Plate No. 3.2)

10.1.1 The flying controls are conventional with a control stick and rudder pedals in each cockpit. Stick and pedals are removable. A hand lever on the starboard side of each cockpit operates the flaps. The control movements are transmitted by connecting rods and by cables running over pulleys.

Longitudinal trim is obtained by means of an elevator tab which is adjusted in flight by a hand-operated trimming wheel in each cockpit. Directional and lateral trim are obtained by ground adjustment of metal trailing edge tabs on the rudder and ailerons respectively.

Access to the flying controls in the fuselage is obtained by removing the seats and the control box covers. There is an additional external inspection panel in the fuselage belly behind the rear seat. The adjustable aileron and rudder control stops are located in the control box. The elevator control stops are on the elevator bellcrank support bracket, located on the aftmost fuselage bulkhead.

Cable runs in the wing may be inspected through zippered patches in the fabric undersurface of the wing.

Recommended cable tensions are:

Aileron	55 lb.
Elevator (Bottom Cable)	60 lb.
Rudder - per cable	60 lb.
Elevator trim tab	5 - 8 lb.

These should be checked periodically. Under winter conditions care should be taken to ensure that the tensions are correct in outdoor temperatures, not in a heated hangar.

Control surface movements and general rigging data are given in Plate 10.1.

10.1.2 Rudder

To adjust the rigging of the rudder:

1) Lock the rudder to fin with rudder clamp (Part No. 02011).
2) Remove rear seat and adjust turnbuckles so that rudder pedals are in neutral position. Cable tension should be 80 lb. per cable.
3) Remove clamp and examine rudder travel (Plate 10.1). Adjust travel to correct limits with stops on front rudder bar. Ensure that rudder control arms do not touch

10.1.2 (Cont'd)

fin post flanges when the rudder pedals are moved to full travel position against either stop.

4) Lock turnbuckles with 22 G. soft iron locking wire, or equivalent.

10.1.3 Elevator

To adjust the rigging of the elevator:

a) Examine elevator travel (Plate No. 10.1). Elevator stops are on the elevator layshaft support bracket on the rear fuselage bulkhead and are not adjustable. These stops are fitted and elevator travel checked on final assembly of the aircraft. If at some later inspection it is found that full elevator travel is not obtained, the elevator, control rod, layshaft and rear bulkhead should be examined for distortion.

b) Remove rear seat (or cover plate on rear fuselage belly) and with the elevator against the up travel stop, adjust the turn-buckles so that the control column clears the front edge of the seat by 0.125 inches minimum. Bottom cable tension should be 60 lb.

c) Check elevator travel.

d) Lock turnbuckles with 22 G. soft iron locking wire or equivalent.

10.1.4 Elevator Trim Tab

To adjust the rigging of the trim tab:

a) Adjust the turnbuckles on the inter-cockpit tab control cables until the two handwheels have their indexing marks in the same relative positions. Cable tension should be 5 to 8 lb.

b) Remove rear seat. Adjust turnbuckles in the rear fuselage circuit until, with the tab neutral, (flush with elevator trailing edge), the indexing mark on the rear cockpit handwheel is at the neutral position. Cable tension should be 5 - 8 lb.

c) Ensure that trim tab travels in the correct sense. When either handwheel is rotated in a nose down direction, the trim tab trailing edge should rise.

d) Lock turnbuckles with 22G. soft iron locking wire or equivalent.

10.1.5 Ailerons

To adjust the rigging of the ailerons:

a) Locate each aileron in the neutral position with incidence board (Part No. 00011). Set aileron sprocket to the neutral position (Plate No. 10.1) by applying rigging plate (Part No. 02012) and adjusting the length of the aileron push rod at the aileron end. Wire lock the rod in the adjusted position.

10.1.5 (Cont'd)

b) With the control column held in the neutral position by control lock (Part No. 01900), adjust the turnbuckles adjacent to each control chain so that the ailerons have no droop when approximately a 2-pound force is applied at the aileron trailing edge in an upward direction. Cable tension should be 55 lb.
c) Remove control column lock and adjust the aileron stops, located on the main rockshaft between the rear rudder pedals, to give the aileron travel shown on Plate No. 10.1. Check for correct sense of movement.
d) Lock turnbuckles with 22 G. soft iron locking wire or equivalent.

10.1.6 Flaps (Plate 3.4)

To adjust the rigging of the flaps:
a) Fully retract the flaps and set the flap control handle in the "flaps up" position.
b) Adjust the turnbuckles on the flap actuating cables, located inside the wing root fairing on each side, to take up cable slack. Do not tension the cables. The cables must be slack when the hand lever is in the "flaps up" position, to ensure that the flap up-lock functions properly.
c) Move the flap control handle to the "flaps down" position, and adjust the flap push rods at the flap end to give the correct flap down travel (Plate No. 10.1).
d) Lock the push rods and turnbuckles.

10.2 Engine Controls

The engine controls are conventional push-pull rods, etc., and may be inspected and adjusted to give the engine control travels noted in the engine handbook.

10.3 Control Surface Movements

10.3.1 Rudder

Current production aircraft incorporate rudder to Drawing No. 00413, which has a greater chord and larger area than earlier rudders to Drawing No. 0043. The latter were fitted to aircraft No.s 1 - 62 inclusive. In both cases, dimension "A" is measured from the most aft point of the bottom rudder rib (i.e. that portion parallel to the fuselage axis).

Rudder Drawing	A(INS.)	A(CMS.)	B(DEGREES)
0043) 00413)	9.90 + 0.64	25.1 + 1.63	$27\ ^{+2}_{-0}$

10.3.2 Elevator

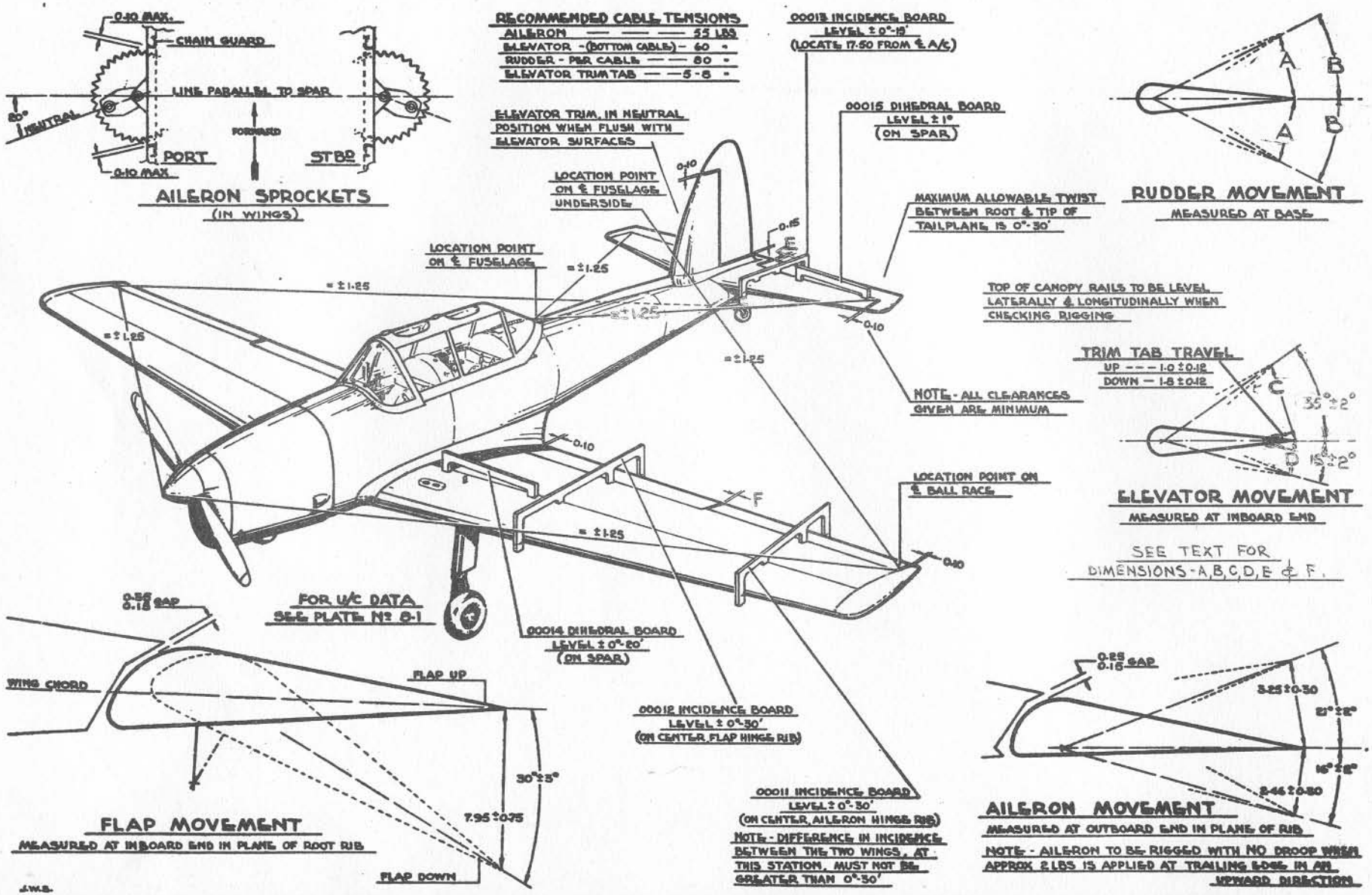
Earlier aircraft, No.s 1 - 62 inclusive, were fitted with elevators to Drawing No.s 0048-9. Current production aircraft incorporate elevators to Drawings No.s 00416-7, which have a greater chord and larger area than the earlier type.

Elevator Drawing	C(INS.)	C(CMS.)	D(INS)	D(CMS.)
0048-9	10.4 ± 0.6	26.4 ± 1.5	4.6 ± 0.6	11.7 ± 1.5
00416-7	11.5 ± 0.7	29.2 ± 1.8	5.0 ± 0.7	12.7 ± 0.7

10.4 Control Surface Clearances

Minimum clearances between movable surfaces and adjacent parts of the aircraft are shown on Plate No. 10.1. At points "E" and "F" values of 0.10 inches were specified for early production models.

Current production incorporates a narrower tailcone which provides at point "E" a clearance of 0.25 to 0.45 inches. The minimum clearance at point "F" has been increased to 0.4 inches on later production aircraft.



DHC 1 - CHIPMUNK ··· RIGGING DIAGRAM PLATE Nº 10.1

AMENDMENT Nº 1

- CHAPTER 11 -

LUBRICATION

(Plate No. 11.1)

Note: See alternative specifications under Item 11.3.

Periods: 30 hours or 7 days/120 hours/at overhaul.

11.1	Parts Requiring Periodic Lubrication	Period	Lubricant
11.1.1.	Small moving parts that may tend to stick or squeak, for which there are no specific requirements, may be lubricated sparingly with oil or grease, i.e. - bellcranks - pivot points - fork ends in flying controls - rudder pedal assemblies - hand brake lever - engine cowling fasteners and hinges - canopy latches.		Oil to specification AN-O-6A, 3-GP-335-1947 or 3-GP-13-1947 (The latter for maximum corrosion resistance is preferred) However, Engine oil to Specification DED-2472 B/O may be used if necessary. Grease: DTD-577
11.1.2	Elevator trim tab hinge	30H or 7D	AN-O-6A
11.1.3	Tailwheel yoke - 2 grease nipples	30H or 7D	DTD-577
11.1.4	Main undercarriage scissors - pin joint	30H or 7D	AN-O-6A
	- 2 grease nipples	30H or 7D	DTD-577
11.1.5	Main undercarriage cylinder - grease nipple	30H or 7D	DTD-577
11.1.6	Aileron control chain and sprockets	30H or 7D	DTD-577
11.1.7	Flexible drives - engine tachometers	30H or 7D	DTD-577
11.1.8	Battery contacts	30H or 7D	Petroleum Jelly
11.1.9	Tailwheel swivel - grease nipple	120H	DTD-577
11.1.10	Tailwheel hub - grease nipple	120H	DTD-577
11.1.11	Mainwheel hub	120H	DTD-588
11.1.12	Main and tail ski axles	120H	DTD-577

11.2 Parts Requiring Lubrication at Time of Overhaul

		Lubricant
11.2.1	Control cable pulleys	DTD-577
11.2.2	Ball bearings - Repack	DTD-577
11.2.3	Bowden cable for trim tab	Bowden Graphite Wax or Castrolease Brake Cable Lubricant or Petroleum Jelly

11.2.4 Oilite bearings. Examine bearings and, if necessary, clean and relubricate to directions in Oilite Catalogue B-44.

NOTE

1. Do not lubricate control cables or fairleads.
2. Do not lubricate the cockpit canopy tracks. The lubricant would attract foreign matter, with the resultant tendency to cause malfunctioning and increase wear. A light application of paraffin wax will be sufficient.

11.3 Miscellaneous

11.3.1	Anti-seize grease for dressing spark-plug threads	DTD-392
11.3.2	Engine oil - when inlet temperature over 70°C (158°F)	DED-2472 C/O
	- when inlet temperature between 70°C and -10°C	DED-2472 B/O
	- when average daytime temperature below -10°C (+ 14°F)	DED-2472 A/O

11.3.3 See engine and accessory manufacturers' handbooks for lubrication of engine, starter, generator, magneto, landing lamp, gyro instruments, etc.

11.3.4	Hydraulic fluid for brakes (Chapter 9)	DTD-585

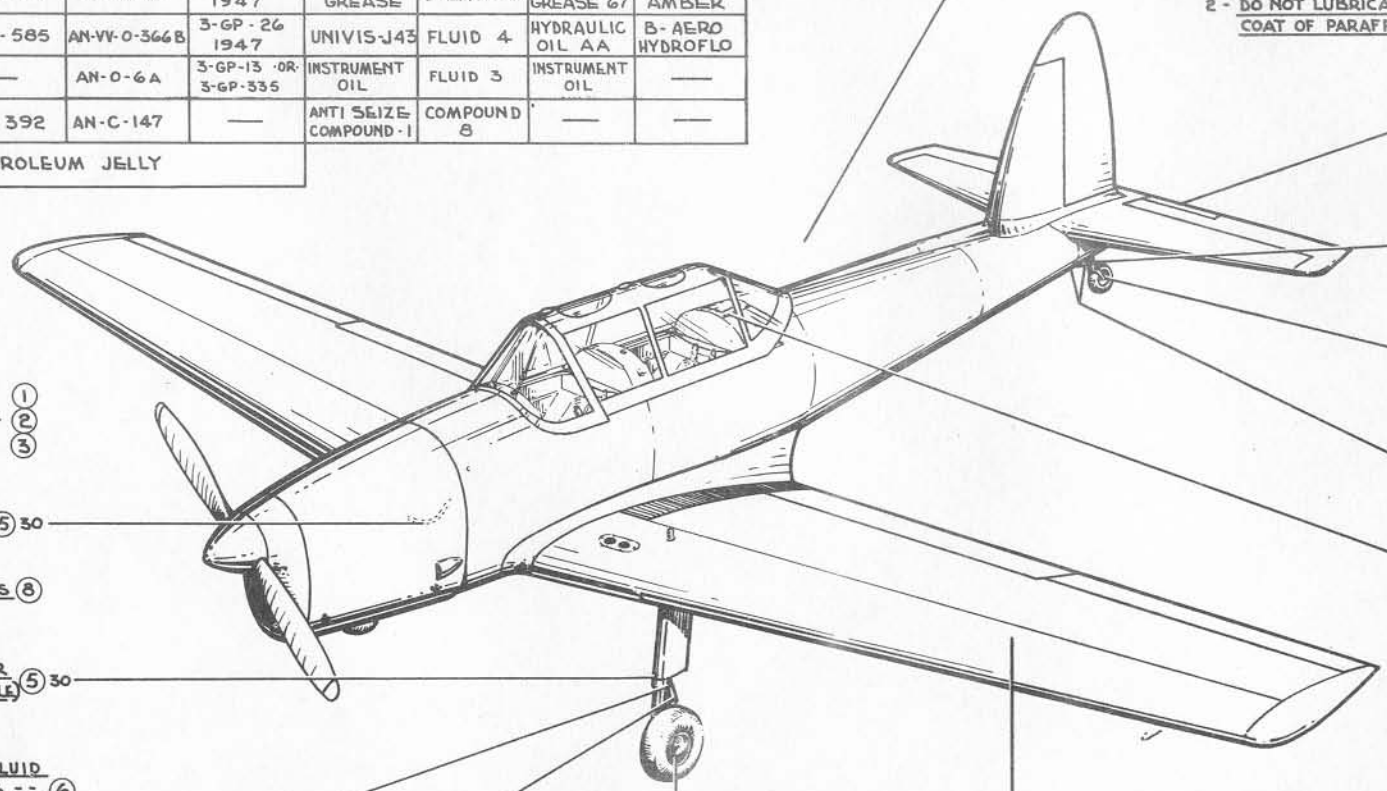
11.3.5 Specification Alternatives

SPECIFICATION	Esso Aviation	Aero Shell	Texaco Aviation	B.A. Aviation	White Rose
DED-2472 C/O AN-O-8 Grade 1120 3-GP-120-1947	Oil 120	Oil 120	Oil 120	Engine Oil 120	Avoil 120
DED-2472 B/O AN-C-8 Grade 1100 3-GP-100-1947	Oil 100	Oil 100	Oil 100	Engine Oil 100	Avoil 100
DED-2472 A/O AN-O-8 Grade 1080 3-GP-80-1947	Oil 80	Oil 80	Oil 80	Engine Oil 80	Avoil 80
DTD-588 AN-G-5A ---	High Temp. Grease	Grease 5	High Temp. Grease	B-Aero Strona Ht.L	---
DTD-577 AN-G-3A 3-GP-681-1947	Low Temp. Grease	Grease 4	Low Temp. Grease 67	B-Aero Amber	---
DTD-392 AN-C-147	Anti Seize Compound-1	Compound 8	---	---	---
DTD-585 AN-VV-O-366B 3-GP-26-1947 ---	Univis J 43	Fluid 4	Hydraulic Oil AA	B-Aero Hydroflo	---
AN-G-4 Grade AA Special	Utility Grease	Grease 3A	---	---	---
AN-O-6A 3-GP-13-1947 or 3-GP-335-1947	Instru-ment Oil	Fluid 3	Instru-ment Oil	---	---

SYMBOL	BRITISH	U.S. ARMY-NAVY	CANADIAN	ESSO AVIATION	AERO SHELL	TEXACO AVIATION	BA AVIATION
①	DED-2472-C/O	AN-O-8 GRADE 1120	3-GP-120 1947	OIL 120	OIL 120	OIL 120	ENGINE OIL 120
②	DED-2472-B/O	AN-O-8 GRADE 1100	3-GP-100 1947	OIL 100	OIL 100	OIL 100	ENGINE OIL 100
③	DED-2472-A/O	AN-O-8 GRADE 1080	3-GP-80 1947	OIL 80	OIL 80	OIL 80	ENGINE OIL 80
④	DTD-588	AN-G-5A	—	HIGH TEMP GREASE	GREASE 5	HIGH TEMP. GREASE	B-AERO STRONA-HT 1
⑤	DTD-577	AN-G-3A	3-GP-681 1947	LOW TEMP GREASE	GREASE 4	LOW TEMP GREASE 67	B-AERO AMBER
⑥	DTD-585	AN-VV-O-366B	3-GP-26 1947	UNIVIS-J43	FLUID 4	HYDRAULIC OIL AA	B-AERO HYDROFLO
⑦	—	AN-O-6A	3-GP-13 OR 3-GP-335	INSTRUMENT OIL	FLUID 3	INSTRUMENT OIL	—
⑧	DTD 392	AN-C-147	—	ANTI SEIZE COMPOUND-1	COMPOUND 8	—	—
⑨	PETROLEUM JELLY						

⑦ OR ⑤ AS REQUIRED
FOR SMALL MOVING PARTS HAVING NO SPECIFIC REQUIREMENTS --- LUBRICATE SPARINGLY
I.E. -- BELL CRANKS - PIVOT POINTS - FORK ENDS IN FLYING CONTROLS - RUDDER PEDAL ASSEMBLIES - HAND BRAKE LEVERS - ENGINE COWL FASTENERS AND HINGES - CANOPY LATCHES - ETC.

NOTE -
1 - DO NOT LUBRICATE CABLES OR FAIRLEADS
2 - DO NOT LUBRICATE CANOPY RAILS -- A LIGHT COAT OF PARAFFIN WAX WILL BE SUFFICIENT.



30 ② TRIM TAB HINGES

120 ⑤ TAILWHEEL SWIVEL (GREASE NIPPLE)

120 ⑤ TAILWHEEL HUB (GREASE NIPPLE)

30 ⑤ TAILWHEEL YOKE (2 GREASE NIPPLES)

30 ⑨ BATTERY CONTACTS

120 ⑤ MAIN & TAIL SKI AXLES

FOR LUBRICATION AT TIME OF OVERHAUL SEE TEXT ..

ENGINE OIL (SEE TEXT) ① ② ③

TACH. DRIVE ⑤ 30

SPARK PLUGS ⑧

U/C CYLINDER (GREASE NIPPLE) ⑤ 30

HYDRAULIC FLUID FOR BRAKES -- ⑥ SEE CHAPTER 9

U/C SCISSORS (2 GREASE NIPPLES) ⑤ 30

U/C SCISSORS PIN JOINT ⑦ 30

MAIN WHEEL HUB ④ 120

AILERON CONTROL CHAIN & SPROCKET ⑤ 30

NOTE -- THE NUMBER INSIDE THE CIRCLE IS THE LUBRICANT SYMBOL -- THAT OUTSIDE IS THE NUMBER OF FLIGHT HOURS, FOR SERVICING

J.W.S.

DHC 1 - CHIPMUNK ... LUBRICATION PLATE № 11.1

- CHAPTER 12 -

POWER UNIT

12.1 Description

12.1.1 The standard Chipmunk DHC-1 (Chapter 1.1) is powered with a single de Havilland Gipsy Major 1C or Major 10-3 four cylinder, four stroke, poppet valve, in-line, air cooled, inverted, normally aspirated, engine developing 136/142 BHP at sea level, full throttle 2400 rpm.

12.1.2 The tractor propeller is fixed pitch, wood or metal, direct drive, rotating in a counter-clockwise (left hand) direction. The wooden propeller is to de Havilland Drawing No. CP.3298-18, diameter 78.8 inches, blade angle 18° at 0.75 R. The Fairey metal propeller has a diameter of 6 ft. 9 in. and a pitch of 5.34 feet.

12.1.3 The engine mount is a conventional welded steel tube frame structure attached to the front fuselage at four points where the longerons intersect the firewall. The engine is attached to the mount with four conical rubber shear mounts which permit freedom of movement and reduce the transmission of vibration.

12.1.4 The engine cowling is formed in four removable panels:

a) Nose section containing the cooling air inlet.
b) Bottom panel, which is slotted for the exhaust manifold and may contain a scoop for generator cooling air.
c) Starboard side panel containing the carburetter air intake scoop and the oil cooler air exhaust duct.
d) Port side panel contains the oil cooler air intake scoop and may have openings for carburetter flooder control and fuel pump priming lever.

The two side panels are hinged at the top centre line and open upwards providing full access to the engine. Stay struts are provided to support the cowling panels in the open position. These panels are secured when closed by means of hand operated spring loaded fasteners, two on each panel.

The engine cooling air is exhausted by way of an annular space formed between the rear of the cowling panels and the fuselage.

The forward end of the fuselage consists of a stainless steel firewall complying with all the requirements of the Air Registration Board of Great Britain.

12.1.5 Fuel and Oil Specifications are given in Chapters 7.1.2. and 7.2.2., respectively.

12.2 Engine Performance (For limitations see Chapter 4.5)

12.2.1 Power Output

Condition	RPM	Altitude	BHP	Fuel Consumption IG-Hr	Litres/hr
Full Throttle take-off	2400	S.L.	136/142	11.25	51
Maximum continuous cruising	2300	S.L.	138	10.75	49
Maximum weak mixture cruising	2300	3750 ft. (1140 m)	120	8.5	38.5
Recommended economical cruising power	1900/2100	S.L.	76/100	6.4	29

12.2.2 Oil consumption will range from 4.5 pints (2.55 litres) per hour at full throttle to 2.0 pints (1.1 litres) per hour at economical cruising power.

12.3 Accessories and Equipment

12.3.1 The Major 1C and Major 10-3 are equipped with dual fuel pumps, dual oil scavenge pumps, screened or unscreened ignition harness and a 12 or 24 volt direct cranking electric or hand starter. K.L.G. spark plugs, Type V12 or V.12-2 are fitted.

12.3.2 In addition to the above the Major 10-3 may be equipped with a generator (Rotax B1804), a vacuum pump (Plessey B3 or B3X) and air compressor (Heywood SH6/2) or hydraulic pump (Lockheed Mk.V or VI).

12.3.3 An automatic carburetter air intake control is coupled with the throttle linkage in such a manner as to provide protected warm air from within the cowling for the carburetter at throttle settings corresponding to approximately 1850 rpm or less. Above this speed, free outside cold air is used.

12.4 Operating Procedure

12.4.1 Starting the Engine - See Chapter 4.1.4

12.4.2 Warming Up - See Chapters 4.1.2, 4.1.3

12.5 Maintenance and Repair of Engine

12.5.1 Low Oil Pressure may be due to any of the following causes, the cure for which is obvious. Insufficient oil in tank, air leaks in suction pipes, suction or pressure or scavenge oil filter choked, stuck release valve, choked pressure gauge pipe, or defective pressure gauge.

12.5.1 (cont'd)

Unsatisfactory lubrication in extremely cold weather due to using oil of too heavy a grade. Correct grades for different conditions are quoted above. If the engine has been standing out in the cold for any length of time and a heavy grade of oil is in use, preheating the oil is an advantage under extreme conditions. It may be advisable to reduce ventilation of the crankcase and oil tank in order to keep the oil at a reasonable temperature.

12.5.2 For detailed instructions on the maintenance and repair of the engine and accessories, reference should be made to the Gipsy 1C or Major 10 Engine Handbook, issued as a separate publication.

12.6 Propeller and Spinner

12.6.1 The propeller hub is keyed to the crankshaft and retained by a hub nut which also contains the spinner mounting stud. The propeller is bolted to the hub flanges by 8 bolts which also compress the propeller between the front and rear hub flanges.

12.6.2 The spinner is retained on the mounting stud by means of a washer, slotted nut and split pin. A spinner fairing is attached to the propeller hub to blend the spinner nose into the lines of the engine cowling. Should the necessity of flying without spinner nose arise, it is important to first remove the long stud which may otherwise break off in flight.

12.7 Maintenance and Repair of Wooden Propeller

12.7.1 If a wooden propeller is supplied it should be inspected daily for damage to the blades, complete adhesion of the fabric covering and the security of the brass sheathing. Loose fabric can be doped down using a clear dope. If the fabric is broken it may be repaired by means of a doped on patch providing the wood beneath the fabric is undamaged. If the brass sheathing becomes loosened the propeller should be removed and repaired.

12.7.2 At each 30 hour inspection the spinner nose should be removed and the propeller hub bolts checked for tightness. This is particularly necessary in the case of new propellers. The nuts should be evenly tightened to avoid throwing the propeller out of line but not over-tightened to crush the wood of the hub.

12.7.3 The track of the blade tips should also be checked at this time. The maximum allowable difference between the track of the two blade tips is 3/32 inch.

12.7.4 The two drainage holes in each tip sheath must be kept clear at all times.

12.7.5 Repairs should be carried out only by an approved propeller repair organization.

12.7.6 To remove spinner nose:

a) Remove 800/SP1 (1/16) split pin, 800/SN1 (6MM) slotted nut, 800/PW4 washer and spinner washer, Part No. 0583.
b) Spinner nose, Part No. 0584, can now be removed.

12.7.7 To remove propeller without hub:

a) Remove the spinner nose.
b) Remove the four AGS784/2B split pins and AGS748/B (2BA) slotted nuts retaining the crankshaft front nut locking plate and remove the locking plate, Part No. 1900-39/1.
c) Remove the propeller hub nuts locking plate, Part No. 1900-40/1.
d) Remove the eight propeller hub nuts, Part No. 2100-15/3, twenty-four shrinkage washers, Part No. 1900-16/2. Three of these washers are fitted under each nut.
e) Remove the propeller hub front plate, Part No. 1900-35/2.
f) Remove the eight AGS245-13 (2BA) round head screws and AGS 160/C washers which secure the spinner fairing to the spinner attachment plate and remove the spinner fairing, Part No. 0585.
g) Remove the propeller, Part No. CP.3298-18.

12.7.8 To remove the propeller complete with hub:

a) Remove the spinner nose.
b) Remove the four AGS 784/2B split pins and AGS 748/B (2BA) slotted nuts retaining the crankshaft front nut locking plate and remove the locking plate, Part No. 1900-39/1.
c) Remove the crankshaft front nut fitting assembly, Part No. 0581.
d) Remove propeller, complete with hub, from the crankshaft.

12.8 Maintenance and Repair of Metal Propeller

12.8.1 Where applicable the procedure described above for the wooden propeller should be followed. A seriously damaged aluminum alloy propeller should be repaired only by the manufacturer or an authorized repair agency. Minor surface dents, scars, nicks, etc. do not constitute serious damage and may be removed by field personnel.

12.8.2 Blades bent in face alignment may be cold straightened if the bend does not exceed values ranging from 18° at the tip to 0° at the root. After straightening, the affected portion of the blade should be etched and thoroughly inspected for cracks and other flaws. Blades with bends in excess of this amount are classified as "seriously damaged". (12.8.1)

12.8.3 Scratches and suspected cracks should be given a local etch and examined with a magnifying glass. The metal around minor dents, cuts, scars, scratches, nicks and the like should be removed to form a shallow saucer shaped depression. With the exception of cracks it is not necessary to completely remove the defect. If the required depression exceeds 0.1 inches in depth, 0.4 inches in width, 1.0 inches in length, the propeller should be rendered unserviceable. Raised edges should be carefully rounded and smoothly finished with No. 00 sandpaper. It is not permissible to peen down the edges of any defect.

When the removal of defects on the tip necessitates shortening a blade, the opposite blade should be treated in the same fashion and the propeller balance checked.

12.9 Oil Separator

On Major 10 installations which incorporate a vacuum pump, a Pesco Oil Separator has been fitted to the exhaust side of the pump. Exhaust air from the separator is discharged into the air stream, while the waste oil is piped to the collector box.

- CHAPTER 13 -

RADIO and ELECTRICAL

13.1 Introduction

Radio and electrical equipment is installed in Chipmunk aircraft to customer's requirements. (See Plate 13.1)

13.2 Battery

The usual electrical system includes a pair of 12 volt batteries connected in series to provide 24 volts with a capacity of 15 or 24 ampere hours. Access to the batteries is provided by a removable cover panel on the decking behind the rear seat. The electrical power supply is controlled by a solenoid switch which is remotely operated by a "Master Switch" on the left hand electrical panel in the front cockpit.

13.3 Generator

In Major 10 installations, an engine driven generator supplies power to the batteries and electrical equipment. The output is controlled by an automatic voltage regulator of the vibrating reed type, and charge rate is indicated on a volt-ammeter on the left hand electrical panel. By pressing the button "Push for Volts" on the volt-ammeter, the system voltage is indicated. On the same panel is a generator circuit breaker which trips to the OFF position when the maximum (17 amperes) generator current is exceeded. This breaker may also be used as a generator on-off switch.

13.4 Starter

The starter is a direct cranking type unit operated by a momentary contact circuit breaker switch on the port electrical panel. A ground starting plug for external 24-volt supply is located on the port side of the fuselage just aft of the engine cowling. The receptacle is designed so that a partial turn to the right is required before the plug can be fully inserted. This ensures that the aircraft battery is disconnected from the starter circuit before contact is made with the external supply.

13.5 Instrument Lights

The instruments are illuminated by a light in an adjustable mount on the port side of the cockpit. The intensity is controlled by a rheostat on the instrument panel. The circuits are protected by a circuit breaker mounted on the right hand electrical panel in the front cockpit.

13.6 Navigation Lights.

The navigation lights comprise standard navigation or "running" lights mounted on the wing tips and tailcone. They are controlled by a circuit breaker switch mounted on the right hand electrical panel.

13.7 Landing Lights

One or two retractable lights may be fitted to the underside of port and/or starboard wings. Three conditions may be selected for each unit: "IN", "OFF", and "OUT". Selecting "OUT" extends the lamp, and just before its fully extended position, the filament lights. "OFF" will turn off the filament but leave the lamp extended. "IN" will turn off the lamp and also retract the unit. Each circuit is protected by a "push to reset" type circuit breaker mounted with the selector switches on the right hand electrical panel.

13.8 Intercommunication

13.8.1 In aircraft emplying a 24-volt electrical system, and intercommunication amplifier may be fitted aft of the rear seat. The unit is automatically turned on or off by the battery "Master" switch. The amplifier is protected by a 2 ampere fuse mounted directly on the front face of the unit. Headphones and microphones may be connected to the outlets provided on the right side of each seat diaphragm. Control is provided at a panel on the right side of each cockpit. These control panels function independently of each other. As well as providing headphone volume control, each panel contains a microphone transfer switch for selecting intercommunication amplifier or radio-telephone transmission (if radio is fitted).

A "press-to-talk" switch is provided on the top of each control column as well as at the lower right corner of each instrument panel. The latter are for use by the occupant who is not flying the aircraft. This unit is available for use with either carbon or magnetic microphones as specified.

13.8.2 In aircraft without a battery, inter-cockpit communication may be effected by either a Gosport tube or a self-contained dry battery operated amplifier.

The master unit is mounted on the starboard side of the rear cockpit with a sub-station in the front cockpit on the starboard side. Volume control is possible only at the master unit but affects both outlets. The unit is normally off and becomes active only by pressing one of the "press-to-talk" switches on the control columns or instrument panels. Early series aircraft were equipped with hand-held microphones incorporating "press-to-talk" switches. There is no "ON-OFF" switch fitted, consequently no chance of inadvertently leaving the unit on, causing the batteries to run down. The unit is available for use with either carbon or magnetic microphones as specified.

13.9 Radio

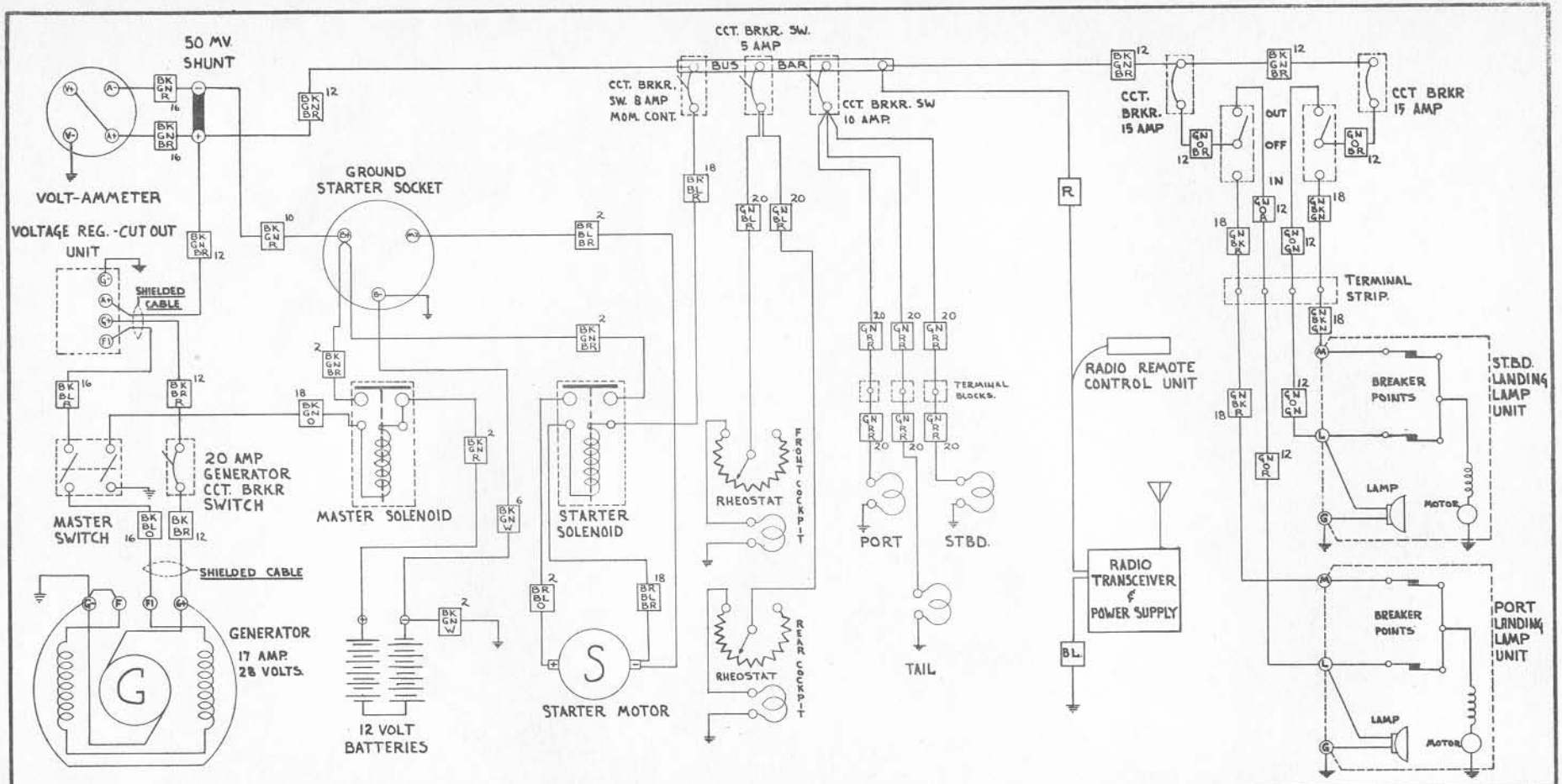
13.9.1 For air-to-air and air-to-ground communication an STR-9 VHF transceiver may be provided. This set has a transmitting power of approximately 3.5 watts. The antenna is a standard 1/4 wave whip type and is mounted on top of the fuselage just forward of the fin. The transmitter-receiver unit is mounted in the rear fuselage and access is provided through an opening in the back of the rear seat, covered by a removable panel, or by a quickly removable rear seat. To operate the unit, an on-off-channel selector switch is mounted in the front cockpit. A selection of 4 pre-determined crystal controlled frequencies may be made between 115 to 145 mc. The set incorporates a squelch circuit that suppresses the received background noise when no incoming signal is being received. Audio output is obtainable from the outlets on the right side of the seat disphragms. The output volume is pre-set to a desired level and no adjustments in flight are necessary. This unit is designed for use with magnetic microphones.

13.9.2 In some Chipmunk aircraft a light weight (16-1/2 lb.) Murphy VHF transceiver is fitted. The installation including the antenna system is similar to that of the STR-9. The set is controlled by a remote control unit mounted on the right hand side of the front seat diaphragm. Headset volume is automatically regulated with no external controls. With the "ON-OFF" switch on the remote control unit "ON", transmission is accomplished by pressing the switch on the hand-held microphone and speaking. Reception comes back upon release of the microphone switch. The radio circuit is protected by a 2 ampere Slo-Blow fuse on the power supply in the rear fuselage. Transmitting and receiving is possible on any one spot frequency between 116 to 124 mc. Transmitter output power is approximately 1/4 watt. The set is designed for use with carbon microphones.

13.9.3 For operation on HF, a light weight (12.6 lb.) General Electric "Radiofone" may be supplied. It has two receiving bands covering 200 to 420 KC and 550 to 1500 KC. A range filter is incorporated for attenuating the 1020 cycle beam signal, to assist in reading the superimposed voice signal. Wired for carbon microphone, the transmitter has a power output of 12 watts and is normally crystal controlled on 3105 KC. An alternative frequency may be fitted as required, in the HF band.

PUBLICATIONS

Item	Manufacturer
STR-9 VFH Technical Manual TM/125	Standard Telephones & Cables Ltd., London N.11, England.
The Murphy VHF Aircraft Transmitter- Receiver LA-24 VHF	Murphy Radio Limited, Welwyn, Garden City, Herts., England. Cable - Radmurphy.



BK BR GENERATOR BK GN BATTERY BR BL STARTER GN BL INSTR^T L^TS GN R NAVG^N L^TS RADIO GN O LANDING L^TS

COLOUR CODE

BR - BROWN	BL - BLUE
R - RED	P - PURPLE
O - ORANGE	GY - GREY
Y - YELLOW	W - WHITE
GN - GREEN	BK - BLACK

NOTE

THE NUMBER ADJOINING THE COLOUR CODE BLOCK IS THE "AN" WIRE SIZE.

ASSOCIATED DRAWINGS

04045 · G.A. NAVIGATION LIGHTS
04050 · G.A. INSTRUMENT LIGHTS
04055 · G.A. BATTERY INSTALLATION
04130 · G.A. BENDIX STARTER INST^N
04180 · G.A. LANDING LIGHTS
04010 · G.A. ROTAX STARTER INST^N
04275 · G.A. MURPHY RADIO
04300 · G.A. GENERATOR INST^N

SCHEMATIC WIRING DIAGRAM

DHC 1 - CHIPMUNK PLATE No 13.1

- CHAPTER 14 -

EXPORT SHIPMENT - UNCRATING AND ASSEMBLING

14.1 General

Each aircraft is protected against damage and corrosion during transit by thorough inhibiting and crating. Instructions for unpacking and reassembly of the aircraft are given in this chapter of the Manual. Included in the crate are all necessary drawings, and a packing list for checking contents.

In certain cases the inhibiting agents, paints, oils or greases may cause damage to moving parts unless carefully removed, and instructions regarding the cleaning or draining of inhibited parts should be followed scrupulously.

14.2 Dimensions

As an aid in estimating shipping costs, the following approximate crase dimensions and weights are given:

14.2.1 One Aircraft in One Case

Dimensions of Case	English	Metric
Width	5' 6"	1,68 m.
Height	7' 6"	2,29 m.
Length	23'	7,01 m.
Volume	949 cu.ft.	27 cu.m.
Gross Weight	4150 lb.	1882 kg.

14.2.2 Two Aircraft in Two Cases

14.2.2.1 Case No. 1 - containing 2 fuselages, 2 engines, 2 tailplanes, 2 sets of undercarriage units and miscellaneous small components.

Dimensions of Case	English	Metric
Width	7' 6"	2,29 m.
Height	5' 9"	1,75 m.
Length	23' 1"	7,04 m.
Volume	993 cu.ft.	28,1 cu.m.
Gross Weight, Approximate	4379 lb.	1982 kg.

14.2.2.2 Case No. 2 - containing 4 wing panels, fairings and miscellaneous small components.

Dimensions of Case	English	Metric
Width	5' 5"	1,65 m.
Height	7' 6"	2,29 m.
Length	16' 9"	5,11 m.
Volume	682 cu.ft.	19,3 cu.m.
Gross Weight, Approximate	2520 lb.	1143 kg.

14.3 Uncrating the Aircraft

Remove the boards from both ends of the crate and from the roof, then take away sides and remove smaller items. Sling or trestle fuselage and remove crate floor. Place fuselage in flying position (Plate No. 10.1).

Remove protective waterproof paper or covering from metal surfaces and inspect parts for signs of corrosion. All sheet metal parts should then be polished and/or waxed according to the methods outlined in Chapter 6. Wipe protective oil or grease film from all bright metal parts and check for corrosion.

14.4 Undercarriage (See also Chapter 8)

Main Wheels 01460&61, Installation Drawing 006

Replace	Washer	AGS 160 H
	Slotted Nut	A16YLS
	Split Pin	AGS 166 12
	Cover Plate	01496

Connect hydraulic brake line. Replace leg fairings 02798&9 and Clips AGS 605 3, when required.

Tail Wheel Assembly, 007 or 0071, Installation Drawings 00411 and 004, Sheets 1 & 2. (To be installed after tailplane and before tailcone). Tailwheel yoke to fin rear spar.

Replace	Bolt	004-2
	Washer	AGS 160 E
	Nut	A16YGS
	Split Pin	AGS 784 3A

Tailwheel compression leg to tailplane front spar fitting.

Replace	Bolt	6A1 10 G
	Washer	AGS 160 E
	Nut	A16YGS
	Split Pin	AGS 784 3A

Check tire inflation

14.5 Wings, 002 or 00210

Trestle wings in position.

Front spar attachment, replace	Bolt	AGS 10 J
	Washer	AGS 160F
	Slotted Nut	A16YJS
	Split Pin	AGS 166 3
Main spar top attachment, replace	Bolt	0609 or 05178
	Washer	AGS 160 H
	Slotted Nut	A16YNS
	Split Pin	AGS 166 12

14.5 (cont'd)

Main spar bottom attachment, replace bolt 0611 or 05179
Washer AGS 160 H
Slotted Nut A16YNS
Split Pin AGS 166 12

Connect aileron cables at wing root,
replace pin SP 4 B4
Washer AGS 160 C
Split pin AGS 166 2

Connect flap cable turnbuckles at wing root.
Connect pitot and static lines at wing root.
Connect electric wiring at wing root junction strip.
Connect hydraulic brake lines at wing root, fill reservoirs and bleed brake system in accordance with instructions in Chapter 9. Check brakes.
Connect fuel line banjo fitting at wing root.
Replace pitot-static mast on port wing.
Attach bracket assembly to rib with Washers AGS 160 B
Bolts 6A1 1B
Check lines for leaks.
Check rigging of ailerons, flaps, undercarriage and wings to instructions in Chapter 10 and Plate No. 10.1.
Wire-lock all fittings where applicable.
Replace Wing root fillets 01120 & 30
Screws AS1885-1-B (4BA)
Screws C-2-SS2590 (2BA)
Close inspection panels, cover with tape and dope as applicable.

14.6 Fin and Rudder - 0042 & 0043, Installation Drawing No. 00411 and 004, Sheets 1 & 2 and No. 070.

Attach fin post to fuselage rear bulkhead.

At top of bulkhead, replace Bolts 6A1 1C
Washers AGS 160 C
Nuts CA 1

At bottom of bulkhead, replace Bolts 6A1 2C
Washers AGS 160 C
Nuts CA 1

Attach fin leading edge to fuselage,
replace Bolts 6A1 1C
Washers AGS 160 C
Nuts CA 1

Connect rudder cables to control horn,
replace Bolt 6A1 7C and 7E
Spacer 03743 and 02576
Nut A16YCS and ES
Split Pin AGS 166 3

14.7 Tailplane and Elevator, 0041, 0048 and 0049, Installation Drawings No.s 00411, 004, Sheets 1 & 2 and No. 070.

Attach tailplane front spar to bulkhead

Replace Bolt	01618
Washer	AGS 160 D
Nut	A16YES
Split Pin	AGS 784 3A

Attach tailplane struts to bottom bulkhead fitting,

Replace Bolt	01617
Washer	AGS 160 D
Nut	A16YES
Split Pin	AGS 784 3A

Attach elevator connecting rod to layshaft,

Replace Bolt	6A1 7 E
Washer	AGS 160 D
Nut	A16YES
Split Pin	AGS 784 3A

Connect elevator trim tab cables to Bowden cables.

Insert Bowden inner cables through fitting on fin spar and slide into slot in nuts. Tighten lock nuts on Bowden outer cable ends against slotted nuts in fin spar fitting. Slide Bowden inner cable ends in slots in fuselage cable end fittings and lock by pulling Bowden cable end fittings through enlarged holes at bottom of slots.

Check rigging of fin, rudder, elevator, elevator trim tab and tailplane to instructions in Chapter 10 and Plate No. 10.1.

Attach wiring for tail navigation light to connector on rear fuselage bulkhead and install tailcone 0046, 03893 or 00412.

Install front fin fairing 01721, front rudder fairing 03762 and 03762-1, centre rudder fairing 03761, end section rudder fairing 03686 and side fin fairings 01722&3.

Screws used are AS1885-1C for tailcone and AS1885-1B for fairings.

14.8 Engine

For instructions regarding removal of inhibiting oils, greases and silica gel bags, etc. and restoration to running order, see Engine Handbook.

14.9 Propeller and Spinner

See Propeller and Spinner Assembly Drawings No.s 0052, 0053 and Chapter 12.7.

14.10 Fuselage

Interior - Clean grease off exposed bright metal parts. Check all controls for ease and correct sense of operation (Chap.10). Check instruments, radio, etc.

14.10 (cont'd)

Exterior - Clean and polish.

14.11 Miscellaneous

Batteries - Check acid level and specific gravity, recharge if necessary, remove excess grease from terminals.

- CHAPTER 15 -

MAINTENANCE SCHEDULE

15.1 Introduction

The Maintenance Schedule is designed to keep the engine and airframe in a satisfactory and efficient mechanical and structural condition and it is largely determined therefore by the local conditions under which the aircraft is housed and operated, and by the duration of flights and the power which is generally used. It comprises routine attentions and periodical examinations to check adjustments, the progress of wear and tear, and deterioration.

No schedule can be more than an estimate of the requirements, and must be modified and adjusted as experience dictates. The following detail of routine checks and inspections constitutes a maintenance schedule which will meet first requirements and serve as a basis from which, for each particular case, the most efficient schedule can be compiled.

15.2 Special Inspections

The following are special checks, which need be done only on the occasions indicated.

15.2.1 After the first flight (when engine has been newly installed)

Engine

Inspect cowl fastenings and then remove cowlings.
Inspect all installation joints and fastenings.
Examine oil and fuel lines and joints for leakage.
Check controls for adjustment and security at adjustment points.
Examine engine thoroughly, externally, for oil leakages, blowing joints and misfitted parts.
Check high tension cables and electrical connections for undue tightness and slackness, and flexible drives for sharp bends and support.
Ensure that all pipes are supported effectively against vibration.
Check that the propeller is tight on the engine shaft.

Airframe

Examine all external surfaces, control hinges, cable ends, turnbuckles, etc.
Remove fiarings and open inspection panels and examine wing and tail root fittings, control rod joints, control horn connections.
Examine undercarriage - wing joint for looseness.

15.2.2 Inspection procedure in case of damage to propeller due to nosing aircraft over, etc.

15.2.2.1 When tip of propeller receives minor damage:

Engine

a) Remove damaged propeller and engine cowling.
b) Examine engine bearer arms and crankcase externally in the vicinity of bearer arm attachment for indications of fracture.
c) Check propeller hub flange for distortion, fracture or elongation of holes.

Method and permissible distortion:

Attach a dial indicator to the crankcase by means of a suitable bracket under two crankcase bolts or by means of a "C" Clamp. Remove sparking plugs to facilitate turning the crankshaft and check for error on the rear face of the propeller hub flange, approximately 1/2" in from the extreme edge.

Distortion up to .010" total reading is permissible.
Distortion up to .020" can be rectified by removing the hub and carefully truing in centre lathe.
If distorted beyond .020" or if cracked or fractured, hub will be rejected.

d) Remove propeller hub from shaft and check nose of shaft for truth. With dial indicator in position as described above, check should be made on the small end of the taper. Permissible out of truth .004" total reading (i.e., .002" eccentricity).
e) Remove bolts from propeller hub and check for necking and straightness.
f) Examine key and keyway and shaft, particularly at rear end of keyway, for cracks, employing a glass of 6 X Magnification and electric torch.
g) Remove front cover, examine for cracks, reassemble with correct nip, and centralise with centralising gauge.
h) Check magneto timing after ascertaining that contact points are set to standard gaps.

Airframe

Examine throughout for wrinkled or scraped skin surfaces and replace surfaces or components as necessary.

Check rigging to Chapter 10. If any part of aircraft is out of rigging, that part plus the main fuselage must be examined carefully for permanent buckles or distortion.

15.2.2.2 When propeller receives major damage:

Engine

a) Remove crankcase top cover.
b) Visually inspect bearing caps, bearing housings, and webs with special attention to the front bearing housing. Provided no irregularities are apparent this may be considered adequate, otherwise further dismantling must be resorted to as necessary to facilitate the closer inspection of any unusual or doubtful features.
c) After reassembling, the usual ground running tests must be carried out satisfactorily, before passing for flight.

Airframe - As for a) above.

15.2.3 After a Bad Landing

Airframe
Examine engine mount and mount pickups at firewall.
Examine wheels and tires.
Examine shock absorber leg units, axles and all bolts and pins. If any signs of strains are apparent, components affected should be replaced.
Examine the wing "D" nose skin for signs of permanent buckles.
Examine the tailwheel structure and attachment points for damage.

15.3 Periodic Checks

The following are periodic checks which must be carried out at regular intervals, although experience may permit or require different time intervals from those outlined. Reference to items not installed in an aircraft may be ignored for that aircraft.

15.3.1 Between Flights:

Engine
Replenish the fuel and oil tanks as necessary.
Ensure that the fuel and oil filler caps are properly secured.
Ensure that all cowling panels are secure.

Airframe
Brief external examination, including tires for cuts, bruises and inflation.

15.3.2 Daily Inspection

Engine
Replenish the oil tank as necessary and secure the dip-stick.
Replenish the fuel tank as necessary and note the amount recorded by the fuel contents gauge.
With the ignition off, check the functioning of the impulse starter (there should be an audible click from the impulse mechanism), and compression of each cylinder by rotating engine by hand. Wash out and oil lightly the impulse starter.
Test the controls to ensure that they work freely and give full movement to the throttle, advance and retard mechanism, air intake flap and mixture control valve.
Note what the instruments are recording as the engine is started and run-up.
Empty the engine drain box.
Empty the fuel filter drain.
Turn handle on Auto-Klean pressure oil filter about one revolution.
Examine engine installation for signs of oil or fuel leaks, loose parts or connections.
Check propeller for damaged blades or looseness and ensure spinner is secure.
Check cowling for security.
Run engine, check maximum rpm, oil pressure and single magneto rpm drop.

15.3.2 (cont'd)

Fuselage
Examine all external surfaces for indications of damage, fabric for holes or cracks.
Examine main and tail undercarriage and fuselage attachments for signs of abnormal landing stresses. Check tires for cuts and bruises. Examine anti-rattle clips on brake discs for breakage.
Examine tail structures, rear fuselage skin and wing leading edge for permanent wrinkles indicating abnormal flying stresses.
Examine battery box for spilled or leaking acid.
Check canopy for security.
Examine fire extinguisher for contents and security.
Examine pilots' harnesses for security and wear.
Examine control mechanisms for frayed cables, loose pins, etc.
Ensure that all primary controls, flaps and trim tab controls have full freedom of movement and operate in correct sense.
Clean windscreen.

15.3.3 After each 30 hours flying, or each seven days:

a) Inspection by licensed ground engineer, including examination of airframe, engine, propeller, instruments, electrical equipment and controls, the exhaust and cabin heating systems, and installations of components exposed by the removal of all cowlings, fairings and inspection covers.
b) Carry out daily inspection program.
c) Carry out 30 hour lubrication listed in Chapter 11.
d) Clean airframe and engine and take protective measures against corrosion and deterioration. See Chapter 6.
e) Engine
Inspect the nose cowls airscoops, and cowling panels for damage and security. Examine exhaust and cabin heat systems, induction system, and firewall for cracks, particularly near attachment points.

Inspect the unions and pipe lines of the fuel and priming system for damage and leaks. Drain the fuel tank sumps. Ensure that the fuel vent pipes are secure and unobstructed. Clean out the fuel filters and caps and renew, if necessary, the synthetic rubber washers.

Check the pipe lines and unions of the oil system for damage and leaks, particularly on the suction side of the pressure pump. Ensure that the oil system vent pipes are clear. Remove the oil suction and scavenge filters and clean.

Inspect the cylinder head joints for leakage and, as necessary, tighten the cylinder holding down nuts.

Remove the rocker arm covers and check tappet clearances.

Refill rocker covers to indicated level and replace.

15.3.3 (cont'd)

Lubricate the spindle of the carburetter air intake flap.

Remove the power and high speed jets from the base of the carburetter and flush the carburetter through by operating the fuel pump priming levers.

Ensure that the low tension and high tension connections to the magnetos and distributors are secure. Ensure that the contact breaker rocker arms are free and the contact points clean. Place one drop of light oil on the wick. Check the gaps between the contact breaker points, which should be .012" $\pm$ .001".

Lubricate the impulse starters, first making sure that the switches are off, then turn the engine backwards until the holes in the inner and outer casings of the impulse starter are in line. A mixture of 50% winter grade lubricating oil and 50% paraffin should be used. Remove the sparking plugs, clean, and adjust gaps to .012" - .015".

Examine the throttle control cables for corrosion or fraying. Also check for tension and ensure that the turnbuckles are securely locked. Inspect the controls for excessive wear and security. Check the settings and adjust as necessary. Lubricate all joints.

Run engine, check maximum rpm, oil pressure and magneto operation, idling rpm and smooth operation throughout power range.

f) Airframe

Check landing gear hub bolts for equal wrench torque at 83 inch pounds. Tire pressures - main 20 lb., tailwheel - 35 lb.

Check hydraulic brake reservoirs and add fluid if necessary.

Examine instruments, blow out airspeed indicator lines.

15.3.4 After each 60 Hours Flying

a) Repeat the 30 hour schedule.

b) Engine

Examine the engine bearer arms for security and ensure that the rubber mounting blocks are in good condition. Check engine mount welded structure for cracks, dents and other damage.

With engine hot, drain the lubricating system and refill with clean oil Examine all rubber connections in the oil system for deterioration.

15.3.4. (cont'd)

Check the operation of the fuel cock, lubricate as necessary.

Check the security and external condition of the fuel pumps.

Inspect the flexible fuel and oil pipes for kinking and damage and ensure that no chafing is occurring between the pipe packing and the supporting clips.

Examine the valve springs for fractures and the valve ends for wear.

Ensure that the induction pipe flange nuts and rubber connections are tight.

Remove distributors, clean and check condition of the high tension pickup brush. Remove the contact breakers, smooth the points as necessary and examine the earthing brushes and the tracks on the magneto end plates for cleanliness. When refitting, ensure that the keyways are properly engaged, and finally, adjust the gaps. Inspect all low tension and high tension cables and ensure that the harness is secure and in good condition.

Examine the starter and generator housings and mountings for signs of cracks or failure. Remove generator cover and inspect interior for oil and particles of brush or copper. Clean starter and generator brushes and ensure they fit properly. Examine the commutators and clean if necessary.

c) Airframe

Clean the voltage regulator contact surfaces with a dry cloth. Polish contacts if necessary. Examine for loose connections, cracked or broken insulation or housing.

Check flying control cables for wear, seized pulleys, cable tension.

Check shroud clearances and clearances between control surfaces and adjacent structures.

15.3.5 After each 120 hours flying

a) Repeat the 60 hour schedule.
b) Remove the tailwheel fork assembly from yoke, and examine the spindle and washers for wear. Check main and tailwheel shock struts for signs of scoring.
c) If cabin heater is provided, remove and inspect heater tube in exhaust manifold for cracks, distortion or burning.
d) Check vacuum relief valve for cleanliness of inlet gauze.
e) Check operation of compass and swing if necessary.

15.3.6 After each 240 hours flying

a) Repeat the 120 hour schedule.
b) Remove and clean the Auto-Klean filter and clean casing.
c) Examine the rubber joints of the induction system for deterioration. Inspect the flame trap.
d) Examine the magneto vernier couplings for deterioration and oil soakage. Clean the magneto high tension pickup slip rings and the flange mouldings. Check the low tension ignition cables for insulation and contact.
e) Inspect the flexible fuel and oil pipes for deterioration. Drain the fuel and oil tanks and examine them thoroughly for any defects and corrosion.