PILOT'S NOTES

SV 4B

EPE-EVS

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PART I

DESCRIPTIVE

1. INTRODUCTION

The SV4b is a conventional, two seat biplane, training aircraft; powered by one DE HAVILAND GIPSY MAJOR, series 10 Mk 1 or Mk 2 of 142 BHP (international rating)

This GIPSY MAJOR is a four stroke aircooled engine, with four inline inverted cylinders.

A fixed-pitch wooden propeller is used.

The airframe is a combined wood-metal construction, covered with fabric

The aircraft can be equipped for glider towing.

During DUAL flight, the instructor is seated in the front seat, the student in the rear seat.

The rear seat is the seat prescribed for SOLO Flight.

All the flying controls, fuel cock and parking brakes for instructor and student are rigidly connected together.

The aircraft is normally fitted with a sliding hood, the summer version being with open cockpit and collapsable side doors, even the front seat can be covered for solo aerobatics.

The hood is fitted with movable orange perspex pannels, used with blue goggles for instrument flying training.

All aerobatics are permitted, but a by-pass fuel - feeding system must be selected for inverted flight.

2. CHARACTERISTICS

A. FRAME

(1) DIMENSIONS

Wing span	8,40 m
Lenght in line of flight	6,77 m
Height in line of flight	2,35 m
Diameter of the propeller	1,982m
Pitch	1,42 m
Propeller clearance in line of flight	0,665m

(2) WINGS

Formula	Biplane
Sweep back	
both wings	9°
dihedral-upper wing	2°30
lower wing	3°30
Angle of incidence	
upper wing	3°30
lower wing	4°
Total wing area	18,06 m^2

Ailerons on 4 wings - Type : Differential and Freeze combined.

(3) TAIL SECTION

Horizontal section -Surface	2,20 m^2
Angle incidence	3°30
Vertical section HORNTYPE	
BALANCE	
Height	1,38 m_2
Surface	1,05 m^2

(4) WEIGHT

A/C empty	563 Kg (equipped for Dual)
Fuel 90L	63 Kg
Oil 9L	8 Kg
Battery	9,5 Kg
Radio	8 Kg
	651 Kg

(5) UNDERCARRIAGE

2 main wheels	Type SV7 - 7 1/2
Dimensions	500 X 180
Pressure	1,25 Kg/cm^2 (17 bls)
Shock absorber	10 rubber blocs
Wheel base	1m580-Travel-15 cm
Brakes type	Bendix mechanical
Tail wheel	SV 6" x 2" rubber

B. ENGINE

(1) LEADING PARTICULARS

GIPSY MAJOR Mk 8 AERO-ENGINE

Type of engine : inverted, air-cooled, four stroke, OHV normally aspirated.
Number of cylinders : four
Arrangement of cylinders : in-line
Cylinder numbering : 1, 2, 3, 4. (commencing from the propeller end of the engine)
Bore : 118 mm. (4°646 in.)
Stroke : 140 mm. (5°512 in.)
Swept volume : 6.124 litres (373°7 cub in.)
Compression ratio : 6 to 1
Big-end and main bearings : plain split.

Main bearing numbering : 1,2,3,4,5.
(commencing from the propeller end)
Propeller drive : direct
Weight (nett dry) : 328 lb. + 2,5%
± 148,8 Kg + 2,5 %

(2) POWER RATING (sea level)

International power rating :
142 BHP at 2.400 rev/min.
Maximum power rating :
145 BHP at 2.550 rev/min.
Maximum take-off power :
145 BHP at 2.550 rev/min

(3) FUEL

Type : 91/98 grade.
Refer to AP 1464, current issue of leaflet C/4.
Minimum grade permissible for Army Co-op : 80 octane. NATO Symbol F 12

(4) OIL

0-125 Dispersant Interservice X°
OMD 250
This oil may be replaced by mineral oil, such as 0-128 or 0-117 in case of necessity.
The use of detergent oil is strictly forbidden.

(5) IGNITION

Magnetoes : two BTH AG 4-10.
Direction of rotation : Port magneto anti-clockwise (viewed from their driving ends)
Speed of rotation : Crankshaft speed
Impulse starter coupling : BTH Z 1-1 on starboard magneto

Distributors : Integral with magnetos
Sparking plugs : Eight
Type : Refer to AP 1374G, Vol 3, Sect 2 and D. Eng RD specification
KLG R12-3 2021, issue 1
KLG RC 50R KLG RC 5-4 i modified
Firing order : 1, 3, 4, 2.
Timing : GIPSY MK II : Port magneto 30° before t.d.c. when fully advanced
Starboard magneto 27° before t.d.c. when fully advanced
GIPSY MK I : both 30°

(6) VALVES

Type : Poppet (one exhaust and one inlet per cylinder).
Exhaust valve : Sodium cooled
Timing : inlet opens - 20° before TDC
inlet closes 71° after BDC
exhaust opens 62° before BDC
exhaust closes 29° after TDC
Tappet clearance (cold) : 0-005 in. (inlet and exhaust).

(7) CARBURATTOR

Type of carburettor : GIPSY MK II:
Float chamber type Hobson A.1.48PM
Number of carburation : one
Fuel pressure at carburattor : 1°5 to 2°5 lb/in.2
Mixture control : manual
Fuel pumps : Two DHAC diaghram type

(8) STARTING SYSTEM

Rotax type N_3 EY ELECTRIC STARTER -12V
or
Rotax type CO 209 - 12V

(9) ACCESSORIES

Generator : Rotax B 1820, 500 watt 14 Volt
Vacuum pump : Plessey B3X, Mk 1.
Propeller
Mark : STAMPE & VERTONGEN
Type - 2 blades - Wood
diameter - 1,982 M
Pitch - 1,42 m
or
Mark : STAMPE & RENARD
Type - 2 blades - Wood
diameter - 1,980 M
Pitch - 1,42 m

3. AIRCRAFT SYSTEMS

A. FUEL SYSTEM

(1) Fuel tank

The fuel tank which is situated in the middle part of the upper wing, has a capacity of 90 litres. The amount of fuel is indicated by a fuel contents gauge installed directly beneath the fuel tank.
The gauge indicates the contents of the tank with the aircraft in normal flying attitude.
The fuel tank, which feeds by gravity, is divided into three

compartments to prevent engine cutting, due to air or fuel vapor being drawn into the fuel system.
An air vent is fitted on top of the fuel tank to allow air to enter as fuel is used. The air vent is closed by a valve when flying upside down while fuel is drawn by means of a flexible lested tube.

(2) Fuel cock

The fuel from the tank is amitted to the fuel pumps through the fuel cock (on-off type) and a low pressure filter

(3) The fuel pumps

Two DHAC fuel pumps, supply the fuel to the carburettor. They are diaphragm type pumps in which the engine fuel filters are incorporated.
Each pump is operated by a lever which rides on an eccentric on the camshaft. An additional hand operated lever which rides on an ecc. is also provided to prime the engine fuel system before starting.
The inlets of the pumps are coupled together by a short, copper pipe and their outlets by a T shaped pipe, the stem of the T being connected to the carburettor inlet by a flexible, fireproof, hose pipe.

(4) Inverted flying

Between the fuel pumps and the carburettor a selector valve is installed to allow inverted flying.
The selector valve which is controlled by the pilot by means of the

lower red handle has 2 positions :

(a) Fully back - normal circuit
Fuel tank - pumps - selector valve - float chamber - fuel nozzle

(b) Fully forward - Inverted circuit
Fuel tank - pumps - selector valve- needle (valve) - venturi of the carburattor

(5) Carburettor

(a) The carburation system of this engine consists of a Hobson A.I.48Q.M or A.I.48NM downdraught carburettor which is placed between a two-position, hot and cold, air-intake. Fuel is supplied to the carburettor by two DHAC fuel pumps.

(b) The construction of the carburettor which incorporates three jet systems, ensures the maximum economy for all running conditions. The butterfly throttle valve is part of the slow-running system giving an even distribution of mixture which, together with an overlap between the operation of the slow-running and main-jets, prevents flat spots during the change over period. In addition a power jet is incorporated to supplement the main jet during full throttle operation, a feature which permits the main jet to be calibrated for economical cruising and not as a compromise between cruising and full throttle conditions A manual mixture control is provided to admit additional air for

economical cruising and to prevent over-richness under altitude conditions.

(c) The carburettor flooder is operated by a small lever pivoted on the top of the carburettor immediately in front of the altitude -mixture control lever pivot. On the port-end of the flooder lever pivot is a further spring-loaded lever to which is attached one end of a long pullwire. The pull-wire is enclosed in a tubular guide which is clipped along the starboard side and rear of the engine. The other end of the pull-wire terminates in a small finger ring.

(d) The carburettor flooder is operated by a small lever pivoted on the top of the carburettor immediately in front of the altitude-mixture control lever pivot. On the port-end of the flodder lever is a further springloaded lever to which is attached one end of a long pull-wire. The pull-wire is enclosed in a tubular guide which is clipped along the starboard side and rear of the engine. The other end of the pull-wire terminates in a small finger ring.

(e) The air-intake is secured to the upper, circular flange of the carburettor choke housing. The air-intake is of a two-way construction

so arranged that cold air can be drawn from the vicinity of the crankcase. The source of the air is determined by the position of a flap valve inside the air-intake which is operated by the throttle - lever. Only warm air is admitted with the throttle in slow-running position. Cold air is selected from approximately half the throttle range up to full power.

B .LUBRICATION

(1) General

The Gipsy Major Mk II is lubricated on the dry-sump principle, one pressure only being employed throughout the engine. A pressure pump feeds oil, through external pipes and internal ducts, to the main and big-end-bearings, the accessory drive shafts and the tachometer drive gears, and by an oil jet to the magneto drive spiral gears. The cylinder walls, camshafts and the remainder of the gears in the rear cover are lubricated by splash. The drain oil is returned to the oil tank by means of two scavenge pumps one draining the front of the crankcase the other the rear of the crankcase and the rear cover, thus ensuring that the engine is effectively drained in all altitude of flight. Filters are placed in the oil pipe lines to protect the pumps and engine components from damage which might be caused by the admission of foreign particles.

(2) The OIL TANK is placed outside of the engine compartment in the slipstream for cooling. It has a capacity of 9 litres with 1 litre airspace to allow oil expansion. The tube through which the oil is drawn from the tank is rigid and placed on the bottom, so that, when the aircraft is rolled over to inverted flight no oil will be fed to the engine, the oil pressure indicators will read zero. The time allowed for inverted flight is therefore limited to 3 minutes.

(3) OIL PUMPS
The three gear type oil pumps are assembled into one composes unit and secured with studs to the rear cover, the pressure pumps being to the rear. Each pump is enclosed in its own housing and is separated from its neighbour by dividing plates.
The only working parts common to all three pumps are two gear spindles.

(4) PRESSURE RELIEF VALVE - BYPASS
A pressure relief valve is fitted into the pump rear cover.

(5) SUCTION FILTER
The suction filter is situated in the oil line from the tank to the pressure pump
It consists of a reinforced gauze sleeve enclosed in a magnesium alloy casing.

(6) PRESSURE FILTER
The auto-clean pressure filter is fitted into a circular casing mounted across the back of the rear cover. In this type of filter the oil percolates between thin laminated plates set close together. A system of scraper blades, which removes the sediment from

between the plates, increases the overhaul life.

(7) OIL PUMP
The oil pump is a magnesium alloy casting mainly cylindrical in shape, secured to the lowest point of the engine rear cover. An integral housing inside the botton of the pump accomodates the rear scavenge filter.

(8) SCAVENGE FILTER
The rear scavenge filter consists of brass gauze sweated to a reinforcing copper sleeve. THe front scavenge filter is similar to the rear scavenge filter and is contained in a small housing secured by three studs to the lower forward end of the crankcase.

(9) PRESSURE LUBRICATION SYSTEM
The oil supply is drawn from the aircraft tank through the suction filter and external piping to the inlet side of the pressure pump. A further short lenght of pipe conveys the oil from the pressure pump to the Auto-clean pressure filter. The main bearings are supplied with oil under pressure from the main oil gallery which runs along the starboard side of the top cover and which is connected at its rear end to the pressure filter. The big-end bearings are lubricated from N°2 and 4 main bearings. Another pipe from the oil Auto-clean filter brings oil under pressure to the rear compartment to lubricate timing gears magneto generator tachometer and other accessory drive gears.

(10) SPLASH LUBRICATION
All working components not supplied with oil by the pressure system are lubricated by splash oil released from the main and big-end bearings. This splash oil in the crankcase is supplemented by two jets in each big-end bearing cap. Each time that the oil holes in the crankpins coincide with two holes drilled in the bearing cap a spurt of oil is directed into the crankcase.

(11) ROCKER BOXES
The four rocker assemblies are not lubricated by the main pressure and splash system but by separate oil baths contained in the rocker boxes covers. Some oil seeps down the push rod covers from the crankcase to lubricate the push rods and tappets but it is not sufficient to maintain the lever in the rocker covers which must be "topped up" periodically.

(12) SCAVENGE SYSTEM
The rear cover drain oil flows down the sides of the rear cover into the sump. From the sump the oil is drawn through the rear scavenge filter and returned to the aircraft tank by the front scavenge pump which is connected to the rear scavenge filter by a short lenght of piping.
The drain oil which collects in the bottom of the crankcase, flows around the cylinder barrel extensions and through cored holes in the crankcase webs to either the front or rear of the engine the direction of flow depending upon the flight attitudes of the engine.

If the flow is rearwards the oil drains into the rear cover where it joins the rear cover drain oil. If, however the oil drains towards the front of the engine it is drawn by the rear scavenge pump (that is the long pipe fitted along the starboard side of the engine, and is returned to the aircraft tank through the common scavenge outlet union.

(13) INSTRUMENT CONNECTIONS
A banjo pillar to take capillaries for two oil pressure gauges is fitted :
(1) into the main oil duct-Front cockpit indicator
(2) on the outlet end of the pressure filter rear cockpit indicator.

(14) OIL PRESSURE
Minimum oil pressure should be 30 LBS/"
Normal oil pressure 45 LBS/"
Maximum oil pressure 60 LBS/"
A slight difference between the two indicators may be noticed, the pressure being measured at different places.

(15) BREATHING AND VENTING
The oil tank vent is piped to and breathes into the crankcase. The crankcase breathes to atmosphere through an elbow on the rear cover adjacent to the oil tank-vent connection and suitable baffles are provided to prevent the escape of liquid oil.
Each rocker cover has an individual vent or overflow pipe.

IGNITION

(1) GENERAL

1. Ignition on the Gipsy Major Mk II is provided by a dual system consisting of two independent ignition groups. Each group consists of a magneto with an integral distributor (one magneto being fitted with an impulse starter) an ignition harness and four sparking plugs. The ignition system is completely screened to obviate radio interference.

(2) MAGNETOS

2. The magnetos are two BTH - type AG4 - 10 the distributors and contacts breakers being totally enclosed in metal covers.
Starboard magneto : N° 1
Port magneto : N°2
The magnetos, which are of the rotating armature type, produce two sparks per revolution and are therefore driven at crankshaft speed, the starboard magneto clockwise and the port anti-clockwise, when viewed from their driving ends.

(3) IMPULSE STARTER

3. An impulse starter BTH type Z.1-1, is fitted behind the vernier coupling of the starboard magneto in such a manner that the driven half of the Simms coupling is integral with the driving member of the impulse starter.
The impulse starter is so constructed that, when the engine is being rotated for starting, the magneto is arrested and then given

a momentary forward impulse.
This occurs twice in every revolution so that momentarily at each impulse, the magneto speed greatly exceeds that of the engine causing a powerful spark to be produced regardless of the speed of the engine. Immediately the engine has attained a speed sufficiently high to enable the magneto to generate normally, that is at approximately 160 RPM, centrifugal force acting on weighted pawls frees the impulse starter which then functions as a spring coupling between the engine and magneto.

(4) VARIABLE TIMING CONTROL

4. The advance and retard control lever of each magneto, which is integral with its respective magneto cam, ring, is limited in movements, one to each end of the throttle operating cross-shaft. Thus, movement of the pilots throttle lever alters the ignition timing in addition to controlling the carburetor. The profiles retarded when the cams are so designed that both magnetos are fully retarded when the pilot's throttle lever is in the slow-running position, then they are advanced rapidly as the throttle is initially opened and finally remain fully advanced over the remaining wide of throttle settings.

(5) FULLY ADVANCED

means 27 before TDC for Starboard magneto
30 before TDC for Port magneto
for : Gipsy Major II
30° before TDC for Starboard and port on Gipsy Major I

D. ELECTRIC SYSTEMS

(1) THE ROTAX TYPE N.3 E.Y ELECTRIC STARTER OR C.0.209

The 12 VOLT N.3.E.Y. ROTAX DIRECT CRANKING STARTER rotates in a clockwise direction looking from the front.

The starter comprises three main housings. Firstly, the front housing containing jaw, oil seal and clutch. Secondly, the rear housing incorporating the gearing. Lastly the motor housing, mounted at an angle of 90° to the gearing, containing armature, field and brusgear.

THE CLUTCH ASSEMBLY is designed to limit the maximum torque transmitted to the engine.

(2) GENERATOR D.C ROTAX B.1820 AC

Output	10,5 amp at 14,5 volts
Speed range	3000 to 7000 RPM
Rotation	Anti-clockwise
Weight	- 11 BLS 402

(3) BATTERY : Voltablock Alcaline 12 V - 15 A/H

Weight : ± 9,5 Kg

4. AIRCRAFT CONTROLS

A. FLYING CONTROLS

The flying controls are conventional. The rudder of the rear cockpit can be adjusted for reach when the two knobs on the cockpit floor are pulled out. Care should be taken to ensure equal adjustment.

The rudder pedals in the front seat can be adjusted before flight, by means of a pin, mounted on the pedal.

The flying controls can be locked by means of the harness straps.

B. TRIMS

The elevator trim is controlled by a small handwheel on the left side of the cockpit.

The rudder is trimmed by a fixed tab at cruise RPM.

C. WHEELBRAKES

The wheelbrakes are mechanicaly operated. They are controlled separately, when pushing the rudder pedal fully forward.

D. PARKING BRAKE

The parking brake is mechanicaly operated by means of a handle placed on the lower left side of the cockpit. Care should be taken not to put the parking brake on when the aircraft is still in mouvement.

E. FLIGHT INSTRUMENTS

(1) COMPASS

Pilot P11 Type compasses are provided in both cockpits for setting course and course reading. The magnet system is suspending in a liquid filled bowl.
The P11 has a correcting box, composed of the magnets, placed underneath the compass.

(2) STAND - BY COMPASS

An A2A stand-by compass is fitted on top of the instrument panel of the front cockpit.
taken to equip the rear cockpit also with a stand-by compass.

(3) ASI AND ASSOCIATED INSTRUMENTS

The ASI, altimeter and VSI are supplied with pressure from a pressure head on the leading edge of the left wing.

(4) SUCTION DRIVEN INSTRUMENTS

A suction pump, driven by the engine provides suction for the directional gyro, turn & bank indicator andthe artificial horizon

F. ENGINE CONTROLS

(1) FUEL CONTROL

The fuel cock on the left instrument panel in both cockpits opens the fuel lance when pushed in.
The fuel quantity left in the tank can be read on the fuel gauge below the tank itself.
The reading being correct when the aircraft is in line of flight.

(2) THE ENGINE STARTING CONTROL

Must be pulled out to activate the starter motor and is placed on the right panel of the rear cockpit.

(3) THROTTLE CONTROLS

Four levers are mounted on the same

axe and controlled for friction by one nut.

(a) The upper is the throttle lever
(b) The upper black - controls the needle valve for inverted fuel supply
(c) The lower red - the selector cock for inverted flight
(d) The lower blue - is the mixture (altitude) control.

(4) Engine instruments are mounted in both cockpits. They are, a RPM indicator and a oil pressure indicator

5. COCKPIT EQUIPMENT

A. COCKPIT ENTRY

Wing footsteps on each side of the fuselage give acces to both cockpits. Hand-holds are provided on the upper wing and on the instrument case of the rear cockpit.

B. HOOD OPERATION

To open or close the hood, sliding in a rail, the spade-grip-handle must be turned 90°. Both hoods can be locked in half-way positions.

C. HOOD JETTISON CONTROL

The hood can be jettisoned by pulling the grip handle at the bottom of the front instrument panel.
This action disengages the rails from the fuselage. If the hood does'nt swing up of its own accord, a slight upward hand pressure should be applied.

D. SEAT AND HARNESS

The seat in the rear cockpit can be adjusted in height by an adjusting lever on the right side of the seat. Five straps are attached on the seat and can be adjusted separatly. The harness is fitted with a quick release pin. The seat only allows the use of a seat type parachute.

E. COCKPIT HEATING

Cockpit heating is controlled by a button on the Starboard side of the instrument panel in the rear cockpit. Air warmed around one exhaust pipe is directed along a pipe and enters the cockpit above the front rudderpedals.

F. INTERNAL LICHTING

A Red instrument panel lamp in both cockpits is mounted on the starboard cockpit wall and controlled by a dimmer. In the rear cockpit the dimmer is mounted underneath the radio central case.

G. EXTERNAL LICHTING

(1) NAVIGATION LIGHTS
The navigation lights are operated by a two-position switch on top of the rear cockpit instrument housing.

(2) IDENTIFICATIONLIGHTS
The indification lights fitted under the fuselage is

controlled by a ON-OFF-STEADY switch and a morse push-button on the starboard cockpit-wall in the rear cockpit.

H. GLIDER TOWING SYSTEM

On some aircraft a towing hook is mounted under the rear end of the fuselage. The cable may be released by operating a handle in the rear cockpit on the left under the instrument panel.

I. RADIO

Light-aircraft VHF Transmitter - Receiver

Plessey Type PTR 61 E
12 V Supply.

The receiver is a cristal contrl-led superheterodyne, the transmitter crystal-controlled and amplitude modulated.
The PTR 61 provides up to six present channels of Radio-telephone communication for air to air or air to ground in the band 116-132 mc/s
A range of 50 miles at 3000 feet air to ground can be expected.
The modulation amplifier is used in the receive condition as an intercommunication amplifier.
The remote control installed in rear cockpit on the startboard side has an ON-OFF switch - a channel selector switch and a volume control switch.

A modification on the system ILLIMINATE TUNING CONTROL AND METER. The tuning being automatic. The crystals are accessible from the front panel of the Transmitter-Receiver on removal of the Perspex fronted covers. The PTR is mounted behind the rear seat. The vertical aerial is mounted on the fuselage behind the hood. A "press to transmit" button on each stick permits transmission by both Instructor or Student The instructor in the front cockpit can cut the receiver with a switch on the left side of his cockpit. The microphone used will be of the E.M Type. The headset telephone having an impedance, of 16,4 Ohms

J. MISCELLANEOUS INSTRUMENTS
In the rear cockpit is a Voltmeter provided to check the battery. Also a clock is mounted on the starboard instrument panel.

6. EMERGENCY EQUIPMENT

The first-aid outfit is built into the fuselage directly behind the second cockpit on the righthand side, the exact location is marked with a red cross.
To open the case, the little hand hold must be pulled to tear off the fabric.
The kid is mainly composed of :
A. Medics : a. Cream for wounds or burns

b. Cream to prevent sunburn or skin irritation.
c. Morphine sulfate for severe pain shock or burns
d. Tablets for air and sea sickness.

B. Bandages and dressings.

- Bandages - dressing - gauze - wool
- safety pins - Samway tourniquet -
- Scissors.

PART II

ENGINE HANDLING

1. STARTING AND WARMING UP

A. STARTING BY SWINGING THE PROPELLER

Ensure that both magnetos are switches OFF. Turn on the fuel cock. Set the throttle lever in the FULLY CLOSED position. Set the mixture (altitude) control in the FULLY RICH position. Operate one of the hand priming levers on the fuel pumps through the full range of travel whilst holding out the carburettor flooding device. Turn the engine over four compressions by means of the propeller in order to prime the cylinders. Move the throttle lever forwards about 1/2 inch, 12 mm from the fully closed position. Switch ON the magnetos. Swing the propeller. When the propeller is being swung for starting, it is advisable for the pilot, or a second operator to keep a hand on the throttle lever so that, if necessary, its setting can be adjusted immediately. Adjust throttle for 1200 RPM.

B. STARTING BY USE OF THE ELECTRIC STARTER

The Electric Starter should not be operated continuously for more than twenty seconds and at least one minute should be allowed between each successive attempt. It is, however, possible to operate the starter under load for a period of one minute with approximately

15 minutes rest. If the engine fails to start after three or four attempts the cause should be investigated. Although the initial turning to prime the cylinders can be done by means of the electric starter, hand turning is preferable. Ensure that both magnetos are switched OFF. Turn ON the fuel cock. Set the throttle lever in the FULLY CLOSED position. Set the mixture (altitude) control in the FULLY RICH position. Operate one of the hand priming levers on the fuel pumps through the full range of travel whilst holding out the carburettor flooding device. Turn the engine over four compressions by means of the propeller in order to prime the cylinders. Move the throttle lever forward about 1/2 inch, 12 mm from the fully closed position. Switch on both magnetos. Press the starter button. Adjust 1200 RPM - Check oil pressure. When starting a hot engine that has been standing only for a short period since the previous ground run or flight, operation of the hand priming lever on the fuel pumps and turning the engine to prime the cylinders, may be omitted.

NOTE :

(1) If the engine fails to start and overpriming is suspected, it should be turned forwards several revolutions, with ignition off and throttle well open, to clear it.
(2) If the oil pressure doesn't rise almost immediately the engine must be shut down and the cause investigated.

(3) The oil pressure may rise considerally particularly in cold weather.

C. WARMING UP AND ENGINE CHECK

(1) WARM UP : Run the engine at 1200 RPM for about four minutes to allow the oil to warm up and to circulate freely. Under winter conditions eight minutes or more should be allowed.

(2) ENGINE CHECK - (AIRTEST)

Open up the fuel throttle, the normal groundrunning maximum speed should be obtained without any indication of hesitation in acceleration. If the acceleration is not satisfactory, it will be necessary to enrich the mixture by minor adjustements. After the acceleration check open up to full throttle, switch OFF, each magneto in turn, the resultant drop in RPM should not exceed 120 RPM. Whilst making this check there should be no excessive vibration. Open up to full throttle and move the altitude (mixture) control lever to the fully weak position and check that the maximum speed obtained is reduced by 100 +/- 20 rev/min. To avoid faulty engine running and overheating due to weak mixture, the altitude control must be returned to the fully rich position as soon as the drop

in engine speed has been noted. Reduce engine to 800 RPM switch OFF both magnetos, a deadcut must be observed. Reduce to idling position : the desired idling must be 600 to 650 rev/min.

(3) ENGINE CHECK BEFORE EACH FLIGHT

Open up to full throttle - check RPM min 1950 - Oil pressure between 30 and 60.

Reduce to 1600 RPM - Check the magnetos by switching each magneto off in turn max drop permitted is 100 RPM.

Reduce to idling position - Check RPM max 650.

2. A. HANDLING IN FLIGHT

(1) GENERAL

a. The operating limitations given are those for which the engine has been approved for Service use. Infringement of these limitations may lead to defects which will render the engine unserviceable before the normal period between overhauls has been completed.

b. Constant checks should be made of oil pressure readings and the limitations specified for each operating condition must not be exceeded. This is of

particular importance when a reconditioned engine is being flown for the first time.

c. If the oil pressure falls below the minimum value stated in the Leading Particulars, the flight will be terminated.

d. When a long period of idling is unavoidable, as for instance when waiting for the runway to clear, the aircraft should be turned into the wind to reduce the risk of overheating.
With parking brakes on, the engine should be allowed to run at 1200 RPM to assist in keeping the sparking plugs free from oil.

e. Smooth operation of the throttle is an important factor in conserving the live of the engine and coarse movement of the throttle-lever should be avoided.

(2) CLIMBING

Climb at full throttle at optimum climbing speed 60 Kts and with the fixed pitch propeller the RPM used will be approximately 2100.

(3) CRUISING

The permissible limiting RPM may not be obtainable in level flight without moving the Throttle lever into the rich - mixture range.
Whilst the engine may be operated at the engine speed, oil pressure and temperature stated in the Operating Limitations

it is inadvisable to do so continously. Whenever maximum conditions are unnecessary the mixture (altitude) control should be ajusted to give best economy consistent with smooth running.

NOTE : The power jet in the carburettor is brought into operation by a cam on the throttle valve spindle, approximately 26° before full throttle, therefore at a corresponding point in the throttle lever travel the power jet is brought into operation automatically. If on the ground, the throttle lever is moved steadily towards the full throttle position and a second man observes the point at which the cam on the carburettor commences to lift the power jet valve tappet, the throttle lever quadrant can be marked to indicate the point of change-over from weak to rich.

(4) a. DIVING

Whilst diving, the throttle must be at least one-third open and the use of max. permissible RPM limited to a 20 seconds duration. Ensure that the mixture control is placed in the FULL RICH position, before commercing to drive the aircraft.

b. GLIDING

When gliding from any considerable altitude, the throttle should be opened at intervals to keep the engine warm, and the mixture control lever placed in the FULL RICH position.

(5) LANDING AND SHUTTING DOWN

When coming in to land, the mixture (altitude) control must be set in the FULL RICH position in order to obtain maximum power in the even of a baulked landing. Before shutting down, allow the engine to run at 1000 RPM for a few minutes so that it cools down gradually. Then : Switch off both magnetos, and open the throttle fully. When engine has stopped close the throttle and turn OFF the fuel cock. (In tropical conditions it is advisable to turn OFF the fuel cock and allow the engine to run until the fuel in the carburettor and the pipe lines is exhausted before switching off the magnetos).

(6) USE OF THE MIXTURE (ALTITUDE) CONTROL (LOWER BLUE HANDLE)

(a) The mixture (altitude) control must be in the Fully Rich position for starting ground running and take-off.

(b) This control should be used at altitudes greater than 3000 Ft (900 meters) in order to obtain increased smoothness and economy.

(c) The mixture control lever should be moved carefully towards the "weak" position until a slight drop in RPM is detected and then returned a short distance usually about half the distance

moved towards weak - towards the "Rich" position in order to restore original RPM

(d) The control is then set in the correct position for all throttle settings at that particular altitude.

(e) The engine must not be run longer than necessary when the engine speed has been descreased by the use of the mixture control.

(f) Whenever any change in altitude occurs this control must be immediately readjusted.

(g) The mixture control must always be in the "Rich" position when diving and approaching to land.

(7) THE EFFECTS OF LOW AND NEGATIVE G ON THE ENGINE

(a) INTRODUCTION

When pushing down into a dive the pilot imposes a reduced G on himself and on everything in the aircraft. A sufficiently sharp push-down leads to G becoming negative and the pilot finds his weight transferred from the seat to the harness. At the same time fuel and oil move to the top of the tanks and the float in the carburettor float chamber floats downward.

-G occurs also in other manceuvres such as loops and rolls, and in a true slow roll and in badly executed aerobatics G may become negative.

(b) THE EFFECTS ON THE CARBURETTOR

i. In float chamber carburettors reduction of G upsets the balance between float forces and fuel pressure and - usually around 1/2 G - causes flooding of the carburettor and a RICH cut of the engine. The engine will cut less readily and recover more quickly with the throttle well open ; but, for the reason explained below, the throttle must be closed when the engine cuts. (see ii)

ii. When G becomes negative quickly the engine cuts WEAK from the uncovering of jets at the base of the float chamber. The duration of the WEAK cut is brief and it is followed at once by the RICH cut due to flooding of the carburettor.

iii. Recovery from a cut takes normally about 10 seconds from the removal of the cause.

iv. Although the tendency to cut is less, and recovery is quicker with the throttle well open, the pilot must close the throttle before power returns to avoid the risk of serious overspeeding

of the engine (depending on the AIRSPEED)
It is, therefore, advisable to close the throttle when a cut has occured from any cause and to re-open it carefully when power returns.

(8) INVERTED FLIGHT

(a) A by-pass fuel feeding system must be selected for inverted flight. This inverted position must not exceed 3 minutes because of oilstarvation. (Being inverted no oil can be succed from the tank and the oil pressure indicator will read ZERO)
Fuel flow on integral

Fuel tank - pumps - selector valve (handle in forward position) - needle (manual mixture control) - ventury of the carburettor.

(b) Going over to 'INTEGRAL' : put +/- 2000 RPM on the engine - push the selector forward (lower big lever). The fuel line to the carburettor is closed and the fuel presents itself at the needle valve closed ; higher small lever (in aft position). When the float chamber of the carburettor is empty (after +/- 20 sec at 2000 RPM) the engine cuts. Open the needle valve at that moment by putting the higher small lever in the vicinity of the throttle. For a given position of the throttle you control with the needle the quantity of the fuel-jet in the ventury, you have to obtain a mixture that makes run

without knocking. (rich).

(c) RETURN to 'NORMAL' : Reduce throttle lever and needle valve control in to the aft position, bring selector cock to normal. The fuel pressure will immediately fill the carburettor float chamber. The normal system functioning, any desired RPM can be selected.

B. DRILLS AND CHECKS

(1) EXTURNAL CHECK

The outside of the aircraft should be checked systematically for signs of damage or wrinkling for security of panels, filler cps, hood (or doors) and aerial. The engine intake must be free from obstruction, The types must be checked for cuts and creep, the break leads for security. Check pressure head cover removed and trim neutral.

(2) CHECK BEFORE SOLO FLYING

In the front cockpit

R. - Radio VHF receiver ON
C. - Contacts ON 1+2
G. - Gyro's caged
B. - Battery fastened
S. - Straps tight
O. - Objects

(3) PRE-START CHECK

a; Parking brakes ON
b; Adjust rudder pedals and seat
c; Strap in and make the radio connection.
d; Check petrol cock on.

e; Fuel system normal
f; Mixture control rich
g; Switches OFF
h; Throttle closed
i; Caution : the ground crew will then hand operate the fuel pump, holding the floater device down, then he will plug in the ground battery. On his signal "ALL CLEAR", put the switches on 1 + 2, throttle 1 à 2cm forward. Pull the starter while holding the stick fully back. Check OIL pressure builing up within the first seconds, adjust throttle 1200 RPM.
j; If the engine fails to start, the ground crew will check for possible causes, check switches off.

(4) COCKPIT CHECK

a; Parking brakes on
b; Trim - freedom of movement, then fully back
c; Throttle-nut for fiction
d; Mixture control back
e; Inverted fuel system backwards
f; Fuel - cock on - enough for flight
g; Oil pressure - min. 30 lbs/sq/inch
max. 60 lbs/sq/inch
h; Contacts : 1 + 2
i; Instruments and compasses : in good conditions and normal readings, gyros unlocked.
j; Radio : -Radio ON
-Select channel
-Volt meter min. 12 Volt.
k; Objects : no foreign objects in the cockpit.

(5) ENGINE TESTS

After warming up the engine :

a. Open the full throttle : check min RPM 1950 - OIL pressure between 30-60 lbs/sq/inch
b. Reduce to 1600 RPM : check the magnetos by switching off each magneto in turn Max. drop permitted is 100 RPM
c. Reduce to idle position : Max RPM 650

(6) PREPARING FOR TAXI

a. check throttle nut for friction
b. check throttle idle
c. starting blocks removed
d. taxi clearence
e. parking brake off
f. look-out before leaving area
g. check brakes.

(7) CHECK BEFORE TAKE-OFF

Parking brakes ON 1200 RPM

T - Trim 2/3 forward
T - Throttle nut - tightened
M - Mixture fully rich
F - Fuel cock ON - Check quantity - Normal fuel system
H - Hood - locked in required position
H - Harness tight
I - Instruments alt setting, etc...

(8) CHANGE OVER TO INTEGRAL SYSTEM FOR AEROBATICS

(a) Procedure : Normal - Integral.
(b) On take off : 1. Line up

2. Parking brakes ON
3. Open up 1200 RPM or more if the brakes are holding
4. Selector cock - fully open
5. After 10 sec release brakes and open up fully
6. Rolling - when engine cuts - open needle valve
7. Adjust needle valve for smooth running

NOTE : If the engine doesn't run accurately be prepared to pull the selector cock back to normal, and continue the take off on "NORMAL"

(c) Airborne :

1. Select 2000 RPM
2. Selection cock fully forward
3. When engine starts cutting, adjust the needle valve appr. against the throttle lever

(d) Full power :

First open the throttle lever and then adjust the needle valve. Be careful not to run on weak mixture (overheating).

(e) Gliding :

1. Needle valve in intermediate

position.
2. Throttle closed.

NOTE : To open up from idle, proceed very slowly because your accelaration will be poor.

(f) Procedure : Back to normal

1. Bring back the needle valve and throttle in the fully aft position.
2. Selector cock to normal
3. Open up the throttle lever.

(9) VITAL ACTIONS BEFORE STALL - SPIN AEROBATICS

AEROBATICS

Internal check

I. - Instruments - Oil pressure - gyro's locked
O. - Objects - all loose objects stocked
H. - Hood - Harness

External check

A. - Altitude - 3000' feet/ground min.
P. - Position
O. - Orientation
S. - Sky free

(10) VITAL ACTION BEFORE EXTENDED GLIDE

a. Fuel system normal
b. Mixture rich
c. Warm up engine every 1000'

(11) CHECK AFTER LANDING

T. - Trim fully back

T. - Throttle nut tight
L. - Look-Out

(12) STOPPING THE ENGINE

a. Parking brakes ON
b. 1000 RPM for at least 1 minute
c. Switch OFF both magnetos
d. Open the throttle fully
e. After the engine stops, throttle back, fuel OFF, radio OFF
f. After SOLO flight cut switches OFF in the front cockpit

PART III

LIMITATIONS AND PERFORMANCES

1. ENGINE DATE : GIPSY MAJOR SERRIES 10 MK 1 & 2

the principal engine limitations are :

-See tabel in annex N° : -

2. FLYING LIMITATIONS

A. The aircraft is designet for duties appropiate to instruction. All aerobatic manoeuvres are permitted.
B. Stall - spin recovery normal
C. Max speed 160 Kts
D. Inverted flying - max 3 minutes.

3. PERFORMANCES

Climbing speed - 60 Kts
Initial rate of climb - +/- 700 min
Gliding speed - 60 Kts
Rate of descent - +/- 700 min
Basic stalling speed - 38 Kts IAS
Cruising speed at 1950 RPM - +/- 75 Kts
Cruising speed at 2300 RPM - +/- 95 Kts
Ceiling 1600 feet

4. RECOMMAND SPEED FOR AEROBATICS

Looping - 100 Kts
Stall-turn - 100 Kts
Slow-roll - 100 Kts
Barrel-roll - 100 Kts
Flick-roll - 70 Kts
Immelman - 120 Kts

PART IV

EMERGENCIES

1. FIRE ON THE GROUND

A. Throttle closed
B. Fuel OFF
C. Contacts OFF
D. Parking brake OFF
E. Abandon A/C

2. FIRE IN THE AIR

A. Throttle closed
B. Fuel OFF
C. Contacts OFF and stop engine
D. Make a forced landing or abandon aircraft

3. LEAVING THE AIRCRAFT

A. Hood
B. Straps
C. Radio call
D. Abandon aircraft

4. ENGINE FAILURE DURING TAKE OFF AND STILL ON THE GROUND.

A. Throttle closed
B. Contacts OFF
C. Stick backward
D. Keep rolling and try to stop at the end of the airfield (eventually make a ground loop).

5. ENGINE FAILURE ON TAKE OFF

A. Throttle closed
B. Immediate glide attitude
C. Contacts OFF
D. Fuel OFF
E. Land straight ahead (only small

heading corrections).

6. ENGINE FAILURE IN FLIGHT

Suspected reason

A. Faulty flying technique in aerobatics

Negative "G" 's

(1) Engine running - Windmilling

The engine should pick up again in normal flying attitudes.
Keep the speed high.

(2) Engine dead-cut

a. Glide 60 Kts
Check Fuel : ON - system normal
Mixture : Rich
Switches : ON

b. Restart :

i. Electrically : Throttle 1/3 open.
Speed 60 to 70 Kts
Pull the starter button, if succesful, gain altitude

ii. Aerodynamiccally: Throttle 1/3 open
Roll over - dive until 120 Kts - If the propellor does'nt start moving Kick the rudder
Pull out, beware not to exceed the max speed and max permitted RPM
NB : Only permitted when starting the dive above 2000 feet air/ground level. Loss of altitude 1000' approximately

B. Carburettor throubbles

When engine cuts : windmilling will give you approximately 700 RPM at 60 Kts. go over to Integral.

(1) Put Throttle in idle position

Check switches and fuel cock or others, if all seams normal, proceed as follows :

a. Selector cock forward
b. Needle valve in an intermediate position
c. Open up slowly
d. Adjust desired RPM - With throttle and needle valve lever.

(2) Restart engine on "Integral"

a. Vital actions - fuel, switches on.
b. Selector cock - forward
c. Needle valve intermediate position.
d. Throttle 1/3 open
e. Restart - by diving, or electrical above 60 Kts
f. Adjust with throttle and needle valve lever.

C. Mis-firing, Rough running.

Throttle back to low safe cruising RPM, 1700 speed -65 Kts land as soon as possible.

LIST OF CONSULTED PUBLICATIONS

1. "NOTICE" Technique et d'entretien Avion Type SV 4 bis
Constructions Aéronautiques "STAMPE & RENARD"
34-36 Av. Jules Bordet
BRUSSEL 13

2. The DE HAVILLAND GIPSY MOJOR SERIES 10 HANDBOOK

3. Air Publication 1500 B Volume 1 and VOLUME 6 - Part 1
GIPSY MAJOR MK 8 AERO-ENGINES

PART III

LIMITATIONS AND PERFORMANCES

1. ENGINE DATE : GIPSY MAJOR SERRIES 10 MK 1 & 2

		RPM	BHP	Fuel consumption
Max for Take Off and climb		Full Throttle no time limit +/- 2100		
Straight and level		1950		+/- 30 L
Max continuous weak	MK1	2300	138 SL	49,2 L/H
	MK2	2400	140 SL	51,2 L/H
Max continuous weak		2300	116 SL 120 at 3750	37,5 L/H 39,5 L/H
Max level flight		2550 5 min Limit	145 SL	52,5 L/H
Diving 20 sec limit with throttle not less then 1/3 open		2675		
Ground idling		500 - 650		

Oil pressure : Min. 30 PSI
Normal 45 PSI
Max 60 PSI

Oil consumption : Normally between 0,5 L to 1,5 L/H