# AIRCRAFT FLIGHT MANUAL

**AND**

# PILOT'S OPERATING HANDBOOK

## PIEL EMERAUDE CP301

## VH-SJH

**FLIGHT MANUAL**

| | |
|---|---|
| Nationality and Registration Marks | VH-SJH |
| Aeroplane Serial Number | 357/N10 |
| Manufacturer | Schenk, Jenatsch, Hodges. |
| Designation of Aeroplane | Piel Emeraude CP301 Series 100 |
| Certification Catergory | Amateur built |

Information supplied by Mr P Tyler and P White

## INTRODUCTION

This Flight Manual applies only to the particular aeroplane identified by registration markings and serial number on page 1 and contains the airworthiness limitation and essential operating data for that particular aeroplane.

The Flight Manual shall be carried in the aeroplane on all flights. It is the responsibility of the pilot in command to be familiar with the contents of this Manual and to comply with all directions contained herein relating to the operation of the aeroplane.

Amendments. It is the owners responsibility to incorporate in this Manual all amendments, and to enter the date of incorporation and his/her signature on the Amendment Record Sheet.

## DEFINITIONS

The following definitions apply throughout this Manual:

**Airfield Pressure Height**
The Airfield Pressure Height is that height registered at the surface of an aerodrome by an altimeter with the pressure sub-scale set to 1013.2 hectapascals.

**I.A.S.**
Indicated airspeed, which is the reading from an airspeed indicator having no calibration error.

**Take-Off Safety Speed.**
The Take-Off Safety Speed is chosen to ensure that adequate control will exist under all conditions, including turbulence and sudden and complete engine failure, during the climb after take-off.

**Approach Speed**
The approach speed is a speed chosen to ensure that adequate control will exist under all conditions, including turbulence, to carry out a normal flare and touchdown.

**Normal operating Limit Speed (Maximum Structural Cruising Speed)**
This speed shall not normally be exceeded. Operations above the Normal Operating Limit Speed shall be conducted with caution and only in smooth air.

**Manoeuvring Speed.**
Maximum for manoeuvering involving an approach to the stall conditions or full application of the primary flight controls.

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## Piel Emeraude CP301 VH-SJH

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**WARNING……The personal safety of the Pilot and Passenger may be involved. Disregarding this information could result in injury to the Pilot and Passenger**.

**CAUTION…….These instructions point out special procedures or precautions that must be followed to avoid damaging the aircraft**

**NOTE……..This provides special information to make maintenance easier or important instructions clearer.**



## DESCRIPTION

### Type

The Piel "Emeraude" is a low wing monoplane of French origin designed by Monsieur Claude Piel as a two-seater, semi-aerobatic, sports and touring aircraft.

This aircraft was manufactured in Australia by Schenk, Lenatsch and Hodgens. It first came on the register on the 20 November 1964.

Construction is mainly of wood and fabric, of imported spruce and a specially developed synthetic resin glue, universally accepted as the best yet developed for aircraft structures.

This aircraft is fitted with the Continental 0-200 engine of 100 hp.

### Seating

Side by side seating is provided for two occupants, enclosed by a one piece fixed windscreen and a single sliding canopy (Airtourer).

The left-hand seat must be occupied by the pilot in command. This aircraft has full duel controls.

### Fuselage

The fuselage is of conventional wooden construction with a combination plywood and fabric covering.

### Wing

The wing is comprised of a single one piece laminated wooden spar with a moulded plywood leading edge forming a torsion box, completed in conventional fashion with wooden ribs and fabric covering aft from the torsional box.

Differential, slotted ailerons are fitted together with hand operated slotted flaps extending from the root fillets to the inboard ends of the ailerons.

The flaps are constructed in wood and fabric.



## DESCRIPTION

### Undercarriage

Tailwheel type. The conventional two-wheel cantilever non-retractable undercarriage is secured direct to the wing. The tailwheel is mounted on a quarter elliptical leaf spring and is connected by springs to the rudder to eliminate shimmy and to assist in turning.

External disc type hydraulic brakes are fitted.

### Empennage

A single fin and rudder, streamlined with the bottom of the fuselage is used. The empennage is completed by a cantilever tailplane and elevators.

Anti-spin strakes extend forward along both sides of the fuselage from the inboard ends of the tailplane.



## LEADING PARTICULARS

### Principal dimensions

Span……....26ft 6ins

Length……20ft 11ins

Height, overall (tail down)…….5ft 10½ins

Ground angle……..9°

Fuselage width (max)…….3ft 8ins

Fuselage height……...4ft 8ins

### Wing

Chord at root……..4ft 11ins

Chord (mean)……..4ft 5¼ins

Incidence (chord line to fuselage datum at centre section)……..……3°

Dihederal (on chord plane)……5° 40'

### Tailplane

Span…… 8ft 6ins

Incidence……0°

### Areas

Gross wing area……117 sq ft

Ailerons (total)……10.68 sq ft

## LEADING PARTICULARS

Flaps (total)……..……..10.4 sq ft

Tailplane (without elevators)…….……9.69 sq ft

Elevators (total)……..……..……8.95 sq ft

Elevator trim tab……..……86 sq ft

Fin……..……6.09 sq ft

Rudder……..……..6.88 sq ft

**Control Surface Movements**

Ailerons – up…….….25°
- down……15°

Flaps (3 positions)…….up - 20° - 35°

Elevators – up……....25°
- down……..25°

Rudder (each way)……23°

**Main Undercarriage**

Type……..Single cantilever with cantilever axles.

Track……7 ft

Shock Absorber system……Rubber blocks in compression springs for rebound

Wheels……..Dunlop

Tyers…….500x4in

Tyre Pressure……25 lb

Brakes……Hydraulic external disc.

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**LEADING PARTICULARS**

**Tail Wheel**

Type…….…….Semi–castering, non retractable

Shock Absorber……..……..Cantilever ¼ elliptical leaf spring

Wheel…….……..“Piel” France

Tyre……

**Engine**

Name……..Continental Model 0-200A

Type……...4 Cylinder, horizontally opposed, air cooled

Fuel……80 octane.

Oil……..SAE 20-40

**Propeller**

Type……...2 blade fixed pitch, wooden

Part Number A53……..……...Invincible Airscrews serial 8149

**Tank Capacities**

Fuel Tank……..83 Litres (81 litres useable)

Oil Tank……5.6 litres (1.5 US gals 1.25 imp gals)

# AIRCRAFT SYSTEMS

## 1 Electrical Systems

Electrical energy is supplied by a 12 volt direct current system, powered by a 20 amp engine driven generator. A 12 volt, 24 amp hour battery, carried in a battery compartment on the starboard engine side of the firewall supplies current to the system when the generator is inoperative. Access to the battery is obtained by removing the engine cowl.

Generator output is controlled by a voltage regulator on the front face of the firewall. A cut-out unit incorporated with the voltage regulator prevents feed back from the battery to the generator when the engine is stationary or running below 1600 rpm. A generator isolation switch is provided on the right side of the instrument panel.

Engine self starting is by means of an electric direct cranking "Bendix" starter, which draws power only from the internal supply.

A master switch also situated on the right side of the instrument panel controls the entire electrical system, except the magneto powered ignition system. When starting the engine either electrically or by hand swinging the propeller, the switch should always be on. If, after starting the engine the switch is off, the electrical services including the radio, will be running direct from the generator and will therefore fade out when the throttle is closed in flight.

Power from the aircraft source is also provided for the auxiliary fuel pump and fuel gauge. On-off switches for these services are positioned on the right side of the instrument panel adjacent to the master and generator isolation switches.

An ammeter placed to the left of the master switch shows the rate of charge to the battery. Any excessive reading should be considered abnormal and the generator isolated as soon as possible.

## 2 Vacuum System

There is no vacuum system. All instruments are electrically driven.

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AIRCRAFT SYSTEMS

## 3 Fuel System

### Fuel Tank

Fuel is carried in a metal tank mounted in the top centre section of the fuselage aft of the firewall providing a total fuel capacity of 83 litres.

A filler neck and cap protrudes through the top of the fuselage.

To test for decontamination a spring–loaded drain valve is located centrally underneath the fuselage in an easily accessible position. A system of drainage channels at the bottom of the tank leading to a sump and thence to the drain point ensures that any foreign substance can be detected. A fuel filter drain is located at the bottom of the fire wall on the starboard side.

### Fuel venting

The tank is vented to the atmosphere through a vent pipe installed in the filler cap.

### Fuel contents gauge

An electrically operated fuel gauge mounted on the right side of the instrument panel shows contents.

### Fuel pumps and priming

An engine driven fuel pump is mounted at the front of the engine. Fuel to this pump flows from the tank under gravity through suitable plumbing and a filter on the forward face of the firewall.

An electric auxiliary fuel pump supplying fuel to the carburettor through the same system assists in starting the engine and prevents fuel starvation and subsequent engine stoppage should the driven pump fail.

With the auxiliary fuel pump turned on, adequate priming is effected by one or two forward strokes of the throttle.

**Warning…. When the fuel tank is approximately ¼ full or less, continuous uncoordinated flight such as side slips or skids can uncover the tank outlet, causing fuel starvation and engine failure, avoid prolonged uncoordinated flight.**



**Fuel cock**

A fuel lever is positioned on the instrument panel in front of the left hand seat and is clearly marked ON, OFF and RESERVE.

**4 Oil System**

A wet sump system is common to all the Continental 'C' series engines. Oil is carried in an ovaloid shaped sump or tank mounted on the underside of the engine, total capacity 5.6 Litres

Oil level is checked by a dip stick embodied in the filler cap on the starboard side, accessible by removing the top engine cowl. Air scooped in from the front cowling cools the oil as it passes around the sump. Oil returns to the sump under gravity.

Oil temperature and oil pressure gauges are mounted towards the right side of the instrument panel.

**5 Engine Controls**

**Throttle Control**

One push-pull type throttle operating in the conventional manner is mounted centrally on the instrument panel.

**Mixture Control**

A push-pull type control is fitted to the right of the throttle.

The mixture control knob is clearly marked and coloured red. With the knob fully in mixture is fully rich. When pulled out the mixture is leaned sufficiently to stop the engine.

**Carburettor Air Temperature Control**

A push-pull type control is fitted to the left of the throttle.

Carburettor air temperature is controlled by a lever operated plate valve in the intake housing which opens and closes a hot air inlet to the manifold. With the plate valve in the open position cold ram air is drawn through the forward facing



filter intake. With the valve closed, hot air is drawn into the intake from a shroud fitted around the starboard exhaust pipe.

The carburettor heat control is located to the left of the throttle. To select COLD air the knob is pushed fully in. To select full HOT air it is pulled fully out. The degree of heat applied is varied by adjusting the mixture control between the full HOTand full COLD positions.

Hot air entering the intake does not pass through the air filter, use of carburettor heat should therefore be avoided when taxiing under dusty or dirty conditions.

NOTE Further instructions on carburettor heat are given in Chapter 5:12.

**Engine Starting Controls**

A "T" shaped handle at the extreme left hand corner of the instrument panel engages the engine starter when pulled fully out. It is spring loaded to return to the disengaged position. The engine may also be started by hand swinging the propeller.

**Warning…… Hand swinging should only be attempted by persons appropriately trained**

An ignition switch is located on the instrument panel on the left hand side and controls the duel magneto ignition system. Four switch positions are incorporated, designated clockwise as follows:-

"OFF", "R", "L",and "BOTH". The engine should always be operated on "BOTH", the "L" and "R" positions being for check purposes only.

The left magneto is fitted with an impulse coupling, therfore, the “L” position is recommended for starting.

**Engine Instruments**

The engine instruments fitted comprise a tachometer, cylinder head temperature gauge, oil pressure and oil temperature. The tachometer is in front of the pilot and the other instruments are above and to the right of the engine controls.



## AIRCRAFT SYSTEMS

### 6 Aircraft Controls

**Control Columns**

Conventional, dual control columns operating the elevators and ailerons are provided. Anti-friction bearings and ball-races are used throughout and with the cables properly adjusted there is little or no control friction.

**Rudder Pedals**

Dual non-adjustable type rudder pedals are fitted with toe brakes. The tailwheel is connected to the rudder for steering on the ground.

**Trim Tabs**

The elevator trim tab fitted to the port elevator is controlled by a lever mounted centrally in a box between the two seats. Settings designated NOSE UP and NOSE DOWN are clearly marked on the box at each side of the lever which operates in the normal sense

A tab, fitted to the starboard elevator adjusts automatically as the flaps are operated to cancel out changes of trim.

**Flap Controls**

Cable operated wing flaps are controlled by a flap lever positioned in the control box between the seats just forward of the elevator trim wheel.

The lever operates in the natural sense. Three positive positions are provided.

| | | |
|---|---|---|
| UP | - | fully forward |
| 20º | - | mid-position |
| 35º | - | fully down. |

To lower the flaps it is necessary to disengage a spring-loaded pawl from the forward cut-out in the flap quadrant by operating a moveable sleeve forming the handle of the flap lever. This is achieved by placing the thumb on the button provided at the extreme end of the flap lever and squeezing upwards, the total movement being approximately 12.5mm (½ inch). Once the lever has been

disengaged and moved back it will lock in first the 20º position and then if disengaged and moved further backwards in the 35º position.



Raising the flaps is achieved by releasing the spring-loaded pawl by squeezing upwards on the sleeve and then moving the lever forwards.

Flap position is easily identified from the cockpit, therefore no indicator is necessary.

Caution: When parking the aircraft it is recommended that the flaps be placed full down to minimise the risk of damage in leaving and entering the aircraft.

**Brakes**

The main wheels are fitted with external disc type brakes operated hydraulically, the system consisting of two master cylinders on the port side rudder pedals.

Straight braking is obtained by exerting equal pressure on the respective brake controls, differential brake by operating either left or right controls individually.

**Flight Instruments**

The aircraft is equipped for flight under the Visual Flight Rules as follows:-

1. One Airspeed Indicator
2. One Altimeter
3. One Turn and Balance Indicator
4. One Magnetic Compass

The ASI and Altimeter are operated by the pilot static system comprising a combined pressure and static head carried on the underside of the port wing outer section.

The Turn and Balance Indicator is electrically driven.

All the instruments including the Magnetic Compass are grouped in front of the pilot in the instrument panel.



## 7 General Equipment

**Cockpit Canopy**

The cockpit is fully enclosed by a fixed, one-piece Perspex windscreen and a single sliding canopy framed in steel tubing and fitted with Perspex panels.

A handle is situated at the extreme top centre of the canopy, which when operated from the outside anti-clock wise unlocks it From the inside there is a knurled knob which when turned clock wise unlocks and when turned clock wise locks it in any one of three positions:-

1. Closed
2. Open approximately 100mm (4 inches)
3. Fully open.

It is not possible to jettison the canopy, but easy emergency escape or access can be had by breaking the large Perspex panels.

**Seats and Harness**

A non-adjustable bench type seat of wooden construction forming part of the fuselage structure is provided, fitted with two separate seat cushions and a single back squab.

Type shoulder harness is provided for both occupants.

**Maps and Stowage Space**

Pockets are fitted to both inside cockpit walls for maps and documents, etc.

**Luggage Space**

Ample luggage for two persons may be carried aft of the front seat.
Maximum baggage compartment see section 4.4 A.F.M.

**Heating and Ventilation**

A cockpit heating system is fitted and operated by pulling out the knob on the bottom left hand side of the instrument panel.



Fresh, outside air is scooped into the cockpit through two adjustable louver type circular vents positioned at the top corners of the instrument panel.

**Radio and Intercommunication**

A 720 channel VHF "Narco Comm 11A " transceiver is mounted under the centre of the instrument panel.

Jack boxes for microphone and earphones are fitted to the bottom left and right hand sides of the instrument panel, whilst a jack for microphone only is mounted above and to the left of the radio.

A simple ON-OFF switch on the face of the radio cabinet also doubles as a volume control.

A "Sigtronics" intercom system is mounted above the radio in the instrument panel.

Protection for the radio is provided by a separate press-to-reset circuit breaker positioned next to the master switch on the instrument panel.

**Emergency Equipment**

A portable "MT310" EPIRB is located in the left side pocket.



**1 Design Limitations**

At 658kg (1450lb) all up weight flight factors, (flaps up) are + 4.4 to – 1.76. Design load factors are 150% of the above. In all cases the structure meets or exceeds design loads and the requirement of the US airworthiness Car. 3 category.

**2 Engine Limitations**

**Continental Series 0-200-A Fixed Pitch Propeller**

Rated power at sea level……100bhp @ 2750 rpm

Max manifold pressure – rated
rpm at sea level……..……29 hg

Max recommended manifold pressure
cruising at level…….24.5 hg

Recommended cruising…….sea level…..2500 rpm
5,000 ft……2600 rpm
10,000 ft…..2750 rpm

**Oil Pressure**

Minimum idling……..……..10 psi

Normal operating……..30-60 psi

**Oil Temperature**

Take off – min……...21ºC (75ºF)

Continuous – rich and weak mixture……..……..108ºC (225ºF)

Maximum……..……....108ºC (225ºF)

**Cylinder Head Temperature**

Maximum……...273ºC (525ºF)



## 3 Flying Limitations

Never exceed diving speed (Vne) ……135 knots IAS

Normal operating limit……..107 knots IAS

Manoeuvring…….……107 knots IAS

Half flaps extended……100 knots IAS

Maximum, wing flap extended…..…..…….67 knots IAS

Max cross wind component……..10 knots IAS

**Warning: Manoeuvring speed – manoeuvres involving an approach to the stall or full application of aileron or rudder control must not be undertaken when the airspeed exceeds 107 knots I.A.S.**

**Spinning and Aerobatics**

The "Emeraude" 100 may be operated in the semi-aerobatic category, including intentional spinning in accordance with the C of A for individual aircraft.
See DCA Aeronautical Report 61/3

**Inverted Flight**

Prohibited

**Pilot - in -Command**

Solo flying permitted only from the left seat.

**Smoking**

Prohibited

## 4 Weight and Centre of Gravity Limitations

**Normal category**

Max AUW for take off and landing…….658kg (1450lb)

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**AIRCRAFT SYSTEMS**

Empty Weight……..……..416kg (920lb)
(unusable fuel, undrainable oil)
Empty CG position…….417.5mm

CG datum…….……..Leading edge of rib 3, 39.76ins from the aircraft centre line.

CG Limits - Forward……..……225.02mm
- Rear…….……..420.17mm

Max load in baggage compartment…….20kg (44lb)
(structural consideration)

**Utility category**

Nil baggage permitted

Max take off weight……...621kg (1370lb)

## 5 Load Schedule

It is possible to exceed the CG limits if the aircraft is improperly loaded. To safeguard against this each aircraft is placarded in accordance with the C of A.

# Handling

## 1 Pre-Flight Inspection

First ensure aircraft is in a suitable position for starting, ie, clear of other aircraft, open hangars etc. Master switch OFF, ignition switch OFF, fuel is ON (for draining).

Start at the port wing root and work clockwise around the aircraft, check as follows:-

**Port Mainplane**

Upper surface……Condition

Flap……Condition – upper and lower surfaces. Visible hinges and linkages for security

Aileron……...As for flaps. Full and free movement

Pitot/Static head…….Remove cover – security

Leading edge and lower surfaces……...Condition – all inspection panels secure.

**Port Undercarriage**

Wheel Fairing……Condition and secure.

Leg……Condition – extension (approx 120mm)

Torque Link……..secure

Brake Unit…….Secure – no leaks

Tyre……...No cuts or creep, pressure correct, valve free.

**Engine and Front Fuselage**

Fuel Tank…….Remove filler cap – check contents, secure cap, vent free.

Fuel Tank Drain…….. fuel free from contamination by draining

**Pilot's Operating Handbook VH-SJH Chapter 5**

## Handling

Fuel Filter…….fuel free from contamination by draining, Fuel Tape must be On.

Cowls……....All cowls secure

Propeller……Undamaged and secure

Spinner……..Condition and secure

Oil leaks……Visual indications

Oil……..Check contents and secure cap

**Starboard Undercarriage**

As for port undercarriage

**Starboard Mainplane**

As for port mainplane, omitting the pitot/static head

**Starboard Fuselage**

Main area of fuselage ……..Condition

**Tail Empennage**

Fin and Tailplane…….Condition

Elevators and Tabs…….….Condition of surfaces, hinges and linkage. Full and free movement.
Rudder ……Condition – hinges and linkages. Full and free movement.
Tail wheel……....Secure – tail wheel spring condition. Springs secure, tyre for cuts.

**Port Fuselage**

Main areas of fuselage…….……...Condition

**Cockpit – (from outside)**
Perspex panels…….Secure and clean



## Handling

Canopy……..…Slides freely - locking securely

Safety Harness…….From outside for condition and security

Baggage area…….Contents for weight and security

Loose articles……..…..nil

**2 Cockpit Check Before Starting**

Fasten and adjust harness, then check :-

Flaps……...UP

Canopy……Closed and latched.

Master switch…….ON

Fuel Pump …….ON

Instrument Switch……..ON

Generator……ON

Fuel Selector……..ON

Fuel Gauge……Check Contents

Mixture……..Full rich

Carburettor air temp …….cold

Radio…….OFF

Ignition Switch……..ON (both)

**Starting Cold Engine**

Hold Brakes on, hold control column back.

**Pilot's Operating Handbook VH-SJH Chapter 5**

## Handling

Prime engine by opening the throttle twice, close throttle, call CLEAR and pull "T" handle.

NOTE:- The starter should not be used continuously for periods longer than 30 seconds, allowing short intervals between each attempt to avoid running down the battery and overheating the starter motor.

**WARNING:- If the oil pressure does not rise after 30 seconds the engine should be closed down and the cause investigated.**

**Hot start**

Do not prime, engage starter with the throttle closed, when engine starts advance throttle and check oil pressure.

**4 After Starting**

**Warming up**
The engine should not be operated at more than 800 r.p.m for the first 60 seconds after starting to allow proper oil circulation.

Adjust the engine speed to approx 1000 r.p.m. after this period will aid the warming up process. After two to three minutes running at 800 – 1000 r.p.m the engine speed may be increased to 1500 r.p.m., if desired for taxiing.

Carburettor heat is not recommended unless icing conditions exist

**Cockpit Check before Taxiing**

Circuit Breakers……Not tripped

Ignition Switch …….On both

Radio…….ON

Oil Pressure……..30 – 40 p.s.i

Oil Temperature……rising



Cylinder Head Temperature …….rising

Flight instruments……..Serviceability Altimeter setting.

Flaps……..……Up

**5 Taxiing – use of brakes**

The type of undercarriage employed together with the low wing, rear C.G. position and differential brakes allow easy manoeuvring on the ground even in high wind conditions. Thr aircraft has been demonstrated as safe to taxi in winds up to 25 knots.

There is no tendency for the aircraft to tip onto its nose if the brakes are used harshly. As always however, care should be taken to avoid harsh use of the brakes.

Make radio call

**6 Before Take off**

**T**……..Trim free and in the neutral position

**M**…… Mixture rich
Master On
Magneto Both
**F**……..Fuel on
Fuel pump on
**I**……...Instruments – Fuel gauge
- Oil pressure 30 – 40 p.s.i.
- Oil temperature 21ºc (75ºf)
- Cyl head temperature 150ºc minimum
- Ampers charging

**H**…….Harnesses and canopy secure

**Engine Run up**

Hold control column fully back open throttle to at least 1700 r.p.m. Test each magneto in turn – maximum drop 75 r.p.m.
Check that there is no excessive vibration and that the generator is charging
Select full carburettor heat and check for operation.
Close throttle fully and check idle, Approx 500r.p.m.



Controls full proper and free
Flaps 20º
Make Radio Call

**7 Take off**

**Normal take off**

Flaps 20º for best performance.

Carburettor air COLD – fully in.

When lined up remove feet from the brakes then advance the throttle slowly to the full open position.

A slight tendency to swing to port can be held easily with the rudder.

The aircraft should be flown off at approx 40 knots IAS, Before climbing increase speed to 46 knots IAS (20º Flap) or 50 knots with no flap.

After retracting the flap at a safe height a speed of 55 knots IAS and full throttle will satisfy normal climb requirements.

**Short take off**

Minimum ground run and best obstacle clearance is obtained using the 20º flap setting and a climb speed of 46 knots IAS.

Apply full throttle while holding the aircraft on the brakes.

Release the brakes when the aircraft starts to move forward or when at full throttle and accelerate to the minimum possible unstick speed maintaining a slightly lower than normal tail low attitude.

Allow the aircraft to accelerate to 46 knots IAS, then climb steadily at this speed until clear of all obstacles.

When clear, increase speed to 50 knots IAS, raise the flaps, increase speed to 55 knots IAS and continue the climb, using full throttle.

**Cross-Wind Take-Off**

Flaps retracted.



## Handling

Apply full throttle using sufficient aileron into wind to keep the wings level.

Hold the aircraft on the ground until speed is about 5 knots above the normal unstick speed, then effect a clean, quick take-off with a positive backwards movement of the control column.

Climb at full throttle increasing airspeed as for a normal take-off at the same time laying off the effect of drift by turning slightly into wind as required.

NOTE. All airspeed quoted apply to a maximum AUW of 658kgs (1450lbs), therefore, slightly better performance at lower weights can be obtained by reducing the speeds quoted but this practice is not recommended for normal operations.

**8 Climbing**

Maximum rate and angle of climb at 658kgs (1450lbs) maximum AUW and full throttle is obtainable at the following speeds:-

Flaps 20º - 46 knots IAS
Flaps up - 50 knots IAS

For all other requirements the recommended climbing speed is 55 knots IAS (flaps up). The engine manufacturers recommend full throttle for all climbs but power may be reduced if desired for "cruising" climbs.

Full rich mixture should be used unless leaning is necessary to eliminate rough running due to over-rich mixture at altitude or use of carburettor heat, (refer to 11 and 12, this Chapter).

**9 General Flying**

**Flying Controls**

Flying the "Emeraude" is a pleasant experience. Stick forces are exceptionally light, the controls are well harmonised and effective throughout the speed range.

Little, if any rudder is required to assist turning. In calm conditions the aircraft may be flown feet off for long periods.



## Handling

The maximum rate of roll is approximately 80º per second.

**Change of Trim**

There is no change of trim when the flaps are operated due to the action of the automatic trim tab on the starboard elevator operated from the flap cables.

Changes of power and speed produce slight changes in directional trim.

**Stability**

The aircraft is dynamically stable about all axes.

Ample trim control is available for all conditions of flight and the aircraft holds the trimmed speed well.

**10 Cruising**

The maximum recommended engine speeds for cruising are 2500 rpm at sea level, 2650 rpm at 5000 feet and 2750 rpm at 10,000 feet. These figures will produce approximately 70% power at the given altitudes.

Up to 5000 feet this power will produce an IAS of approximately 100 knots, giving a true airspeed of nearly 105 knots. For actual figures on range and endurance, fuel consumption etc, refer to Chapter 6, Cruise Performance Table.

**11 Mixture Control**

When operating at altitudes of more than 5000 feet above mean sea level or at any altitude where best power is required, adjustment of the mixture strength is necessary.

This is done by pulling the knob out toward the "LEAN" position until maximum RPM is obtained while holding the airspeed steady and with fixed throttle, then returning the control toward "FULL RICH" until RPM drops just perceptibly. This procedure produces best power with the mixture slightly on the rich side to prevent overheating.

Re-adjust the fuel-air mixture for each change in throttle setting, altitude or carburettor heat.





**12 Carburettor Icing**

Carburettor icing on the ground has been dealt with earlier in this Chapter. Carburettor heat should be used in flight at the first indications (engine roughness, or loss of rpm) that ice may be forming.

To remove carburettor ice first apply full heat, then by trial and error determine the minimum heat required to prevent any further accretion, using full heat to remove any build-up of ice during the process.

With full carburettor heat rough engine operation and loss of power will result. In addition to this the engine will run rough due to an over-rich mixture.

In such cases the mixture should be leaned in accordance with Paragraph 11 except that it must be remembered that too lean a mixture will cause overheating and detonation. The mixture must not be leaned unless an increase in engine rpm results.

**13 Vapour Lock**

When operating in very hot weather there is a possibility of vapour forming in the fuel suction lines.

Idling on the ground, in such circumstances should be reduced to the minimum and rpm maintained at a higher than normal figure.

Descending to lower altitude may restore any power loss due to vapour formation at high altitudes, normally above 10,000 feet.

**14 Pre-Stalling and Pre-Aerobatic Check**

**Preliminaries – Check:-**

Height……Sufficient to recover by 3000 feet above terrain
Airframe……Flaps and trim

Security……..Canopy, harnesses and loose articles

Engine……Normal engine operation. Fuel contents, fuel pump and mixture rich





Location…….Not in controlled airspace. Not over a built up are. Within gliding distance of a forced landing field.

Lookout……..Make an inspection turn of 360º

**15 Stalling**

Before practice stalling complete check, refer to Paragraph 14.

At 658kgs (1450lbs – Utility Category) maximum AUW approximate stalling speeds are:-

Power off – Flaps retracted ……..40 knots IAS
Flaps down 20º……..39 knots IAS
Flaps down 35º……...…...38 knots IAS

Power on under typical approach conditions….33 knots IAS

Stalling characteristics may be described as positive but gentle. In all cases except the high speed stall there is little or no stall warning.

At the stall the nose drops gently and may be accompanied by a slight wing drop.

Recovery is immediate if the slight nose down pitching moment is assisted by a relaxation of stick force while the height lost will seldom be greater than 100 feet.

The ailerons are effective at and beyond the critical angle of attack but use of aileron to correct a wing drop should always be accompanied by use of rudder.

Slight buffeting is felt about 3-5 knots before the actual stall if the aircraft is subjected to aerodynamic loading as in a high speed stall during a steep turn, accompanied by an increased tendency for a wing to drop. Recovery is conventional and normal in all respects and characterised by the relatively slight loss of height, as in the former case.

Stalling speeds are decreased about 2-3 knots at reduced AUW, eg, with only one person in the aircraft.



**16 Spinning**

Before practice or intentional spinning complete pre-aerobatic checks as in Paragraph 14.

Entry in the spin is accomplished in the normal manner. To the left there is little or no delay prior to the spin proper. To the right the aircraft has a definite tendency to spiral and in some cases will not enter the spin proper unless opposite aileron is applied. This is not recommended as part of the normal technique for recovery takes slightly longer.

In the true spin the rate of rotation is fairly rapid and the nose attitude steeper than 45º. There is no alteration or sudden change in pitch, roll or yaw, while noise level is low except in the spiral which is characterised by moderate fluctuations in pitch and rate of rotation, increasing airspeed and rattle, mainly from the canopy.

Rate of descent is high, in the order of 4000 feet per minute and there is a tendency for the propeller to stop in a true spin exceeding 3-4 turns.

Recovery from the spin is conventional in all cases where the centre of gravity is within the allowable range. The technique is the same as for most other types of spinnable light aircraft which is:-

FULL opposite rudder
PAUSE (count – one, two, three), then ease the control column slightly and steadily forward until the spin stops.
Complete the recovery by easing the aircraft out of the ensuing dive.

The action outlined above will effect recovery within 3 turns, in most cases in less than this. When rotation ceases the control column will be at the neutral or central position. A slight increase in rotational speed and a nose-down pitch movement as the control column is moved forward is normal and indicates that recovery is imminent. All control forces are light.

The "Emeraudes" have been demonstrated to recover from sustained spins with application of full opposite rudder and the control column fully back, thus providing a measure of safety not encountered in some aircraft.

NOTE: 1 To ensure recovery by 3000 feet AGL it is recommended that intentional spins be entered at not less than 5000 feet AGL and in the number of spin or spiral be limited to 4.

NOTE: 2 Should the propeller stop during a spin proceed in accordance with procedures for re-starting the engine in flight, Chapter 7 "Emergencies".

**17 Aerobatics**

Aerobatics are an outstanding feature of the "Emeraude". All normal manoeuvres are permitted as listed on the Aircraft C of A. There is no aerobatic weight restriction.

The following speeds are recommended:-

Inside loop……..120 knots IAS
Slow roll……..…..100 knots IAS
Barrel roll……..….100 knots IAS
Stall turn……...95 knots IAS
Half roll off the loop……..…130 knots IAS
Spins……..…slow deceleration.

When executing manoeuvres in the looping plane do not subject the aircraft to high (G) loads, (elevator stick force is approximately 10 lbs per "G")

Throttle back to avoid exceeding rpm limitations

**18 Descending**

To descend, height may be lost by the conventional power on descent at cruising speed, or for en route let-down by gliding with the throttle closed.

Before descending check mixture is fully RICH unless carburettor heat is required in which case adjust accordingly.

Optimum gliding speed, power off at 658 kg max AUW are:-

Clean ……50 knots
Flaps 20º or 35º …45 knots



# Handling

**19 Pre-Landing Check**

When down wind check:-

B……..….Brakes
M……..Mixture

F……...Fuel Pump ON
Fuel selector

I……Fuel contents
Generator charge
Oil pressure

S……Master
Magneto

H……..Harnesses
Hatches

C……...Carburettor heat (as required)

**20 Approach and Landing**

**Glide Approach**

Reduce speed to 70 knots and lower flap as required. Recommended speed 50 knots IAS flaps up, 45 knots IAS flaps down.

With the throttle closed height is lost quite rapidly.

Ample vision and a good angle of descent is obtained with flaps at 20º.

Full flap may be used if it is desired to steepen the descent still further with no significant alteration of the landing feel, which is conventional in all cases.

**Powered Approach**

Reduce Speed to 70 knots IAS and lower flap as before. With power on maintain 45 knots IAS (35º of flap) and regulate rate of descent with the throttle as required.

## Handling

**Short Landing**

Commence by using the powered approach techniques and full flap.

On short final reduce airspeed to 40 knots IAS adjusting rate of descent with the throttle. Keep power on throughout, flaps at 35º.

Both the round out and the hold off period are reduced to the minimum using this technique. Take care that power is not reduced too early. Arrest any tendency for the aircraft to land heavily with ample use of throttle in the conventional way.

**Cross Wind Landing**

Powered approach technique should be used for all cross wind landings.

Use 20º of flap under average conditions, no flap if the crosswind component is high.

Counteract drift during the approach by yawing the nose sufficiently into the wind and/or holding the into wind wing slightly down with aileron.

Land as for any other tail wheel aircraft.

Once on the ground the low wing, low centre of gravity simplified control but due to the tail wheel undercarriage and the comparatively large keel surface aft the main wheels there is a tendency to weathercock when landing in strong cross winds. Use of differential brake will help prevent this.

**Flapless Landing**

Little difference exists between the flapped and un-flapped landing, apart from the slightly flatter angle of descent in the latter case.

Recommended speed is 50 knots IAS.

**21 Going Around Again**

At full throttle and maximum AUW the aircraft will climb away easily with the flaps full down.

Pilot's Operating Handbook VH-SJH Chapter 5

Handling

To go round following a baulked landing, etc, open the throttle fully and climb at 42 knots IAS flaps fully down, 46 knots IAS if flaps set to 20º, 50 knots IAS flaps up.

At a safe height raise any flap and stabilise the climb at 55 knots IAS.

There is no appreciable sink and the action of the automatic tab compensates for changes of trim when the flaps are raised.

**22 After Landing**

When the aircraft has stopped check -

Carburettor heat…….cold
Trim ……..neutral
Flaps……..up
Fuel pump…….off

Normal taxiing should cool the engine sufficiently. Should excessive taxiing be necessary, allow engine to cool by idling at 800 rpm for at least two minutes before stopping.

**23 Stopping the Engine**

Radio……off
Magnetos……..test for dead cut
Throttle…….close
Mixture…….full lean
All other switches…….off

# Performance

## 1 Take Off

Take off distances quoted are those required to reach a height of 50 feet. The following conditions apply to both cases:-

Standard sea level conditions
Short, dry grass surface
Nil wind
Continental engine 200A
Propeller – G Adams, wood blade, design No. A53/D
Full throttle and use of the relevant take off safety speeds as shown.

At 1450 lbs 51 knots IAS……..……..1700 feet
At 1071 lbs 40 knots IAS…….771 feet

## 2 Landing

The landing distances, in all cases, is less than for take off.

NOTE The aircraft has been classified by DCA to Category 3 (see AIP Section AGA 4 and the LAH, Section GEN) which specifies a minimum strip length at sea level of 2000 feet plus 200 feet increase for every 1000 feet the landing area is above sea level.

## 3 Climb

Maximum rate of climb at sea level……...750 rpm
Maximum gradient of climb at sea level…….13%

## 4 Cruise Performance Table

**Cruise Performance Table**

| Alt | Mixture | RPM | % BHP | IAS | LPH | Endurance | Still Air |
|---|---|---|---|---|---|---|---|
| 2,500 | Leaned for best power | 2475 | 64 | 103 | 18 | 4.5 | 464 |
| | | 2200 | 47 | 100 | 17.3 | 4.8 | 480 |
| 5,000 | | 2650 | 67 | 105 | 18 | 4.5 | 472 |
| | | 2200 | 45 | 102 | 16.8 | 4.9 | 500 |
| 10,000 | | 2740 | 68 | 112 | 18.6 | 4.4 | 493 |
| | | 2200 | 43 | 104 | 16.4 | 5.0 | 520 |



# Performance

NOTE 1 Endurance is decreased at throttle settings below 2200 rpm

NOTE 2 Use of carburettor heat increases fuel consumption by approximately 5% The effect on IAS is negligible.

# Emergencies

## 1 Engine Failure after Take off

Aim to land straight ahead.

Maintain best gliding speed, 50 knots IAS (flaps up), 45 knots (flaps down).

Select best area for landing.

If time permits conduct a quick trouble check:-

Mag Switches ……BOTH
Fuel ……FULL ON
Mixture……...FULLY RICH

Before landing ensure:-

Ignition……..OFF
Fuel……OFF
Master switch……OFF

Avoid high obstacles. Use flaps to best advantage.

### Forced Landing

Should engine failure or serious mal-function occur other than immediately after take-off proceed as follows:-

Close the throttle, trim aircraft to glide at 50 knots IAS flaps up.

Select landing area and plan descent.

Conduct trouble check:-

F……Fuel quantity
Fuel selection
Fuel Pump ON
M…….. Mixture RICH
O……Oil pressure
S…….Switches Magnetos on BOTH
T……Throttle Linkages



# Performance

Assuming the failure cannot be rectified pass the appropriate Radio distress message and check:-

Canopy……..Closed
Harnesses……...Tight
Throttle……..Closed
Fuel……Off
Ignition……..Off
Master Switch……Off

Warn passenger, use flap to best advantage and aim for a normal three point landing.

## 3 Action in the event of Fire

### Engine fire in Flight

Immediately fire is detected close the engine down:-

Throttle…….Closed
Fuel……...Off
Ignition…….Off
Master Switch…...Off

Select the best landing area and make a forced landing without delay

| |
|---|
| Note: 1 Circumstances may not permit sufficient time to pass a distress message. It is vital that the engine be stoped and all sources of electrical power turned off immediately. |

| |
|---|
| Note: 2 Should the fire be extinguished proceed with the forced landing. Under no circumstances attempt to restart the engine. |

### On The Ground

In all cases proceed as follows:-

Throttle……Closed

Magnetos……Off
Fuel…….Off
Master Switch…….Off



## Performance

**Warning: If fuel is burning on the ground move aircraft away immediately**

**Re-starting the Engine in Flight**

Should the engine stop in flight due to faulty technique in the performance of aerobatics or spins it may be re-started by means of the electric self starter or by diving if sufficient height is available.

**Use of Electric starter**

Trim aircraft to glide at 50 knots IAS.

Check as follows:-

Master switch …….On
Fuel …….On
Mixture……Full Rich
Carburettor Air……Cold
Throttle……Closed

Operate starter control. If engine will not respond abandon the attempt and commence a forced landing in plenty of time to ensure its successful completion.

**Dive Start**

Height at least 3000 ft AGL

Establish the glide – trim and conduct cockpit check as above, but open the throttle half way.

Check all clear then dive steeply until engine starts, throttle right back immediately and ease the aircraft out of the dive.

Note: If the engine has not started before Vne = 135 knots IAS abandon the attempt and carry out forced landing.

**Pilot's Operating Handbook VH-SJH Chapter 7**

## Performance

### Weight Problems Normal Category

Aircraft weight……418kg……..919lb…….

Fuel (81 litres)……..….59kg……..128lb..……..

Oil…….…..5kg…….11lb…..……..

Pilot……..70kg…..…..154lb……

Passenger……..…70kg……154lb……..

Baggage (max 20kg)……20kg……..44lb……..

Max weight..(658kg-1450lb)…. **642kg……1410lb…**……

### Weight Problems Utility Category (Aerobatic)

Aircraft weight…….418kg (919lb) ..…….

Fuel (litres x 0.8kg/lt)….. ……kg ……

Oil…….….5kg(11lb) ..…….

Pilot……. …… kg ……..

Passenger…… ….….kg ……..

Baggage ……**Nil**

**Total……..kg** ( lb) **……**

Must no exceed 621kg (1370lb)…….……

## AMENDMENT RECORD SHEET

| Amendment Number | Paragraph(s) Affected | Signature | Date of Incorporation |
|---|---|---|---|
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