De Havilland

DHC 1   Chipmunk

ZK-SAX

Pilot's Notes

Third Edition - September 2017

Derived from various material by

Waypoints Aviation Ltd

De Havilland

DHC 1 - Chipmunk

ZK-SAX

Pilot's Notes

Third Edition – September 2017

Mark Woodhouse

19 Valhalla Drive
Richmond, Nelson 7020
New Zealand
03 5440968
021 620267
waypoints@clear.net.nz
www.waypoints.co.nz

Contents

Ch 5 Aircraft Handling

Ch 7 Safety and Emergency Checklists

Ch 8 Safety and Emergency Expanded Procedures

Ch 9 System Descriptions

Ch 10 Performance

Ch 11 Weight and Balance

Ch 12 Ground Handling

Ch 13 ZK-SAX Syndicate Rules & SOPs

Introduction

While these Pilots Notes have generally been prepared for the De Havilland DHC 1 Chipmunk, because of the age of these aircraft and the range of type and systems variations developed over the years, these Pilots Notes have been prepared with a focus on one particular aircraft, that being the De Havilland DHC 1 Chipmunk Mk. 22, registration ZK-SAX.

These notes have been compiled to give pilots an operational knowledge of the Chipmunk, together with airframe and engine data and notes on the handling of the aircraft. They should be read in conjunction with the approved Flight Manual for each particular aircraft flown. Should the information given in these Pilots Notes conflict with that in the applicable Flight Manual, the latter should be taken as the overriding authority.

Should you or anyone you know wish to offer constructive comment on the content of these notes they would be highly valued. Please contact Mark Woodhouse at waypoints@clear.co.nz.

Should you or anyone you know wish to obtain an electronic copy of these notes, they are freely available by contacting Mark Woodhouse at waypoints@clear.co.nz.

Disclaimer

This publication is intended to be a learning tool for pilots converting onto and operating the De Havilland DHC 1 Chipmunk.

These notes were derived and compiled from a wide range of sources, and while the quality and accuracy of these sources appears to be reliable, there is every possibility that errors exist in this document.

Consequently, Waypoints Aviation Ltd does not guarantee that this publication is without flaw of any kind, and make no warranties, express or implied, with respect to any of the material contained herein.

Waypoints Aviation Ltd also disclaims all liability and responsibility to any person or entity with respect to errors and omissions, or loss or damage caused or alleged to be caused directly or indirectly by the use of information contained within this publication.

Waypoints AVIATION

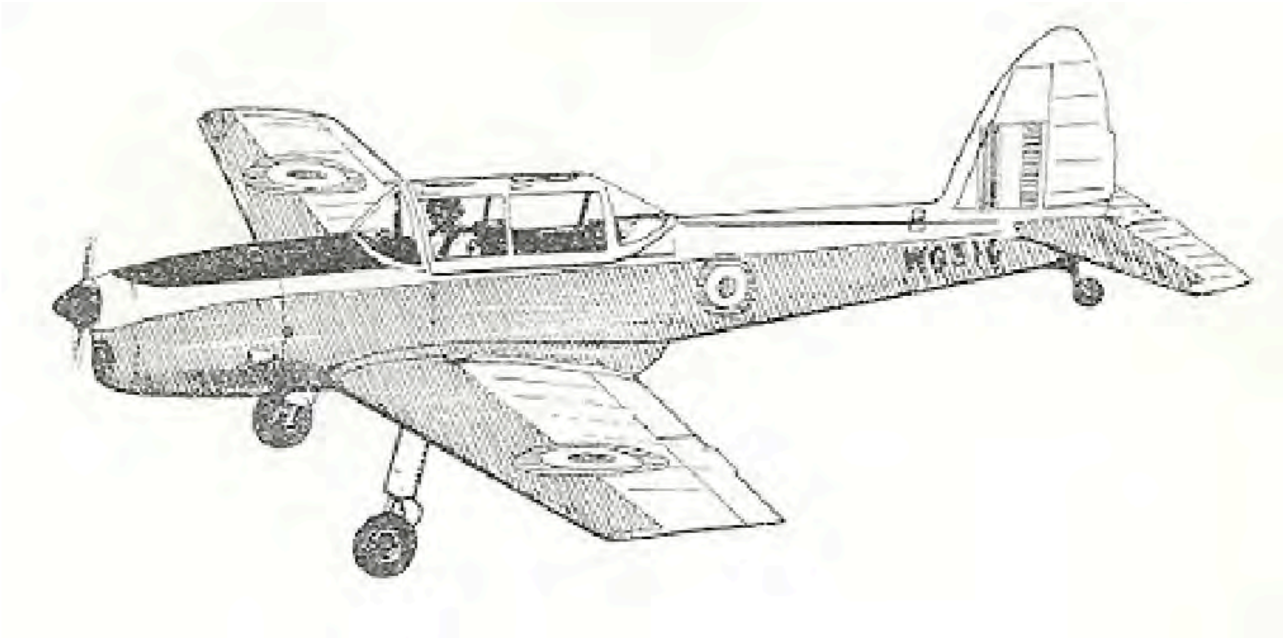
Chapter One

General

Introduction

The De Havilland DHC 1 Chipmunk is a two seater, low wing, cantilever monoplane. ZK-SAX is a Mk. 22 Chipmunk powered by a Gipsy Major Mk. 8, four cylinder, in-line inverted, air cooled engine. Virtually the same engine is used to power the Chipmunk Mks. 20, 22 and 22A. In all cases the engine drives a two bladed, fixed pitch, metal propeller.

Chipmunk variants are similar in most respects. The main difference being the fuel tank capacity. The Mk.20 and 22 have a capacity of 18 Imperial gallons, and the Mk. 22A has a capacity of 24 Imperial gallons. All variants were fitted with complete dual controls.



History of Chipmunks

The DHC-1 Chipmunk was designed as the successor to the classic DH82 Tiger Moth. The design was assigned to De Havilland's Canadian subsidiary as Hatfield was fully occupied with the Comet and other post-war aircraft.

The prototype first flew in 1946 and after evaluation by the RAF production was initiated in both Canada and England. Eventually nearly 1300 were built, about 1100 in England, and about 200 in Canada, with about 60 being built under licence in Portugal.

The Royal Airforce (RAF) was the largest user of the Chipmunk, with 735 in service, however the type never become the standard RAF primary trainer, rather they were flown by University Air Squadrons and Volunteer Reserve flying schools.

Large numbers were released onto the surplus civil aviation market at the end of the 1950's, many of which were subsequently considerably modified, including horizontally opposed engines, single seat versions, etc.

The History of ZK-SAX

ZK-SAX is a DHC-1 Chipmunk Mk 22, manufactured by De Havilland Canada. Its serial number is C1-0566, and its Military number was WK551.

ZK-SAX was first registered in New Zealand, in December 2000, to the Chipleigh Trust in Palmerston North.

In December 2010 ZK-SAX was purchased by a newly formed Warbirds syndicate, to operate from the Ardmore Base. The Chipmunk's role is of an entry level, tailwheel, aerobatic Warbird which was a welcome addition to the fleet.

The cover photo of ZK-SAX was taken by Colin Hunter, on the 7th of April 2007, at Omaka, New Zealand. Colin Hunter has been around taking aviation photos for a little longer than most instructors these days!

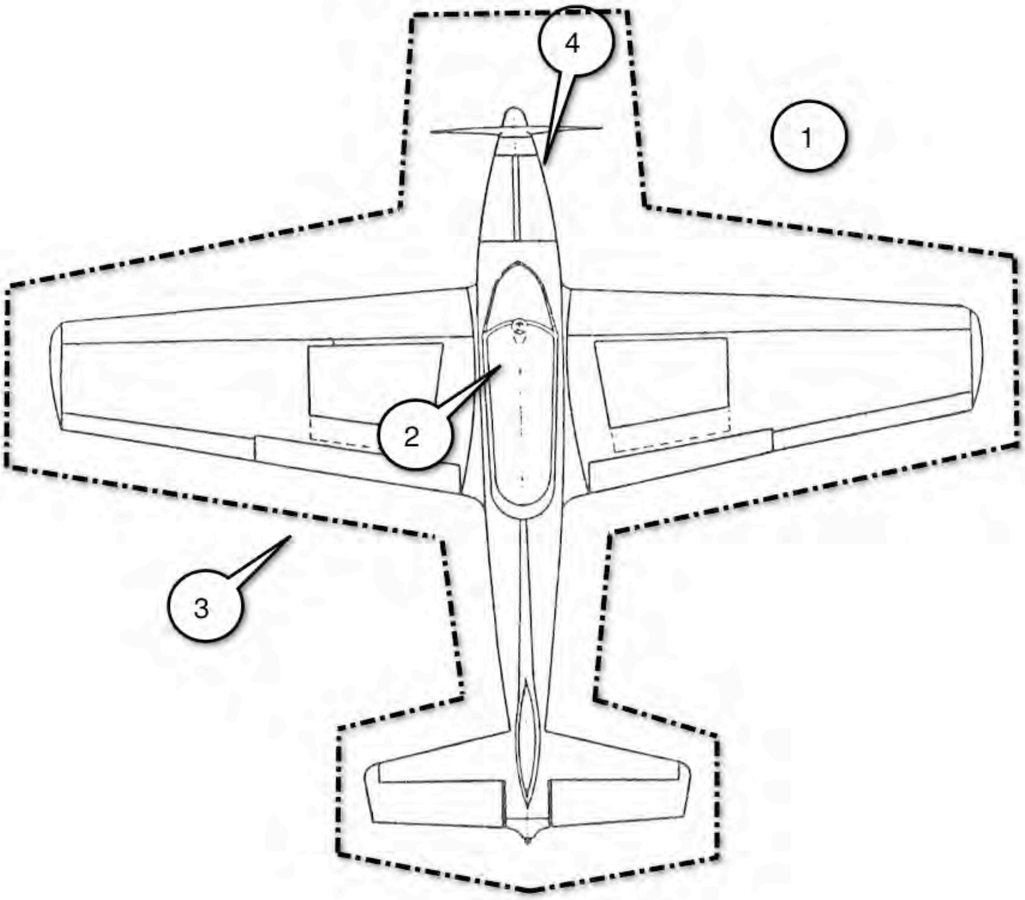
For a vast selection of some of his finest, you can start by checking out Airliners.net to see just what Colin can offer. Call Colin on 021 566115 or by email at hunterrck.xtra.co.nz.

Aircraft Callsign

"Chipmunk 51" is our accepted callsign. Initially it was planned to return the registration ZK-SAX to Dr Ralph Saxe, the previous owner, however with his unfortunate and untimely passing the registration ZK-SAX has been retained in his honour.

Chapter Two

Preflight Inspections



1. Approaching the Aircraft

As the pilot approaches the aircraft, check:

- ✈ The general appearance and suitability of the position of the aircraft;
- ✈ The condition of the tyre inflation; and,
- ✈ Whether or not the wheels are chocked.

Position the aircraft in a appropriate position for starting and taxiing, preferably with the nose into wind and on a suitable surface where the propeller area is clear of stones and gravel.

Remove the:

- ✈ Pitot cover;
- ✈ Cockpit canopy cover; and/or,
- ✈ External control locks.

With the electric starter fitted and serviceable there is no requirement to use wheel chocks. If the aircraft is to be started by hand swinging the propeller, then CHOCK THE WHEELS.

2. Cockpit Preflight Preparation

Open and secure the cockpit canopy. Check the condition and operation of the canopy.

Stow the:

- ✈ Pitot cover;
- ✈ Cockpit canopy cover; and,
- ✈ External and internal control locks.

Stow:

- ✈ Personal baggage, etc;
- ✈ Headsets;
- ✈ Maps and flight documents;
- ✈ Parachutes, if carried; and,
- ✈ Survival equipment.

Verify that the:

- ✈ Ground/Flight switch is selected to GROUND;
- ✈ Fuel is ON & Gated;
- ✈ Brakes are off (brakes off is required to check the rudder); and,
- ✈ Ignition switches in the front cockpit are both OFF.

Check that the:

- ✈ Flight controls are free;
- ✈ Windscreen is clean; and,
- ✈ Canopy side (escape) panels are secure.

Prepare the rear cockpit, as required:

- ✈ Ensure the ignition switches are both ON (up) and gated;
- ✈ Ensure the mute switch is guarded in the OFF position;
- ✈ Cage the DI; and,
- ✈ If solo, secure the harness straps and any other loose objects.

For solo flight, returning to the departure airfield, it is recommended that you remove EVERYTHING from the rear cockpit seat before securing the harness, regardless of whether you are doing aerobatics or not. This includes:

- ✈ All seat cushions;
- ✈ The wooden seat pad; and,
- ✈ Any other loose objects.

For solo flight, move the canopy to the half forward position before entering the aircraft.

Deploy the flaps to max (30 degrees) checking for symmetrical deployment. Return the flaps to the fully up position.

3. Preflight Walk Around

Perform a normal preflight walk around of the aircraft. During the walk around, pay particular attention to the:

- ✈ Aircraft surfaces for damage, i.e., popped rivets, dents, and any distortions;
- ✈ Ailerons, elevators and rudder control surfaces. Check for free and easy of movement. Check the hinges, security of bolts, nuts and locking mechanisms;
- ✈ Fabric covering of all control surfaces for holes, rips, tears, peeling, etc, especially the underside of the flaps;
- ✈ Propeller. Check the security and mounting of the propeller. Examine the blades for damage;
- ✈ Tires. Check for cuts, cracks, bald spots, etc;
- ✈ Tailwheel inflation;
- ✈ Undercarriage oleo legs. Check for leaks, excessive compression, etc. Check the hydraulic wheel brake hoses/connections for leaks, signs of scuffing etc;
- ✈ Wheel chocks. In place if required;
- ✈ Fuel tank capacities. Complete a water drain test on each of the fuel tanks to remove excess water;
- ✈ Tightness and security of the fuel tank caps;
- ✈ Pin holes on outboard sides of fuel vent stems. Check they are not clogged;
- ✈ Fuel vent on the underside of the fuselage between the flaps. Check it is not obstructed;
- ✈ Clearance between elevator and rudder with full deflection of both;
- ✈ External panels. Check that they are all locked and secure;
- ✈ Drain holes. Check that all are clear and there are no obvious leaks.

NOTE

Since full tanks allow only 90 mins flying until reaching a 45 minute reserve, and since ZK-SAX does not yet have a dipstick, it is a good policy to refuel to full before and after every flight.

Gross and aerobatic weight limits should not be an issue.

4. Engine Inspection

Recheck that the:

- ✈ Master switch is OFF (“Ground”); and,
- ✈ Front ignition switches are OFF.

> **WARNING**
>
> Never allow yourself or anyone else to stand or put any part of the body within the arc of the propeller, since a loose or broken wire, or a component malfunction, could cause the propeller to be live and to suddenly rotate.

Open and latch both the port and starboard engine cowlings. In the engine compartment:

- ✈ Check for excessive oil or other fluid deposits;
- ✈ Check for excessive oil leakage from cylinder heads;
- ✈ Check for cracks in the inlet or exhaust manifolds;
- ✈ Check for loose wires and loose fittings;
- ✈ Check that the oil cooler intake (left side engine cowling) is unobstructed;
- ✈ Check for cracks and evidence of oil leaks from the engine oil cooler;
- ✈ Check that the oil quantity is between 1.5 Imp gallons and full. Replenish as necessary;
- ✈ Rotate the oil filter through 90 degrees; and,
- ✈ Check for missing inlet and exhaust pipe gaskets/manifold securing nuts (right side of engine).

Close and secure the starboard engine cowling.

<u>Priming</u>

Priming should be carried out prior to all starts, whether the engine is cold, hot or in between, with the exclusion perhaps of restarting within 5 minutes or so of shutdown. If it is a hot still day you might get away with longer, on a cold windy day the opposite is likely to be the case.

If in doubt it is recommended to prime the engine prior to a start attempt.

Leave the engine priming until just prior to getting into the aircraft, to avoid having to get out and do it again.

While holding out the carburettor float ring, operate the priming lever on the fuel pump until fuel flows from the overflow vent at the bottom of the engine. If, due to the position of the fuel pump operating cam, there is insufficient leverage on the priming lever, alter the cam position by rotating the propeller through 180 degrees.

Close and secure the port engine cowling. Recheck that all cowling fasteners are securely locked.

Check all air intake areas for foreign debris.

De Havilland DHC 1 Chipmunk
NORMAL CHECKLISTS

BEFORE ENGINE START CHECKS

Prime ....As required
Electrics ....Off
Ignition..................................Off
Throttle ....Fully closed
Elevator Trim ....Full and free movement; Set as required
Brakes ....Parked
Ground / Flight Switch ....Flight (unless using ground power)
GEN Fail Light......................On
Fuel Selector ....On & gated
Avionics ....Off
Flaps ....Up

ENGINE START CHECKS

Ignition..................................Both On
Throttle ....Set ¼ inch open
Propeller Area ....Clear
Start Master..........................On
Starter Button ....Press (20 seconds max)

AFTER ENGINE START CHECKS

Throttle ....1100 rpm
GEN Fail Light......................Out
Starter Light ....Out (otherwise shutdown immediately)
Start Master..........................Off
Oil Pressure ....Indicating within 30 seconds
Ignition..................................Checked
Avionics ....On; Set

Prepared by Waypoints Aviation

TAXI CHECKS

Chocks ....Removed
Brakes ....Release; Test; 3-4 clicks On
Flight Instruments ....Checked

ENGINE RUN UP CHECKS

Park......................................Into wind (if possible)
Area ....Clear
Brakes ....Parked
Oil Temperature ....> 15ºC
Oil Pressure ....30-60 psi
Throttle ....1600 rpm
Aircraft.................................Stationary
Carb Heat ....Checked
Ignition.................................Checked
Throttle ....Check idle;
Reset 1100 rpm

PRE-TAKE OFF CHECKS (D.V.A.'s)

T - Trim............................Set
T - Throttle Friction ....Set
M - Mixture........................Rich
C - Carb Heat...................Off
P - Pitch...........................Fixed
F - Fuel ....Selector On & Gated;
Contents sufficient
F - Flaps ....Set
I - Ignition........................Both On
I - Instruments ....Checked
H - Hatches; Harness .....Locked; Fastened
C - Controls......................Full, free and correct movement

LINE UP CHECKS

Transponder.........................On ALT
D.I. ....Aligned with the runway

AFTER TAKEOFF (CLIMB) CHECKS

Flaps ....Up at a safe speed and height
(min 60 kts and 200 feet AGL)
Brakes ....Off
Temps and Pressures ....Checked

PRE-LANDING CHECKS

B - Brakes ....Checked; Park brake Off
U - Undercarriage.............Fixed
M - Mixture ....Rich
P - Pitch ....Fixed
F - Fuel..............................Contents sufficient
H - Harness ....Secure

FINALS CHECKS

Landing Flap ....Set
Landing Clearance ....Received
Runway.................................Clear
Carb Heat ....Off

AFTER LANDING CHECKS

Flaps ....Up
Transponder.........................Off
Brakes ....Test; 3-4 clicks On (or as required)

SHUTDOWN CHECKS

Brakes ....Parked
Throttle ....900 rpm
Avionics ....Off
Ignition.................................Checked
Throttle ....Closed
Ignition.................................Off
Throttle ....Fully open as the engine runs down
Throttle ....Closed
Ground / Flight Switch ....Ground
Control Locks ....As required

HASELL CHECKS

H - Height ....Sufficient for recovery at a safe height
A - Airframe.......................Flaps as required; Brakes Off; DI caged
S - Security ....Harness tight; Hood closed;
No loose objects
E - Engine ....Mixture fully rich;
Carb heat as required;
Temps and pressures checked
L - Location ....Not over built up areas
L - Lookout ....Around, above and below

SADIE CHECKS

S - Suction ....Checked
C - Carbon Monoxide ....Checked
A - Amps ....Checked; Generator charging
D - D.I. ....Checked with compass
I - Icing ....Check carb heat
E - Engine ....Instruments and fuel checked

PROP SWINGING - ENGINE START CHECKS

Wheel Chocks .... Secure
Safely Pilot .... Secure

Cold Engine:

Prime .... As required
Ignition................................. Both Off
Throttle .... Closed
Control Column .... Full Back
Propeller .... Pull through 4 compressions
Throttle .... Set ¼ inch open
Ignition................................. Front (right) On
Propeller .... Swing to start

Hot Engine:

Throttle .... Set ¼ inch open
Ignition................................. Front (right) On
Propeller .... Swing to start

If no start after 4-6 swings, proceed as for a cold engine.

PROP SWINGING - AFTER ENGINE START CHECKS

Ignition................................. Both On
Throttle .... 1100 rpm
GEN Fail Light..................... Out
Oil Pressure .... Indicating within 30 seconds
Ignition................................. Checked
Avionics .... On; Set

SPEEDS and LIMITATIONS

V_X	Best Angle of Climb..................	55 kts IAS
V_Y	Best Rate of Climb	65 kts IAS
V_{NE}	Velocity Never Exceed	155 kts IAS
V_A	Max Manoeuvring......................	117 kts IAS (@ 2100 lb)
V_{SO}	Full Flap, Power Off	43 kts IAS
V_{S1}	Flaps Up....................................	47 kts IAS
V_{FE}	Half Flap....................................	93 kts IAS
V_{FE}	Full Flap	71 kts IAS
V_{REF}	Full Flap	50-60 kts IAS

Max Demonstrated Crosswind .... 10 kts

POWER SETTINGS and PERFORMANCE

Normal Climb .... Full power
70 kts IAS

Cruise .... 2100 rpm
90-110 kts IAS

Descent .... 2100 rpm
120 kts IAS

Glide.................................... approx. 1.7 nm/1000 ft
70 kts IAS

Fuel Consumption .... 7.4 Imp gal/hr @ MSL
(34 litre/hr)

Fuel Quantity........................ 17 Imp gal useable
(77 litres useable)

Waypoints
AVIATION

Chapter Four

De Havilland DHC 1 Chipmunk Expanded Normal Checklists

The following is an expansion of the De Havilland DHC 1 Chipmunk Normal Operations Checklists.

BEFORE ENGINE START CHECKS

Ideally, for engine start and run-up, or at any other time when the aircraft is stationary, the wind should be on the nose. In any case, to maximise engine cooling and reduce high abnormal loads on the propeller shaft and the engine mounts, the crosswind component should be less than 10 knots. The propeller area should be visually checked clear of personnel, obstructions and vehicles. The area ahead should be clear in case of brake failure. The intended taxi path should also be clear. The area behind the aircraft should be clear to avoid damage to equipment or other aircraft and inconvenience to other personnel.

With the electric starter fitted and serviceable there is no requirement to use chocks and there is normally no requirement to touch the propeller before start.

Prime .... As required

Priming should be carried out prior to all starts, whether the engine is cold, hot or in between, with the exclusion perhaps of restarting within 5 minutes or so of shutdown. If it is a hot still day you might get away with longer, on a cold windy day the opposite is likely to be the case. If in doubt it is recommended to prime the engine prior to a start attempt.

Leave the engine priming until just prior to getting into the aircraft, to avoid having to get out and do it again. While holding out the carburettor float ring, operate the priming lever on the fuel pump until fuel flows from the overflow vent at the bottom of the engine. If, due to the position of the fuel pump operating cam, there is insufficient leverage on the priming lever, alter the cam position by rotating the propeller through 180 degrees.

Electrics .... Off

Ignition.. Off

Throttle .... Fully closed

Elevator Trim .... Full and free movement; Set as required

Check the elevator trim for full and free movement both sides of the neutral position and leave the elevator trim set as required.

Brakes .... Parked

Check the brakes by applying pressure and checking for acceptable resistance when applied, to ensure there is fluid and effective seal in the circuit. Then set the park brake fully ON.

Ground / Flight Switch .... Flight (unless using ground power)

GEN Fail Light... On

Fuel Selector... On & gated

Avionics .... Off

Check that the VHF radio and transponder are switched OFF.

Flaps .... Up

ENGINE START CHECKS

Ignition..Both On

Both magnetos should be on for an electric start.

Throttle ....Set ¼ inch open

Set the throttle to ¼ inch forward of the fully closed position.

Propeller Area ....Clear

A call of "CLEAR THE PROP" and a final look outside the aircraft should be made to ensure that it is all clear around the aircraft just prior to starting the engine.

Start Master...On

Starter Button ....Press (20 seconds max)

Press the electric starter button until the engine fires. The electric starter should not be operated continuously for more than 20 seconds. At least one minute must be allowed between each successive start attempt.

Starting from a Ground Power Supply

If the aircraft is to be started using an electric starter in conjunction with an external electric power source, have the ground assistant plug in the ground power supply and select the Ground/Flight switch to GROUND. Proceed as for a normal electric start.

Once the engine is running smoothly after start, select the Ground/Flight switch to FLIGHT and have the ground assistant disconnect the external electric power source.

Over Priming

If, after several attempts, the engine fails to start, the cause is most probably due to over priming. To remedy this, switch both magnetos OFF, open the throttle wide and turn the propeller backwards through six (6) revolutions. The starting procedure should then be repeated, making the first attempt without further priming.

If the engine fails to start after three successive attempts, have the cause investigated by an engineer.

AFTER ENGINE START CHECKS

Throttle ....1100 rpm

After start open the throttle gently to about 1100 rpm - just sufficient to bring the generator on line and extinguish the GEN warning light.

GEN Fail Light...Out

Starter Light ....Out (otherwise shutdown immediately)

> **CAUTION**
>
> If the start light does not go out this indicates that the starter has remained engaged. In this case immediately shut down the engine by switching both ignition switches OFF.

Start Master.. Off

Oil Pressure .... Indicating within 30 seconds

As soon as the engine is running smoothly, the oil pressure should be checked. The oil pressure should rise and stabilise between 30 and 40 psi within 30 seconds of a successful start.

If the oil pressure does not rise within 30 seconds the engine should be shut down immediately (by turning the ignition OFF) to prevent engine damage.

In cold conditions the indicated oil pressure tend to rise rather slowly. In such conditions, provided that some oil pressure is indicated, it is permissible to warm the engine at 1100 rpm. However, a minimum of 30 psi is required before increasing the engine rpm above 1100 rpm.

CAUTION

Check the oil pressure immediately after starting the engine.

If no pressure rise is evident after 30 seconds, shut the engine down immediately and investigate the cause prior to any further start attempts.

Ignition... Checked

To check the ignition system select the **LEFT** magneto OFF for about one second then back ON, then select the **RIGHT** magneto OFF for about one second then back ON**.**

This is a 'dead cut' check to see if the ignition goes dead when the **LEFT** and **RIGHT** magnetos are selected OFF. When each magneto is turned OFF the engine should continue running, albeit at reduced rpm. This confirms that both magnetos are operating correctly.

If the engine dies when the **LEFT** or **RIGHT** magneto is selected OFF then the other magneto (and the aircraft) is unserviceable and this should be rectified immediately.

CAUTION

If the engine dies when either of the magnetos is selected OFF **DO NOT** reselect the magneto back on to try to keep the engine running, as this may lead to a serious backfire and engine damage. Rather, leave the magneto OFF, close the throttle and allow the engine to stop rotating.

Avionics .... On; Set

Erect the artificial horizon(s) and uncage and align the DI. Also test the intercom if the rear seat is occupied. Set the QNH on the altimeter Set standby on the transponder and check that the appropriate code is set.

TAXI CHECKS

Chocks .... Removed

With the electric starter fitted and serviceable there is no requirement to use chocks, however if the aircraft has been started by hand swinging the prop, chocks are required and should be removed prior to taxiing.

Brakes .... Release; Test; 5 clicks On

When in a clear area, apply the brakes sufficiently to feel their operation then continue. The brake test should be done gently, with even pressure on both brakes. If one brake is not working the aircraft will swing in the direction of the good brake. The brake test does not have to bring the aircraft to a complete stop.

Some other Pilot's Notes suggest that the brakes should be preset to about five (5) notches on a sealed surface or about two (2) notches on a grass surface, to enhance directional control during taxiing, especially in crosswind conditions. However this is not a universally accepted technique. Pilots should pre-apply brake if they feel it is appropriate.

Flight Instruments .... Checked

Check the operation of the artificial horizon, the direction indicator and the turn and slip indicator.

ENGINE RUN - UP CHECKS

Park.. Into wind (if possible)

Preferably park the aircraft within 20º of the wind if it is 15 knots or more. Ideally, for run-up or at any other time when the aircraft is stationary, the wind should be on the nose. To maximise engine cooling and reduce high abnormal loads on the propeller shaft and the engine mounts, the crosswind component should be less than 10 knots.

Area .... Clear

Check that the area behind the aircraft is clear. There should be no aircraft or personnel close behind, and the run-up should be carried out in a situation where the slipstream will not cause damage or blow small objects around.

Brakes .... Parked

Centralise the rudder and apply the brakes fully for the run-up. However, do not rely solely on the park brake, keep an awareness of the aircraft position during the high power run-up.

Oil Temperature .... > 15ºC

Oil Pressure .... 30-60 psi

Throttle .... 1600 rpm

Hold the control column fully back and ensure the aircraft does not move against the brakes as the rpm is increased.

Aircraft.. Stationary

Carb Heat .... Checked

Select the carb heat ON for 10 seconds. There should be a small but noticeable drop of between 20 and 50 rpm when this happens. The rpm should return to normal when the carb heat is selected OFF.

CAUTION
If no rpm drop is noted when the carb heat is applied during run-up, the carb heat control may not be working.

In this case, **do not takeoff.**
Investigate the cause prior to further flight.

WARNING
Do not use carb heat excessively on the ground as this allows unfiltered air (i.e. air with dust, pieces of grass seed, etc) to pass into the engine.

Ignition.. Checked

To check the ignition system select the **LEFT** magneto OFF for about two seconds then back ON, then select the **RIGHT** magneto OFF for about two seconds then back ON**.**

When the **LEFT** magneto is selected OFF note the rpm drop (from 1600), then select the **LEFT** magneto back ON again. The rpm should return to 1600 rpm. When the **RIGHT** magneto is selected OFF note the rpm drop (from 1600), then select the **RIGHT** magneto back ON again. The rpm should return to 1600 rpm.

Do not linger on only one magneto. Each magneto drop should be a maximum of 75 rpm, and the engine should continue to run smoothly on only one magneto.

On occasions it is possible to experience rough running when the ignition check is carried out. This may be due to plug fouling from an accumulation of oil or lead on the plug electrodes. If this problem is encountered the following procedure should be applied:

- Check that the area behind and adjacent to the aircraft is clear and the brakes are firmly applied. The park brake may not hold at full power - so you may need the rear seat occupant to hold the brakes on firmly. Obviously the control column must be held fully back throughout the run up.

- Run the engine at **full power** for 10-15 seconds then throttle back to 1600 rpm and carry out a further ignition check.

- If the problem persists the aircraft is unserviceable and must be returned to engineering for rectification.

- Under no circumstances is the mixture to be leaned to clear the plugs.

If the selection of a single magneto, either **LEFT** or **RIGHT**, causes the engine to stop, or if any other malfunctions are noted, the engine should be shutdown and the cause investigated prior to any further start attempts.

CAUTION
If the engine dies when either of the magnetos is selected OFF **DO NOT** reselect the magneto back on to try to keep the engine running, as this may lead to a serious backfire and engine damage. Rather, leave the magneto off, close the throttle and allow the engine to stop rotating.

Throttle ....Check idle
Reset 1100 rpm

Smoothly and completely close the throttle and check that the engine idles at between 600 and 800 rpm. Reset the throttle to 1100 rpm. 1100 rpm should always be set whenever the aircraft is stationary on the ground. If, for some reason, the engine has been run continuously below 1000 rpm for 5 minutes or more, it must be opened up to at least 1600 rpm for 10 seconds to clear the plugs.

> **WARNING**
>
> If during these power checks, the prescribed limits of rpm, oil pressure or temperature etc. are exceeded, the aircraft should not be flown.

PRE-TAKE OFF CHECKS (D.V.A.'s)
(Drills of Vital Action)

A complete set of Pre-Takeoff Checks should be carried out prior to the first takeoff of a day and if the After Landing Checks are begun, or the aircraft systems are significantly reorganised. However, following a "Stop and Go" or "Stop and Backtrack" an abbreviated Pre-Takeoff Check of 'Trims; Flaps; and Engine Temps and Pressures' is all that needs to be carried out.

T - Trim ....Set

Set the elevator trim at neutral when both the front and rear cockpits are occupied and set slightly back when only the front cockpit is occupied.

T - Throttle Friction...Set

The throttle friction should be firm, but not over tight.

M - Mixture ....Rich

Check that the mixture is set to FULL RICH (i.e. fully back).

C - Carb Heat ....Off

Select the carb heat ON for 15 seconds and then select it OFF.

P - Pitch ....Fixed

While virtually all Chipmunks are fitted with a fixed pitch propeller, consideration of the pitch is good preparation for flying larger, more sophisticated warbirds.

F - Fuel ....Selector On & Gated
Contents sufficient

F - Flaps. ....Set

On long smooth runways, where there are no significant obstacles in the immediate takeoff path, no flap is required for takeoff. On runways where a reduced takeoff run, or obstacle clearance in the immediate takeoff path is required, select half flaps.

I - Ignition ....Both On

Check that the magnetos are both selected ON in both the front and rear cockpits.

I - Instruments.. Checked

A visual scan of the instruments left to right across the panel. Important items are:

- ✈ ASI zero;
- ✈ AI erect;
- ✈ Altimeters - QNH set. Airfield deviation ± 50 feet;
- ✈ Turn coordinator - power warning flag away, wings level, ball in the centre;
- ✈ D.I. and compass aligned;
- ✈ VSI ± 200 feet; and,
- ✈ Engine Temps and Pressures in the Green Range.

H - Hatches; Harness... Locked; Fastened

Fully close the sliding cockpit canopy hood. Check that the harnesses are fastened and tight.

C - Controls .... Full, free and correct movement

Check all of the flying controls for full and free movement.

LINE UP CHECKS

Ensure the approach path is clear and while the aircraft is being taxied into position on the active runway complete the Line Up Checks.

Transponder.. On ALT

Set the transponder to **ALT** (altitude).

D.I. .... Aligned with the runway

AFTER TAKEOFF (CLIMB) CHECKS

Flaps .... Up at a safe speed and height (min 55 kts and 200 feet AGL)

Once at a safe airspeed, (greater than 55 knots) and clear of obstacles (greater than 200 feet above ground level or above obstacles), smoothly retract the flaps if they have been set for takeoff or if these checks are being carried out after a go-round. Raising the flaps at too low an airspeed or too early can lead to a loss of lift that could cause the aircraft to sink back towards the ground or obstacles.

Brakes .... Off

Temps and Pressures .... Checked

PRE-LANDING CHECKS

B - Brakes .... Checked; Park brake Off

Apply sufficient pressure to the brake lever to determine that there is resistance and that there is pressure for them to operate. Then assure they are fully OFF.

U - Undercarriage .... Fixed

M - Mixture .... Rich

The mixture is fully rich when the mixture control lever is FULLY BACK. Unless specifically selected ON (HOT), the carb heat should be checked OFF (COLD).

P - Pitch .... Fixed

While virtually all Chipmunks are fitted with a fixed pitch propeller, consideration of the pitch is good preparation for flying larger, more sophisticated warbirds.

F - Fuel .... Contents sufficient

H - Harness .... Secure

FINALS CHECKS

Landing Flap .... Set

Landing Clearance .... Received

At a controlled aerodrome, ensure a landing clearance has been received. At aerodromes where a Flight Service is in attendance, and at unattended aerodromes, make a radio call advising intentions.

Runway .... Clear

Make a final check of the landing area before completing the final approach and landing.

Carb Heat .... Off

In case a go-round becomes necessary, the carb heat should be returned to the OFF (COLD) position when you are sure that you would be able to glide the aircraft to a safe landing area if the engine stopped. If it was still ON (HOT), the engine would only develop about 95% of full power.

AFTER LANDING CHECKS

Flaps .... Up

Flaps should be up when taxiing as they may be damaged by stones or other objects which may be flicked up by the propeller or tyres.

Transponder .... Off

Brakes .... Test; 5 clicks On (or as required)

Some other Pilot's Notes suggest that the brakes should be preset to 5 notches or so, to enhance directional control during landing, especially in crosswind conditions. However this is not a universally accepted technique. Pilots should pre-apply brake if they feel it is appropriate.

SHUTDOWN CHECKS

Before you reach the aircraft parking area recheck the brakes and the wind direction, then decide on your route to park the aircraft into wind in the required position.

Brakes .... Parked

Throttle .... 900 rpm

Allow the engine to idle for one minute at 900 rpm. This allows the engine oil to cool, and also allows even cooling of the entire engine generally.

Avionics .... Off

Listen on the emergency frequency (121.5) to ensure that your last landing(s) did not activate the emergency beacon, then select the avionics OFF.

Ignition.. Checked

To check the ignition system select the **LEFT** magneto OFF for about one second then back ON, then select the **RIGHT** magneto OFF for about one second then back ON**.**

This is a 'dead cut' check to see if the ignition goes dead when the **LEFT** and **RIGHT** magnetos are selected off. When each magneto is turned off the engine should continue running, albeit at reduced rpm. This confirms that both magnetos are operating correctly.

If the engine dies when the **LEFT** or **RIGHT** magneto is selected off then the other magneto (and the aircraft) is unserviceable and this should be rectified immediately.

> **CAUTION**
>
> If the engine dies when either of the magnetos is selected off **DO NOT** reselect the magneto back on to try to keep the engine running, as this may lead to a serious backfire and engine damage. Rather, leave the magneto OFF, close the throttle and allow the engine to stop rotating.

Throttle .... Closed

Ignition.. Off

Throttle .... Fully open as the engine runs down

Throttle .... Closed

Stop the engine by closing the throttle and then switching the ignition off from either the front or rear cockpit. Open the throttle fully when the rpm drops to 200-300 rpm. When the engine has stopped completely, reclose the throttle.

Ground / Flight Switch .... Ground

Control Locks .... As required

If parking outside for any period of time, install the control locks.

> **NOTE**
>
> When vacating the aircraft, please ensure that the harness release levers are returned to the “FASTEN” position. If they are left in the “UNDO” position (displaced 90º or so) it weakens the return spring and eventually it stops returning and a replacement is required.

HASELL CHECKS

These checks are completed prior to any manoeuvre which takes the aircraft close to it's limits, for example, stalling, aerobatics and spinning.

H - Height .... Sufficient for recovery at a safe height

A - Airframe .... Flaps as required; Brakes Off; DI caged

Ensure the Di's in both the front and rear cockpits are caged. If the aircraft is being flown solo, the DI in the rear cockpit should be caged during the pre-flight. To ensure full rudder authority the brakes MUST be completely off prior to commencing aerobatic manoeuvres. See Chapter 5.

S - Security .... Harness tight; Hood closed;
No loose objects

E - Engine .... Mixture fully rich;
Carb heat as required;
Temps and pressures checked

L - Location .... Not over built up areas

Consider identifying a suitable forced landing paddock within gliding range.

L - Lookout .... Around, above and below

SADIE CHECKS

These checks should be completed at regular intervals, say every 15 minutes.

S - Suction .... Checked

In ZK-SAX there is no suction gauge. Check for normal operation of suction driven instruments.

C - Carbon Monoxide .... Checked

Check for signs of Carbon Monoxide leaking into the cockpit.

A - Amps .... Checked; Generator charging

Check that the generator is charging, i.e. that the Generator (GEN) FAIL light is extinguished.

D - D.I. .... Checked with compass

Before checking the Direction Indicator (D.I.) against the Magnetic Compass ensure straight, level and unaccelerated steady flight.

I - Icing .... Check carb heat

Cycle the carb heat to check for carb icing, leave it ON for 10-15 seconds. If the engine runs a little roughly it is an indication of normal operation. If the engine initially runs roughly then runs smoothly at an increased rpm, it is an indication that you had carb icing. You should increase the frequency of carb icing checks or leave it on until you have left the area of carb icing.

E - Engine .... Instruments and fuel checked

Check temperatures and pressures. As well as confirming normal engine operation. If the temperatures are high it may be good practice to ease the power back to enable the engine to cool slowly. Check the fuel contents and consumption rate.

PROP SWINGING - ENGINE START CHECKS

Wheel Chocks .... Secure

Chocks MUST be securely placed ahead of the main wheels prior to starting the aircraft by hand swinging the propeller.

Pilot.. Secure

A qualified pilot MUST occupy either the front or rear cockpit prior to starting the aircraft by hand swinging the propeller. The person swinging the propeller MUST also be adequately trained. When the pilot is securely seated in the cockpit and ready for start, indicate to the ground assistant that preparations for starting the aircraft are complete by calling:

- ✈ Brakes ON;
- ✈ Fuel ON;
- ✈ Ignition OFF (accompanied by a thumbs DOWN signal); and,
- ✈ Throttle Closed.

Cold Engine:

Prime .... As required

Priming should only be necessary on a cold engine. A hot engine should not require priming.

While holding out the carburettor float ring, operate the priming lever on the fuel pump until fuel flows from the overflow vent at the bottom of the engine. This can be done with the (left side) engine cowling open or closed, however it is much easier with the cowl open. If, due to the position of the fuel pump operating cam, there is insufficient leverage on the hand priming lever, alter the cam position by rotating the propeller through 180 degrees.

Ignition... Both Off

Throttle .... Closed

Control Column .... Full Back

Propeller .... Pull through 4 compressions

When fuel has ceased draining from the overflow vent, prime the cylinders by turning the propeller by hand through four (4) compressions.

On completion of priming, the ground assistant should call:

- ✈ Ready for starting; and
- ✈ Contact (accompanied by a thumbs UP signal);

Throttle .... Set ¼ inch open

Set the throttle to ¼ inch forward of the fully closed position.

Ignition... Front (right) On

Switch ON the impulse magneto (No 2) and call:

- ✈ Contact (accompanied by a thumbs UP signal).

Propeller .... Swing to start

The ground assistant should then carefully swing the propeller through the compression stroke to start the engine.

Hot Engine:

Throttle .... Set ¼ inch open

Set the throttle to ¼ inch forward of the fully closed position.

Ignition.. Front (right) On

Switch ON the impulse magneto (No 2) and call:

- ✈ Contact (accompanied by a thumbs UP signal).

Propeller .... Swing to start

The ground assistant should then carefully swing the propeller through the compression stroke to start the engine.

If no start after 4-6 swings, proceed as for a cold engine.

If the engine fails to start, switch both magnetos OFF and give a clear call of:

- ✈ Ignition OFF (accompanied by a thumbs DOWN signal).

PROP SWINGING - AFTER ENGINE START CHECKS

Ignition.. Both On

When the engine starts, switch the No 1 magneto ON.

Throttle .... 1100 rpm

After start open the throttle gently to about 1100 rpm - just sufficient to bring the generator on line and extinguish the GEN warning light.

GEN Fail Light... Out

Oil Pressure .... Indicating within 30 seconds

As soon as the engine is running smoothly, the oil pressure should be checked. The oil pressure should rise and stabilise between 30 and 40 psi within 30 seconds of a successful start.

If the oil pressure does not rise to the specified value within 30 seconds the engine should be shut down immediately (by turning the ignition OFF) to prevent engine damage.

Ignition.. Checked

To check the ignition system select the **LEFT** magneto OFF for about one second then back ON, then select the **RIGHT** magneto OFF for about one second then back ON**.**

This is a 'dead cut' check to see if the ignition goes dead when the **LEFT** and **RIGHT** magnetos are selected OFF. When each magneto is turned OFF the engine should continue running, albeit at reduced rpm. This confirms that both magnetos are operating correctly.

Avionics .... On; Set

Chapter Five

Aircraft Handling

Introduction

The De Havilland DHC 1 Chipmunk is very pleasant to fly, the controls are well harmonised and they remain light and responsive throughout the speed range. However, they tend to become heavier as the limiting speed is approached.

Prop Swinging

General Rules

Rule 1: ALWAYS treat the prop as “live”.

Stating the obvious perhaps, but sometimes it doesn’t stay obvious, especially when you have a wet or weak magneto, and you have been swinging the prop for half an hour with no result. By then your shoulder will be aching, its 12°C with a 15 knot breeze, its drizzling, and its getting wet and muddy and slippery on the ground in front of the prop from your repeated walking over the same spot. In these circumstances it is easy to treat the prop with less respect than it deserves. Also, just because the switches are off, there is no guarantee that the mags are not live.

Rule 2: ALWAYS use chocks.

Even if you have brakes set hard on, a piece of 4x2 is a lot better than nothing. Then the worst that can happen, if the engine somehow goes to full throttle and the stick isn’t held hard back, is that the aircraft can tip onto its nose.

Rule 3: ALWAYS have a PILOT in the cockpit.

The pilot should preferably be experienced and qualified on type. Farmers are good practical blokes, but the throttle on a Massey Ferguson works in the reverse sense to the throttle in an aircraft. If you HAVE to start the aircraft on your own, i.e. you are being shot at, or you can see the approaching tsunami, then tie the tailwheel to a fence or some pickets, tie the stick back with the harness, and chock the wheels.

Rule 4: The person swinging the prop is in charge of the whole process, and calls the shots.

The cockpit occupant can obviously share his intellectual property re the process, but it is the person risking life and limb (literally) who dictates how things will be done.

Rule 5: Remove any lose, trailing, or baggy clothing that might get caught by the prop.

Scarves, helmet leads, wedding dresses etc. In fact, remove your helmet also so you can hear what is going on.

Rule 6: Get some practical instruction on how to do this.

These notes are not a license to go and try it by yourself.

How to Swing a Prop

So, with respect for the prop foremost in their mind, chocks in position, brakes on, and a pilot in the cockpit, the ground assistant is ready to get started. If the engine is cold, prime for long enough for excess fuel from the carb to drip out of the fuel drain underneath the engine. If the engine is still hot, i.e. it has been running in the last 20 minutes or so, then priming may not be need. Try starting the engine and if there is no response after five or six swings, then prime it.

Now, assuming the prop MAY be live, the ground assistant should swing the prop through four compressions, to ensure each cylinder is primed. Use these “low threat” swings with the ignition off, as a practice for the live ones coming up. The ground assistant should face the prop with both hands on the down going blade, with their right hand 2/3 to 3/4 of the way down its length. They will need to curl their fingers slightly around the trailing edge of the blade in order to get sufficient grip to pull it through the compression. Use the minimum curl necessary, as in the unlikely event of the prop kicking backwards, they don’t want to damage or lose their fingertips, or be pulled back into the prop arc. There is a pair of leather gloves in the baggage compartment for the person swinging the prop to use during prop swinging.

Balance is very important, so the ground assistant should be mindful of the state of the ground underfoot. If it is wet/slipper/boggy/uneven etc – then this adds another challenge. Consider moving the aircraft.

The ground assistant should stand at an appropriate distance from the prop for maintaining your balance. There is little natural incentive to stand too close for some reason, but many people stand too far away. This results in them having to lean toward the prop in order to reach and swing it. This puts their CofG in the wrong place, and if the prop suddenly swings thru on a low compression, or an early firing of one cylinder, it is easy to fall into the prop arc.

The ground assistant should pull the prop through initially with both hands, but as the prop starts to move they should bring your left hand away (helps with CofG), and as their right hand pulls the prop through start to walk away, mostly in the direction the blade is travelling, but slightly away at the same time. I.e. if the aircraft is heading 360 degrees, the ground assistant should be walking on a track of approx 070 to 080 degrees, slightly away from the plane of the prop. As soon as the ground assistant feels the prop go through the compression, they should pull their right hand away, and continue walking slowly away.

The swing itself should not be a high energy effort. Firstly, because doing so increases the chance of the ground assistant losing their balance. Secondly, because it is unnecessary, as the strength of the spark is dictated by the spring powered impulse in the right magneto. It will be the same regardless of how hard the swing. All the ground assistant has to do is pull through a compression for it to work.

Having done this practice four times each of the cylinders should be primed. If the ground assistant is now happy with their swing (so to speak) proceed with the start. If not, the ground assistant should have some more ignition off practice, or get someone else to do it.

If proceeding, the ground assistant should call to the pilot “Ready for starting” and “Contact” (accompanied by a thumbs UP signal)”. The pilot should set the throttle to ¼ inch forward of the fully closed position, switch ON the impulse magneto (No 2). The pilot should also have the stick hard back at this point, to cater for the possibility that the throttle linkage has broken and the engine is stuck on full throttle. Then when they are fully ready, the pilot calls back “Contact” (accompanied by a thumbs UP signal).

All terribly formal, but this is one occasion when you do not want any ambiguity.

The ground assistant should then go ahead and swing the prop until it starts. There is no need to repeat the call outs with each swing, everyone should consider that the right mag is ON and the throttle is set until such time as either the ground assistant or the pilot announces otherwise.

Give it at least half a dozen swings before moving on to "If the Engine Will Not Start" below.

If, after a swing, the prop stops in an awkward position, it may be prudent for the ground assistant to call "Switches OFF", check the appropriate response from the pilot. Then stretch and reach up to pull the prop into an ideal position. Then, when the ground assistant is happy again, they should call "Contact" (accompanied by a thumbs UP signal). Likewise, when they are fully ready, the pilot calls back "Contact" (accompanied by a thumbs UP signal).

If the ground assistant or the pilot wants to stop swinging for any reason, then they should call "Switches OFF" and check the appropriate response from the other person.

<u>After Engine Start</u>

When the engine does start, the ground assistant should walk out to the right wingtip where they will be easily visible to the pilot, and wait for the pilot to turn the left mag on and get the engine settled down. Then, when the pilot is happy, they should signal the ground assistant to remove the chocks. The ground assistant should walk up the leading edge slowly and carefully, and remove the right chock. This will be easier if the pilot has throttled back a bit.

Having successfully removed the chock the ground assistant should walk carefully back out along the wing leading edge, at least as far as the roundel, and then walk around the front of the aircraft in a VERY wide arc and approach the left wing, no further inboard than the left side roundel, then walk slowly and carefully in along the left wing leading edge to remove the left chock.

Some advocate walking around the tail, your choice. However, walking around the front keeps the ground assistant in sight of the pilot, and saves them from having to adjust their hair piece.

If either of the chocks is jammed in front of the wheel, typically after a high power run up, ensure that the park brake is off, and move back out along the wing leading edge until you are well clear of the prop arc, and push the wing back to ease the wheel away from the chock. Then go back and remove it.

If the ground assistant now has to climb in to one of the cockpits, they should be very careful not to connect their left boot with the throttle as they climb in. The pilot, waiting for someone else to clamber aboard, should throttle back as the person climbs aboard, and clamp their hand on the throttle.

<u>If the Engine Will Not Start</u>

The possible reasons for an engine failing to start are not enough petrol, too much petrol i.e. too rich, and finally, no spark.

An engine not starting because of not enough petrol is unlikely if during priming you had fuel flowing from the drain underneath and it was within the last 10 mins or so. However if the cures below don't work then it is probably worth priming again and having another go.

Not starting due to too much fuel is not that likely with a Chipmunk, but may be possible with a hot engine, on a hot day, and/or with the temperament of that particular engine. In theory if you just keep swing the prop without repriming, the mixture in the cylinders should slowly get leaner and leaner until you hit the sweet spot.

A quicker way of making it "more lean" is to open the throttle fully, and pull the prop backwards for 8 to 10 compressions. Ensure the switches are OFF, the pilot has his hand on the throttle "expecting" it to fire, and that the stick is held hard back during this exercise.

Finally, no spark or not a big enough spark is quite a common problem with the Gypsy Major. This can be for many reasons, including damp or wet mags, an impulse which is stuck, windings that are old and tired, oil in the mag, or a short in the mag. If the mag is producing only a weak spark, then this may show up as reluctance to start, i.e. it will only start when the mixture is perfect. We are of course talking about the right mag here – the one that has the impulse. It is not interchangeable with the left mag.

A first step to cure an engine that will not start is to listen for the impulse. When you pull the engine through a compression, you should hear a distinct, quite loud, "click" as the impulse does its thing. If you can't hear the click after a few compressions, then the ground assistant should call "Switches OFF", and lift the right engine cowling. Take the wooden dipstick (or similar shaped piece of wood) and give the "round silver part of the mag where it meets the engine" a couple of sharp taps. If there is no external ambient noise, you may hear a very soft "click" as the impulse releases itself from whatever gunk was holding it in the wrong place. If this happens, the ground assistant should close the cowl, call "Contact", and expect the engine to start on the next swing. If the ground assistant doesn't here the soft click, try another start anyway.

If the aircraft has been outside overnight, and/or it is cold, it is very humid, or it has been raining, then dampness is probably the prime suspect. There is a lot of bakelite in the mag which loves to soak up water, and so the voltage produced by the mag has all sorts of places to go other than where you want it to. An extension cord, some masking tape, a two wheel hand trolley, and a hair drier is now required.

Sit the trolley upright close to the mag, and tape the drier to it with its outlet aimed at the mag – perhaps 8 inches to a foot away. Take the bakelite cap covering the points off the mag. Plug the drier in and set it on high. Give it at least 20 minutes or so. It is probably worth staying in the vicinity and monitoring it though….. if it is an old drier there is the possibility it could get a bit hot in an area where you might just be able to smell petrol etc, and I'm not sure what Bill Beard might say if the unthinkable happened and you did finally get a spark, but not where you wanted it!

In Summary

To repeat, **ALWAYS TREAT THE PROP AS LIVE**. There are a few flimsy and exposed wires around the mags, a break in any one of which could render that mag live even though the switches are off. This is a good reason to do the live mag check (i.e. both mags off for half a second, then back on again) at idle during the mag check before shutdown, to ensure the engine IS going to stop when you switch off. The shutdown checklist calls for you to open the throttle fully immediately after switching the mags off. If a mag remains live when you do this, then obviously your unchocked aircraft is going to take off when you least expect it to. A lot of Tiger Moth wreckage has been generated by this situation.

Apparently the reason the throttle is opened on shutdown immediately after the mags have been switched off is to bring a big inrush of fresh air into the cylinders to make the mixture too lean for the ever present red hot carbon deposits on the pistons and cylinder heads from keeping the engine running on, i.e. firing erratically, once the spark plugs have been switched off.

This “pre-ignition” will often cause the prop to suddenly fire violently backwards, which can damage the mag drive and probably several other engine components.

Airspeeds For Safe Operations (IAS)

The following airspeeds are those which are significant to the operation of the De Havilland DHC 1 Chipmunk. These figures are for aircraft flown up to maximum gross weight, under standard conditions at sea level.

Performance for a specific aircraft may vary from published figures depending upon the equipment installed, the condition of the engine, propeller, airframe, equipment, atmospheric conditions and piloting technique.

Normal Takeoff	45 kts IAS
Normal Climb	70 kts IAS
Manoeuvring Speed (Va)	117 kts IAS
Never Exceed Speed (Vne)	155 kts IAS
Normal Base and initial Final Approach Speed	70 kts IAS
Final Approach Speed – full flaps extended	60 kts IAS
Maximum demonstrated crosswind	10 kts IAS

Taxiing

When initially taxiing away after engine start, close the throttle and request removal of the chocks (if used during start and a ground assistant is available). When the chocks are clear, release the brakes and open the throttle sufficiently to allow the aircraft to move forward. Then test the effectiveness of the brakes by closing the throttle, and with the rudder bar central, applying gentle braking. The aircraft does not need to be brought to a complete stop to test the effectiveness of the brakes.

For control of direction while taxiing, the brakes are used differentially through the rudder bar. To obtain differential braking, apply rudder in the desired direction of turn and move the brake lever backward until pressure is felt on the rudder pedal. Vary brake lever and rudder bar application as required to manoeuvre the aircraft on the ground.

The maximum crosswind component, in which the aircraft has been demonstrated to be safe for taxiing is 30 kts. In high crosswinds during taxiing, care should be taken not to use excessive brake or excessive power against brake, and the stick should be held back to keep the tail down.

Use of Brakes During Taxiing

Some other Pilot’s Notes suggest that the brakes should be preset to 5 notches or so, to enhance directional control during taxiing, especially in crosswind conditions. However this is not a universally accepted technique. Pilots should pre-apply brake if they feel it is appropriate.

Takeoff

Normal

Align the aircraft with the intended takeoff path, fully release the brakes and open the throttle smoothly and positively to full throttle. The full throttle static rpm on the ground will vary slightly according to the engine condition, the propeller fitted and the atmospheric conditions. The minimum static rpm before takeoff is 2000 rpm.

> **NOTE**
>
> The engine should not be held at full throttle on the brakes for more than 30 seconds.

Maintain directional control with rudder. Initially significant rudder input is required, but this reduces as the airspeed increases. There is a slight tendency for the aircraft to swing to the right, especially if the throttle is opened too aggressively, however this is entirely manageable.

Raise the tail and fly the aircraft off at 45 kts. Accelerate smoothly to climb away at 70 kts.

Crosswind

Hold the control column into wind and open the throttle slowly to full throttle. Maintain directional control with rudder, and if necessary use differential brake appropriate to the wind conditions.

Raise the tail smoothly and progressively and hold the aircraft on the ground to 50 kts, then fly the aircraft off with a positive movement of the controls. Raising the tail too positively with a crosswind from the right will increase the tendency for the aircraft to swing to the right, so increased attention must be paid to keeping straight with rudder.

The maximum crosswind component in which the aircraft has been demonstrated to be safe for takeoff is 10 kts.

Maximum Performance

To achieve a maximum performance takeoff, select half flap prior to takeoff and align the aircraft into wind, using as much of the available takeoff distance as possible. Hold the control column fully back and smoothly open the throttle to the maximum power that can be held against the brakes. Release the brakes, increase to full throttle and maintain directional control with positive use of rudder.

Raise the tail as soon as possible and fly the aircraft off at 35 to 40 kts. Initially maintain a maximum angle climb at 55 kts until clear of obstacles, then lower the nose a little to climb at the maximum rate of climb speed of 65 kts. When at a safe height (200 feet above obstacles) select the flaps up and accelerate smoothly to climb away at 70 kts.

Use of Brakes During Takeoff

Some other Pilot's Notes suggest that the brakes should be preset to about five (5) notches, to enhance directional control during takeoff, especially in crosswind conditions. However this is not a universally accepted technique. Pilots should pre-apply brake if they feel it is appropriate.

Climb

Normal

Climb at full throttle at an attitude for 70 kts, with flaps up. This speed gives close to the maximum rate of climb and requires a reasonable attitude for handling and lookout. 70 kts also increases airflow for engine cooling.

Maximum Rate

Climb at full throttle at an attitude for 65 kts. If a maximum rate of climb is required on the initial climb after takeoff or on a go-round, half flap would normally be selected, however as flap degrades the climb it should be selected up as soon as a safe height has been reached (>200 feet above obstacles).

Maximum Angle

A maximum angle climb in a propeller driven aircraft is achieved at the lowest safe speed above the stall. In the Chipmunk, a maximum angle climb is safely achieved at full throttle at an attitude for 55 kts.

If a maximum angle of climb is required on the initial climb after takeoff or on a go-round, half flap would normally be selected, however as flap degrades the climb it should be selected up as soon as a safe speed and height have been reached (>55 kts and >200 feet above obstacles).

Mixture Control

The mixture should normally be left in the fully rich position for all types of climb, to assist engine cooling. However, at altitudes above 3000 feet AMSL, in order to obtain increased economy and smoothness in the engine running, the mixture should be leaned.

To effectively lean the mixture, set the throttle to attain the recommended rpm, and then move the mixture control gently forward toward the weak position until a slight drop in rpm is first detected or rough running commences, and then richen it again a little to restore the rpm to the highest value. The mixture control is thereby set for all throttle settings at that altitude. Changes in altitude require subsequent adjustments of the mixture control.

> **CAUTION**
>
> Do not operate the engine for more than the briefest time in the condition where the rpm is reduced by use of the mixture control.

> **NOTE**
>
> The De Havilland Approved Flight Manual states that the engine must not be operated in weak-mixture below 3,000 feet, and the RAF Pilots Manual says do not lean the mixture below 3000 feet.

Cruise

Normal

The normal cruise speed is between 90 and 110 kts. The maximum continuous (weak) power setting is 2300 rpm (independent of the mixture control setting), however it is recommended that 2100 rpm is not exceeded in cruising flight.

At or below 2100 rpm a weaker mixture is obtained and the possibility of rough running at higher rpm (up to 2300) is avoided.

Flying for Range

The recommended range speed is 90 kts. To obtain the most economical operation, lean the mixture in accordance with the instructions above.

Flying for Endurance

The recommended speed for maximum endurance is 60 to 65 kts. In turbulent conditions increase the target endurance speed to 70 kts.

Slow Flying

In situations where the maintenance of slow flight is required, e.g. when flying in bad visibility, select half flap and maintain an airspeed of 65 kts. The 1G stall speed in this configuration is about 35 kts.

Carburettor Icing

Carburettor icing is indicated by rough running and/or loss of engine power. If carburettor icing is suspected, at low rpm settings and at regular intervals, select the carb heat control to HOT. If icing does not clear reasonably quickly after selection of the carb heat to HOT, manipulation of the throttle may assist.

> **NOTE**
>
> The RAF Pilots Manual recommends that the carb heat control be wired in the HOT position in temperatures below 30ºC.

Stability and Control

Stick forces are light. Longitudinal stability is positive but with the flap retracted at high power is slightly reduced. Lateral stability is low but positive. Directional stability is positive.

Effects of In Flight Trim Changes

The aircraft is stable and easy to trim under all conditions of flight and holds its trimmed speed well.

POWER ON causes a slight NOSE UP change of trim and a YAW TO THE RIGHT, requiring left rudder correction.

POWER OFF causes a slight NOSE DOWN change of trim and a YAW TO THE LEFT, requiring right rudder correction.

With constant power, an INCREASE OF SPEED causes a YAW TO THE LEFT, requiring right rudder correction.

With constant power, a DECREASE OF AIRSPEED causes a YAW TO THE RIGHT, requiring left rudder correction.

FLAPS DOWN causes a slight NOSE DOWN change of trim.

FLAPS UP causes a slight NOSE UP change of trim.

There is no change in trim if the cockpit hood is opened in flight.

Stalling

Prior to carrying out any manoeuvres which take the aircraft close to the limits of its control, for example practice stalling, spinning or aerobatics, carry out the pre-manoeuvre checks (HASELL).

WARNING

The wheel brakes must be OFF to ensure full rudder travel is available.

The 1G stall speeds are approximately:

- ✈ Clean, engine power off — 47 kts IAS;
- ✈ Half flap, engine power off — 45 kts IAS;
- ✈ Full flap, engine power off — 43 kts IAS; and
- ✈ Approach configuration — 35 kts IAS.

Stalling speeds are reduced by about two to three knots if the aircraft is being flown solo.

In all configurations, warning of the stall is indicated by slight pre-stall buffeting felt through the elevator, about three (3) knots before the stall occurs.

At the stall with flaps up (clean) and power off the nose drops gently and the buffet continues. The control column must be fully back in order to demonstrate the nose drop at the point of stall. There is a slight tendency for the nose to pitch. With the flaps fully down, the stall is more positive.

In all cases a wing drop may occur, but this can easily be controlled by applying rudder to stop further yaw. Any attempt to raise the wing with aileron will aggravate the wing drop.

The stall recovery in all configurations is quite normal. Move the control column sufficiently forward to unstall the wings, and use rudder to prevent further yaw. To minimise height loss, smoothly increase the throttle to full power. When full control is regained, level the wings, apply appropriate rudder to achieve balanced flight and ease the aircraft out of the descent.

When approaching a high speed stall, e.g. in a steep turn, a positive pre-stall buffet occurs, which gives ample warning. There is little tendency to flick.

With the cockpit canopy hood open, there is no affect on the stall speeds and characteristics.

Spinning

Practice spinning is only permitted with anti-spin strakes fitted. The maximum weight for carrying out practice spinning is 2,100 lb.

Prior to carrying out any manoeuvres which take the aircraft close to the limits of its control, for example practice stalling, spinning or aerobatics, carry out the pre-manoeuvre checks (HASELL). Ensure the canopy is fully closed and locked and the wing flaps are UP.

WARNING

The wheel brakes **must be completely OFF** during spinning and aerobatics to ensure full rudder travel is available.

Additionally, prior to carrying out spinning, the:

- ✈ Elevator trim should be neutral;
- ✈ Harness should be tight;
- ✈ Direction indicator should be caged;
- ✈ Mixture should be rich;
- ✈ Carburettor air should be set as required;
- ✈ Oil temperature and pressure should be within limits; and,
- ✈ Fuel should be sufficient.

It is recommended that spinning practice be commenced at least 5,000 feet above the ground (agl), as spin recovery MUST be commenced by 3,500 feet agl in order to be able to regain level flight by 1,500 feet agl, consistent with a height loss of up to 2,000 feet.

General

The aircraft is hard to properly establish in a stable spin at almost all centre of gravity positions. The characteristics of one aircraft may differ from another, where one will enter a stable erect spin, another will enter a semi-stalled spiral dive. Some aircraft will enter either. The difference in behaviour depending on variables such as weight and position of the centre of gravity, the intended spin direction, and aileron deflection into or out of the direction of spin.

As the erect spin and the spiral dive can be confused it is essential to understand the difference between them.

The Semi-Stalled Spiral Dive

The spiral dive resembles the spin and is more likely to occur with a forward centre of gravity.

The following indicate that a spin entry attempt has led to a semi-stalled spiral dive:

- ✈ The attitude is steeply nose down;
- ✈ The airspeed will increase from about 40 kts at the entry to 80-90 kts after about two turns, regardless of the fact that the stick is held fully back and full rudder is applied to maintain the manoeuvre;
- ✈ The controls retain the forces of normal manoeuvres but there is some buffeting of the tail;
- ✈ There is usually noticeable noise and rattle due to buffeting at increasing airspeed; and,
- ✈ Upon releasing the controls the aircraft will recover by itself, or with some opposite rudder, after rotating through a quarter to a half a turn.

The Spin

The spin has the following characteristics:

- ✈ Initially the attitude is steep but after about two or three turns the spin usually becomes flatter, with the nose generally 30 to 50 degrees below the horizon, although it will appear less so;
- ✈ The airspeed will remain steady at between 30 and 50 kts IAS;
- ✈ The rudder force is light; and,
- ✈ The stick force is light when aft of neutral. A relatively positive to heavy push force is needed to move the stick fully forward on recovery, and this may be accompanied by some buffeting.

Entry to the Spin

Close the throttle and, at 50 knots, apply full rudder in the intended direction of spin and move the control column (stick) fully back. A more positive spin entry can usually be achieved by applying aileron opposite to the direction of the intended spin. If aileron is so used it must be centralised when a stable spin entry is achieved.

If the control column is not moved fully back until after the spin has been entered, a semi-stalled spiral dive may be encountered. In this case the speed will remain stable at about 80 knots and normal recovery action is immediately effective.

The aircraft may be reluctant to enter a spin, especially to the left and at forward centre of gravity. A spiral dive may develop instead, particularly if the control column is not kept fully back. The spiral dive can be recognised by an increase in the control column forces and a fairly rapid rise in airspeed during the first two turns.

Characteristics of the Stable Erect Spin Entry

After a half roll in the direction of spin, the nose drops sharply as rotation continues. Slight pitching may be apparent at this stage. The spin stabilises in two to five turns with the nose gradually rising to about 30-50º below the horizon. The rate of rotation is slightly lower than in the initial stage and the airspeed is low and steady.

The aircraft is cleared for practice spins of up to eight (8) turns.

Spin Recovery Actions

Close the throttle, if not already closed. Check ailerons neutral. Check direction of yaw, as indicated by the turn needle.

Apply and maintain full rudder to oppose the direction of yaw. After a brief pause (the RAF recommends two seconds), move the control firmly, progressively, centrally and fully forward until the spin rotation ceases. Centralise the rudder as soon as the spin stops. Level the wings and ease out of the dive.

In the UK, civil registered Chipmunks are required to display the following placard in full view of each pilot.

SPIN RECOVERY

MAY NEED FULL
FORWARD STICK
UNTIL ROTATION STOPS

Spin Recovery Characteristics

The relatively flat attitude may cause longer recovery time than for many other aircraft types. Consequently it is important to appreciate that full and decisive control inputs are needed to recover especially nose down elevator.

A moderate push force is required to move the control forward and care is necessary to ensure that the ailerons are maintained neutral throughout. If recovery action is taken before the spin has become stable, recovery is achieved very quickly. If normal recovery action is taken for recovery from a stable erect spin recovery is achieved within one to two turns, which may involve a height loss of about 1,000 feet to straight and level flight.

After prolonged spinning (six to eight turns), a heavier push force may be necessary to effect the recovery and this may be accompanied by some buffeting. In a stable spin, particularly when the rear seat is occupied, the aircraft may continue rotating for up to three turns after taking recovery action. During this period, the rate of rotation increases and the angle steepens before the spin stops. This is an indication that the correct spin recover actions have been taken. In this case recovery from the spin may involve a total height loss of about 2,000 feet to straight and level flight.

Delayed Spin Recovery

If the aircraft is slow to recover from the spin, the application of aileron in the direction of the roll will assist normal recovery action. If spin recovery action has not been effective by 3,000 feet agl, and parachutes are worn, abandon the aircraft.

Aerobatics

Aerobatic manoeuvres are only permitted with anti-spin strakes fitted. The maximum weight for carrying out aerobatics is 2,100 lb (953 kgs). The maximum positive acceleration which the structure has been designed to withstand without permanent deformation, at a weight of 2,100 lb is +6.0 G. Intentional manoeuvres should be confined to load factors well below this maximum value.

Prior to carrying out any manoeuvres which take the aircraft close to the limits of its control, for example practice stalling, spinning or aerobatics, carry out the pre-manoeuvre checks (HASELL). Ensure the canopy is fully closed and locked and the wing flaps are UP. Aerobatics should not be attempted after flying in icing conditions, as there is a risk of fuel siphoning.

> **WARNING**
>
> The wheel brakes **must be completely OFF** during spinning and aerobatics to ensure full rudder travel is available.

Additionally, prior to carrying out aerobatics, the:

- ✈ Elevator trim should be neutral;
- ✈ Harness should be tight;
- ✈ Direction indicator should be caged;
- ✈ Mixture should be rich;
- ✈ Carburettor air should be set as required;
- ✈ Oil temperature and pressure should be within limits; and,
- ✈ Fuel should be sufficient.

With the stated aerobatics limitations complied with, the aircraft has been demonstrated to have safe handling characteristics in the following manoeuvres:

Tight Turns	Inside Loops	Slow Rolls	Stall Turns
Barrel Rolls	Aileron Rolls	Half Roll off a Loop	Half Roll & Pull Through

Until the experience is gained, the following entry speeds are recommended:

Aileron Roll	120 kts IAS	As experience is gained reduce entry speed to 113 kts
Slow Roll	120 kts IAS	As experience is gained reduce entry speed to 113 kts
Stall Turn	120 kts IAS	As experience is gained reduce entry speed to 113 kts
Barrel Roll	120 kts IAS	As experience is gained reduce entry speed to 113 kts
Inside Loop	130 kts IAS	As experience is gained reduce entry speed to 122 kts
Half-roll off a Loop	140 kts IAS	As experience is gained reduce entry speed to 130 kts

While aerobatics may normally be flown with the throttle set fully open, for manoeuvres in the looping plane, care should be taken not to exceed the rpm limitations at high speed. 2550 rpm is the engine limit when aerobatting. In a dive with full throttle set, 120 kts is the prompt to start pulling the nose up and/or reducing power to avoid an engine overspeed.

The Chipmunk is not cleared for inverted flight, as overfuelling of the engine may occur, leading to a rich cut and possible failure to restart in flight. During manoeuvres involving transient periods of negative G, such as slow rolls, the throttle should be closed before reaching the inverted attitude and the negative G phase confined to a period not exceeding 5 seconds. The engine should be cleared at normal power for several seconds after such a manoeuvre.

Since structural damage is likely to occur during a tail-slide, vertical manoeuvres should be completed and recovery action completed before aerodynamic control is lost. If aerodynamic control is lost and an inadvertent tail-slide is about to develop, close the throttle, centralise the control column (stick) and rudder pedals and brace them VERY firmly. Grip the stick with BOTH hands and remain braced until the nose has dropped and any oscillations have ceased. As a precaution return to land and have a maintenance inspection carried out, to assess for potential tail-slide damage, before further flight.

Diving

Set the mixture control to fully rich before starting the dive. As the speed increases, a progressively greater push force is necessary to hold the aircraft in the dive. However, the limiting speed can be reached without re-trimming. Maintain the aircraft in balance by a progressive application of right rudder.

In the dive, keep the throttle at least one-third open. 2675 rpm is the maximum permissible for up to 20 seconds. At larger throttle settings, as the maximum speed is approached, it is necessary to throttle back to keep the rpm within limits.

Gliding

The optimum glidepath is achieved at 70 kts in the clean configuration, and 65 kts with half flap.

Base Turn Procedure

Mid to late downwind identify a feature on the ground over which you wish to have the aircraft established straight-in on final approach at 500 feet AGL. As the aircraft approaches abeam this ‘straight-in feature’ initiate the following procedure:

- ✈ carry out a thorough **lookout**;
- ✈ select the Carb Heat ON;
- ✈ reduce the throttle to an appropriate power setting for the type of approach you are intending to carry out;
- ✈ immediately begin a medium turn to track toward your straight-in feature;
- ✈ allow the aircraft to descend and trim for the desired airspeed.

Naturally this ‘standard’ base turn procedure should be varied to take into account operational considerations such as wind, other air traffic and/or terrain/obstacles on final approach. However, do not continue extending the downwind beyond your selected base turn point waiting for the aircraft to slow down before turning.

Base Leg

Check that the airspeed is below the maximum speed for half flap (93 kts IAS), then select the flaps to half and maintain 70-75 kts. Retrim for the new configuration and airspeed.

Final Approach

Prior to turning onto final approach, carry out a thorough **lookout** of the area around the opposite base and long finals, then turn to roll out on the extended centreline of the runway.

Where conditions dictate that full flap is appropriate, the full flap is usually taken at about 300 feet above the ground. Check that the airspeed is below the maximum speed for full flap (71 kts IAS), then select full flaps and allow the airspeed to reduce to the applicable final approach speed. Retrim for new configuration and speed.

Final Approach Configurations and Recommended Speeds

Normal Powered Approach:	Full or half flap	60 kts IAS
	reducing to 55 kts into the flare.	
Flapless Powered Approach:	65 kts IAS	
	reducing to 60 kts into the flare.	
Glide Approach:	Full or half flap	65 kts IAS
	reducing to 60 kts into the flare.	
	Flapless	70 kts IAS
	reducing to 65 kts into the flare.	
Short Field Approach:	Approach with full flap, at 55 kts IAS,	
	reducing to 45-50 kts into the flare.	

The 'Three-Point' Landing

The aim of the three point landing is to fly the aircraft into the three point attitude, at minimum height above the runway and at near minimum flying speed. A perfect three-point landing would involve flying about 1cm above the ground with decaying airspeed (stall warning, if fitted, may be blaring).

The approach to a three-point landing involves maintaining the descending attitude until at the round-out (flare) height, approximately 2-3 metres above the ground. At that point, slowly begin to raise the nose to reduce the rate of descent, take all of the power off by smoothly closing the throttle, maintain balance and keep the wings level with aileron. Hold off by flying parallel to and just above the ground (about ½ metre), slowly and continuously raising the nose to the three point attitude. When you reach this attitude, MAINTAIN IT! Do not just keep raising the nose. The three point attitude is the same attitude as you see while you are taxiing on the ground.

The hold off (or float) requires steadily more back pressure because the elevator is becoming less effective as the airspeed reduces, and because of the tendency of the nose to drop when power is reduced. If you apply the back pressure too quickly however, the wings will generate too much lift and the aircraft may balloon upwards. Consequently a slow application of back pressure is required, just sufficient to keep the aircraft flying parallel to and just above the ground. At the moment of touchdown the aircraft will be very close to the stall.

Touch down on all three wheels at the same time. All excess energy will have been dissipated, the aircraft should have no energy to float, bounce or go anywhere! Touching down tailwheel first (slightly nose high) is usually a good thing as the subsequent nose drop until the main gear touches reduces the angle of attack (lift), and the aircraft tends to stay on the ground. The reverse is true if you touch down main gear first, and this often results in a bounce……or bounces….

When the tailwheel is firmly on the ground, promptly and smoothly move the control column (stick) until it is fully back. Keep straight with rudder and carefully use brakes as required to bring the aircraft to a stop or slow taxi speed.

The advantages of a three-point landing include that the aircraft is on the ground to stay and there is minimal energy remaining for the ground roll. The disadvantages include that the aircraft is vulnerable to wind gusts at a high angle of attack, at a time when the rudder is shielded and the throttle is closed, and there is reduced forward visibility at touchdown.

The 'Wheeler' Landing

The aim of the wheeler landing is to fly the aircraft onto the ground in a near level attitude. Although the aircraft's main wheels are in contact with the surface you will have full flying speed and hence more control.

For the wheeler landing, maintain the descending attitude until virtually on the ground. Apply a tiny flare and smoothly close the throttle. At touchdown gently check forward on the control column (stick) to pin the main wheels on and to prevent the tail from dropping. "Check forward, hold it on." If the tail is allowed to drop significantly on touchdown the extra angle of attack will probably cause the aircraft to balloon or bounce back into the air, and a go-round should be considered if the bounce is excessive.

Hold the nose attitude and assess the tracking and runway remaining, etc. Remember that with a wheeler landing, at touchdown the aircraft is still "flying", albeit the main wheels are in contact with surface.

Ask yourself "How's it looking? Straight? Under control? Enough runway?". If the answer to any of these considerations is No - then apply full power, hold the attitude and fly away from the ground into a go-round. If the answer to all of the considerations is Yes - then turn the touchdown into a full landing.

Keep straight with rudder and maintaining the nose attitude by gently increasing forward control column (stick) as the airspeed reduces. When the tail feels like it is ready to settle, "follow the tail down with the elevator". Expect some yaw, but the slower the tail is flown onto the surface the less the gyroscopic effect will be. Don't hold the tail up until it falls quickly as this may lead to a significant yaw. When the tail is in contact with the surface, keep straight with rudder and move the control column (stick) fully back and begin to apply the brakes as required to bring the aircraft to a stop or slow taxi speed.

The advantages of a wheeler landing include greater aerodynamic control, better response to wind gusts or crosswinds, more precise wheel placement and a better forward view at touchdown. The disadvantages include higher touchdown speed and usually a slightly longer landing roll, and the aircraft is more lively at touchdown due to the greater energy. Consequently the aircraft can be more prone to bouncing or ballooning if the touchdown is too firm, as the energy is yet to be fully dissipated after touchdown.

The 'Tail Low Wheeler' Landing

The tail low wheeler is a hybrid landing technique which is designed to take advantage of the best features of both the three-point and the wheeler landing. The tail low wheeler landing tends to be used by Harvards and other heavier Warbirds aircraft such as the DC3, etc. The tail low wheeler gives better speed and control response than the three-point landing and better visibility and shorter landing roll than a pure wheeler. It is not an appropriate technique for light aircraft, which are far more likely to bounce and balloon than the heavier aircraft.

General

Decide early on the type of landing you wish to undertake, e.g. decide on the downwind leg or on early base. Then brief yourself on the speeds, attitudes, technique and most importantly actions after touchdown.

Also, make a habit of MAINTAINING a sensible glidepath, and MAINTAINING your target approach speed ALL THE WAY INTO THE FLARE. This will often require lowering the nose through the last 50 to 100 feet, as you transit the “friction layer” and the (head) wind speed drops. A high percentage of (ex nosewheel?) pilots consistently go low during the last 200 feet or so, and end up increasing power such that they cross the threshold almost in level flight, with the nose high, 1600 to 1700 rpm, and 10 knots slow. Subsequent throttle closure results in big doses of yaw, sink, bouncing, windshear/gust vulnerability, and instructor hypertension. Please don’t do this, we are aging fast enough on our own!

Once thoroughly trained in each technique, you should practice and maintain competency and confidence in each.

Protecting the Tailwheel

In order to reduce wear on the tailwheel (expensive), avoid landings on sealed runways if there is a grass alternative. If a landing on a sealed runway is required, make a wheeler landing and endeavour to fly the tailwheel onto the ground at a low speed.

Crosswind Landing

The maximum crosswind component in which the aircraft has been demonstrated to be safe for landing is 10 kts, although the RAF permitted landings in up to 15 kts of crosswind, subject to local orders.

The crosswind landing technique is conventional. In crosswind conditions, especially if there is a significant gust factor, not more than half flap is recommended and a wheeler landing is often the more appropriate technique.

During the landing run it will be necessary to hold the control column (stick) into wind.

Flapless Landing

With flaps retracted the drag of the aircraft is significantly less and the nose attitude significantly higher than for a normal approach. Consequently the power required on final approach is less and a slightly shallower approach should be flown. An approach speed of 65 kts IAS, reducing to 60 kts into the flare, has been found to be satisfactory, giving an adequate speed margin above the stall, although the float may be slightly longer than normal.

A wheeler landing is generally recommended for a flapless landing.

The Touch and Go Landing

If you are completing a touch and go landing, allow the aircraft to slow as if you were completing a normal full stop landing, keeping straight with rudder. Leave the flap set at the setting used for the final approach and touchdown, up to and including full flap. When ready, smoothly reapply full power, keep straight with rudder and continue the takeoff. Initially climb out at 55 to 60 knots IAS and then, when safely established in the climb at a safe speed and a safe height, slowly retract the flaps. Note that retracting the flaps from full to half has virtually no effect on stall speed, but it will DRAMATICALLY reduce drag. It follows that if you are climbing with full flap at more than 55 to 60 knots, you are giving away lots of energy, since drag increases with the square of speed.

Use of Brakes During Landing

Some other Pilot's Notes suggest that the brakes should be preset to about five (5) notches, to enhance directional control during landing, especially in crosswind conditions. However this is not a universally accepted technique. Pilots should pre-apply brake if they feel it is appropriate.

Go-Round

If a go-round is required from an approach or following some other exercise, with the aircraft in any given configuration, smoothly advance the throttle to full power, maintain balance and select an appropriate nose attitude for an initial climb speed of 55 to 60 knots IAS, and trim as required to maintain the desired attitude. Then check that the carb heat is selected OFF.

Initially climb out at 55 to 60 knots IAS and then slowly retract the flaps in stages when safely established in the climb at a safe speed and a safe height. Then complete the After Takeoff Checks.

The aircraft will climb away with full flap down. If the aircraft has been trimmed for the glide with full flap, then re-trimming will be required as soon as the throttle is fully open. The flaps may be raised in two stages with very little loss of climb performance.

A good mnemonic for the go-round is: **"Power up; Nose up; Clean up"**.

Shutting Down

Upon returning to the aircraft parking area after flight, the correct run down and switching off procedure should be followed. If an engine is shut down when it is very hot, uneven cooling between the fixed and moving parts takes place, leading to deformation and potentially to engine damage. However, the taxiing time after landing will normally have allowed the engine to cool evenly so only a minimal delay is required. Allow the engine to idle for one minute at 900 rpm. The correct method of shutting down is detailed in the Shutdown Checks and should be adhered to.

While idling, check the magnetos for a dead cut. Stop the engine by closing the throttle and then switching the ignition OFF from either the front or the rear cockpit. Open the throttle fully when the rpm drops to 200-300 rpm. When the engine has stopped completely, reclose the throttle.

On leaving the aircraft, secure the cockpit canopy hood. Ensure the aircraft is chocked securely and tied down properly if required. If parking for an extended period of time consider moving the aircraft into the shade or into a hangar, in order to minimise UV damage to the fabric covered surfaces.

If the aircraft is left outside, install the external and internal control locks.

The park brake should not be left on after picketing as the hydraulic brake system does not like being pressurised for long periods.

Waypoints AVIATION

Chapter Six

Limitations

General

The De Havilland DHC 1 Chipmunk is cleared for use as a training aircraft, subject to limitations given in the following paragraphs. These limitations must be observed at all times when operating this aircraft.

Airframe Limitations

Max crosswind component	10 kts
Max speed for half (15°) flap extension	93 kts
Max speed for full (30°) flap extension	71 kts

The flap limiting speeds also apply to flight with the flaps lowered.

Manoeuvring Speed (Va) @ MAUW	117 kts

Manoeuvres involving an approach to the stall, or full application of aileron or rudder, must not be undertaken when the airspeed exceeds the manoeuvring speed (Va). Although the aircraft is strong enough for steady application of rudder at airspeeds up to the manoeuvring speed (Va), a violently checked manoeuvre might overstress the airframe. That is, any violent yaw must NOT be checked with sudden application of full opposite rudder. At aircraft weights less than the maximum AUW, the manoeuvring speed is reduced.

Never Exceed Speed (Vne)	155 kts

Engine rpm Limitations

Run Up rpm	1600 rpm
Max Mag drop	75 rpm / smooth running either magneto
Idle rpm	650 rpm
Normal Cruise rpm	2100 rpm
Max Lean Mixture rpm	2300 rpm
Max Continuous rpm	2400 rpm
Max Takeoff rpm (5 min limit)	2550 rpm
Max Engine overspeed (1/3 throttle)	2675 rpm for 20 sec.

More than this (rpm or seconds) requires that the engine and propeller be removed for maintenance inspection, and declared serviceable before the next flight.

Engine Fuel System Limitations

Total Fuel Capacity	18 Imperial Gallons (82 litres)
Unusable fuel	1 Imperial Gallon (4.5 litres)
Fuel Consumption @ 2100 rpm	7.4 Imperial Gallons (33.6 litres) per hour
Endurance on full tanks @ 2100 rpm	2.25 hrs to fuel exhaustion

Engine Oil System Limitations

Normal Oil Pressure @ 2400 RPM	40 - 45 psi
Min Oil Pressure in flight	30 psi
Min Oil Temperature for Run Up	15º C
Max Oil Temperature @ 2550 rpm	100º C
Max Oil Temperature @ all other settings	85º C
Oil Tank Total Capacity	2.5 Imp Gal
Air Space	0.5 Imp Gal
Effective Oil Capacity	2.0 Imp Gal (9 litres)
Min Oil Quantity before flight	1.5 Imp Gal
Max Oil Quantity before flight	2.0 Imp Gal (9 litres)
Max Oil Consumption	5 Pints per hour

Tyre Pressures

Main Wheels	38 psi
Tailwheel	40 psi

Maximum Operating Weights

Maximum AUW (Private Ops)	2,200 lb (998 kgs)
Maximum AUW (Air transport Ops)	2,100 lb (953 kgs)
Maximum AUW (Aerobatics)	2,100 lb (953 kgs)
Maximum AUW (Glider Towing)	1,900 lb (864 kgs)
Maximum weight in rear seat	250 lb (114 kgs)
Maximum load in luggage locker	40 lb (18 kgs)
	18 lb (8 kgs) when the rear seat is occupied

Centre of Gravity (CofG) Limitations

The CofG datum is on the port side of the fuselage.

The CofG limits are as follows:

Forward CofG	6.8 in forward of datum
Aft CofG	0.77 in forward of datum

The CG moves aft as fuel is consumed.

Spinning and Aerobatic Limitations

WARNING
The wheel brakes **must be completely OFF** during spinning and aerobatics to ensure full rudder travel is available.

Practice spins of up to eight (8) turns are permitted.

Flick manoeuvres are NOT permitted.

In the case of the Chipmunk Mk 22 (i.e. ZK-SAX), aerobatic manoeuvres are not permitted when the aircraft's weight exceeds 2,100 lb.

The maximum load factor when aerobatting is +6G. While the maximum positive acceleration which the aircraft's structure has been designed to withstand without permanent deformation, at a weight of 2,100 lb, is +6G, intentional manoeuvres must be confined to load factors well below this value.

WARNING
Care must be taken in manoeuvres at speeds above 100 kts IAS, as it is possible to exceed the load factor limitation of +6G.

2550 rpm is the engine limit when aerobatting. In a dive with full throttle set, 120 kts is the prompt to start pulling the nose up and/or reducing power to avoid an engine overspeed. When diving, have the throttle set to AT LEAST 1/3 open.

Sustained inverted flying is prohibited at any time. During manoeuvres involving transient periods of negative G, such as slow rolls, the throttle should be closed before reaching the inverted attitude and the negative G phase confined to a period not exceeding 5 seconds.

Miscellaneous Limitations

When the aircraft is flown solo the pilot must occupy the front seat.

The canopy (hood) may be opened in flight at any speed within these limitations. However the canopy should usually be latched open in flight only as far as the second catch. I.e., to the bulkhead between the front and rear seats. Also, the canopy should be fully closed for spinning and aerobatics.

Flight in icing conditions is not permitted.

Smoking is not permitted in the aircraft at any time.

De Havilland DHC 1 Chipmunk
EMERGENCY CHECKLISTS

FIRE DURING START

Starter .... Keep winding

If the engine starts:

Throttle .... Set 1600 for two minutes
Engine .... Shutdown and seek engineering support

If the engine fails to start or the fire continues on the ground:

Throttle .... Closed
Ignition Switches .... Off
Fuel Selector .... Off
Ground / Flight Switch .... Ground
Park Brake............................ Off

Abandon the Aircraft

Attempt to extinguish the fire if safely possible without removing engine cowling and seek engineering support.

ENGINE FIRE IN FLIGHT

Throttle .... Closed
Fuel Selector .... Off

Raise the nose to reduce the airspeed and rpm. When the engine cuts:

Ignition Switches .... Off

Proceed with the forced landing.

If fire persists, abandon the aircraft if parachutes carried and sufficient height, otherwise make a high speed emergency descent.

ELECTRICAL FIRE IN FLIGHT

Ground / Flight Switch .... Ground
Cabin Vents / Canopy .... Opened

If smoke/fire continues:

Locate source and extinguish if possible.

If the smoke/fire continues carry out an emergency descent.

Land as soon as possible.

If smoke/fire stops:

All Electrics .... Off
Ground / Flight Switch .... Flight

Essential electrics on, one at a time, to locate the source if possible.
If source identified, leave it OFF.

If unidentified smoke/fire reoccurs:

Ground / Flight Switch .... Ground

Continue NORDO, remaining VMC and clear of controlled airspace if possible.

LOW OIL PRESSURE

Pressure less than 30 psi

Oil Temperature .... Monitor

Oil Pressure........................... Monitor

Set 1600 rpm, proceed to the nearest suitable airfield and land.

Maintain altitude and be prepared for complete power loss.

HIGH OIL TEMPERATURE

Oil Pressure..........................Monitor

If oil pressure is dropping set 1600 rpm, proceed to the nearest suitable airfield and land.

Maintain altitude and be prepared for complete power loss.

If oil pressure are steady continue to your destination. Check the oil level.

ENGINE ROUGH RUNNING

Carb Heat ....On

If rough running continues after 1 minute:

Carb Heat ....Off
Fuel Selector ....On
Fuel Contents ....Check

Ignition.............................Checked

ENGINE FAILURE DURING TAKEOFF ROLL

Throttle ....Closed
Brakes ....Apply as required

Maintain directional control and advise ATC.

Complete the **After Landing Checks**

If signs of fire or engine completely stopped:

Ignition Switches ....Off
Ground / Flight Switch ....Ground

ENGINE FAILURE IMMEDIATELY AFTER TAKEOFF

Nose.................................Lower
Airspeed ....70 kts IAS
Throttle ....Closed

Select a landing field and plan your approach.

Flaps ....As required

Fuel Selector ....Off
Ignition Switches ....Off
Ground / Flight Switch ....Ground

ENGINE FAILURE IN FLIGHT (Restart procedure)

Airspeed ....70 kts IAS
Throttle ....Closed

Ignition Switches ....On
Fuel Selector ....On
Start Master...........................On
Start Button ....Press

If power cannot be restored carry out a forced landing or abandon the aircraft if parachutes carried and sufficient height.

WINDMILL START PROCEDURE

Throttle ....1/3 open
Ignition Switches.............On
Attitude.............................Near vertical dive

Recover from the dive prior to exceeding Vne.

If power cannot be restored carry out a forced landing or abandon the aircraft if parachutes carried and sufficient height.

Chapter Eight

Safety and Emergency Expanded Procedures

Introduction

This section provides the pilot with procedures that enable him or her to cope with emergencies that may be encountered in operating a Chipmunk.

Emergencies caused by aircraft or engine malfunction are extremely rare if proper maintenance procedures and operating procedures are followed and a proper pre-flight inspection is completed prior to every flight.

Likewise, careful flight planning and good pilot judgement can minimise enroute weather emergencies. However should any emergency develop, the Emergency Checklist items and the guidelines in this section should be considered and applied as necessary to correct or deal with the problem.

Procedures in the Emergency Checklists which are shown in **bold-faced type** are immediate actions which should be committed to memory.

The following paragraphs are presented to supply additional information for the purpose of providing the pilot with a more complete understanding of recommended course of action and probable cause of an emergency situation. Whenever possible seek the assistance/advice of your instructor, ATC or other pilots as available.

Fire During Start

Engine fires during start are usually the result of overpriming or pumping of the throttle combined with a backfire during the ignition phase. The first attempt to extinguish the fire is to try to start the engine and draw excess fuel back into the induction system.

If a fire is present before the engine has started, open the throttle and crank the engine. This is an attempt to draw the fire back into the engine and to use up excess fuel. If the engine has started, continue operating the engine for a few seconds to try to pull the fire into the engine. In either case, if the fire continues more than a few seconds, the aircraft must be shutdown and vacated immediately, and the fire should be extinguished by the best available means.

Never attempt to restart the engine until engineering support has been received.

Engine Fire in Flight

The presence of fire is noted through smoke, smell and/or heat in the cabin. It is essential that the source of the fire be promptly identified through instrument readings, characteristics of the smoke, or other indications, since the action to be taken differs somewhat in each case.

Check for the source of the fire first.

If an engine fire is present its source is more than likely the fuel, consequently the fuel should be ‘starved’ from the fire. Close the throttle, and switch the fuel selector to OFF. The vents should be closed and when the engine stops, the ignition switches should both be turned OFF. Proceed with the power off forced landing procedure.

If an electrical fire is indicated (smoke in the cabin), the Ground / Flight switch should be selected to Ground. The cabin vents and canopy should be opened and the cabin heat turned OFF in an effort to clear the cabin of smoke. If you can identify the source of the fire/smoke and can turn it off, then do so. Regardless, a landing should be made as soon as possible.

> **NOTE**
> The possibility of an engine fire in flight is extremely remote. The procedure given is general and pilot judgement should be the determining factor for action in such an emergency.

Low Oil Pressure

Loss of oil pressure may be either partial or complete. A partial loss of oil pressure usually indicates a malfunction in the oil pressure regulating system, and a landing should be made as soon as possible to investigate the cause and prevent engine damage.

A complete loss of oil pressure indication may signify oil exhaustion or may be the result of a faulty gauge. In either case, proceed toward the nearest aerodrome preserving altitude where possible, and be prepared for a forced landing. If the problem is not a pressure gauge malfunction, the engine may stop suddenly. Maintain altitude until such time as an engine out landing can be accomplished if necessary. Don't change power settings unnecessarily, as this may hasten complete power loss.

Depending on the circumstances, it may be advisable to make an off aerodrome landing while power is still available, particularly if other indications of actual oil pressure loss, such as sudden increases in temperatures, or oil smoke, are apparent, and an aerodrome is not close.

If the engine does stop, proceed with a power off landing.

High Oil Temperature

An abnormally high oil temperature indication may be caused by a low oil level, an obstruction in the oil cooler, damaged or improper baffle seals, a defective gauge, or other causes. Land as soon as practicable at an appropriate aerodrome and have the cause investigated.

Carburettor Icing

Under certain moist atmospheric conditions at temperatures of -5°C to +20°C, it is possible for ice to form in the carburettor air induction system, even in summer weather. This is due to the high air velocity, with an associated pressure and temperature drop, through the carburettor venturi and absorption of heat from this air by vaporisation of the fuel.

To avoid this, carburettor air preheat (carb heat) is provided to replace the heat lost by the venturi effect and vaporisation. Carburettor heat should be used whenever the engine rpm is set to a low power setting. This will help to keep the carburettor air temperature out of the caution range.

Engine Rough Running

Engine rough running is often due to carburettor icing, which is indicated by a drop in engine rpm and may be accompanied by a slight loss of performance. If too much ice is allowed to accumulate, restoration of full power may not be possible, therefore prompt action is required.

Turn the carburettor heat ON. The rpm will decrease slightly and roughness may increase. Wait for a decrease in engine roughness or an increase in rpm, indicating ice removal. If there is no change after approximately one minute, return the carb heat to OFF.

If the engine is still rough running, a check of the fuel contents should be made. Check the engine gauges for abnormal readings. If any gauge readings are abnormal, proceed in accordance with the appropriate Emergency Checklist actions. In the Chipmunk the mixture should be adjusted for maximum smoothness. The engine will run rough if the mixture is too rich or too lean.

Switch the ignition switches OFF momentarily, then back ON, one at a time. If operation is satisfactory on either magneto, proceed on that magneto at reduced power, with mixture full RICH to a landing at the first available aerodrome.

If roughness persists, prepare for a precautionary landing at the pilot's discretion.

Engine Failure In Flight

If you have an engine problem at any time in flight, again the most important thing is to **keep flying the aircraft**.

Maintain altitude as the flying speed reduces. Select a nose attitude for a glide speed of 70 kts. If you choose to glide with half flap lowered, a glide speed of 65 kts is applicable.

Follow normal engine failure procedures for a forced landing by selecting a suitable area for the landing and planning your approach to the area.

If and when time permits assess your situation. Have a good look around the instruments, listen to the engine, and look behind you for signs of fire. Consider anything that will help you establish what is wrong. Once you have an idea of the problem take whatever action you think is appropriate to preserve your life.

Complete whatever emergency procedures you think are appropriate and when you can, make a MAYDAY call.

If the forced landing seems inevitable, while still gliding, switch OFF the fuel and ignition switches, and select the Ground / Flight switch to Ground.

After touchdown, bring the aircraft to a stop and vacate the aircraft quickly.

It is far better to flying the aircraft to a safe landing having done no checks, than to meticulously complete the checks and lose control of the situation/aircraft.

Restarting a Stopped Engine

Engine failure because of a fire has one simple rule – DO NOT RESTART IN THE AIR.

And, on the ground, DO NOT RESTART UNTIL A FULL EXAMINATION IS MADE AND THE FAULT CORRECTED.

If the electric starter is serviceable, establish the aircraft in a glide at 70 kts, close the throttle and attempt a restart using the electric starter.

Select the Start Master ON and press the starter button. Following a successful restart check that the Starter Light is out and select the Start Master OFF.

Propeller Stoppage in Flight

There is the remote possibility that the propeller could stop in flight during aerobatics. This could be a nuisance if the electric start was unserviceable.

The prop stopping is most likely to happen when falling out of a stall turn to the left, when the engine stops due to zero or negative G, and the aircraft comes down backwards for a few seconds removing the wind milling airflow from the prop. Apparently it may also happen in a spin to the left when the IAS drops below 20 kts, and conceivably during a (not so very good) slow roll.

There is some debate as to whether, due to its relatively high compression engine, the Chipmunk can be windmill started, i.e. dived to a speed at which the prop will start turning again. Achieving a windmilling restart is quite a common event in Gipsy Major powered Tiger Moths, there is every reason to believe it will work with the Chipmunk. However the syndicate has yet to put it to the test, and are in no hurry to do so!

The exact speed at which the prop will start turning depends largely on the condition of the engine. A recently overhauled and therefore relatively tight engine, with high compression may take a lot of persuasion, whereas one that is using as much oil as ours will probably be no problem at all. With the Tiger Moth the prop usually starts moving at between 110 and 120 kts.

Anyway, regardless of the serviceability state of the electric starter, prior to commencing aerobatics it would be a good idea to locate a suitable paddock within gliding range just in case, and to review the windmill start procedure.

Windmilling Restart Procedure

Throttle 1/3 open; Mags On; and dive as steeply as possible (preferably vertical) as soon as possible.

Be prepared to go to nearly Vne (155 kts), but initiate a less than 6G recovery before you get there regardless of whether the engine has started turning. It is estimated that the correct procedure will require no more than 120 kts and 1,500 to 2,000 feet of altitude.

> **NOTE**
>
> If your dive is too shallow, say only 30 to 40 degrees, you will simply squander all of your height, and therefore subsequent gliding potential, for no result. Go aggressively for 90 degrees, which will probably ensure you get at least 60, which will probably do the trick.

Ditching

Because of the fixed undercarriage, it is expected that the ditching characteristics would not be good. Consequently, if parachutes are worn, it is recommended that the aircraft be abandoned rather than ditched.

If ditching is unavoidable jettison the cockpit canopy side panels and tighten the safety harnesses.

Approach into wind at normal speed (65-70 kts IAS), using full flap. If power is available, hold the aircraft just clear of the water until ready to splash down at as slow a speed as possible. Close the throttle and stall in the three-point attitude, onto the crest of a wave if possible. If there is a heavy swell running, ditch along the swell.

Some other Pilots Notes recommend that the a/c should be made to strike the water in a flat turn so the impact is taken on one wing. This is to avoid a rapid nose-under upon touching the water.

Be prepared for the aircraft to turn onto its back and float in a nose-down attitude. After splash down, release the harness and leave the aircraft as rapidly as possible.

Flap Failure

While highly unlikely, the flap may fail due a jamming of the flap operating mechanism. If the flaps cannot be lowered, carry out a flapless landing.

A wheeler landing is generally recommended for a flapless landing.

The flapless landing does not pose any particular problem. Remember that without flap the aircraft's drag is slightly less and the stall speed is slightly higher. Consequently, you will require slightly less power and you should maintain slightly higher speeds. The approach should be made with a slightly shallow descent angle than normal. Without flap the nose attitude will be slightly higher, so be careful not to over flare on landing. The landing attitude when flapless is much the same as for a normal landing.

The final approach speed on a flapless approach is about 5 kts faster than usual. Because of the higher approach speed and less aerodynamic and ground drag, brakes should usually be applied for stopping during the landing roll.

If the flaps cannot be retracted, maintain full power and climb at a safe flying speed (60 kts) to a safe height. Even with full flap down at maximum weight the aircraft should still be able to climb adequately. When you have reached a safe height, allow the aircraft to accelerate to a little below the flap limiting speed and reduce the power to maintain that speed. Carry out a normal approach and landing at the nearest suitable aerodrome.

Open Canopy

The cockpit canopy is double latched, so the chances of it sliding open in flight is remote. However if you should forget or do not secure the canopy adequately it may slide partially open. This will usually happen on takeoff or soon afterward. A partially open canopy will not affect normal flight characteristics, and a normal landing can be made with the canopy fully open.

Do not attempt to close the canopy until you are well clear of the ground, at least above 500 feet AGL. Remember to **FLY THE AIRCRAFT** at all times!

Brake Failure Taxiing

If the brakes should fail whilst taxiing, the decisions to be made by the pilot are dependant on the situation at the time, but with the objective of stopping the aircraft whilst avoiding contact with persons or property.

To the best of your ability, steer the aircraft to avoid contact with obstructions. If the speed fails to decay at an acceptable rate, it is better to steer the aircraft between obstructions and allow the wings to absorb collision impact.

The quickest method of stopping the engine is to turn the ignition switches OFF. This will minimise any damage that may be caused by the rotating propeller.

Remember, grass surfaces will slow an aircraft at a greater rate than hard standing i.e. aprons, taxiways, etc.

Brake Failure Airborne

Should brake failure be detected prior to landing, plan to carry out a minimum length field approach using the longest vector available, preferably grass. This will help improve deceleration.

Remember, the landing roll will be considerably longer than normally experienced when braking is available.

Radio Failure

Modern aircraft radio equipment has a very good serviceability record. However, they do occasionally fail. Nevertheless, before declaring that a radio has failed, ensure that:

- The volume control ON/OFF switch has not been accidentally turned to OFF, or the volume turned to minimum;
- Check for noise output by selecting the squelch OFF (i.e. pulling OUT the volume control);
- Change headsets if possible; and,
- Change to the emergency plugs.

If you are sure that your radios will not function, set your transponder to 7600. Avoid busy and controlled airspace if it is practical to do so, and land at a suitable aerodrome. If you think that it is best to return to land at a controlled aerodrome then carryout an overhead join if you can, and keep an extra good lookout for other aircraft. You should look for light signals from the tower, but land when you are sure that it is safe to do so, even if you don’t see light signals.

If you are in the circuit set your transponder to 7600, maintain your position (order) in the pattern of other aircraft and land off the next approach. The control tower will pretty quickly work out that you have a problem because you are not responding to their radio calls. Again, you should look for light signals from the tower, but land if you are sure that it is safe to do so, regardless of whether you see light signals.

Your transponder code 7600 will bring up an alarm in the area radar control centre, and they will contact the tower to warn them of your communications failure.

Bird Strike

Bird strikes are quite possible near aerodromes nowadays. Should one occur during normal flight, damage to the aircraft will normally be minimal but will depend on the size of the bird and impact location on the airframe.

If in doubt, proceed to a safe area/height, slow the aircraft to 70 kts and check by cautious handling, that the aircraft will still fly satisfactorily at slow speed.

Proceed to the nearest aerodrome at a slow, safe airspeed making a normal landing with a slightly higher minimum threshold speed.

If the slow speed handling check indicates some abnormal handling characteristics, maintain the airspeed at 5 kts above the "problem" airspeed for the return to the airfield, approach and landing. Obviously select an airfield with a sufficiently long runway.

Abandoning the Aircraft in Flight when Wearing a Parachute

If parachutes are worn for unusual manoeuvres or operations and it becomes necessary to abandon the aircraft, the following procedures should be followed if time permits:

- ✈ Shut down the engine by switching the ignition OFF; and,
- ✈ Select the Ground / Flight switch to Ground.

> **WARNING**
>
> The minimum safe height for abandoning the aircraft is 1,500 feet agl, except in a spin, when it is 3,000 feet agl.

The canopy can not be jettisoned in flight. However, to enable the canopy to move rapidly rearward to the fully open position in flight, the canopy roof is fitted with a small door hinged at the rear. When this door is pivoted upwards, into the slipstream, it overcomes the suction of the canopy and facilitates normal opening.

To slide the cockpit canopy rearward:

- ✈ Trim an attitude for at least 100 kts;
- ✈ Pull on either of the yellow/black knobs, located in each cockpit roof, on the starboard side, to release the spring loaded door on the top of the canopy; and,
- ✈ Grasp the normal yellow canopy handles and slide the canopy fully open.

With the canopy open, the cockpit is windy and dust will swirl about.

Release the harnesses, stand and dive over the side of the cockpit toward the trailing edge of the wing. The rear seat occupant first, and finally the front seat occupant.

Chapter Nine

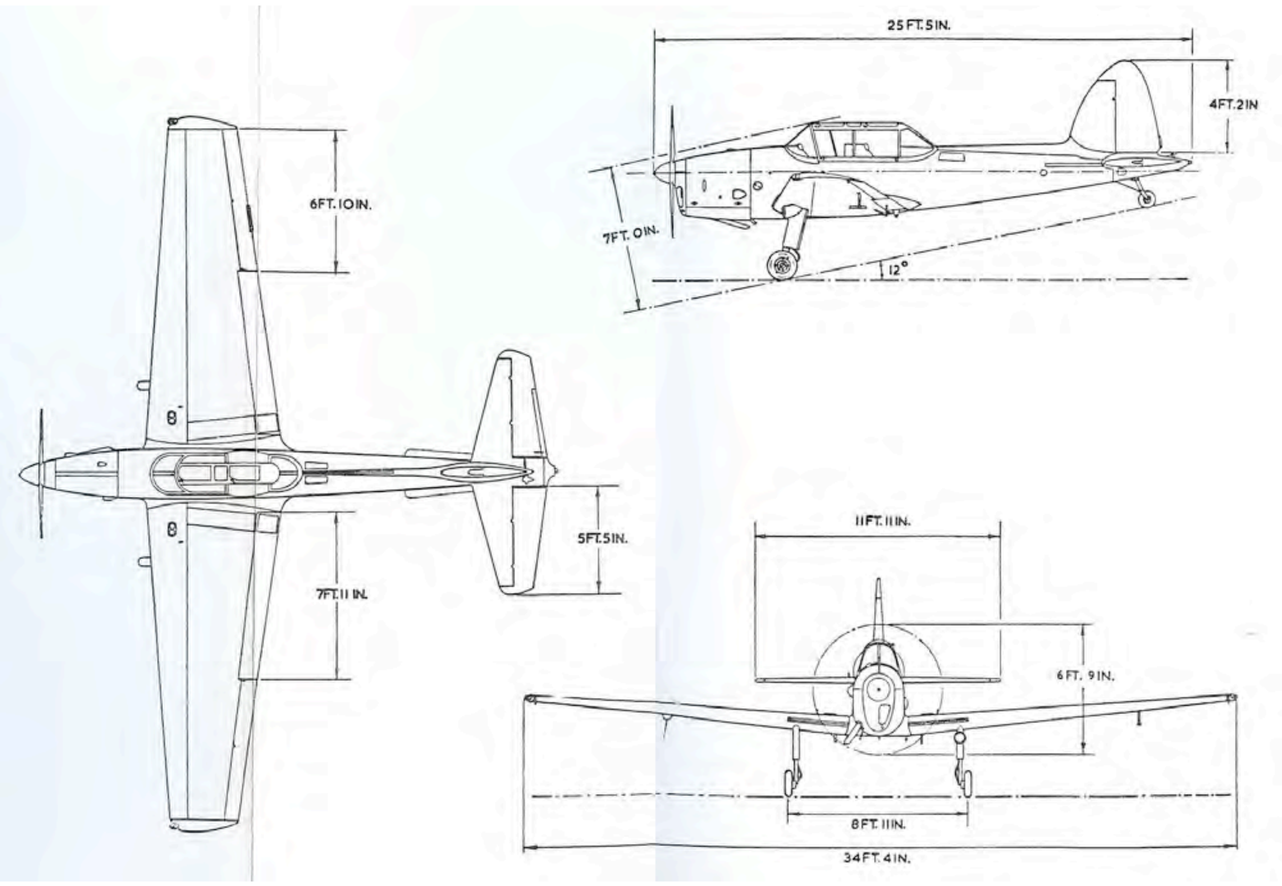
Systems Description

General Description

The De Havilland DHC 1 Chipmunk is designed as a basic trainer aircraft. It has a fixed undercarriage, fully castering tailwheel, brakes and full dual controls. The tandem cockpits are enclosed by a single hood. The fuselage, tailfin, tailplane and leading edges of the mainplane are metal and the rest of the wings and control surfaces are fabric covered.

De Havilland DHC 1 Chipmunk specifications:

Engine:	Gipsy Major Mk. 8
Minimum crew:	One pilot (front seat only)
Capacity:	2 pilots or a pilot and a passenger
Length:	25ft 5in
Wingspan:	34ft 4in
Height:	7ft 0in
Empty weight:	1428 lb
Max gross weight:	2200 lb
Cruising speed:	103 kts TAS
Range:	235 nm



Seating Capacity

The De Havilland DHC 1 Chipmunk has two seats arranged in tandem and enclosed by a fixed windscreen, incorporating a crash pylon and a single sliding canopy. The pilot, when flying solo, MUST occupy the front cockpit. The aircraft must not be flown solo from the rear seat.

Fuselage

The fuselage is metal, with a semi-monocoque structure and is built in two parts. The joint is located near the trailing edge of the wing. The portion of fuselage between the rear cockpit and fuselage joint forms the luggage locker.

Mainplanes

The mainplanes are of single-spar, metal construction and are secured to the fuselage at the spars and leading edges. A metal skin covers the "D" shaped box beam leading edge. The remainder of the mainplane structure is fabric covered.

Slotted ailerons are fitted, and hand operated slotted flaps extend from root fillets to the inboard ends of the ailerons. Both ailerons and flaps are fabric covered.

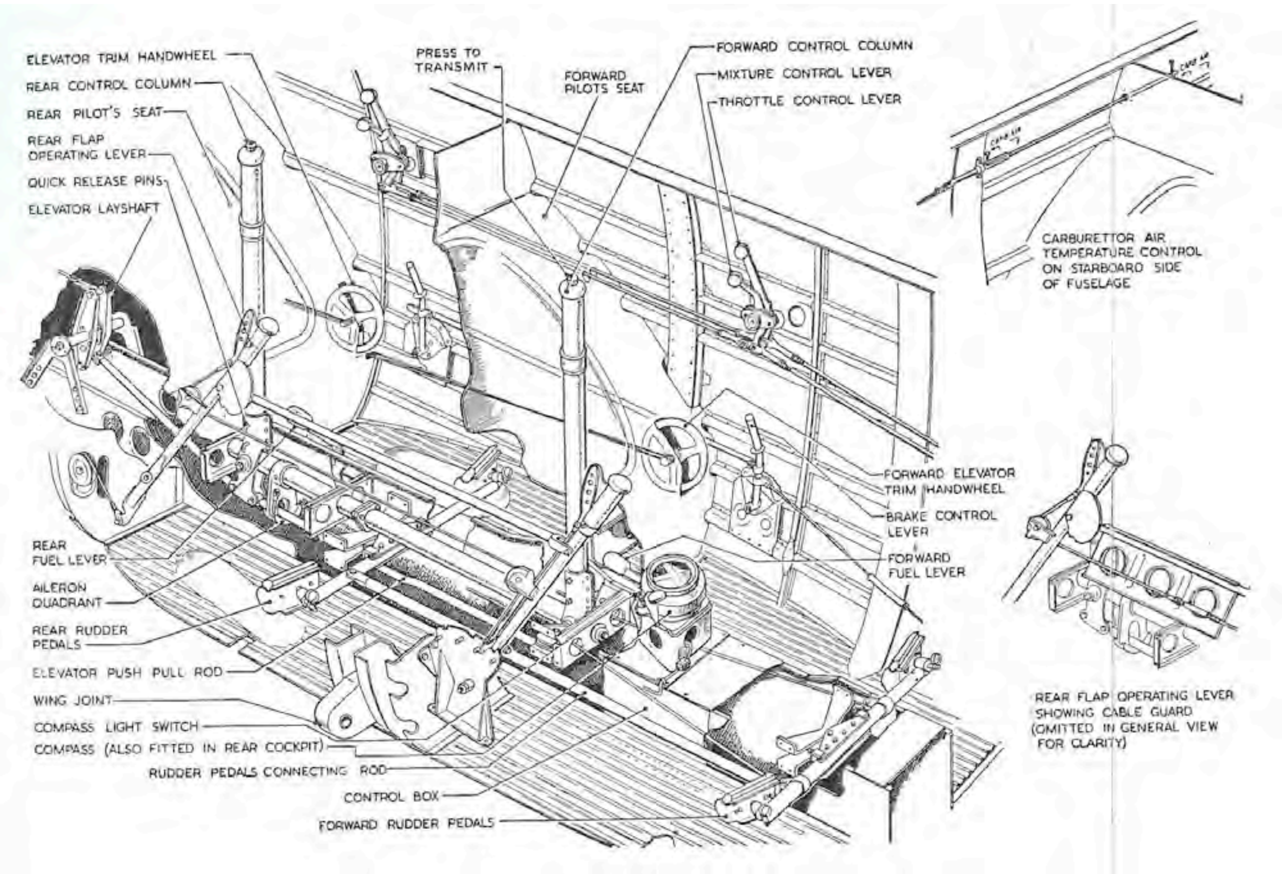
Empennage

A single fin and balanced rudder, mounted wholly above the fuselage, and a cantilever tailplane and balanced elevators form the empennage. The fin and tailplane are metal covered. The rudder and elevators are fabric covered

Flying Controls

The controls are of the conventional type, i.e. a control column (stick) and individual rudder pedals. There are dual controls for flying from either the front or the rear cockpit. The rear control column can be removed, for solo or passenger flying, by removing two safety pins and then withdrawing the two retaining pins at the base of the column and disconnecting the radio cable.

The rudder pedals can only be adjusted for leg reach on the ground. They may be moved to any one of three positions by raising the spring clip and pin and moving the rudder bar forward or aft as required.



Flying Controls Locking Gear

The flying controls locking gear in ZK-SAX consists of a short bungy chord which is wrapped around the control column (stick) in the front cockpit. The bungy is secured at each end into two holes in the radio mounting.

Trimming

Trim tabs are incorporated in the rudder, the starboard aileron and the starboard elevator. The rudder and aileron tabs are only adjustable on the ground. The elevator tab can be controlled in flight. The elevator trim tab is controlled by a handwheel on the port side of each cockpit. The wheel is labelled NOSE - UP/DOWN and is so marked that all nose-up trim positions are black and all nose-down positions are white, the setting being read against the top of the wheel casing.

Flaps Control

Flap operation is controlled by a 3-position lever on the starboard side of each cockpit, up (fully forward), half flap of 15° (mid position) or full flap of 30° (fully aft). No flaps position indicator is provided, as the flaps are easily seen from both cockpits. To move the flap lever forward, thereby reducing the amount of flap deployed, a guarded, spring loaded trigger at the top of the lever must first be operated to release a pawl in the front cockpit quadrant. The trigger is protected by a guard, to prevent accidental movement (reduction) of the flaps. The use of the trigger is not necessary when moving the flap lever aft (increasing the amount of flap deployed).

The flaps must not be raised on the ground if a tail wind component exists, due to the risk of the control cables leaving the pulleys.

Undercarriage

A conventional two wheel cantilever non-retractable undercarriage is secured to the wing. The shock absorbers on the main wheels are a rubber block type. The tailwheel is fully castering.

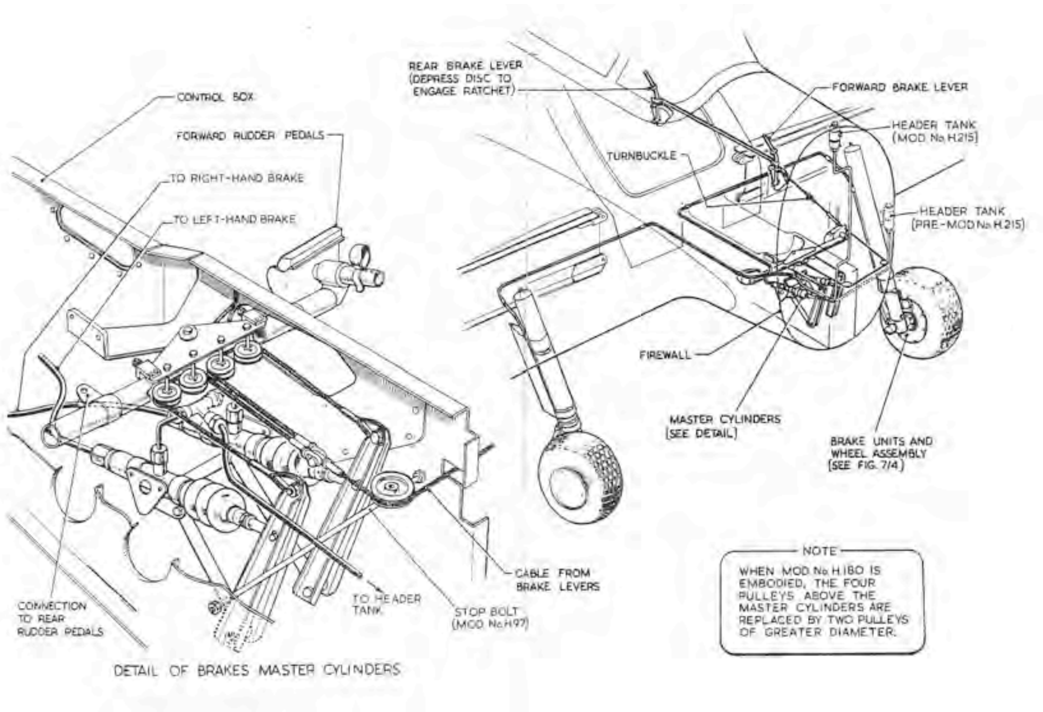
Brakes

The main wheels are fitted with hydraulic brake units. A master cylinder for each wheel is supplied with fluid from a reservoir on the forward face of the firewall.

The brakes are controlled by a hand lever on the port side of each cockpit. The lever is spring loaded and may be set to any position by pressing down the collar on the lever to engage a pawl on the quadrant. Slight backward movement of either lever releases the pawl so that the lever can be moved forwards to the OFF position.

With the lever on, equal braking is applied to both wheels when the rudder is central. Setting the lever to an intermediate position and operating the rudder pedals provides differential braking for ground manoeuvring.

The park brake should not be left on after picketing as the hydraulic brake system does not like being pressurised for long periods.



Engine

The aircraft is powered by a four-cylinder, air-cooled Gipsy Major Mk. 8 engine, driving a two bladed, fixed pitch propeller. The engine develops 145 BHP at sea level in ISA conditions. Two engine driven fuel pumps are provided and the engine also drives a generator and a vacuum pump.

Priming

A hand priming lever, accessible through an opening in the port side engine cowling, is operated to ensure that the pumps, the fuel pipe line to the carburettor and the carburettor float chamber are all filled with fuel.

A carburettor flooder control, operated by a pullwire through another opening in the port side cowling, enables the carburettor to be flooded, to provide the necessary rich mixture for starting.

When priming the engine, the fuel cock should be ON and the flooder control pulled out while the hand priming lever is operated.

Throttle Quadrant

The throttle and mixture levers are mounted on common quadrants, one in each cockpit. The throttle and mixture levers are linked so that the throttle cannot be closed without moving the mixture control back to the full rich position.

Throttles

Two interconnected throttle levers are provided, one in each cockpit. The throttle lever moves in a quadrant divided into two sections, marked ECON CRUISING and POWER JET IN.

Mixture Control

A mixture control lever is in each of the two throttle quadrants. The mixture control operates in the opposite sense to that of modern aircraft, i.e. the mixture lever is moved rearward to richen the mixture and forward to weaken the mixture.

The mixture control should be fully rich for starting, ground running takeoff and operations below 3,000 feet.

Friction Control

A common friction nut is provided on each throttle quadrant for both the throttle and the mixture control levers.

Engine Instruments

An RPM indicator is provided on the left-hand side of the instrument panel in each cockpit. An electrically operated oil temperature gauge and a capillary-type oil pressure gauge are on the right hand side of each instrument panel.

Fuel System

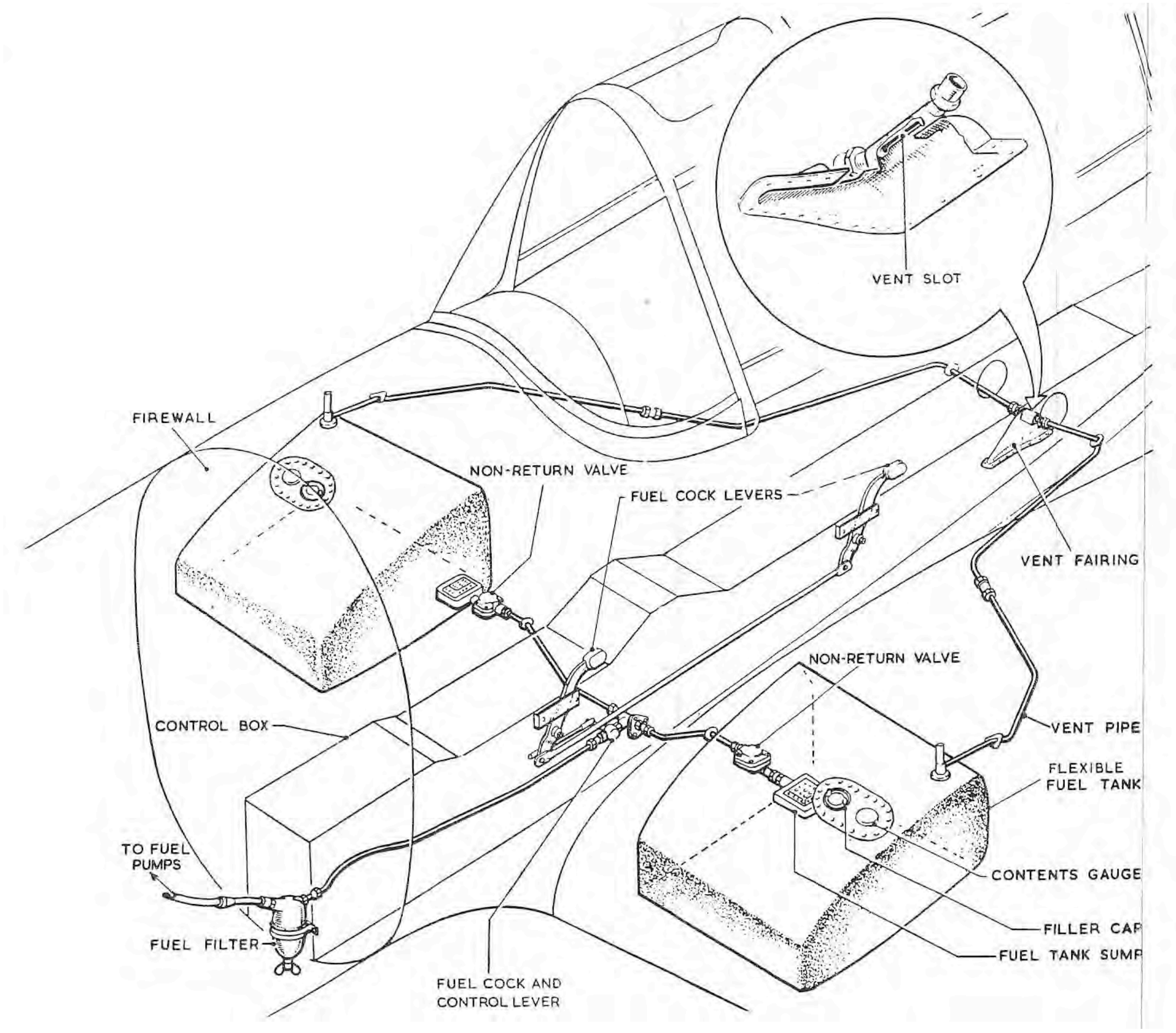
Fuel Tanks

Fuel is carried in two flexible 9 Imperial gallon tanks, mounted one in each wing. The fuel flows simultaneously from each of the two tanks by gravity feed to the single fuel cock and thence to two engine driven fuel pumps. Two non-return valves prevent the contents of one fuel tank being transferred to the other.

Fuel Cock

The fuel cock is operated by either of two mechanically interconnected ON/OFF levers, one in each cockpit, to the left of the control column. A gate is provided in the front cockpit, to retain the lever in the ON (forward) position. The cock cannot then be closed from the rear cockpit.

The fuel cock should be set fully on (forward) before starting and must remain in this position at all times when the engine is running.



Fuel Tank Venting

Each of the two fuel tanks is vented to atmosphere by means of a short vent pipe projecting vertically above the wing top surface and encased by a fairing. Air from a common vent inlet, located centrally beneath the fuselage, is directed to the interior of each vent pipe fairing and thence to the tanks through the vertical pipes.

The position of the common fuel vent inlet on the underside of the fuselage should result in both tanks emptying evenly. If, for any reason, uneven emptying occurs and one tank is allowed to empty completely, the other tank may fail to supply fuel to the engine.

A ball valve, located at the lower end of each vent pipe, ensures that there is no loss of fuel from the tanks during inverted flight, although a small quantity may enter the pipes when rolling into the inverted position or during similar manoeuvres.

A small hole in the side of each vent fairing ensures that fuel siphoning does not occur in the event of fuel entering the vent pipe. It is most important that the anti-siphoning hole in the vent fairing is kept clear, since if it is blocked and siphoning occurs, fuel will be continuously vented overboard through the common vent inlet beneath the fuselage, which is not visible from the cockpit. Consequently the anti-siphoning hole in the vent pipe fairing must be inspected prior to each flight.

WARNING

It is most important that the anti-siphoning hole in the vent fairing does not become blocked in flight.

Aerobatics, or other manoeuvres likely to cause spillage from the fuel tanks, should not be attempted after flying in icing conditions or if ice formation is observed on the vent fairings, as this may lead to the anti-siphoning holes becoming blocked.

Fuel Gauges

A float-operated, direct-reading fuel gauge is located on the upper surface of each wing, next to the fuel filler cap. There are no cockpit gauges.

The fuel gauges are calibrated in white figures to indicate the contents when the aircraft is in flight, and calibrated in red figures to indicate the contents when the aircraft is in a tail-down attitude, i.e. on the ground.

In flight, the gauges can only be read accurately from the front cockpit.

Oil System

An oil tank of 2.5 Imperial gallon capacity (which includes 0.5 gallons of air space) is mounted on the forward face of the engine bulkhead/firewall. Oil level is checked by a dipstick embodied in the oil filler cap, which is under the starboard side engine cowling.

A scoop in the port engine cowling passes air through a cooler in the oil tank.

Carburettor Air-Intake Control

The carburettor air intake control (Carb Heat) is controlled by two inter-connected CARB AIR, HOT/COLD levers, on the starboard side of each cockpit. When the lever is in the COLD (forward) position, air is fed to the carburettor through a scoop in the starboard engine cowling. With HOT selected, the carburettor is supplied with warm air from inside the engine cowling.

The lever is moved aft and down to select HOT and is retained in this position by a gate in the front cockpit bracket. On some aircraft this control may be lock wired in the HOT position if the air temperature is below +30°C. If COLD air is used below this temperature, carburettor icing may occur, indicated by rough running and loss of power.

Ignition Switches

A pair of magneto ignition switches are provided on the port wall of each cockpit. Both pairs of ignition switches must be ON for the engine to run. The engine will not run with the rear cockpit magneto switches OFF, consequently the ignition switches in the rear cockpit are guarded.

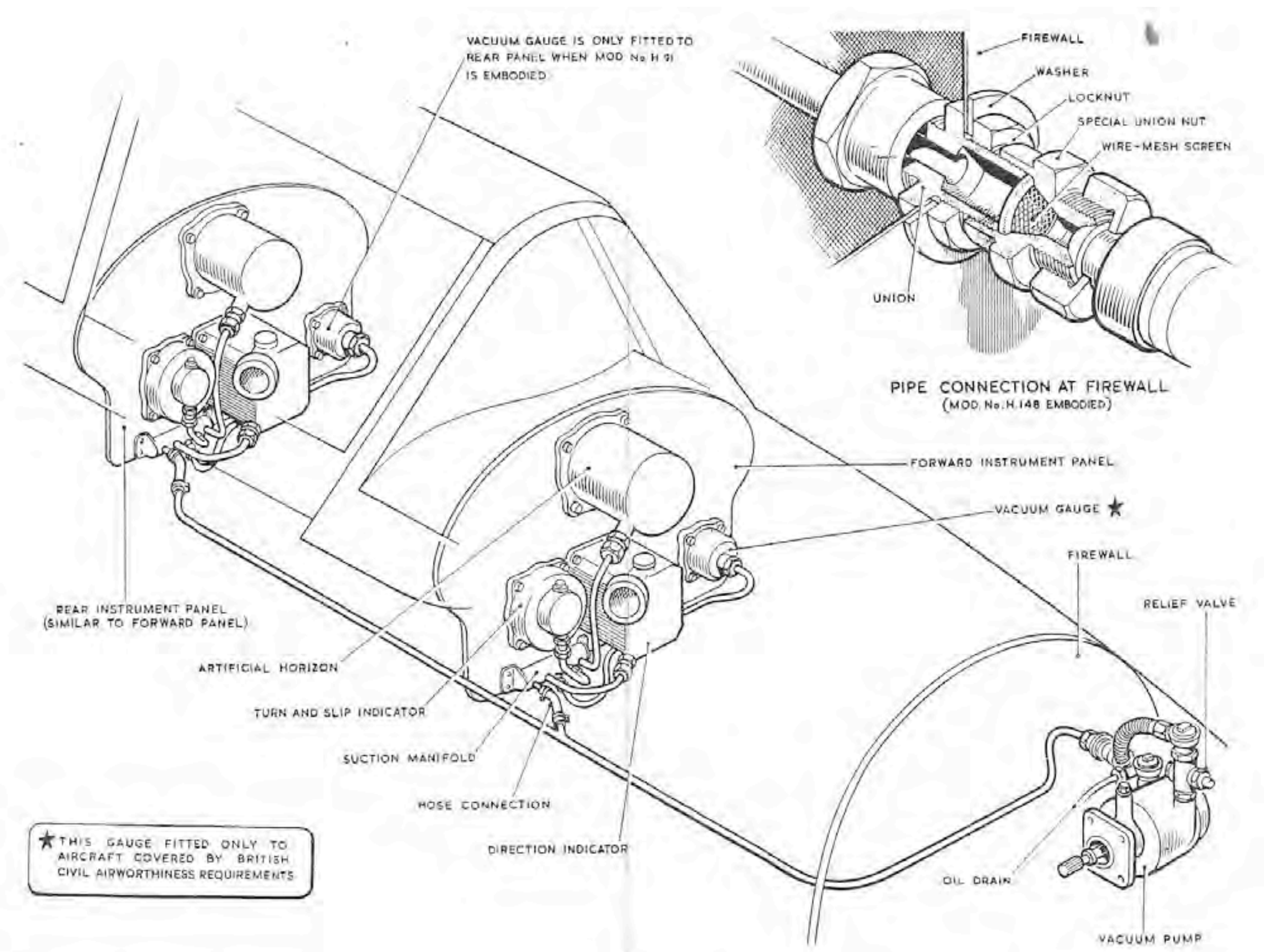
An impulse starter coupling is fitted on the starboard magneto (switch No 2). When starting by hand swinging the propeller, this switch only should be set ON before swinging, the No 1 ignition switch should be put on as soon as the engine fires.

The engine can be shut down from either the forward or the rear cockpit by switching OFF both magneto ignition switches.

Vacuum System

An engine driven vacuum pump provides suction for the gyro-driven instruments, i.e. the artificial horizons, the directional gyros and the turn and slip indicators.

In some aircraft, but not as yet ZK-SAX, a vacuum (suction) gauge is fitted in the front or both cockpit instrument panels. The normal gauge reading is 4.5 to 5.0 in Hg, at 2,100 rpm.



Electrical System

Generator

One 500 watt, engine driven generator charges the batteries and supplies 24 volt DC for the cockpit and external lighting, radio, pressure head heater and oil temperature gauges.

A generator warning light, at the top left-hand corner of the front cockpit instrument panel, comes on when there is no generator output, i.e. the generator is not charging, provided that the Ground/Flight switch is selected to FLIGHT. It will also come on if the main fuse is blown, or the accumulator (battery) cut out does not close.

If the generator fails, the batteries will supply the aircraft services. Radio transmissions should be kept to a minimum and, at night, the emergency lighting should be used instead of the normal cockpit lighting.

Batteries

Two 12 volt, 15 amp-hour batteries, connected in series, are housed in the rear fuselage and supply the aircraft services (except the pressure-head heater) when the generator is not charging.

A 2.4 volt, 1.2 amp-hour alkaline battery, on the port wall of the front cockpit, supplies the emergency lighting.

A socket on the port side of the fuselage allows an external battery to be plugged in for an external power start or for ground-test purposes.

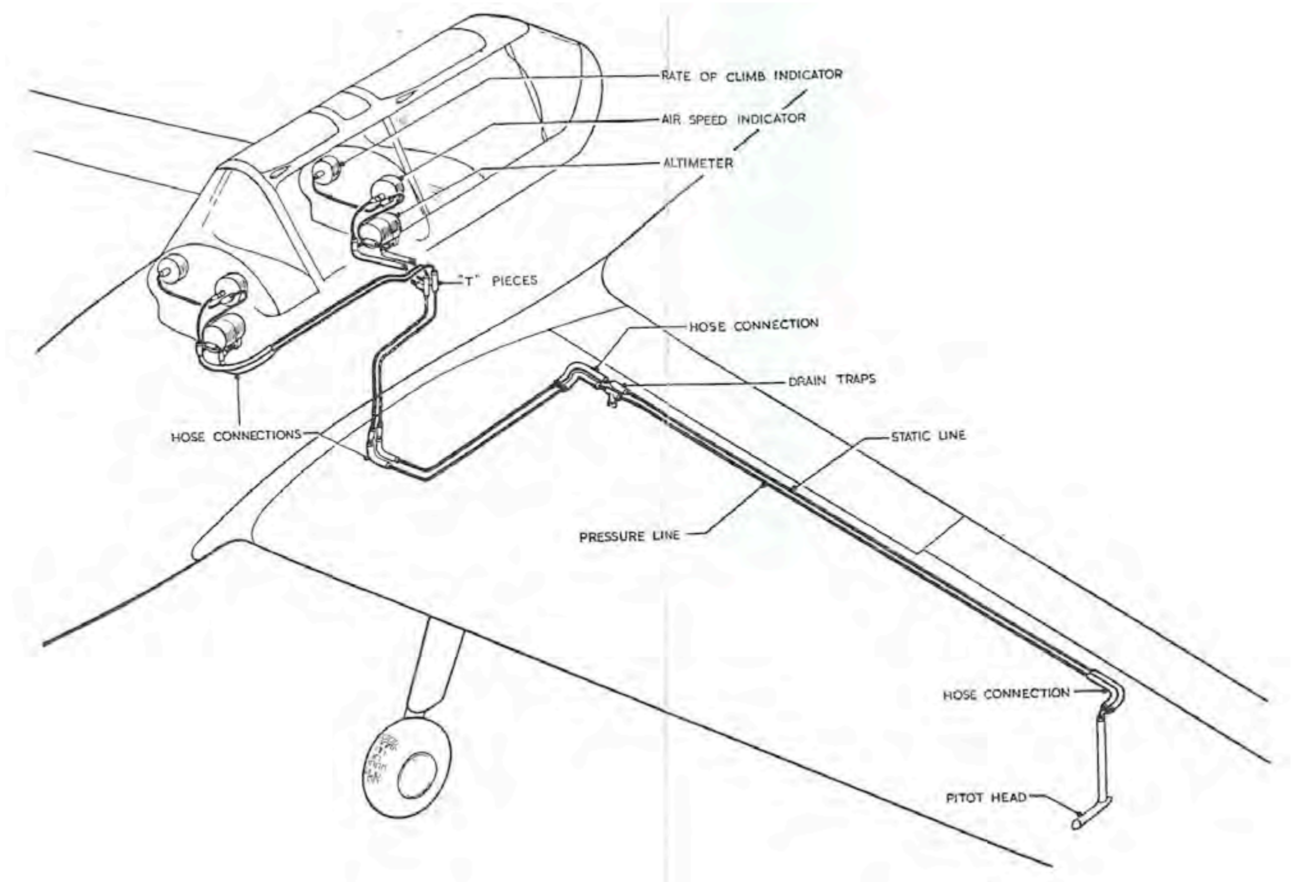
Ground/Flight Switch

A ground/flight battery isolating switch is on the port side of the front cockpit, below the instrument panel. When set to GROUND, this switch isolates the batteries from the electrical system. When set to FLIGHT, it allows the generator to charge the battery and when the generator is not charging, the battery to supply the aircraft services.

The ground/flight switch should be at GROUND whenever the aircraft is parked and when an external battery is plugged in for an external power start. It should be set to FLIGHT before starting the engine and left in this position throughout the flight, if this is not done, the aircraft electrical services will fade whenever the engine is throttled back.

Pitot Static System

A combined pitot static pressure head is located on the underside of the port wing and supplies pressure for the ASI, VSI and altimeter in each cockpit. On some aircraft, the pressure head is electrically heated, with the heater controlled by the rearmost switch on the switch/fuse box in the front cockpit. The pitot heater will only operate when the generator is charging.



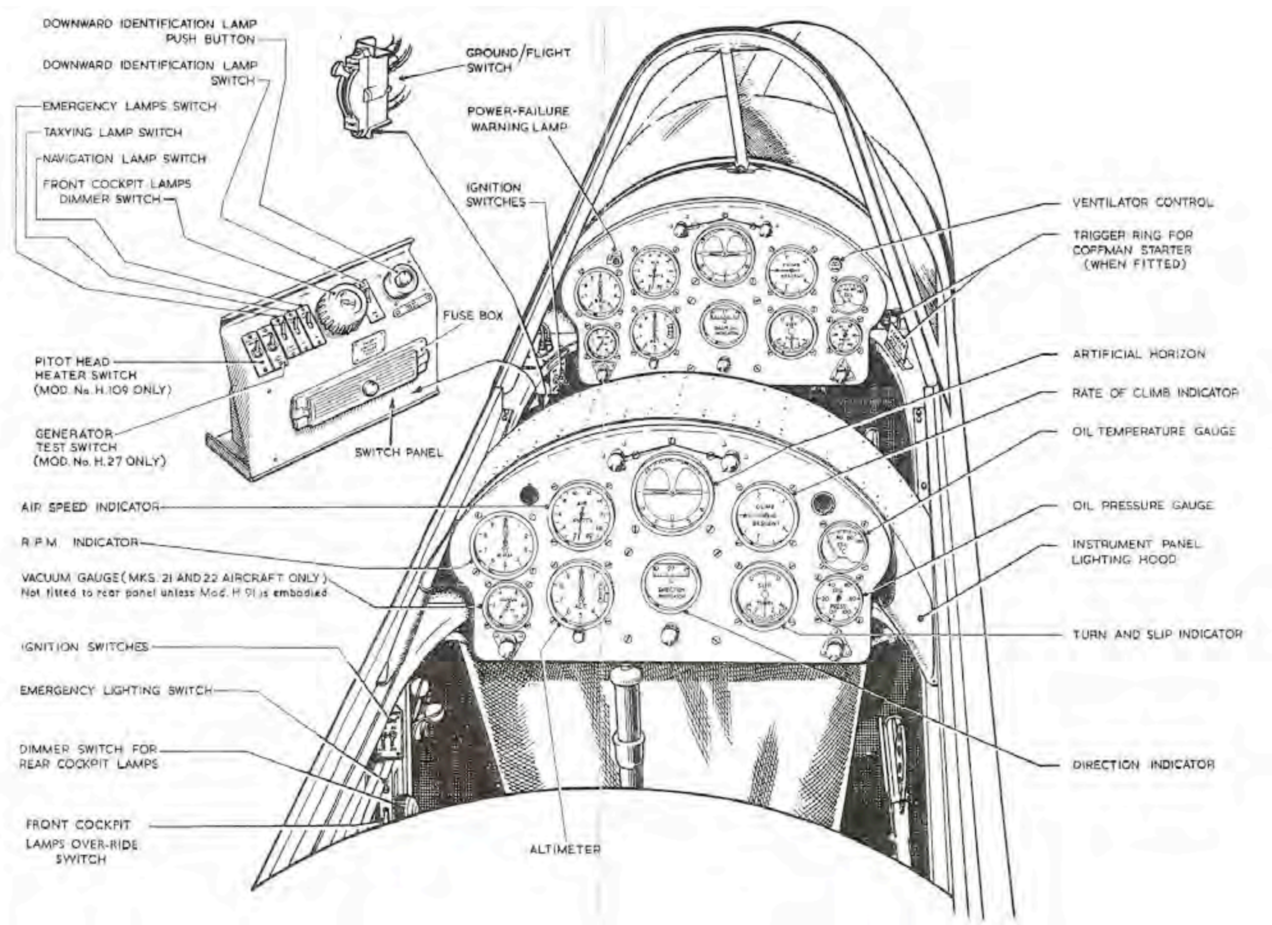
Flight Instruments

Gyro-Operated Instruments

The gyros for the artificial horizon, the directional gyro and the turn and slip indicator on each cockpit are operated by suction from the vacuum system at 4.5 in Hg.

Compass

One P11 compass was originally provided in each cockpit. If still fitted, this is located on the floor forward of the respective control column. SAX has had its P11 compass removed.



Waypoints AVIATION

Cockpit Canopy

A single sliding canopy covers both cockpits. The cockpits are entered from walkways on the port and starboard mainplane surfaces and flaps.

There are two external handles, one for each cockpit, on the top port side of the canopy. These are connected to the corresponding levers inside the structure. Twisting any of the handles unlocks the canopy and allows it to be slid rearwards. This release mechanism is connected to a spring loaded plunger which engages holes in the centre canopy rail to provide the following four alternative locked positions:

- ✈ Fully closed;
- ✈ Partially open;
- ✈ Approximately half-open, giving access to the front cockpit; and,
- ✈ Fully open.

Handgrips are provided internally to facilitate moving the canopy. The canopy must always be moved by the handles and not by pushing on the canopy structure.

The cockpit canopy is not jettisonable. A small spring loaded panel (door) in the top of the canopy can be opened by either of two yellow/black knobs, one in each cockpit, on the starboard side of the roof of the canopy. Opening this panel/door overcomes the suction of the canopy and enables the canopy to be opened full at higher speeds. At speeds below 100 knots, the canopy should open normally.

To provide an emergency exit in the event of the canopy being jammed in a crash, two jettisonable “breakout” panels are provided on the port side of the canopy, one for each cockpit. For release, an internal and an external yellow/black lever are provided for each panel.

The external handles are lockwired and marked:

EMERGENCY - LIFT TURN AND PULL FOR EMERGENCY RESCUE

And the internal handles are marked:

TURN AND PUSH OUT FOR CRASH LANDING EXIT.

Seats and Harnesses

The seats, in both the front and rear cockpits, are of metal construction built into the fuselage structure, are not adjustable, and are designed for use with seat-type parachutes.

The seats, in both the front and rear cockpits, are equipped with Z-type harnesses. These harnesses must not be allowed to hang outside the cockpit when not in use, as they can damage the aircraft skin.

Please ensure that when vacating the aircraft at the end of a flight, that the harness release levers, in both the front and rear cockpits, are returned to “FASTEN”. If they are left in the “UNDO” position (displaced 90 degrees or so) it weakens the return spring and eventually it stops returning and a replacement is required.

Cabin Ventilation

A duct, mounted in front of the windscreen, provides controllable ventilating air for both the front and rear cockpits. A shutter in the duct is controlled by a push-pull control, marked AIR VENT PUSH, at the top right hand side of the front cockpit instrument panel.

Internal Lighting

Front Cockpit

The front cockpit instrument panel is illuminated by the two lamps, controlled by a dimmer switch on the switch/fuse box. An override switch in the rear cockpit on the port side wall, enables the instructor to switch off these lamps. Therefore the lighting master switch in the rear cockpit must be ON before solo night flying. The compass lamp and its associated switch are on the compass mounting.

Rear Cockpit

The rear cockpit instrument panel lamps are controlled by a dimmer switch on the cockpit port side wall. The compass lamp and switch are on the compass mounting.

Emergency Lighting

There are two emergency lamps, one over each instrument panel, which are individually controlled. The front cockpit emergency lamps are controlled by a switch on the switch/fuse box, and the rear cockpit emergency lamps are controlled by a switch on the port side wall, above the override switch. The lamps are supplied from a 2.4 volt, 1.2 amp-hour alkaline battery. The switches are identifiable in the dark by a luminous spot.

External lighting

Navigation Lights

The navigation lights are controlled by a NAV LTS ON switch on the switch/fuse box.

Downward Identification Light

An identification light on the underside of the starboard wing, is controlled by either a DOWN IDENT ON switch or a morsing pushbutton on the switch/fuse box.

Taxying Lamp

The taxying lamp on the port undercarriage leg is controlled by a TAXYING LAMP ON switch on the switch/fuse box.

Stowage

A luggage locker is provided aft of the seat in the rear cockpit. When flying solo the maximum permissible load in the luggage locker is 40 lb. When the rear cockpit is occupied the maximum permissible load in the luggage locker is 18 lb. A control locking bar (which ZK-SAX does not have) may be stowed in this locker (these weigh 1½ lb) thus reducing the luggage load to 38½ lb and 16½ lb respectively.

Avionics

ZK-SAX is fitted with the following avionics:

- A Bendix King KY96A VHF radio;
- An Ameri-King AK451 ELT;
- A GTX 320A Transponder; and,
- A Flightcom 403MC intercom.

The VHF transmitter/receiver is forward of and below the front instrument panel and the aerial is under the starboard wing.

A press-to-transmit button is provided on the top of each control column. However the press-to-transmit button on the top of the control column in the rear cockpit does not work, so a small transmit switch has been fitted onto the righthand side of the rear instrument panel.

A guarded mute switch is provided on the controller in the rear cockpit. This switch is not spring loaded to off, so it must be checked off before solo flight.

Emergency Equipment

Fire Extinguisher

A BCF hand fire extinguisher is fitted on the floor on the starboard side of the front cockpit. The extinguishant is non-toxic. The bottle is trigger-operated and can be stopped and restarted. The total discharge time is approximately 38 seconds. No engine fire extinguisher is provided.

Emergency Exits

To abandon the aircraft in flight, the hood should be opened fully, if necessary using the assister device described above. In a crash landing, if the hood is jammed, the break-out panels described above should be used.

Chapter Ten

Performance

General Performance of the Chipmunk Mk. 22

The following paragraphs provide a general description of the performance of a MK. 22 Chipmunk. For calculation of more specific performance figures, required to meet CAR Part 91 requirements, refer to the performance graphs and tables on the subsequent pages in this chapter. The general performance figures apply to an aircraft at an all up weight of 2,100 lb, and in standard atmospheric conditions.

Takeoff - From a Hard Surface

The takeoff distance from the beginning of the takeoff roll to clear a 50 foot obstacle, in still air at sea level, using half (15º) flap, is approximately 450 yards / 1350 feet / 414 metres.

The ground run component of the takeoff distance, in the conditions described above is approximately 220 yards / 660 feet / 200 metres.

Takeoff - From a Grass Surface

The takeoff distance from the beginning of the takeoff roll to clear a 50 foot obstacle, in still air at sea level, using half (15º) flap, is approximately 485 yards / 1455 feet / 444 metres.

The ground run component of the takeoff distance, in the conditions described above is approximately 245 yards / 735 feet / 224 metres.

Climb

The figures given below are based on an aircraft at 2,100 lb, climbing at an indicated airspeed of 62 kts (71 mph). This airspeed approximates 1.2 times the power off stalling speed and results in very close to the best gradient of climb.

✈ Rate of climb at sea level	840 fpm
✈ Gradient of climb at sea level	12.6 %
✈ Rate of climb at 5,000 feet	600 fpm
✈ Gradient of climb at 5,000 feet	8.5 %
✈ Time to climb to 5,000 feet	7 minutes
✈ Service ceiling (ROC = 100 fpm)	15,800 feet

The sea level rate of climb in ISA conditions (840 fpm) reduces by approximately 45 fpm with each 1,000 foot of altitude increase.

The rate of climb is reduced by approximately 15 fpm for each 10ºC increase in temperature above ISA, and is increased by approximately 40 fpm for each 100 lb reduction in all up weight from 2,100 lb.

The fuel used for takeoff and climb to 5,000 feet is approximately 5 Imperial gallons.

Cruise

- ✈ Maximum level speed at sea level — 120 kts (138 mph) TAS
- ✈ Maximum level speed at 5,000 feet — 116 kts (134 mph) TAS
- ✈ Cruising speed at 2,100 rpm at sea level — 103 kts (119 mph) TAS
- ✈ Cruising speed at 2,100 rpm at 5,000 feet — 101 kts (116 mph) TAS
- ✈ Fuel consumption at 2,100 rpm at sea level — 7.4 gal/hr (13.9 nm/gal)
- ✈ Fuel consumption at 2,100 rpm at 5,000 feet — 6.8 gal/hr (14.8 nm/gal)

Range and Endurance

The recommended range speed is 90 knots IAS, at all altitudes.

The optimum endurance speed is 60 to 65 kts IAS.

The figures given below are based on 18 Imp gallons, in still air, at cruising speed (2,100 rpm), including an allowance for takeoff and landing.

- ✈ Range at sea level — 235 nm
- ✈ Range at 5,000 feet — 240 nm
- ✈ Endurance at sea level — 2.3 hrs
- ✈ Endurance at 5,000 feet — 2.3 hrs

Descent

- ✈ Gliding gradient at 55 kts (63 mph) IAS — 9.5%

Landing

The landing distance from crossing the threshold at 50 feet, in still air at sea level, onto a hard surface, using full flap and a normal landing and braking technique, is approximately 475 yards / 1430 feet / 440 metres.

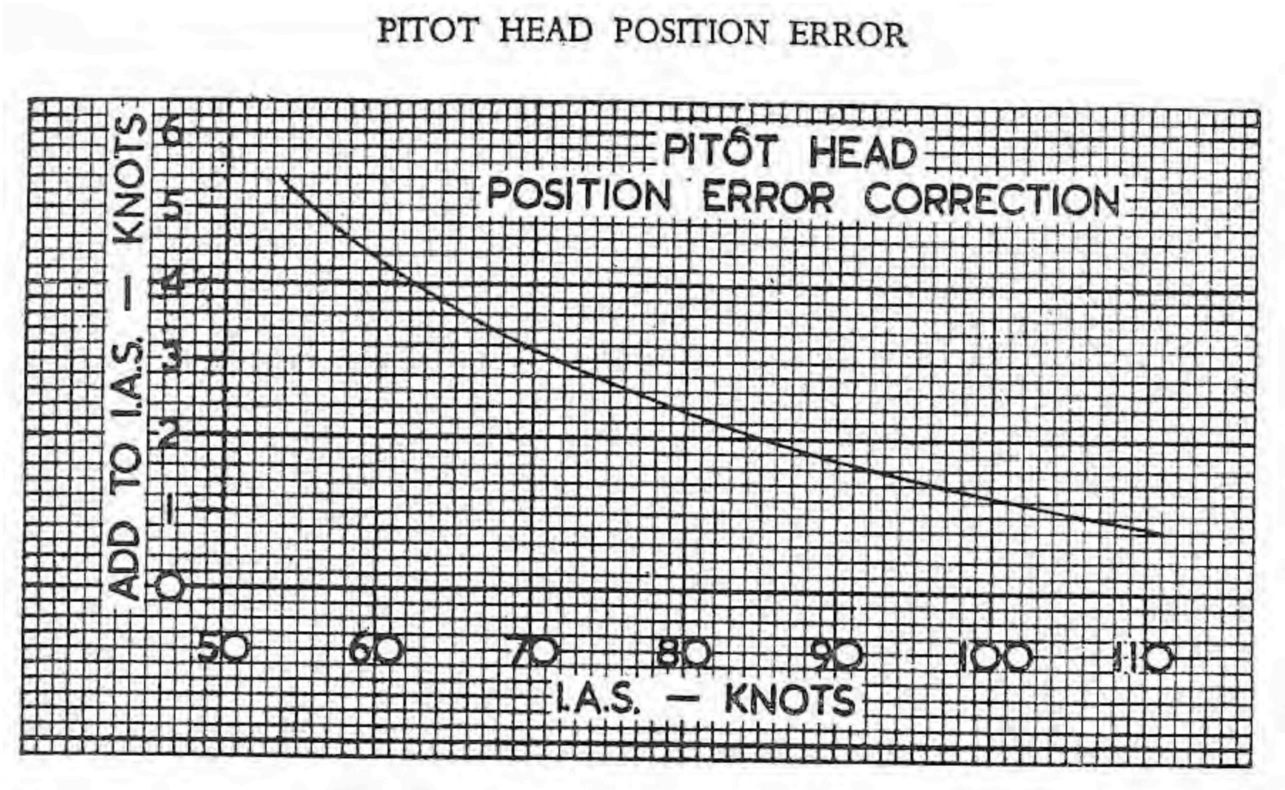
Pressure Error Corrections

The pressure error corrections to be made to the airspeed indicator are as follows:

IAS Range	50-60	60-66	66-78	78-93	93-120
Clean	+5 kts	+4 kts	+3 kts	+2 kts	+1 kt
15º Flap	+4 kts	+3 kts	+2 kts	+1 kt	

Position Error Corrections

For position error corrections to be made to the airspeed indicator refer to the graph below.



The position error correction graph above applies at a weight of 2,000 lb.

The position error correction graph on the following page shows the corrections to be made to the airspeed indicator for two weights, 1,600 lb and 2,100 lb, with flaps retracted. Pilots should interpolate for weights within this range. The correction applies at all altitudes.

With flaps selected to the takeoff position (15º) the correction derived from this graph should be reduced by 1 kt, and with flaps selected to the landing position (30º) the correction derived from this graph should be reduced by 2 kts.

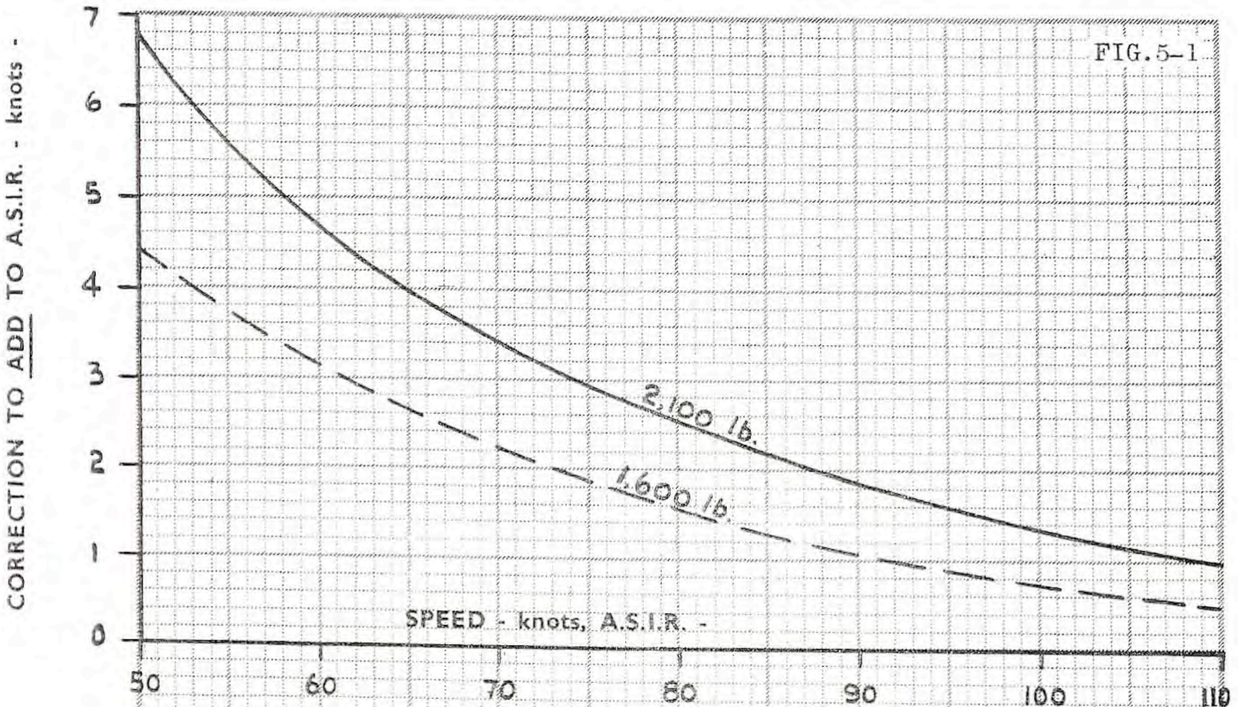
Altimeter Error Correction

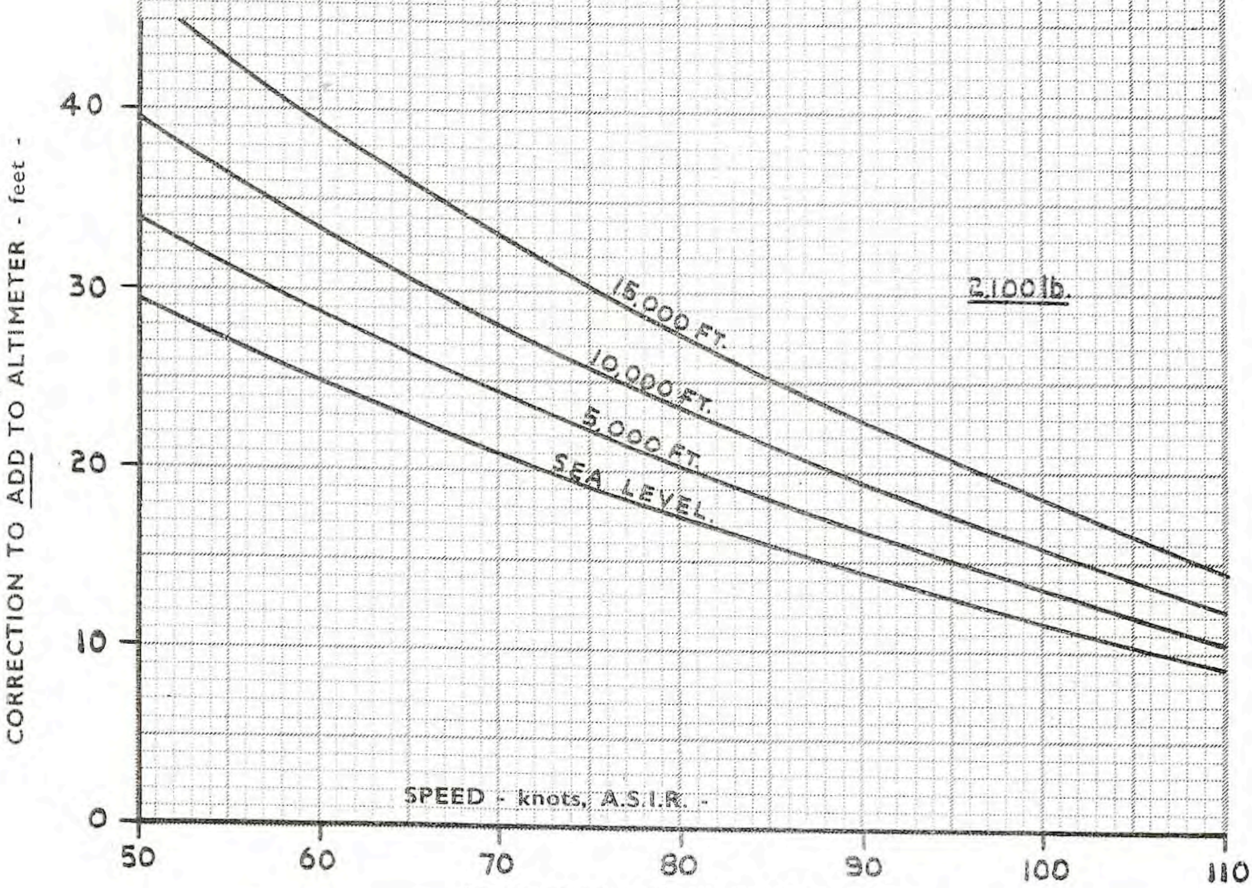
The position error correction graph on the following page shows the corrections to be made to the altimeter. The correction applies at a weight of 2,100 lb with the flaps retracted.

Compressibility Error Correction

The compressibility error affecting both the airspeed indicator and the altimeter is negligible at all permissible airspeeds.

POSITION ERROR CORRECTION TO A.S.I.R.

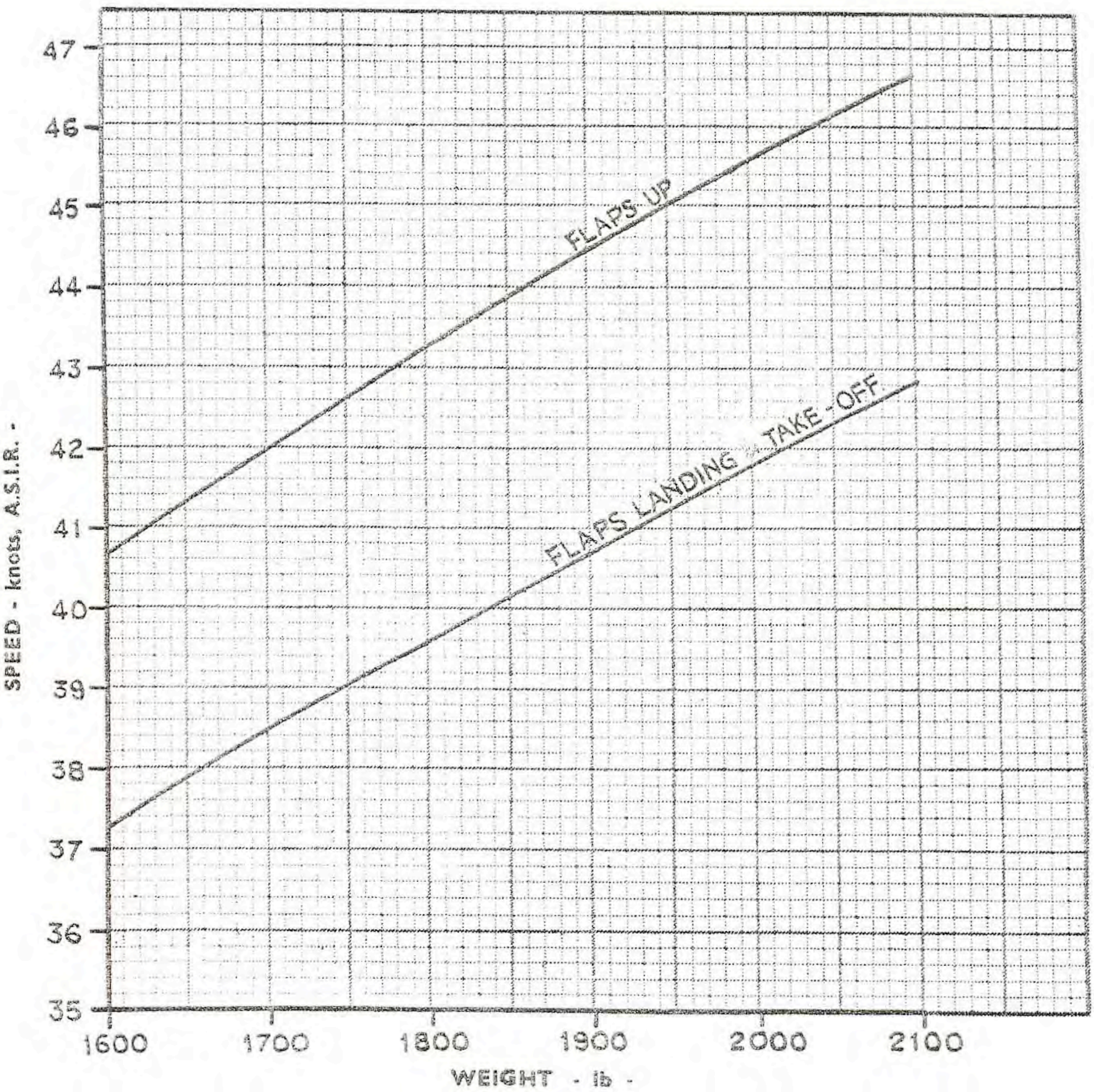




ALTIMETER ERROR CORRECTION

Stalling Speeds

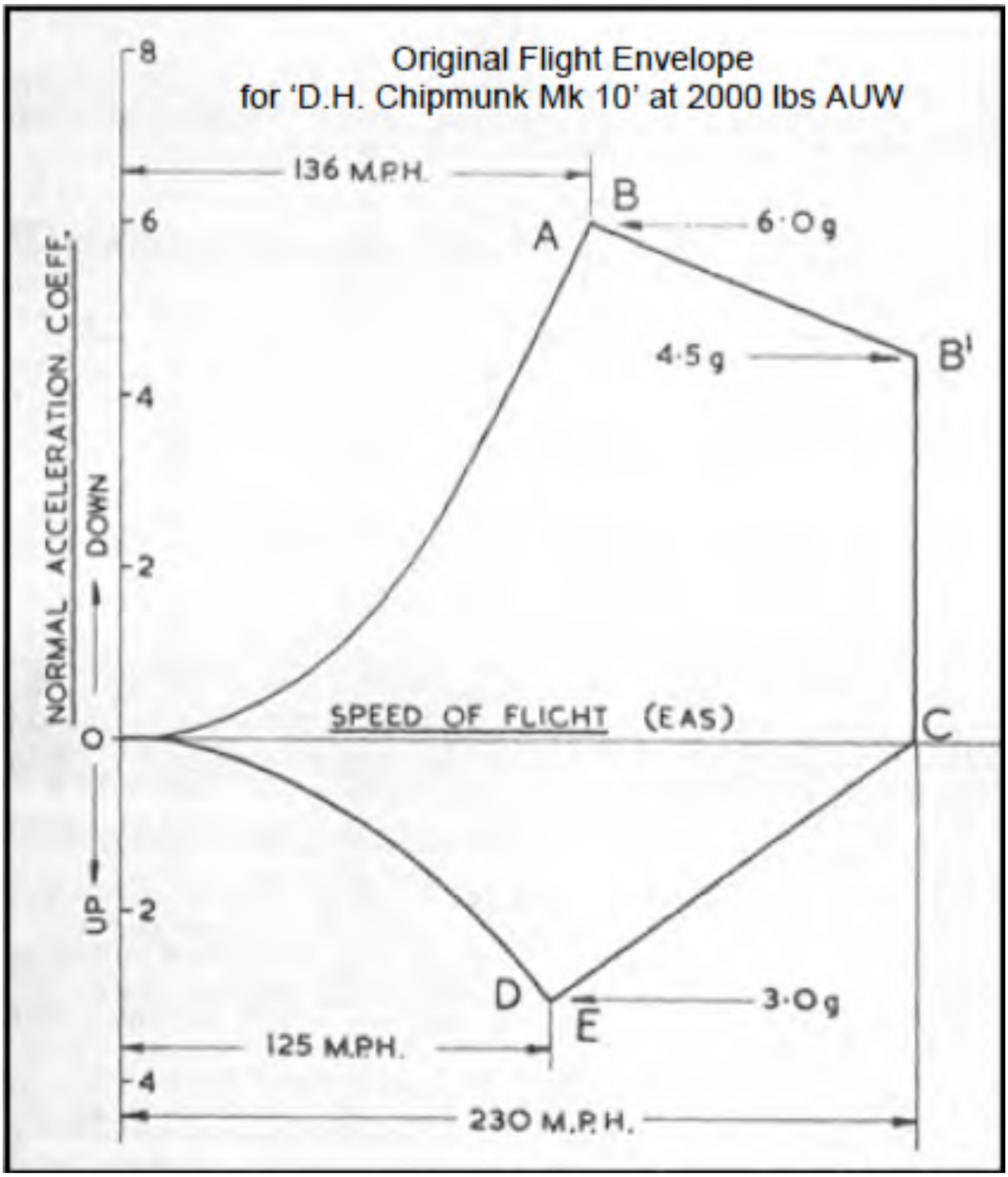
The power off stalling speed can be derived from the graph below.



Flight Envelope (Vn Diagrams)

Like all manufacturers at all times, de Havilland would design and certify aircraft for a given Maximum All-Up Weight and then be faced with an in-service need for an increase. In the first place the Anglicised Chipmunk was approved in 1948 at 2000 lb AUW, with a design Flight Envelope ranging from +6g to -3g, as depicted below, and a placarded VNE of 173 kt rather than the 155 kt which the Air Registration Board later imposed on civil Chipmunks.

Note that both VNE figures are safely inside the right hand side of the Flight Envelope, the 230 mph (200 kt) extreme being purely a Design Speed rather than an intended permissible speed. An Ultimate Factor of 1.5 is implicit in the graphs, that is to say the structure should not collapse at 1.5 times the loads associated with the extremes of the given Flight Envelope. This is NOT to infer that the Chipmunk is a +9.0g to - 4.5g aeroplane. After such treatment it would show permanent deformation and be fit only for melting into saucepans!



This second Vn diagram is effectively the same as the one above, however shows the speeds in knots.

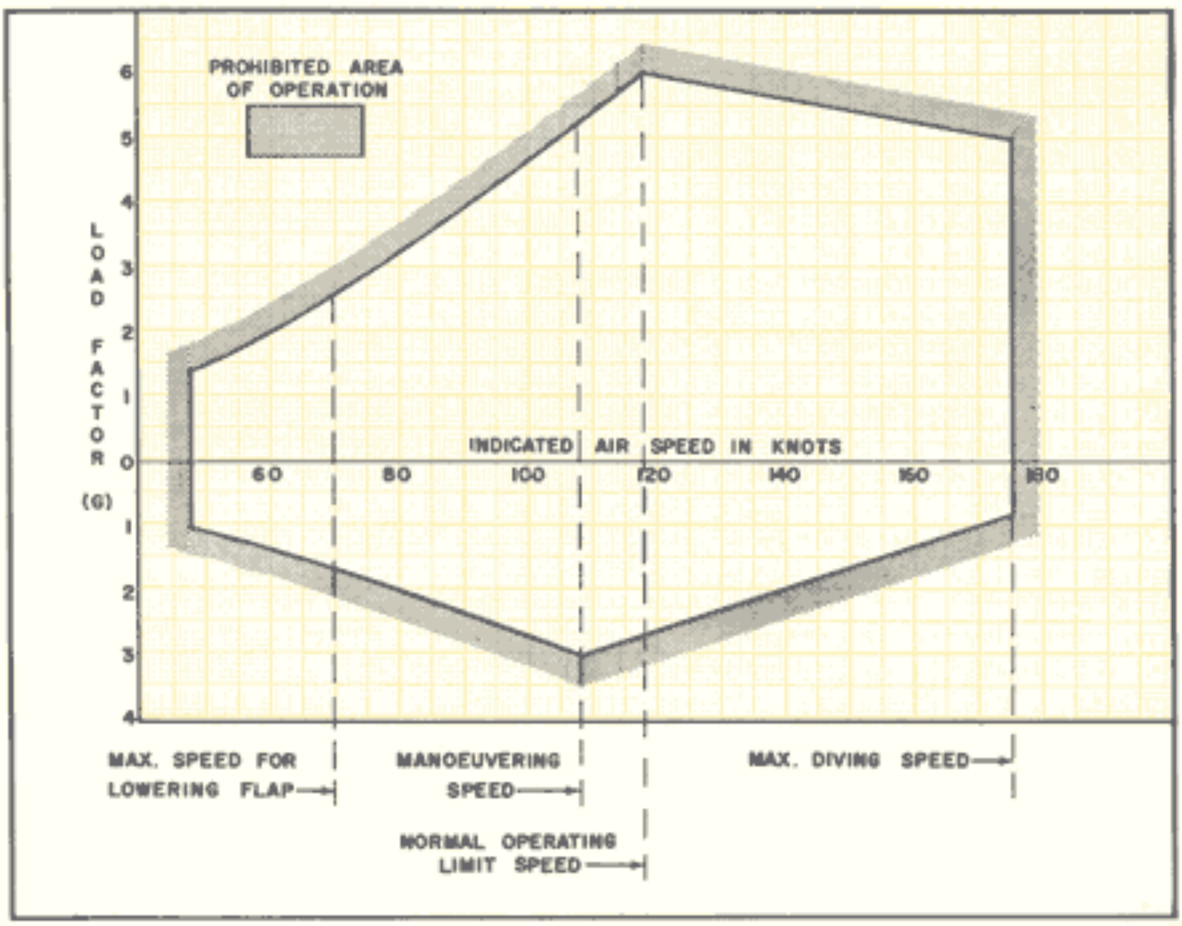
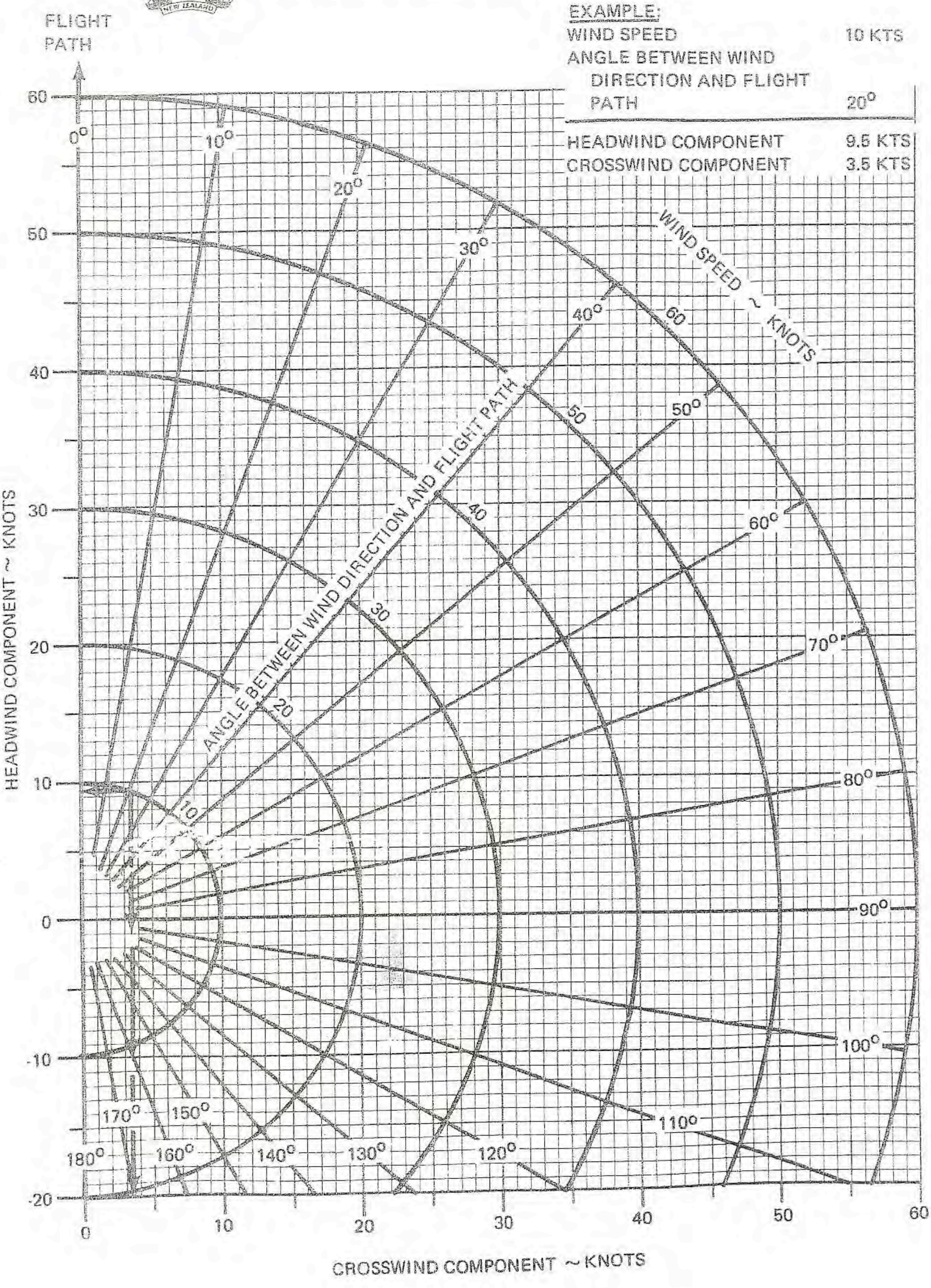


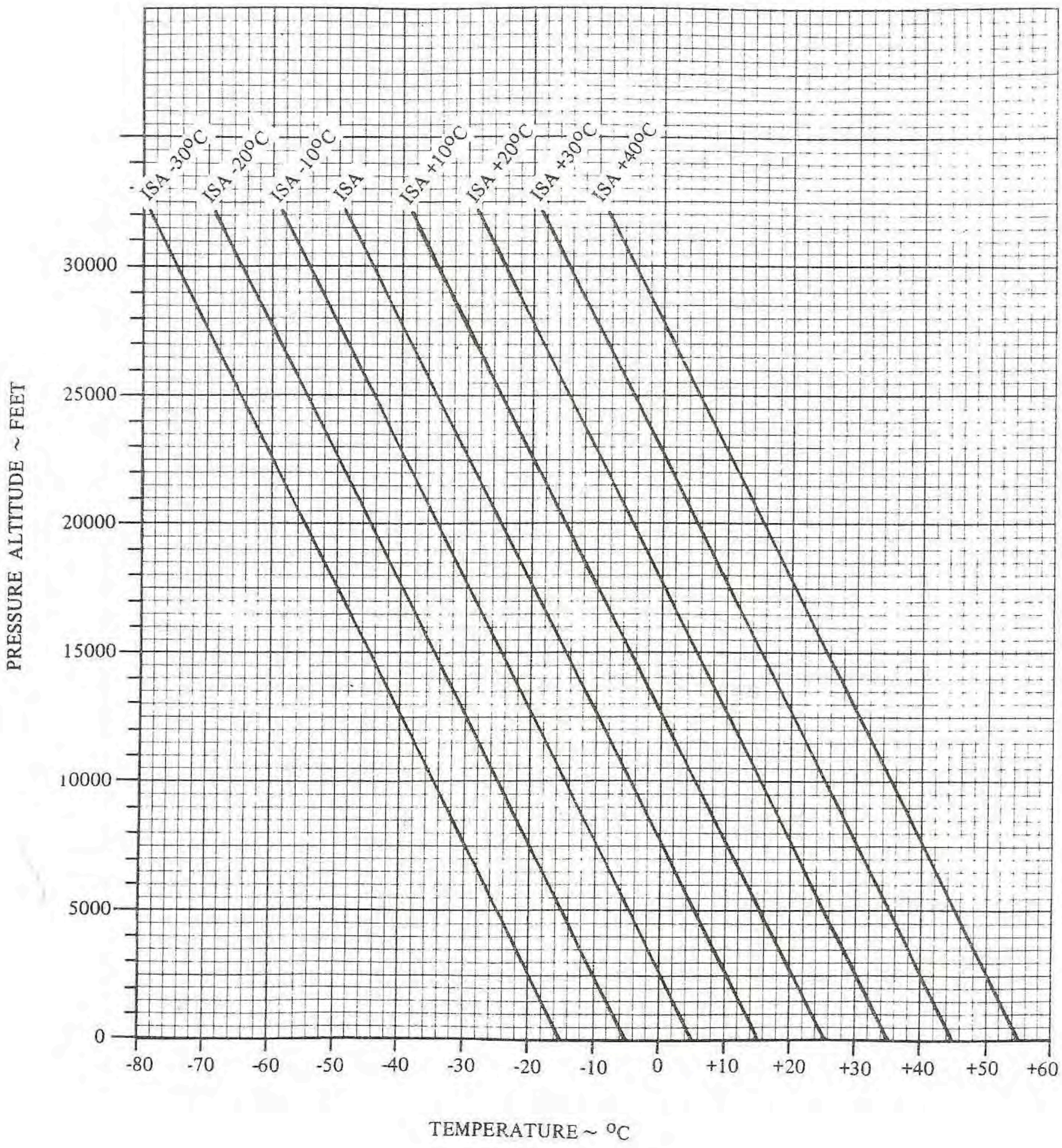
Figure 4-2 Operating Flight Strength Diagram

WIND COMPONENTS



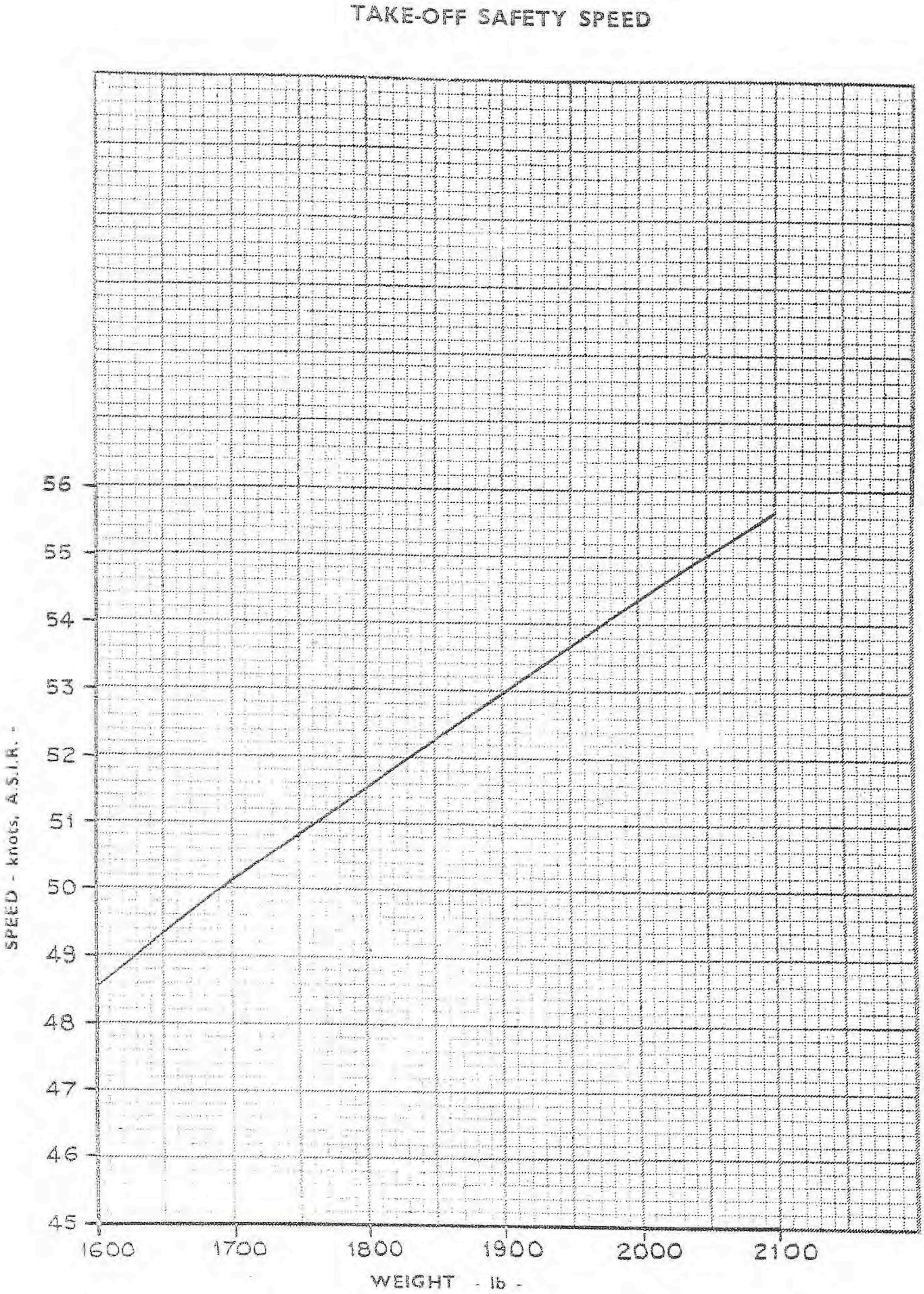
ISA CONVERSION

PRESSURE ALTITUDE VS OUTSIDE AIR TEMPERATURE



Takeoff Safety Speed

The takeoff safety speeds for various weights, derived from the graph below, applies with flap selected to the takeoff (15º) position.



CASO 4 Takeoff Distance Graph

The CASO 4 takeoff distance for various weights, altitudes, air temperatures can be calculated from the graph opposite. This graph was created to meet New Zealand's old Civil Aviation Safety Orders (CASOs) requirements under the Civil Aviation Regulations 1953. These CASOs are still permitted to be used to meet the takeoff distance performance calculation requirements of New Zealand CAR Part 91. See Advisory Circular 91-3.

These distances have been factored for surface type, operation type, uniform runway gradient (slope) and wind component.

The performance information given in this graph is derived from gross data, that is, it is the expected performance of an average DCH1 Chipmunk aircraft and no margins have been applied.

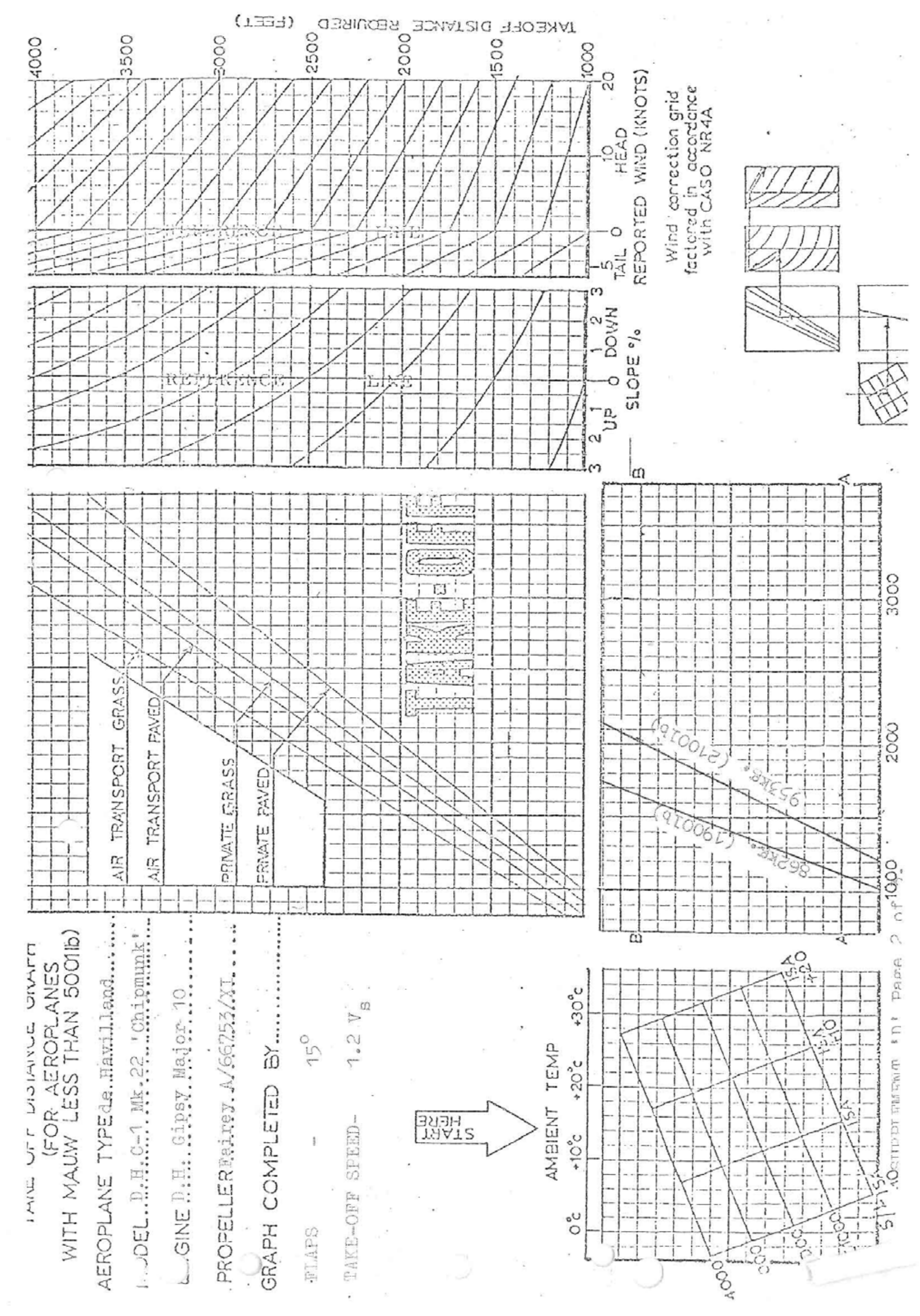
Associated Conditions

- ✈ Engine: Full Throttle;
- ✈ Wing Flaps Takeoff Position (First notch - 15º);
- ✈ Airspeed 1.2 time the power off stalling speed (flaps 15º), appropriate to the weight: and,
- ✈ Technique The aircraft is help on the ground until the takeoff safety speed appropriate to the weight is reached and the initial climb is made at this speed.

The headwind correction grid on this graph is already factored, i.e. it is constructed on the basis that the effective headwind is 50% of the reported headwind component and the effective tailwind is 150% of the reported tailwind component. Consequently, to comply with NZ CARs, the reported wind component can be directly entered into the graph.

Deviation from the above conditions will affect the resulting takeoff distance performance achieved.

The takeoff distance calculated for private operations represents the absolute minimum distance acceptable and pilots should carefully consider all factors before taking off at an airfield with only this distance available.


TAKE OFF DISTANCE GRAPH
(FOR AEROPLANES
WITH MAUW LESS THAN 5001lb)
AEROPLANE TYPE de Havilland
MODEL D.H.C-1 Mk.22 'Chipmunk'
ENGINE D.H. Gipsy Major 10
PROPELLER Fairey A/66753/XT
GRAPH COMPLETED BY
FLAPS - 15°
TAKE-OFF SPEED- 1.2 Vs
START HERE
AMBIENT TEMP
0°c
+10°c
+20°c
+30°c
ISA
AIR TRANSPORT GRASS
AIR TRANSPORT PAVED
PRIVATE GRASS
PRIVATE PAVED
TAKE-OFF
953Kg (2100lb)
862Kg (1900lb)
1000
2000
3000
REFERENCE LINE
SLOPE %
UP
DOWN
TAIL
HEAD
REPORTED WIND (KNOTS)
Wind correction grid factored in accordance with CASO NR4A
TAKEOFF DISTANCE REQUIRED (FEET)
1000
1500
2000
2500
3000
3500
4000

Takeoff Distance to the 50 foot Height Point

The takeoff distance from rest to a height of 50 feet above the aerodrome elevation for various weights, altitudes, air temperatures and headwind components, can be calculated from the graph opposite.

The performance information given in this graph is derived from gross data, that is, it is the expected performance of an average DCH1 Chipmunk aircraft and no margins have been applied.

Associated Conditions

- ✈ Engine: Full Throttle;
- ✈ Wing Flaps Takeoff Position (First notch - 15º);
- ✈ Technique The aircraft is help on the ground until the takeoff safety speed appropriate to the weight is reached and the initial climb is made at this speed; and,
- ✈ Runway Surface Hard, level, dry runway.

The headwind correction grid on this graph is unfactored, i.e. it is constructed on the basis that the effective headwind is 100% of the reported headwind component. Consequently, to comply with NZ CARs, the reported headwind must be reduced by 50% prior to entry into the graph.

The example given in the arrowed dotted line shows that at an air temperature of 7ºC (ISA), at an altitude of 4,000 feet, at a weight of 2,000 lb, and with a headwind component of 5 kts, the distance to a 50 foot height point is estimated to be approximately 480 yards (1440 feet / 440 metres).

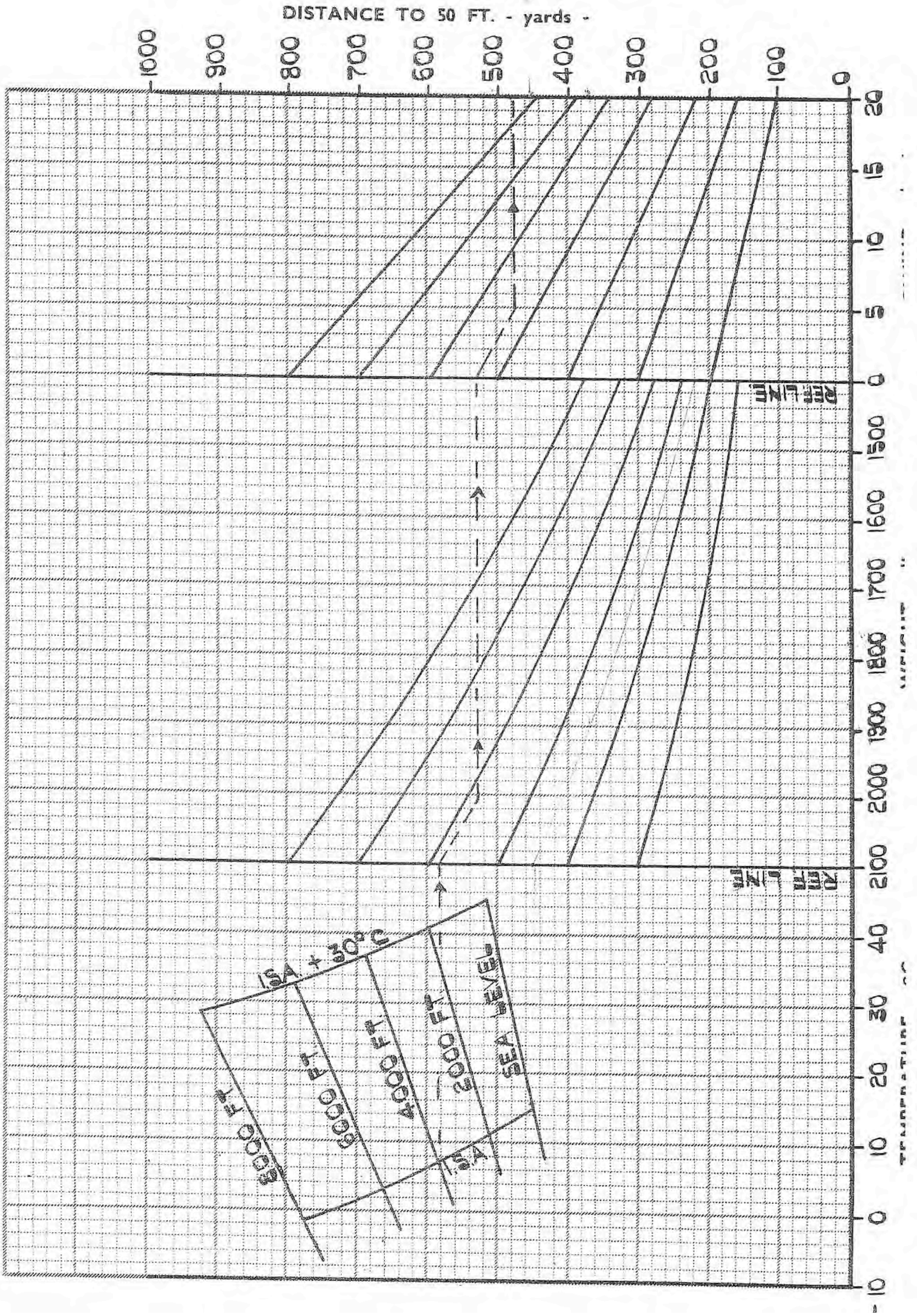
Deviation from the above conditions will affect the resulting takeoff distance performance achieved.

The following table shows the amount by which the distance to 50 feet is increased:

- ✈ For every 1% of uniform uphill gradient (slope); and,
- ✈ For grass surfaces.

Weight	1,600 lb		2,100 lb	
Pressure Altitude	Sea level	8,000 feet	Sea level	8,000 feet
Per 1% gradient	5%	7%	8%	12%
Grass Surface	4%	7%	7%	11%

TAKE-OFF DISTANCE TO 50FT. HEIGHT POINT



Initial Climb After Takeoff - Gradient

The gradient of climb for an initial climb after takeoff at various weights, altitudes and air temperatures, can be calculated from the graph opposite.

The performance information given in this graph is derived from gross data, that is, it is the expected performance of an average DCH1 Chipmunk aircraft and no margins have been applied.

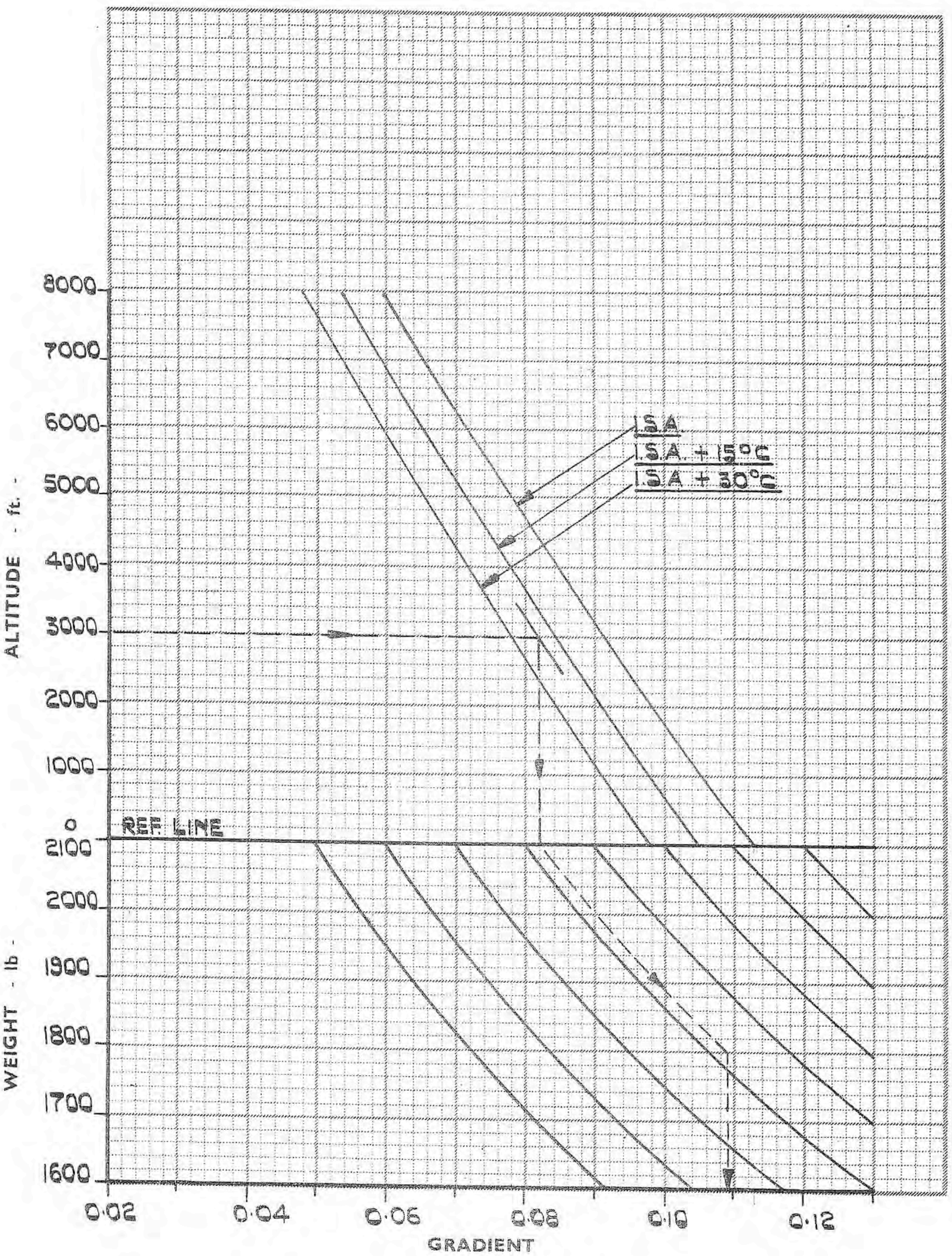
Associated Conditions

- ✈ Engine: Full Throttle;
- ✈ Wing Flaps Takeoff Position (First notch - 15º); and,
- ✈ Airspeed Takeoff safety speed appropriate to the weight.

The example given in the arrowed dotted line shows that at an altitude of 3,000 feet, at an air temperature of 29ºC (ISA +20ºC) and at a weight of 1,800 lb, the gradient of climb at this point is estimated to be approximately 0.1095 (10.95%).

Deviation from the above conditions will affect the resulting gradient of climb performance achieved.

CLIMB AFTER TAKE-OFF



Initial Climb After Takeoff - Rate

The rate of climb for an initial climb after takeoff at various weights, altitudes and air temperatures, can be calculated from the graph opposite.

The performance information given in this graph is derived from gross data, that is, it is the expected performance of an average DCH1 Chipmunk aircraft and no margins have been applied.

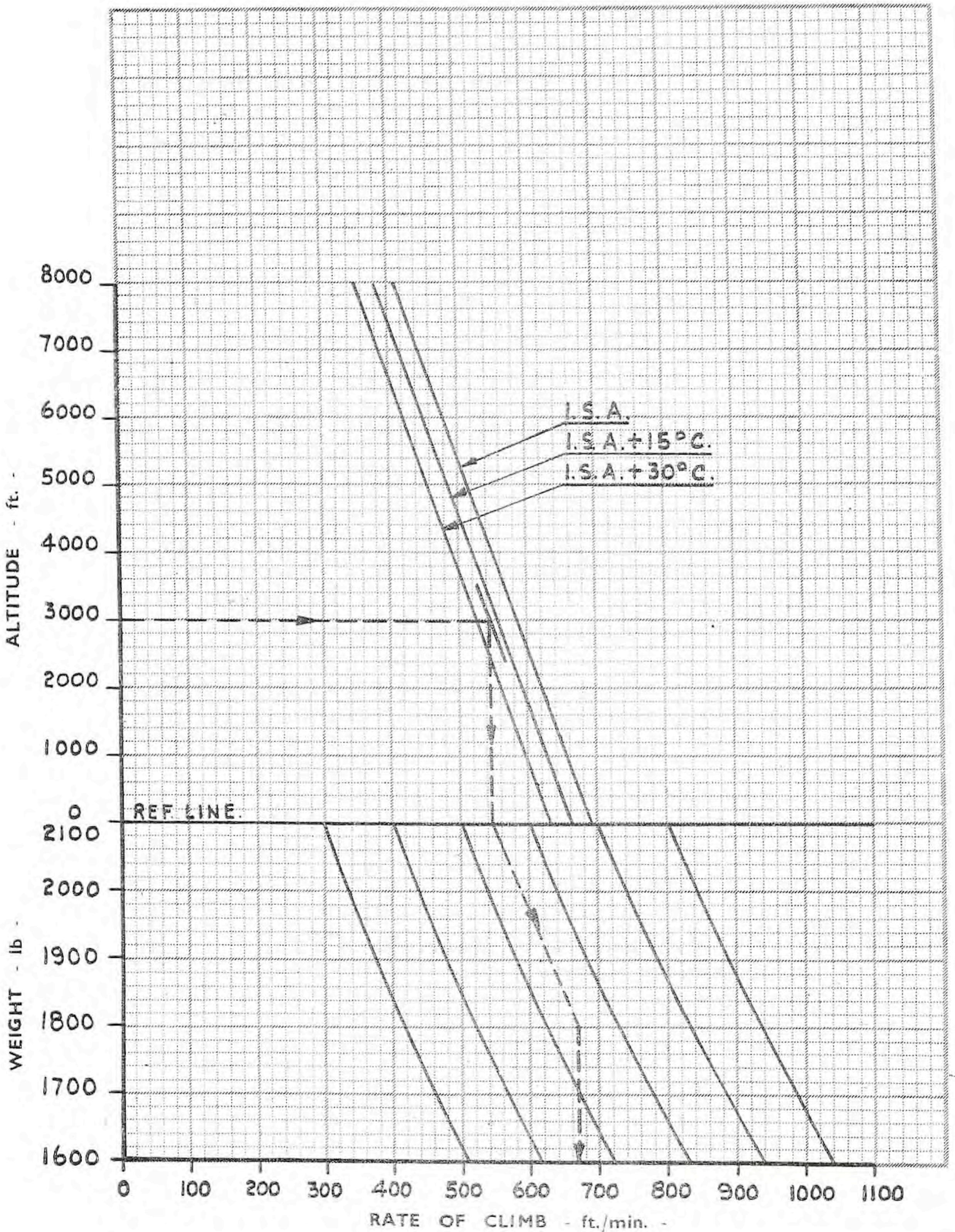
Associated Conditions

- ✈ Engine: Full Throttle;
- ✈ Wing Flaps Takeoff Position (First notch - 15º); and,
- ✈ Airspeed Takeoff safety speed appropriate to the weight.

The example given in the arrowed dotted line shows that at an altitude of 3,000 feet, at an air temperature of 29ºC (ISA +20ºC) and at a weight of 1,800 lb, the rate of climb at this point is estimated to be approximately 670 fpm.

Deviation from the above conditions will affect the resulting rate of climb performance achieved.

CLIMB AFTER TAKE-OFF



Enroute Climb - Gradient

The gradient of climb for an enroute climb at various weights, altitudes and air temperatures, can be calculated from the graph opposite.

The performance information given in this graph is derived from gross data, that is, it is the expected performance of an average DCH1 Chipmunk aircraft and no margins have been applied.

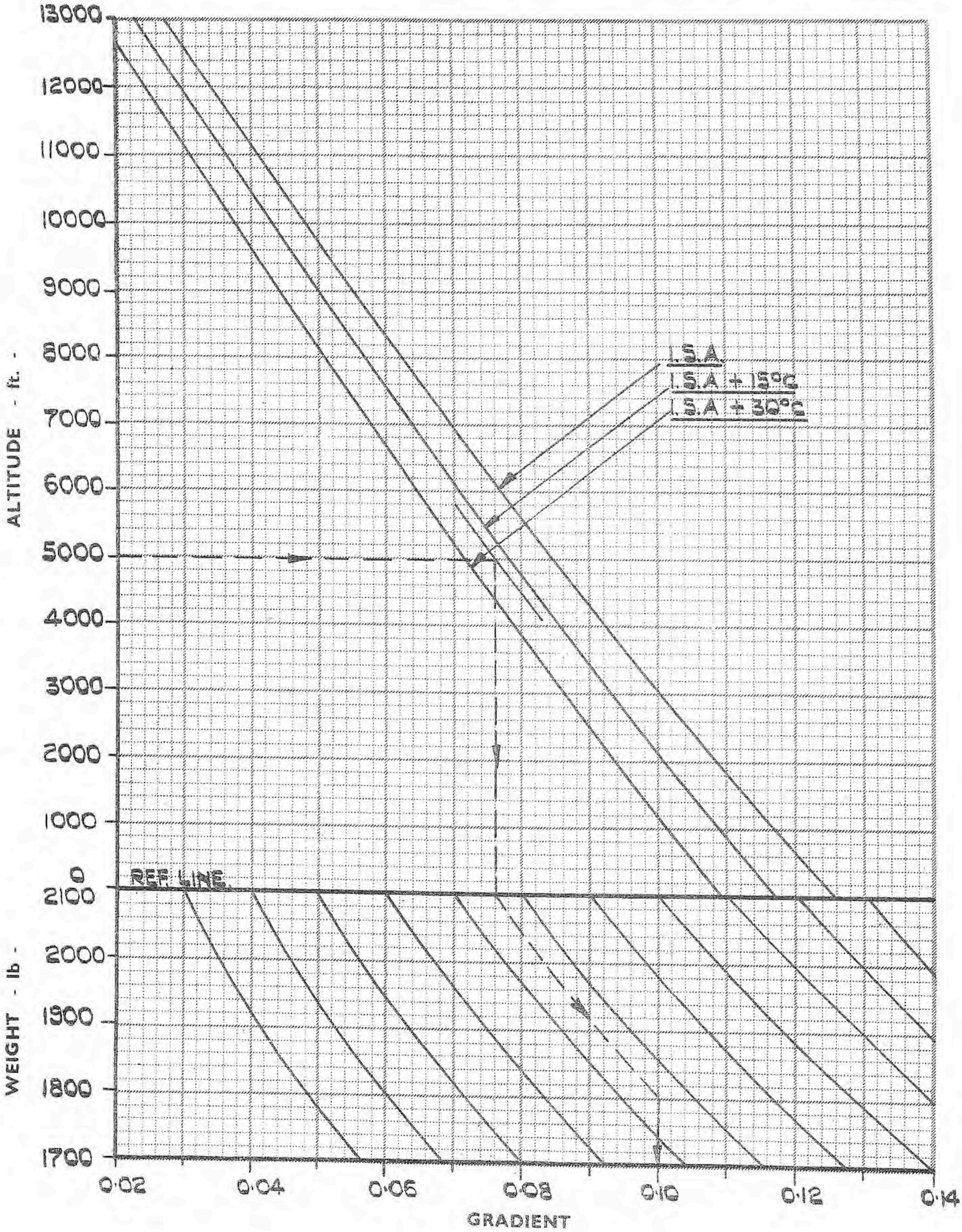
Associated Conditions

- ✈ Engine: Full Throttle;
- ✈ Wing Flaps Retracted (0º); and,
- ✈ Airspeed 1.2 time the power off stalling speed (flaps UP), appropriate to the weight. This is 62 Kts IAS at 2,100 lb and 54 kts IAS at 1,600 lb.

The example given in the arrowed dotted line shows that at an altitude of 5,000 feet, at an air temperature of 25ºC (ISA +20ºC) and at a weight of 1,800 lb, the gradient of climb at this point is estimated to be approximately 0.10 (10%).

Deviation from the above conditions will affect the resulting gradient of climb performance achieved.

EN ROUTE CLIMB



Enroute Climb - Rate

The rate of climb for an enroute climb at various weights, altitudes and air temperatures, can be calculated from the graph opposite.

The performance information given in this graph is derived from gross data, that is, it is the expected performance of an average DCH1 Chipmunk aircraft and no margins have been applied.

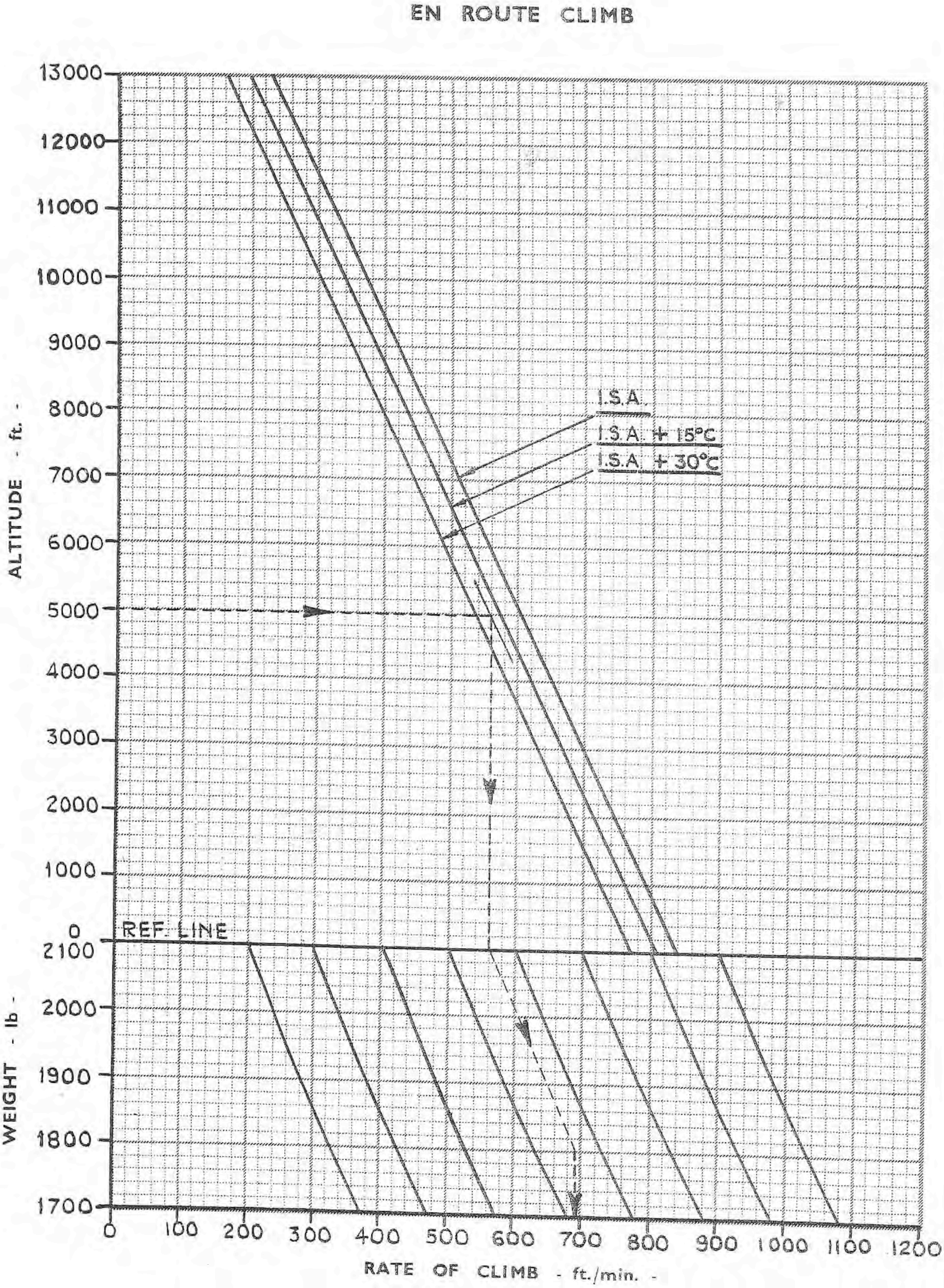
Associated Conditions

✈ Engine:	Full Throttle;
✈ Wing Flaps	Retracted (0º); and,
✈ Airspeed	1.2 times the power off stalling speed (flaps UP), appropriate to the weight. This is 62 Kts IAS at 2,100 lb and 54 kts IAS at 1,600 lb.

The example given in the arrowed dotted line shows that at an altitude of 5,000 feet, at an air temperature of 25ºC (ISA +20ºC) and at a weight of 1,800 lb, the rate of climb at this point is estimated to be approximately 690 fpm.

Deviation from the above conditions will affect the resulting rate of climb performance achieved.

Waypoints AVIATION


EN ROUTE CLIMB
ALTITUDE - ft. -
WEIGHT - lb -
RATE OF CLIMB - ft./min. -
REF. LINE
I.S.A.
I.S.A. + 15°C
I.S.A. + 30°C
13000
12000
11000
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
2100
2000
1900
1800
1700
0
100
200
300
400
500
600
700
800
900
1000
1100
1200

Enroute Glide Range - Engine Inoperative

The horizontal distance covered in an engine inoperative glide from various altitudes down to sea level and for various air temperatures, can be calculated from the graph opposite.

The performance information given in this graph is derived from gross data, that is, it is the expected performance of an average DCH1 Chipmunk aircraft and no margins have been applied.

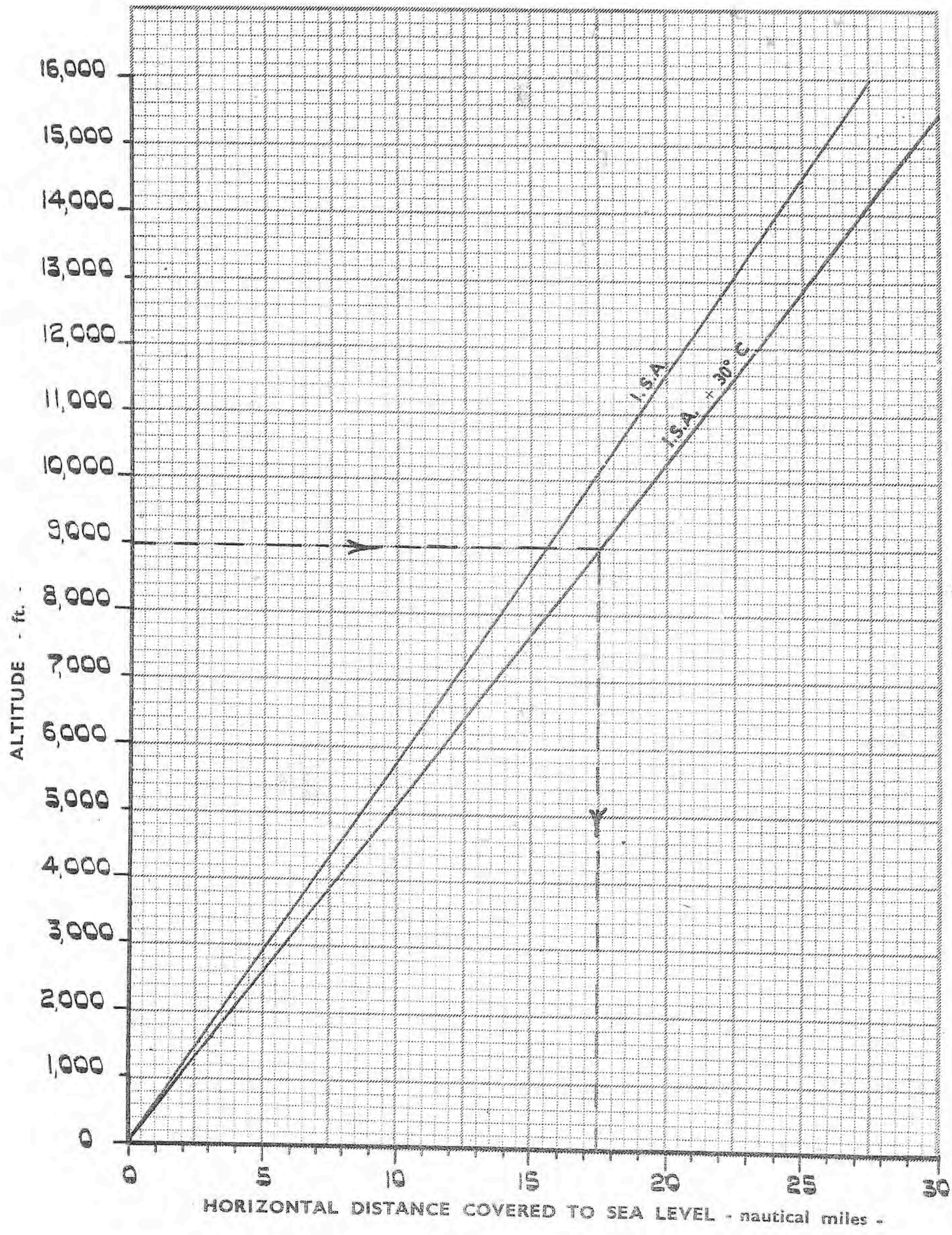
Associated Conditions

- Engine: Inoperative;
- Wing Flaps Retracted (0º);
- Airspeed 1.1 times the power off stalling speed (flaps UP), appropriate to the weight. This is 55 Kts IAS at 2,100 lb and 48 kts IAS at 1,600 lb; and,
- Wind Component Zero.

The example given in the arrowed dotted line shows that at an air temperature of 27ºC (ISA +30ºC), the horizontal distance covered during a glide from an altitude of 9,000 feet down to seal level is estimated to be approximately 17.5 nm.

Deviation from the above conditions will affect the resulting horizontal distance performance achieved, however variation of weight has no appreciable effect on the horizontal distance achieved.

EN ROUTE GLIDE
(ENGINE INOPERATIVE)



CASO 4 Landing Distance Graph

The CASO 4 landing distance for a weight of 2,100 lb, at various runway elevations can be calculated from the graph opposite. This graph was created to meet New Zealand's old Civil Aviation Safety Orders (CASOs) requirements under the Civil Aviation Regulations 1953. These CASOs are still permitted to be used to meet the takeoff distance performance calculation requirements of New Zealand CAR Part 91. See Advisory Circular 91-3.

These distances are based on a 50 foot threshold crossing height and have been factored for surface type, operation type, uniform runway gradient (slope) and wind component.

The performance information given in this graph is derived from gross data, that is, it is the expected performance of an average DCH1 Chipmunk aircraft and no margins have been applied.

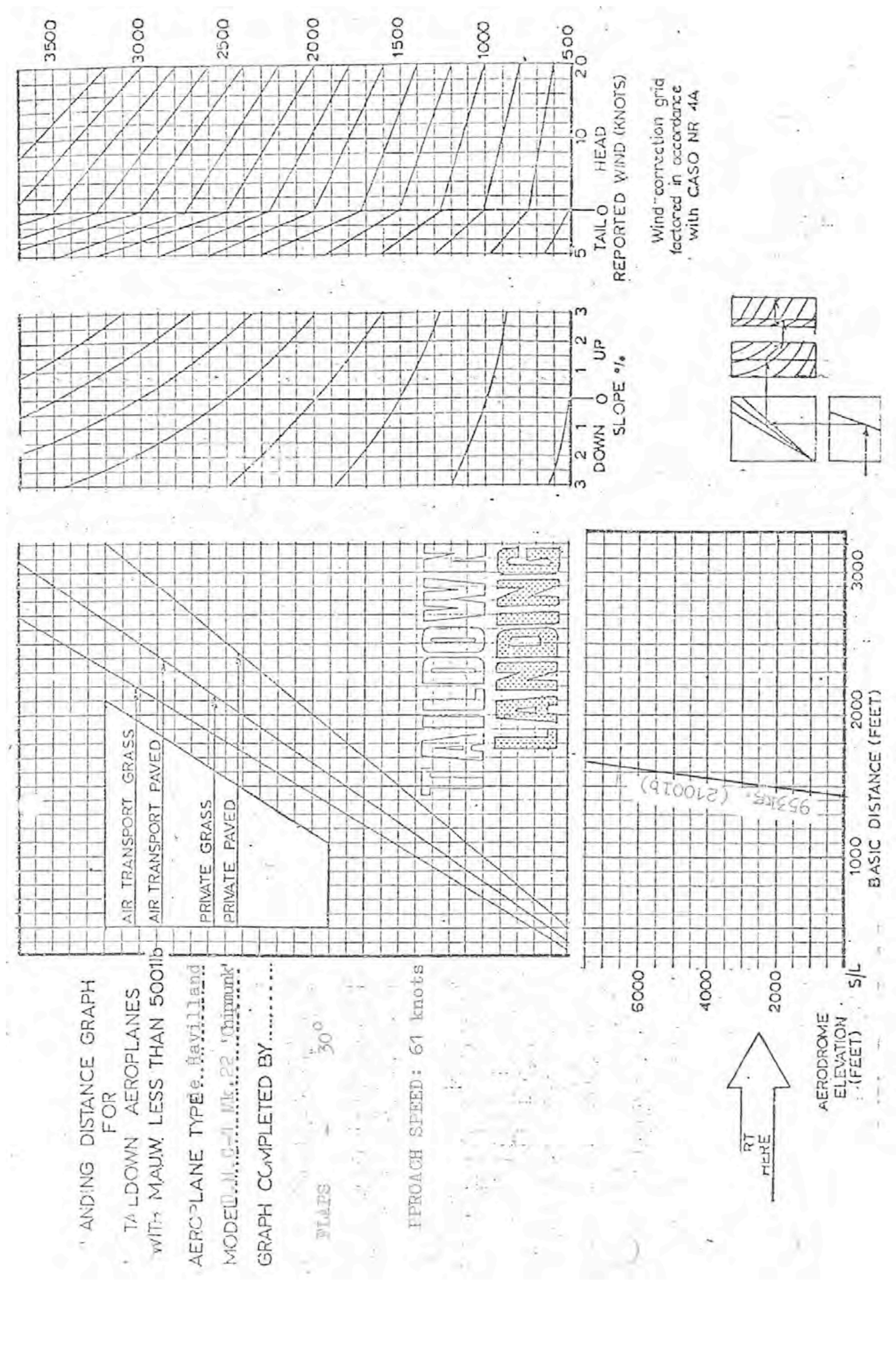
Associated Conditions

- ✈ Wing Flaps — Landing Position (Second notch - 30º);
- ✈ Technique — The airspeed at the 50 foot height point is 1.3 times the power off stalling speed (flaps 30º), appropriate to the weight. This is 61 Kts IAS at 2,100 lb; and,
- ✈ Braking: — Normal.

The headwind correction grid on this graph is already factored, i.e. it is constructed on the basis that the effective headwind is 50% of the reported headwind component and the effective tailwind is 150% of the reported tailwind component. Consequently, to comply with NZ CARs, the reported wind component can be directly entered into the graph.

Deviation from the above conditions will affect the resulting landing distance performance achieved.

The landing distance calculated for private operations represents the absolute minimum distance acceptable and pilots should carefully consider all factors before landing at an airfield with only this distance available.


ANDING DISTANCE GRAPH
FOR
TAILDOWN AEROPLANES
WITH MAUW LESS THAN 5001lb
AEROPLANE TYPE de Havilland
MODEL D.H.C-1 Mk.22 'Chipmunk'
GRAPH COMPLETED BY
FLAPS 30°
APPROACH SPEED: 61 knots
AIR TRANSPORT GRASS
AIR TRANSPORT PAVED
PRIVATE GRASS
PRIVATE PAVED
TAILDOWN
LANDING
953kg (2100lb)
6000
4000
2000
S/L
AERODROME ELEVATION (FEET)
1000
2000
3000
BASIC DISTANCE (FEET)
3 2 1 0 1 2 3
DOWN UP
SLOPE %
5 0 10 20
TAIL HEAD
REPORTED WIND (KNOTS)
3500
3000
2500
2000
1500
1000
500
Wind-correction grid factored in accordance with CASO NR 4A

Landing Distance from the 50 foot Height Point

The landing distance from a height of 50 feet above the landing threshold to a full stop for various weights, altitudes, air temperatures and headwind components, can be calculated from the graph opposite.

The performance information given in this graph is derived from gross data, that is, it is the expected performance of an average DCH1 Chipmunk aircraft and no margins have been applied.

Associated Conditions

- ✈ Wing Flaps — Landing Position (Second notch - 30º);
- ✈ Technique — The airspeed down at the 50 foot height point is 1.3 times the power off stalling speed (flaps 30º), appropriate to the weight. This is 61 Kts IAS at 2,100 lb and 53 kts IAS at 1,600 lb;
- ✈ Braking: — Normal; and,
- ✈ Runway Surface — Hard, level, dry runway.

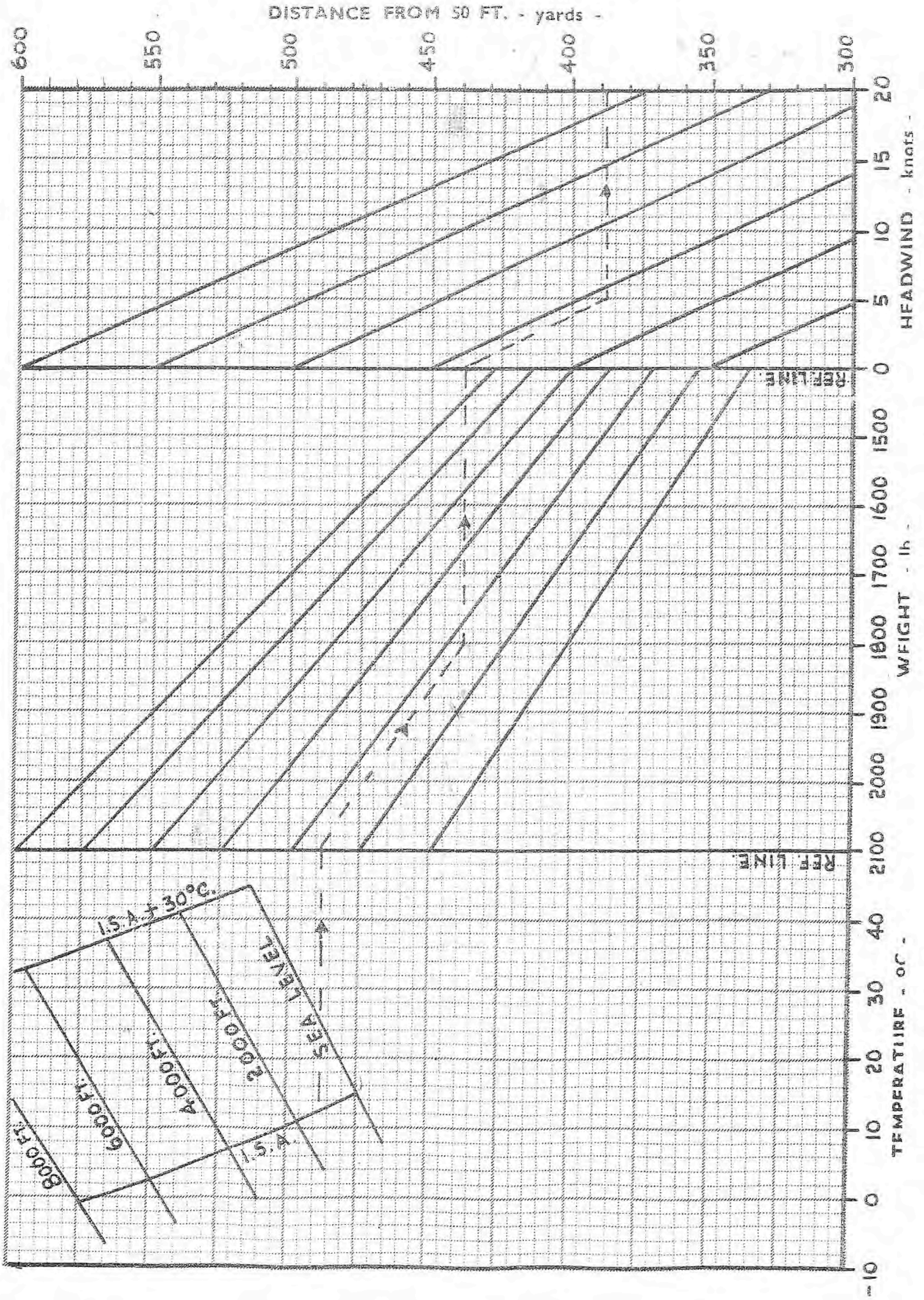
The headwind correction grid on this graph is unfactored, i.e. it is constructed on the basis that the effective headwind is 100% of the reported headwind component. Consequently, to comply with NZ CARs, the reported headwind must be reduced by 50% prior to entry into the graph.

The example given in the arrowed dotted line shows that at an air temperature of 12ºC (ISA), at an altitude of 1,300 feet, at a weight of 1,800 lb, and with a headwind component of 5 kts, the distance from a 50 foot height point to a full stop is estimated to be approximately 390 yards (1170 feet / 360 metres).

Deviation from the above conditions will affect the resulting landing distance performance achieved.

For every 1% of uniform downhill gradient (slope) the landing distance is increased by approximately 7% at all altitudes.

LANDING DISTANCE FROM 50FT. HEIGHT POINT



Waypoints
AVIATION

Chapter Eleven

Weight and Balance

Introduction

This chapter deals with the empty and limiting aircraft weights, and the effects of different weight loads on the fore and aft position of the centre of gravity (CofG) of the De Havilland Chipmunk Mk. 22, i.e. ZK-SAX.

ZK- SAX Weight and Balance

Empty weight (BEW)	1,532 lb
Moment arm	-6.041 in
Moment	-9255.0 lb/in

The aircraft's empty weight (BEW) includes all fixed parts and equipment not shown in the derivation of tare weight given on the CofG diagram.

Maximum Operating Weights

Maximum AUW (Private Ops)	2,200 lb (998 kgs)
Maximum AUW (Air transport Ops)	2,100 lb (953 kgs)
Maximum AUW (Aerobatics)	2,100 lb (953 kgs)
Maximum AUW (Glider Towing)	1,900 lb (864 kgs)
Maximum weight in rear seat	250 lb (114 kgs)
Maximum load in luggage locker	40 lb (18 kgs)
	18 lb (8 kgs) when the rear seat is occupied

The weight in the luggage locker must be evenly distributed within the locker. It will normally be found that the weight in the luggage locker is restricted by CofG limitations.

It is difficult to exceed the gross weight limitations of 2100 lb / 2200 lb. With full fuel (129 lb), two pilots each up to 220 lb (100 kg), and an empty baggage locker you get the weight up to 2,100 lb.

Centre of Gravity (CofG) Limits

The CofG position is determined with the aircraft in the rigging position, i.e. with the fuselage datum line horizontal, and is found by taking moments about a fixed point known as the CofG datum point. The CofG datum is marked on the port side of the fuselage, 36.0 in aft of the forward levelling peg.

The CofG limits are as follows:

Forward CofG	6.80 in forward of the datum (negative)
Aft CofG	0.77 in forward of the datum (negative)

The CofG must always be kept within these limits, even when the fuel and oil are partially or wholly expended.

The front seat pilot sits on the CofG, consequently when the aircraft is flown solo, the pilot MUST sit in the front seat.

Fuel makes the aircraft slightly nose heavy, and obviously rear seat pilot/passenger and locker are tail heavy. The CofG moves aft as fuel is consumed.

With a 170 lb pilot in front seat and a 230 lb pilot/passenger in rear seat, an empty baggage locker and zero fuel, the CofG is just inside aft limit. Consequently, it may not always be possible to load the rear seat or the locker to their maximum permitted weights without exceeding the centre of gravity limits.

There is a limitation of 250 lb in the rear seat. However with ZK-SAX it appears that with no fuel (the rearmost CofG case) you will reach the aft CofG limit with a 230 lb pilot/pax in the rear seat. This is obviously a significant consideration for aerobatics/spinning. This figure will increase a little with the starter motor installed, making the aircraft slightly more nose heavy.

Positive and Negative Moments

The distance of each load from the datum is known as its moment arm. With the Chipmunk, the loads are measured in pound and the moment arms in inches. If a load is forward of the datum point, its moment arm is taken as being negative and therefore the resultant moment is negative. Conversely, if the moment arms and moments of loads aft of the datum as taken as positive.

Method of Calculating the Centre of Gravity (CofG) Position

The CofG position is determined from the following expression:

$$\frac{\text{(BEW x empty moment arm)} + \text{(The weight of all loads x their respective moment arms)}}{\text{BEW} + \text{The total weight of all loads}}$$

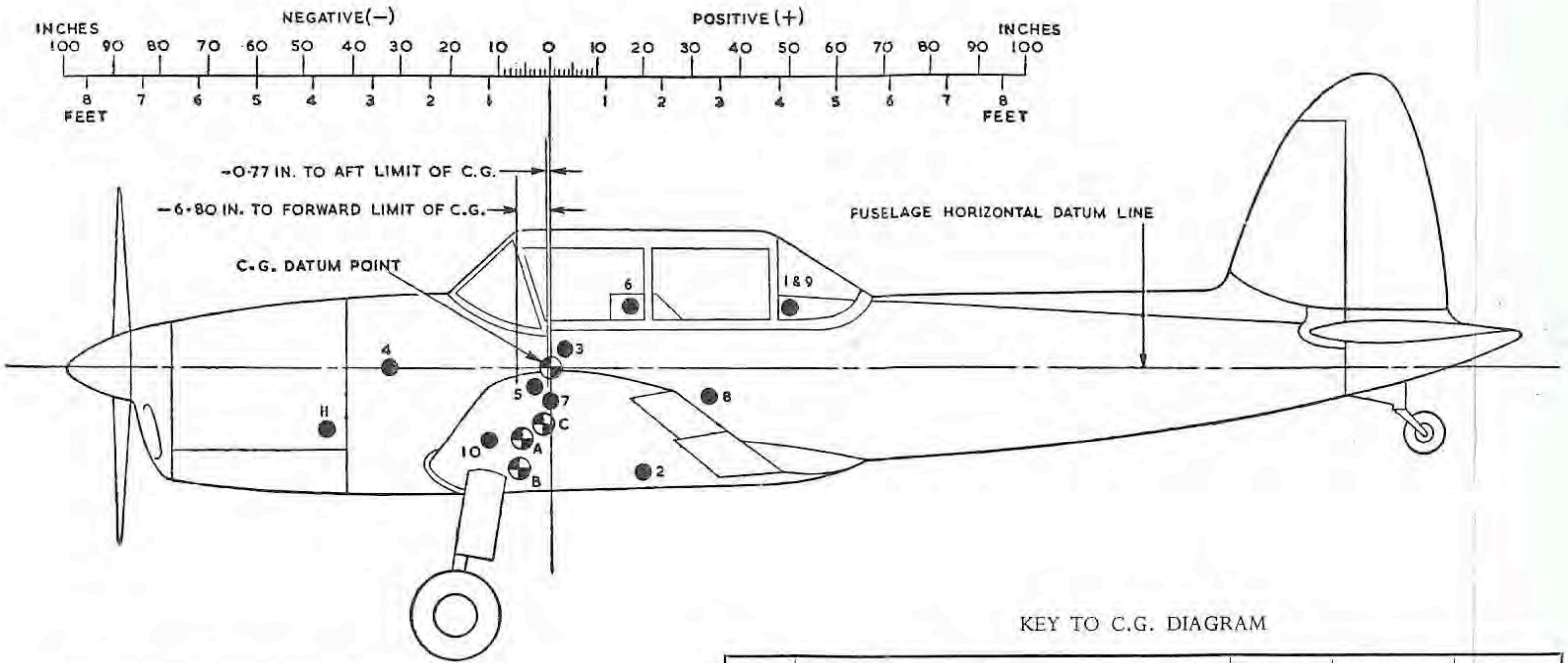
$$\frac{\text{Empty moment} + \text{Load moments}}{\text{The total weight}}$$

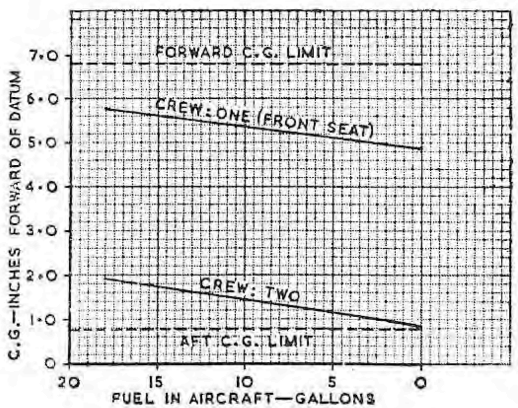
Centre of Gravity (CofG) Diagram

The CofG positions of all items of equipment usually present in a typical load are given below.

The following items of equipment may also be fitted to the aircraft, and are additional to those given in the CofG diagram:

Item	*Weight (lb)*	*Moment Arm (in)*	*Moment (lb/in)*
Front seat cushion (In lieu of a parachute)	11.5	0.0	0.0
Rear seat cushion (In lieu of a parachute)	11.5	33.6	+386
Tool Roll	8.9	50.0	+445
Amber Screens	2.0	-6.0	-12
Electric Starter (increase to empty weight)	5.3	-45.0	-239





KEY TO C.G. DIAGRAM

Item No.	*Removable Items of Load*	Weight (lb.)	Moment Arm (in.)	Moment (lb.in.)
A	EMPTY WEIGHT AND MOMENT	1428·0	−5·65	−8073
	General equipment:			
1	Control locks (stowed in luggage locker)	1·5	50·0	75
2	First-aid kit	1·0	20·0	20
3	Map cases	2·0	3·0	6
	Radio equipment:			
4	V.H.F. STR 9X	26·0	−31·8	−827
5	Control unit	0·6	−3·0	−2
6	Headsets	3·0	17·0	51
B	TARE WEIGHT AND MOMENT	1462·1	−5·98	−8750
7	Pilot and parachute in front cockpit	200·0	0·0	0
8	Pilot and parachute in rear cockpit	200·0	33·6	6720
9	Luggage locker, available distributed load for C.G. considerations	11·5	50·0	575
	Fuel and oil:			
10	Fuel (at 7·2 lb./gall.) 18 gallons	130·0	−12·0	−1560
11	Oil (at 9·0 lb./gall.) 2 gallons	18·0	−45·6	−821
C	TOTAL WEIGHT AND MOMENT WITH 2 CREW AND FULL FUEL AND OIL	2021·6	−1·90	−3836

Waypoints
AVIATION

Chapter Twelve

Ground Handling

Parking and Picketing

Where practical, park the aircraft so that it faces into the prevailing or expected wind. If the aircraft is to be parked for a short time outside on a smooth surface, set the park brake on, otherwise leave the brakes off and chock the wheels. Fully close the cockpit canopy hood.

If the aircraft is to remain parked outdoors for a period of time, fit the pitot head cover and if available, put on the cockpit canopy cover.

To tie the aircraft down, pass a rope through the tie down holes on the lower side of each of the wings. Pass a rope through the horizontal hole in the rear fuselage. Secure these ropes to the pickets or ground tie down points. Then place the control locks in position.

The park brake should not be left on after picketing, as the hydraulic brake system does not like being pressurised for long periods.

If parking for an extended period of time consider moving the aircraft into the shade or into a hangar, in order to minimise UV damage to the fabric covered surfaces.

Towing and Pushing

It is recommended that the aircraft be pushed by hand. When pushing the aircraft forwards by hand, push at the wing roots. When pushing the aircraft rearwards by hand, push at the leading edges of the mainplane or tailplane.

DO NOT PUSH on the flaps, ailerons, elevators, rudder, or on the propeller blades under any circumstances. Undue strain might be placed on them in such a manner as to weaken the structure.

The tow handle built specifically for ZK-SAX is available and its use is encouraged. Care must be taken not to damage the lower rudder surfaces while attaching and removing.

Cleaning

Pilots are encouraged to wash the aircraft after use, particularly if landing on wet grass.

Chapter Thirteen

ZK-SAX Syndicate Rules & SOPs

General

These notes are issued for the guidance of all syndicate members for the safe, enjoyable and continued use of the Chipmunk for all members.

Any points of discussion on the operation of ZK-SAX should be taken up with the Chief Pilot without delay. Additions and amendments to these notes will be issued from time to time.

The aims of the syndicate are:

1. To provide a facility for all syndicate members to undertake recreational flying activities in the Chipmunk. It is not to be used as a source of cheap flying for people wanting to build hours to obtain higher licences.

2. To provide dual instruction for members of NZWBA who are not necessarily Chipmunk Syndicate members, with a view to encouraging their participation in NZWBA flying activities. These people will be charged a higher hourly rate than syndicate members, and may only fly with approved Chipmunk Syndicate Instructors.

These notes should be read in conjunction with the Chipmunk Flight Manual, checklists and technical notes available to all members.

Conditions of Membership

Only paid up syndicate members with more than 100 hours total flying time and 5 hours (minimum) tail wheel time may fly the Chipmunk as Pilot-in-Command.

The secretary will keep a register of all syndicate pilots and notify the aircraft's insurers, if required.

All Chipmunk Syndicate members must also be financial members of the NZ Warbirds Association Incorporated (Warbirds). All applications for new membership of the syndicate must be reviewed by the committee and approved prior to the sale/purchase of a share being finalised.

Sale of Shares

The secretary maintains a list of shares that are being offered for sale. If a member wishes to sell their share in the syndicate, they must notify the secretary in writing of their intention. Shares will be sold in the order that notification was given to the secretary, and at the price specified by the committee. A member may sell their own share rather than going on the waiting list, but the sale price must be that specified by the committee. As with any other new member, the committee must approve the purchaser.

All share transfers attract a transfer fee of $200, payable to the syndicate. Therefore new owners will pay $5200 for a share.

Until such time as a share is sold, the member remains liable for the monthly syndicate subscription of $50 (including GST) for maintenance, hangarage and insurance of the aircraft.

Currency on Type

Each member is responsible for maintaining a valid Pilot's Licence. No member is to fly the aircraft as PinC unless their licence is current, including a Biennial Flight Review (BFR), medical certificate and aircraft type rating. In addition, the Chief Pilot and the committee may lay down further requirements as to currency on type, cross-country or aerobatics for individual members.

Under the conditions of the Warbirds Part 149 certificate, all members must provide up-to-date details of the following to the Chief Flying Instructor of the Warbirds:

- Licence type;
- Licence number;
- All ratings and endorsements on the licence; and,
- Expiry date of medical certificate.

No member shall fly the aircraft as Pilot-in-Command without first obtaining a type rating from a syndicate instructor. If a syndicate instructor is not available, the Chief Pilot may give approval for another Warbirds Qualified Flying Instructor (QFI) to provide dual instruction on the aircraft.

If a member has not carried out 3 takeoffs and 3 landings within the previous 90 days in ZK-SAX or an equivalent type, he or she is to contact a syndicate instructor prior to his or her next flight. The syndicate instructor will ascertain the details and decide whether a dual check is required or solo flight is authorised. Such a dual flight, if carried out, would normally satisfy the requirements of the annual standardisation flight.

Annual Standardisation Flight

Each member will carry out an annual standardisation flight with a syndicate instructor. The Chief Pilot has the discretion to waive this requirement for any member. This discretion will be exercised in circumstances such as where the member carried out their last BFR on the Chipmunk, the member is in current flying practice etc. The Chief Pilot will also consider the member's experience level when deciding to exercise this discretion. It should be remembered that a standardisation flight is intended to ensure that a member maintains proficiency on the aircraft, which is in the interests of all syndicate members.

It is each member's responsibility to contact the Chief Pilot prior to the due date of their annual standardisation flight to ascertain whether they are required to undertake the flight or not.

Booking the Aircraft

Bookings are made using an online booking system for ZK-SAX. It can be found at:

https://www.flybook.co.nz

To log on enter your email and XX as the password. Then please change your password to whatever you want. All email addresses and names have been entered.

When booking the aircraft, members should leave a contact phone number so that they can be contacted in the event that the aircraft becomes unserviceable.

If a member takes the aircraft away for a trip of a reasonable duration, then it should be returned to Ardmore by midday on Saturday, as many syndicate members normally fly at weekends. On Sundays ZK-SAX is usually in demand, and trips away from Ardmore should be limited to a reasonable duration.

Airshows and fly-ins attended by Warbirds, and other special flights such as test flights and related transits will take priority over all other bookings. Any clashes with bookings will be resolved by the committee.

If a member books the aircraft and then changes their plans, they should update the booking site as soon as possible so that the aircraft will be available to other members. Failure to arrive prior to the time that the aircraft is booked, will in effect invalidate the booking and other syndicate members may then use the aircraft.

Aircraft Maintenance

Maintenance at Ardmore is carried out by Aero Technology Ltd (Aerotech) – phone (09) 298-1900. The people to be contacted are Kevin Paulsen, or Greg Ryan. For very Chipmunk specific advice, ask for Jim Lawson, who I understand invented them.

Scheduled maintenance will be monitored and coordinated by the committee member designated as the Maintenance Controller. The Maintenance Controller is also responsible for ensuring that all the aircraft documentation is kept up to date.

If the aircraft becomes unserviceable during a flight, the member acting as Pilot-in-Command is responsible for entering the defects in the Tech Log, and for contacting Aerotech, the Maintenance Controller and if necessary the Chief Pilot. If the member is unsure about any part of the defect or how it may affect a subsequent flight, they should contact the Maintenance Controller or Chief Pilot to discuss the matter further.

If the aircraft is unserviceable on return from a flight, the member acting as Pilot-in-Command should notify Ardmore Helicopters of the unserviceability, and where possible, contact other members who have subsequent bookings for the aircraft.

If a problem is encountered with the aircraft away from Ardmore, or the Pilot-in-Command is unsure about whether the aircraft is serviceable for flight, then they should contact the one of the following people (in the order specified):

- Aerotech;
- The Maintenance Controller;
- The Chief Pilot; or,
- The Syndicate Committee Chairman.

Aircraft Security

Whenever the aircraft overnights away from Ardmore, it should either be hangared or picketed. Picket gear is available in the syndicate locker.

Hangar Access

The Warbirds hangar is normally open during the day. However to enable access at times when the hangar may be locked, members are to obtain a key from the Warbirds office.

Each member is responsible for the safe and careful movement of the Chipmunk and any other aircraft to or from the hangar. The hangar and all other aircraft must be left secure at all times.

Flying Charges

All flying in the Chipmunk will be charged on airborne times and at the following rates:

- ✈ Aircraft — $110 per hour plus GST
- ✈ Fuel — 50 litres per hour
- ✈ All landing and Airways charges
- ✈ Non Syndicate Members — $150 per hour plus GST

The aircraft will not be available to any member whose syndicate account is not paid by the due date (usually the 20th of the following month). Overdue monthly subscriptions will incur a 1% interest surcharge.

Refuelling

Greenstone Energy ("Z" - previously Shell) is our preferred fuel supplier. We receive a discount with them at all locations due to Warbirds affiliation and they kindly support our open day activities. There is a if required.

There are both Greenstone Energy ("Z" - previously Shell) and Air BP syndicate charge cards in the log folder in the aircraft. Fuel may be purchased using either card and fuel dockets should be placed in the Flight Log Folder for the Treasurer. Members may use their own cards to purchase fuel but this must be annotated in the log so that the above fuel charge is not billed. Variance between fuel added vs. fuel used will be credited or debited against a 35 litre/hour usage.

When using the Greenstone Energy ("Z") fuel card a PIN number is required. This PIN number is the same as the serial number of the aircraft, i.e. “0566”. If you pull the cushion in the rear seat forward a little on the port side, you will see the alloy serial number plate, and the number is easy to read. It is also written on the facing page of the Tech Log.

The aircraft should be refuelled after each flight to full fuel tanks.

Aircraft Documentation

The Aircraft Flight Manual and the Flight Log Folder are stored in the locker behind the rear seat. The Aircraft Flight Manual includes the Maintenance Release and a Tech Log. Defects that are entered on the Tech Log must be cleared or deferred by an engineer, the Maintenance Controller (MC) or the Chief Pilot (CP), prior to the aircraft being serviceable for flight. If a defect is deferred then any limitations on the operation of the aircraft will be entered on the Tech Log.

The Flight Log Folder contains the fuel cards, a Flight Time Log and a Syndicate Defects Log card. Defects entered on this Syndicate Defects Log card do not affect the serviceability of the aircraft for flight, but simply inform members of minor defects and keep a record of such defects for the MC and Aerotech to schedule servicing. The Flight Time Log is to be completed by the PinC after every flight with details of the syndicate member to be charged, flight times, fuel uplift, oil uplift and sortie details. This card is replaced at the end of each month.

Airfields

ZK-SAX is only to be operated on licensed airfields unless a specific authorisation is obtained from the Chief Pilot or the committee. Landings at places other than licensed airfields may be subject to dual check with a syndicate instructor.

Aerobatics

All members must be conversant with and observe Civil Aviation Rule Parts 61 and 91 with regards to Aerobatic Fight.

Members must obtain an Aerobatic Rating from a syndicate instructor prior to carrying out aerobatics. If a member does not hold an aerobatic rating but has been receiving dual instruction in aerobatics, they may be authorised by a syndicate instructor to carry out solo consolidation flight in the aircraft. Such authorisation will include specific manoeuvres, minimum altitudes etc.

Members who are not in current aerobatic practice should have a six-monthly dual check with a syndicate instructor. This will reduce the risk of over-stressing the aircraft and maintain flight safety standards.

Pilots must record which flights were “aerobatic flights”, with a tick in the new box on the aircraft log card. The aerobatic factor can then be applied to the fatigue hours going forward.

Formation Flying

No member shall fly the Chipmunk in formation with another aircraft unless they have been issued with a Formation Rating by a syndicate instructor. All formations must be specifically briefed by the designated formation leader, and all formation members must be present at the briefing.

General

- Licence renewals, Instructor CCA's and BFR's may be carried out in the aircraft by members when flying with an approved Flight Examiner.
- Members may only fly the aircraft as Pilot-in-Command from the front seat, unless specifically authorised by the Chief Pilot to operate it from the rear seat.
- Members are not to carry passengers in the aircraft unless current to do so.
- Prop swinging to start the engine may only be carried out by people who have had a thorough briefing on the procedure, and who have undertaken supervised practise to proficiency by an appropriately qualified person. Engine starting may only be carried out whilst one of the cockpits is occupied by a qualified pilot, and whilst the wheels are chocked.

Waypoints AVIATION