Waypoints AVIATION

Nord 1002

Pingouin II

G- ATBG

Messerschmitt ME 108

Taifun

Pilot's Notes

First Edition - April 2013

Derived from various material by

Waypoints Aviation

Nord 1002

Pingouin II

G- ATBG

Messerschmitt ME 108

Taifun

Pilot's Notes

First Edition – April 2013

Mark Woodhouse

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

Contents

Page

Ch 6 Limitations

Ch 7 Safety and Emergency Checklists

Ch 8 Safety and Emergency Expanded Procedures

Ch 9 Systems Description

Ch 10 Performance

Ch 11 Weight and Balance

Ch 12 Ground Handling

Introduction

While these Pilots Notes have generally been prepared for the Nord 1002 / Bf 108 Taifun, 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 Nord 1002, registration G-ATBG.

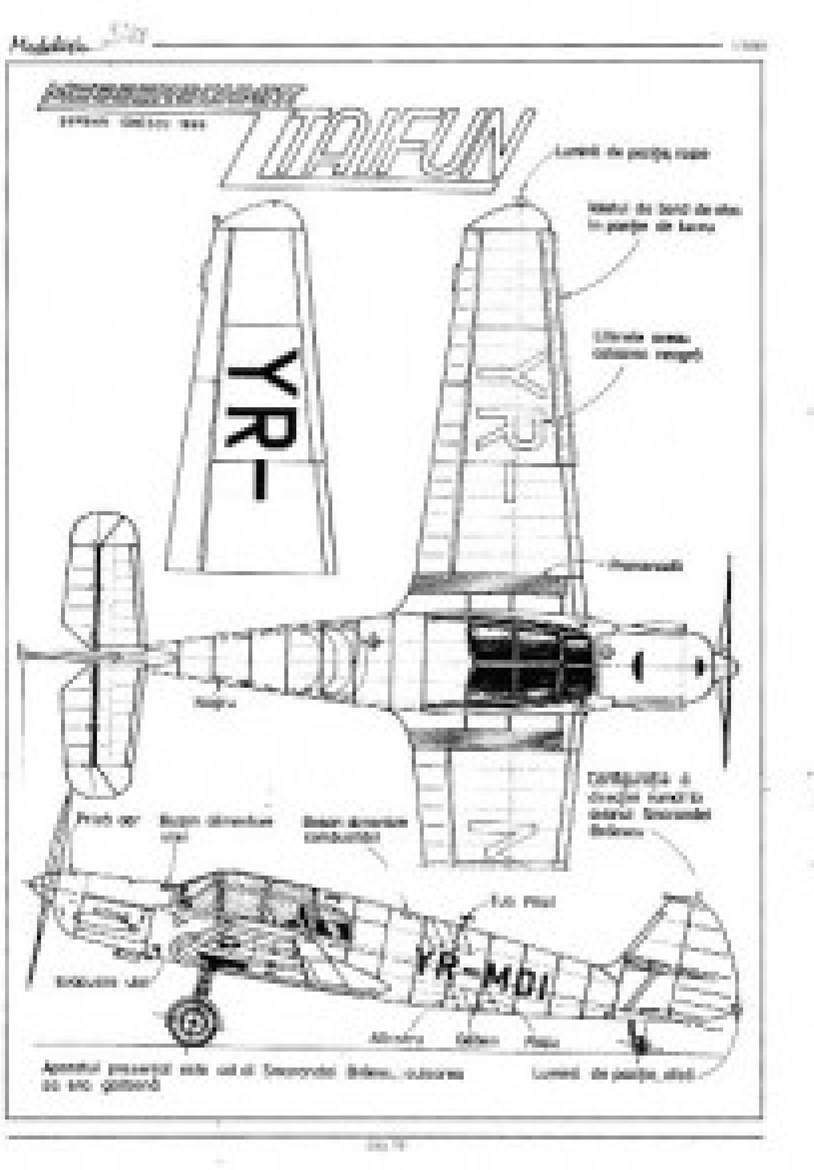
Should you or anyone you know wish to offer constructive comment on the content of these notes they would be highly valued. Please contact Mark Woodhouse at waypoints@clear.co.nz.

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 Nord 1002 Pingouin II / Messerschmitt Bf 108 Taifun.

These notes were derived and compiled from a wide range of sources, by a pilot who has only ever had one flight in a Lycoming O540 powered Bf 108 Taifun. The quality and accuracy of these sources also appears questionable in places. As a consequence, there is every likelihood that errors exist in this document.



Consequently, Waypoints Aviation Limited 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 Limited 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.

Chapter One

General

Introduction

The Nord 1002 Pingouin II is a Messerschmitt Bf108 Taifun built by Société Nationale de Constructions Aéronautiques du Nord (SNCAN) from 1945 in France following World War II.

The main difference between the French Nord Pingouin and the German Messerschmitt Bf108 was the use of a Renault 6Q 10 straight six engine in place of the Bf108's more powerful Argus As 10c inverted V8 engine. The Nord / Bf108 aircraft was used as a communications and liaison aircraft by the Luftwaffe during WW2 and after liberation by the French military.

History of the Messerschmitt Bf 108 / Nord 1002

Design work for the Bf108 Taifun was initiated and completed in 1933 by Willi Messerschmitt of the Bayerische Flagzeugwerke A.G. The initial order for development was given in late 1933 by the German government.

From its appearance the Bf108 was considered a sensation. Some test pilots proclaiming it the finest aircraft of its type they had flow. Internationally it was recognised as of exceptional advanced design, as it was the first fully stressed skin, all metal aircraft of its size. The wing was of Messerschmitt patented single spar construction with British Handley-Page leading edge slats fitted.

The initial order of six Bf108 aircraft was produced in Germany, with the first of these machines fitted with a 160 horsepower Siemens Sh 14 radial engine. The remaining five aircraft were fitted with either the 225 horsepower Hirth HM 8U or the 210 horsepower Argus As 17 air cooled engines.

The initial test flight took place in the spring of 1934, and was highly successful.

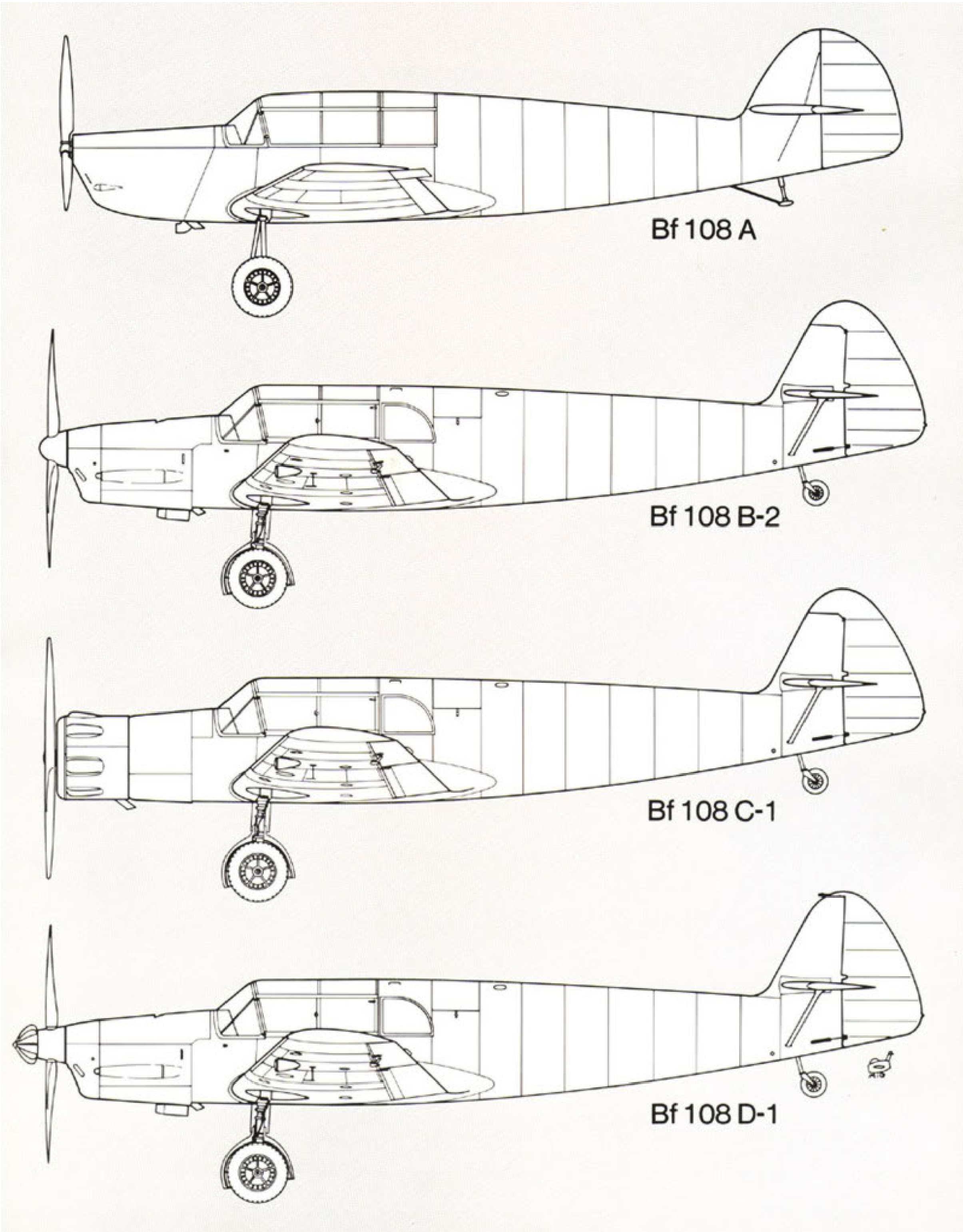
In 1935, the Bayerische Flagzeugwerke received a production contract for 32 improved models, the Bf108B with a 270 HP Argus As 10e air cooled inverted V8 engine. Seven of the Bf108B aircraft were completed in 1936. This was the same year that the manufacturing firm became known as the Messerschmitt G.m.b.H.

In 1937, production of the Bf108B was transferred from Augsburg to a new complex at Regensburg. The production schedule was as follows:

1934	6 (Bf108A)	
1936	7 (Bf108B)	
1938	175	
1939	147	
1940	77	
1941	59	
1942	58	
Total	**529**	(Total German production)

In 1942 the production of the Bf108B was transferred from Germany to Occupied France. The factory jigs and industrial machinery were moved from Regensburg to the S.N.C.A. du Nord plant at Les Mureaux. The German controlled factory in Occupied France production schedule was as follows:

1942	50	
1943	108	
1944	12	
Total	**170**	(Total French production of the Bf108B)



After World War II, with France urgently in need of an excellent all round trainer, liaison, transport and utility aircraft, a unanimous decision was made to maintain production of the Bf 108B, as it was considered to be the best machine of this type in existence at the time.

The Nord firm redesignated the Messerschmitt Bf108B as the Nord 1000. The principal models were the Nord 1001 Pingouin I (Renault 6Q 11 engine), and the Nord 1002 Pingouin II (Renault 6Q 10 engine).

Between 1945 and 1948, the Nord complex at Les Mureaux produced 286 aircraft of the Nord 1000 Pingouin series.

The Bf108 proved to be an extremely popular aircraft. Some of the pre-war international orders for the machine – including its use for airlines work (especially in Japan) – were:

Bulgaria	6
Japan	4
Yugoslavia	12
Switzerland	13
Rumania	9
U.S.S.R.	2
Hungary	8

The aircraft has been used extensively in Germany, France, England, Africa, and many other parts of the world. Total production of the German and French built models of the Bf108 Taifun came to 984 aircraft.

The History of G-ATBG

G-ATBG was built in 1945 and operated in France until 1965 when it was imported into the UK. In 1968 it was purchased by Lindsey Walton, the second UK owner, who operated the aircraft until 1999 when it was sold to Tom Harris.

During the last decade of ownership by Lindsey Walton the aircraft was maintained by The Aircraft restoration Company (ARC) at Duxford. During the period of ownership by Tom Harris the aircraft was maintained by Personal Plane Services.

On 15 August 2008 the aircraft suffered a forced landing adjacent to Headcorn airfield. When established on finals, the aircraft was forced to go-around by another aircraft which entered the circuit contrary to designated joining procedures.

When the throttle was opened at the initiation of the go-around the engine failed and the pilot managed to retract the undercarriage and carry out a text book undercarriage up landing in an adjacent field.

The UK AAIB report noted that the conditions were extremely conducive to carburettor icing, and recorded that the aircraft suffered minor damage to propeller, nose and lower cowling, right aileron, flap, pitot tube and venturi.

Tom Harris sold the aircraft to Mark Jack in January 2010.

Return of G-ATBG to Flight

During 2010 the engine was fully stripped tested and rebuilt by Vintech including all ancillaries.

NDT did not reveal any damage to the engine, and nothing to counter the supposition that the engine failure resulted from carburettor icing. However some deterioration of both ignition and fuel systems was detected, which could have been a contributory factor.

The airframe and rebuilt engine, replacement propeller and aileron, and repaired cowlings are now at ARC at Duxford.

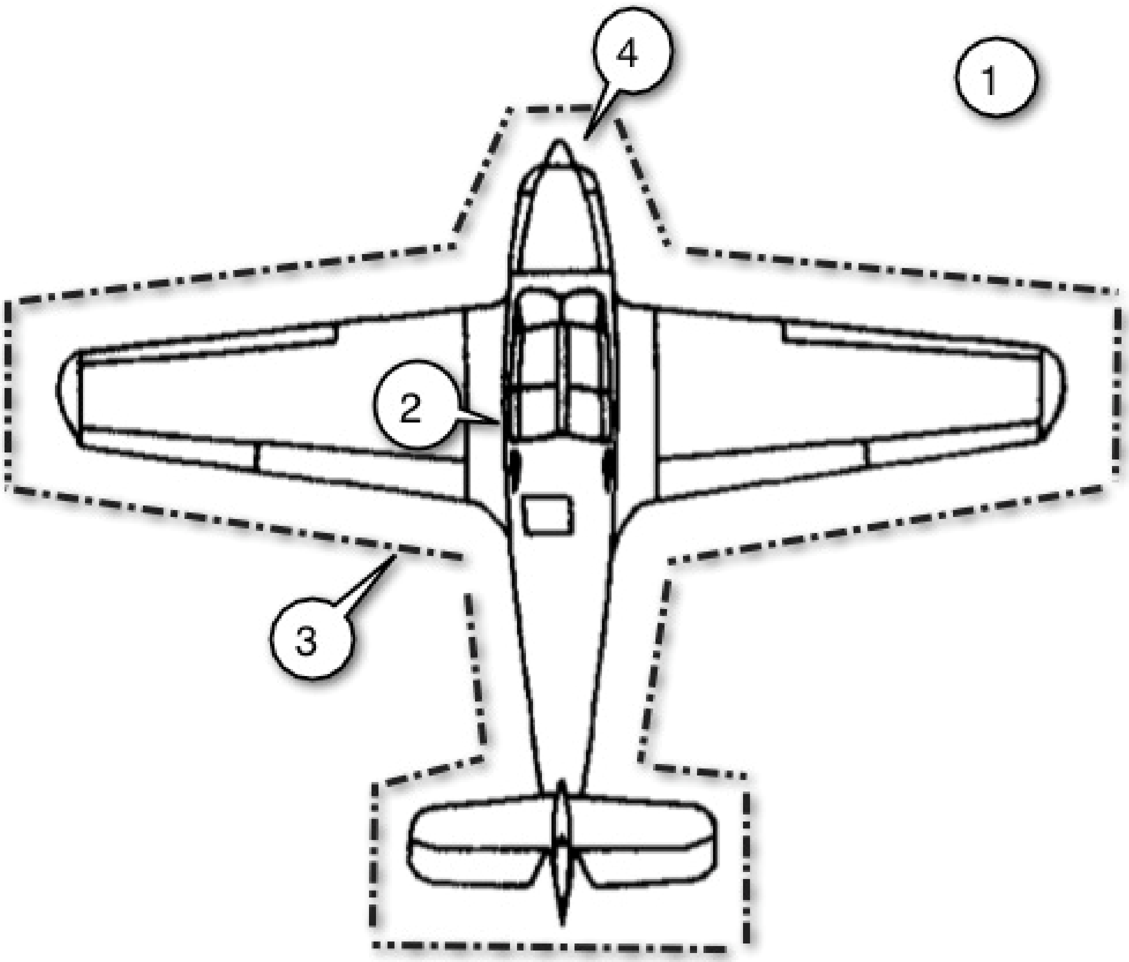
ARC have carried out a full inspection of the airframe and have commenced a programme of NTD and restoration.

The restoration project is being carried out by the engineer who was responsible for the aircraft when this was maintained by ARC for Lindsey Walton.

Waypoints AVIATION

Chapter Two

Preflight Inspections



1. Approaching the Aircraft

As the pilot approaches the aircraft, check:

~The general position and appearance of the aircraft;

~The condition of the tyre inflation; and,

~Whether or not the wheels are chocked.

Remove the:

~Pitot cover;

~Cockpit/cabin cover; and/or,

~External control locks.

Check the tail wheel for free movement and proper alignment.

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.

CHOCK THE WHEELS.

2. Cockpit Preflight Preparation

Open and secure the cockpit/cabin canopy.

Stow the:

~Pitot cover;

~Cockpit/cabin cover; and,

~External control locks.

Stow:

~Personal baggage, etc;

~Headsets;

~Maps and flight documents;

~Parachutes (if carried) * ; and,

~Survival equipment.

* Seat bottom type parachutes require the removal of the seat cushion.

Select the:

~Master switch OFF (“Ground”);

~Fuel OFF; and,

~Magnetos OFF.

On the Electronic Distribution Board (EDB), select the:

~Generator OFF;

~Battery OFF; and,

~Propeller OFF.

Check the state of the:

~Fuel;

~Air; and,

~Battery charge.

Check that the:

~Flight controls are free;

~Windscreen is clean; and,

~Battery charge.

Deploy the flaps to max (48 degrees) checking for symmetrical deployment and that the indicator reading shows 4-5. Leave the flaps deployed.

Cycle the elevator (pitch) trim through its entire range, visually checking for appropriate horizontal stabiliser movement in the correct orientation. Return to the trim to neutral (0 on the indicator).

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;

~The fabric covering of all control surfaces for holes, rips, tears, peeling, etc;

~Leading edge slats. Check for smooth, even operation with no binding by moving the leading edge slats in and out from each end. Leave the slats stowed after inspection;

~Tires. Check for cuts, cracks, bald spots, etc;

~Oleo legs. Check for leaks, excessive compression, etc. Check that the brake fluid lines do not rub against the wheels or tires. Check the wheel wells for proper zipper setting;

~Aileron control relay connections in wheel wells. Check the alignment of the bearings and lack of free play in the contacts;

~Wing folding mechanism. Check the presence, security and stowed condition of the wing folding mechanism actuating cranks. Check to be certain that security locks and wires are safe tied. Check that the wing folding mechanism are flush with the wing roots;

~Oil tank level in the starboard wing root. With a cold engine, the oil level should be between the dipstick groove and two inches (2") below the dipstick groove;

~Compressor isolator valve, in the air bottle access bay at the rear of the starboard wing root trailing edge. Ensure the isolator valve is selected to open. On some aircraft this is located under the engine cowling, close to the compressor at the front of the engine.

~External panels. Check that they are all locked and secure;

~Drain holes. Check that all are clear and there are no obvious leaks;

~Propeller. Check the security and mounting of the propeller. Examine the blades for damage; and

~Security of attachment of the horizontal stabiliser struts.

Check oil and fuel tank capacities. Check the tightness and security of the oil and fuel tank caps. Lock the panels if applicable.

If applicable prior to the flight, drain fuel tanks and collector box (under centre fuselage) to remove water.

4. Engine Inspection

Recheck that the:

~Master switch is OFF ("Ground");

~Magnetos are OFF.

~Generator is OFF;

~Battery is OFF; and,

~Propeller is OFF.

Turn the fuel selector ON.

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.

If the engine has not run for several days, pull through six (6) blades, leaving a ten (10) second gap between each blade. If any oil is discharged from the exhaust pipe or inlet manifold drain during or shortly after pulling the blades through, continue to pull the blades through until no oil is discharged.

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

~Excessive oil or other fluid deposits;

~Excessive oil witness marks from the crankcase cap;

~Excessive oil leakage from cylinder heads;

~Cracks and evidence of oil leaks from the engine oil cooler

~Cracks in the inlet or exhaust manifolds;

~Loose wires and loose fittings;

~Missing inlet or exhaust manifold nuts; and,

~Fuel leak witness marks from the fuel pumps at the rear of the engine.

Using a fuel drain cup, check the fuel for contamination and/or excess water at the water trap in the engine compartment.

Close and secure both the port and starboard engine cowlings.

Check all intake areas for foreign debris.

Recheck that all cowling fasteners and locked.

5. Cockpit/Cabin Entry

Secure unused seat belts and all loose articles. Check the security of all strap fittings and ensure they are not entangled with headset and hand-mic cable lines.

Brief the passengers. Notify all occupants of strict adherence to no smoking rule. Occupants of front seats must wear shoulder harness, drawn tight.

Adjust the front seats as necessary.

Close the cockpit/cabin door hatches. Check the rear upper and lower handles. Lock the forward overhead clamp.

Nord 1002 - Pingouin II
NORMAL CHECKLISTS

BEFORE ENGINE START

Wheel Chocks......................Secure
Magnetos.............................Off
Propeller..............................Pull through 6 blades
Flaps....................................Up
Brakes ....Checked
Master Switch ....On (Flight)
Fuel Selector........................Both On / Main
Battery.................................Off
Generator ....Off
Air Start Valve......................Open
Air Pressure ....Checked (>12 hpz)
Undercarriage ....Pump grip DOWN
Canopy ....Closed & Unlocked
Instruments..........................Checked
Avionics ....Off
Circuit Breakers...................Checked
Beacon / Nav Lights ....Off

ENGINE START

Fuel Pump............................On; Pressure to 2.0 - 2.2 hpz
Prime ....As required
Magnetos.............................On
Throttle ....Fully Closed
Propeller Area......................Clear
Starter..................................Engage
Throttle ....Gently to 800 rpm
Oil Pressure ....3.0 - 4.5 hpz
Electric Fuel Pump ....Off

AFTER ENGINE START

Throttle .... After 1 minute, set 1100 rpm
Propeller .... On
Voltmeter .... Positive charge
Fuel Pressure...................... Checked
Ignition................................ Checked (L – R – Off – Both)
PCS Propeller Control........ Exercise
Avionics.............................. On; 121.5 checked; Set
Altimeter .... Set
Transponder........................ Set
ATC .... Request taxi
Brakes................................. Release; Test

ENGINE RUN UP

Park..................................... Into wind (if possible)
Area..................................... Checked
Brakes................................. Applied and held
Throttle .... 1400 rpm
EDB Propeller Switch......... On
Propeller Control CB .... Engaged
PCS Propeller Switch .... Manual
Throttle .... 1800 rpm
Temps and Pressures .... Checked
CC Propeller Control .... Exercise
PCS Propeller Switch .... Automatic (Fine)
Ignition................................ Checked (L – R – Both)
Carb Heat............................ Checked
Electric Fuel Pump .... Checked
Voltmeter .... 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
P - Propeller.....................Automatic (Fine)
F - Fuel.............................Selector Both On / Main;
Contents sufficient;
Pump On; Pressure checked
F - Flaps...........................15 degrees
I - Ignition ....Both On
I - Instruments................Checked
H - Hatches; Harness.....Locked; Fastened
C - Carb Heat ....Exercise
C - Controls.....................Full, free and correct movement

LINE UP CHECKS

Landing Light / Strobes ......On
Transponder ....On ALT
D.I..Aligned with the runway

CLIMB CHECKS

Flaps....................................Up at a safe speed and height
(min 80 kph and 200 feet AGL)
Undercarriage......................As required
Fuel Pump............................Off
Power...................................Reset
Temps and Pressures.........Checked

PRE-LANDING CHECKS

B - Brakes .... Checked
U - Undercarriage .... Down
M - Mixture........................ Rich
P - Propeller..................... Automatic (Fine)
F - Fuel .... Selector as required;
Contents sufficient;
Pump On; Pressure checked
H - Harness .... Checked

FINALS CHECKS

Undercarriage .... Down
Propeller .... Automatic (Fine)
Landing Clearance .... Received
Runway................................. Clear
Carb Heat............................. Off

AFTER LANDING CHECKS

Flaps .... Up
Trim...................................... Neutral
Fuel Pump .... Off
Propeller Control .... Off
Landing Light / Strobes ..... Off
Transponder........................ Standby

SHUTDOWN CHECKS

Brakes	Applied and held
Throttle	800 rpm
Avionics	121.5 checked; Off
Ignition	Checked (L – R – Off – Both)
Throttle	Reduce to a slow idle
Idle Cut Off	Pull out and hold
Ignition	Off
Fuel	Off
Beacon / Nav Lights	Off
Master Switch	Off
Control Locks	As required

HASELL CHECKS

H -	Height	Sufficient for recovery at a safe height
A -	Airframe	Flaps as required
S -	Security	Harness tight; No loose objects
E -	Engine	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
A -	Amps	Checked; Generator charging
D -	D.I.	Checked with compass
I -	Icing	Check carb heat
E -	Engine	Instruments and fuel checked

Prepared by Waypoints Aviation

SPEEDS and LIMITATIONS

VX	Best Angle of Climb	90 kph IAS (49 kts / 56 mph)
VY	Best Rate of Climb	100 kph IAS (54 kts / 62 mph)
VNO	*Velocity Normal Ops*	*100 kph IAS (54 kts / 62 mph)*
VNE	Velocity Never Exceed	350 kph IAS (190 kts / 219 mph)
VA	Max Manoeuvring (@3200 lb)	260 kph IAS (140 kts / 160 mph)
VSO	Full Flap, Power Off	85-96 kph IAS (46-52 kts / 53-60 mph)
VS1	Flaps Up	105-112 kph IAS (56-60 kts / 65-70 mph)
VFE		180 kph IAS (98 kts / 112 mph)
VREF	Full Flap	104 kph IAS (56 kts / 65 mph)

Max Demonstrated Crosswind...

POWER SETTINGS and PERFORMANCE

Normal Climb	2350 rpm 0.9 ATA 130 kph IAS (70 kts / 80 mph)
Cruise	2200-2350 rpm 0.7 - 0.8 ATA 200-240 kph IAS (110-130 kts / 125-150 mph)
Descent	2200-2350 rpm 0.7 ATA 305 kph IAS (165 knots / 190 mph)
Glide	140 kph IAS (75 knots / 85 mph) approx 2 nm per 1000 feet @ 600 fpm
Fuel Consumption	14 US gal/hr (53 litre/hr)
Fuel Quantity	52 US gallons (197 litres) usable

Waypoints
AVIATION

Chapter Four

Nord 1002 Expanded Normal Checklists

The following is an expansion of the Nord 1002 / Bf108 Taifun Normal Operations Checklists.

BEFORE ENGINE START

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.

If the engine has not run for several days, the airstart bottle is unlikely to have sufficient charge for a reliable start and may have no charge at all. It can be recharged using the correct connector via the access panel at the rear of starboard wing root trailing edge (on some aircraft this is located under the engine cowling close to the compressor at the front of the engine). The air bottle isolator valve in the cabin, on the port side rear passenger seat squab, opposite the centre section main spar must be selected ON to achieve accurate judgement of the correct pressure.

Introduce compressed air carefully, noting the pressure reading on the airstart bottle reservoir gauge, which is coloured blue and located on the starboard main instrument panel above the fuel and oil condition gauges. It is calibrated in hpz (hectopièze). One hpz equals 1000 hPa or one bar (ata) or 14.7 psi. The bottle is fully charged when the pressure reading is 33 hpz, which is marked on the gauge with a red line. The pressure relief safety valve should not permit charging above that pressure. 33 hpz should give four (4) good start attempts on a cold engine.

Care must be taken when charging the airstart bottle, as there is a delay in the instrument panel gauge reading the actual pressure stored in the bottle whilst charging. It is not recommended to leave the charging cylinder attached once full pressure has been achieved in the airstart bottle.

Wheel Chocks .... Secure

Ensure that the wheel chocks are secure, as the brakes cannot be locked on and do require some effort to hold the aircraft for prolonged periods.

Magnetos .... Off

Propeller .... Pull through 6 blades

Double check that everything is OFF. I.e. fuel, mixture, magnetos and master switch are OFF. Then, hand pull the engine through six (6) blades helps to clear and/or prevent a hydraulic lock.
If the engine has not run for several days wait 10 seconds between each blade. If any oil is discharged from the exhaust pipe or inlet manifold drain during or shortly after this, continue to hand pull the blades until no oil is discharged.

Flaps.. Up

Select the flaps UP. Check for symmetrical operation and that the flap position indicator returns to "0" as the flaps return to the fully up (faired or trail) position.

Brakes .... Checked

Check the toe brakes by applying pressure and checking for small amount of travel and acceptable resistance when applied, to ensure there is fluid and effective seal in each circuit.

Master Switch.. On (Flight)

Select the master switch, located on aft face of the main spar on the right hand side of centre section in the rear cabin, to ON ("Flight").

Fuel Selector .... Both On / Main

Turn the instrument panel fuel selector to BOTH ON. Check the Main / Reserve fuel tank selector on the central panel, between the front seats is set to MAIN (to rear). Check safety wiring.

Battery.. On

At the EDB switch the Battery ON.

Generator... On

At the EDB switch the Generator ON.

There appears to be a contradiction between the notes received. I am unsure whether the battery and generator should be selected on or off at this stage. I suspect off. However the electric fuel pump appears to need the battery for its operation. There is also contradiction between the notes as to whether the generator is selected on before or after the battery. I suspect it doesn't matter.

5.1 CHECK: Master switch ON ("Flight"), Starter Air Bottle isolator ON, Fuel ON, Generator OFF (EDB), Battery OFF (EDB), Canopy closed but not locked with sliding windows open or "Generator, battery, propeller master circuit breakers to ON"

Air Start Valve .... Open

If the air start bottle isolator valve has not previously been turned on during replenishment, select it OPEN now.

Air Pressure.. Checked (>12 hpz)

Check the air pressure. On a cold engine, 30 hpz should be sufficient for four (4) start attempts and 12 hpz sufficient for only one start attempt. Less than 15 hpz will require some familiarity with the engine if it is cold, to be confident of achieving a reliable start. Less than 10 hpz will not turn the engine over a compression at all.

A full charged and serviceable air bottle, if it has been selected OFF, should hold sufficient pressure for a start for up to two days. If the air is left ON with engine shut down, the air will eventually leak away.

Undercarriage.. Pump grip DOWN

Pump grip rotated to DOWN. Check the visual indicator.

Canopy... Closed & Unlocked

Close but do not lock the canopy. Leave the sliding windows open.

Instruments .... Checked

Cage the DI. Set QNH and check the aerodrome altitude on the altimeter, or set QFE and check that the altimeter indicates close to zero feet.

Avionics .... Off

Circuit Breakers .... Checked

Beacon / Nav Lights... On

ENGINE START

Fuel Pump.. On; Pressure to 2.0 - 2.2 hpz

Turn on the electric fuel pump at the switch at the rear of the Electrical Distribution Board (EDB). If battery condition and charge are good, the fuel pressure should rise after 5 to 15 seconds to show between 2 and 2.2 hpz.

If the battery charge is insufficient to operate the electric pump, switch the electric fuel pump OFF and use the hand pump, which is a yellow toggle handle at the bottom of the instrument panel.

It is important to ensure that fuel pressure is maintained, electrically or manually, during the start operation until the engine has been running steadily for 10 to 15 seconds, after which the engine driven mechanical fuel pumps should take over.

Prime .... As required

With fuel pressure maintained, either electrically or manually, prime the engine using the throttle. For the first start of the day, pump the throttle over its entire range four (4) times. Hot starts require no priming, a warm engine may require one (1) priming stroke. On a particularly cold day, the engine should be given six (6) priming strokes.

Pull the engine through one (1) blade after each two (2) primes. It has not been found necessary to use the choke in the UK climate. Ensuring the throttle is returned to its fully closed position prior to attempting the start.

Magnetos .... On

Throttle.. Fully Closed

Ensuring the throttle is returned to its fully closed position prior to attempting the start.

Propeller Area .... Clear

A call of "CLEAR PROP" through the canopy sliding window, 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.

Starter .... Engage

Apply full pressure on the toe brakes, hold the stick FULLY BACK, with the throttle FULLY CLOSED and maintaining fuel pressure, release the airstart hand valve safety catch and engage the starter by applying a firm pull on starter toggle. Maintain the pull for one (1) second and then release. This should turn the engine briskly through 3 to 5 compressions, after which it should fire and run, if a little unevenly and slowly. Pumping the throttle is not usually effective in encouraging a cold engine to start.

There may be a significant amount of smoke generated on the first start of the day, which should clear as the engine warms up.

Throttle.. Gently to 800 rpm

Do NOT attempt to open the throttle until the engine has settled into a steady, albeit slow, idle.

Once the engine is idling, open the throttle very cautiously until it is running at 800 rpm and wait until it settles down and runs evenly.

If the engine does not pick up and the start stagnates, it is important to decide whether the engine is over or under primed and taking remedial action before attempting another start. If the engine does not fire at all on first attempt, the reason for this should be investigated before further start attempts.

Oil Pressure.. 3.0 - 4.5 hpz

As soon as the engine is running smoothly, the oil pressure should be checked. The oil pressure should rise and stabilise between 3 and 4.5 hpz 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 magnetos OFF) to prevent engine damage.

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.

A reading of the oil temperature should also be noted. The oil temperature is often slow to rise in cold weather, but normally if a steady reading is observed after engine start it is acceptable.

Electric Fuel Pump... Off

The fuel pressure should become self-sustaining after 5 to 10 seconds and the electric fuel pump can be turned OFF, or operation of the hand pump can be discontinued.

AFTER ENGINE START

Throttle.. After 1 minute, set 1100 rpm

Open the throttle very cautiously to set 1100 rpm. Opening the throttle too early after start or too quickly when cold may cause a rich cut.

Propeller .... On

At the EDB switch the Propeller Control Switch ON.

Voltmeter .... Positive charge

Check for a positive charge on the EDB voltmeter.

Fuel Pressure .... Checked

Select the electric fuel pump ON and check that the fuel pressure has increased to 2.2 hpz. Turn the electric fuel pump OFF and check that the fuel pressure drops by 0.2 hpz, but to not below 19.5 hpz.

Ignition .... Checked (L – R – Off – Both)

Check each magneto for appreciable rpm drop of no more than 150 rpm. This is a basic function test, the magneto performance test is completed during engine run-up checks.

*Check **LEFT; RIGHT; OFF; BOTH.***

*This is a double check, a 'dead cut' check to see if the ignition goes dead when it is selected to **LEFT** or **RIGHT**, and a 'live mag' check to see if the mag is live when it is selected to **OFF**. Therefore, the ignition is being checked for correct operation of the **LEFT/RIGHT** and **OFF** positions.*

*To check the ignition system select the **LEFT** magneto for about one second, repeat for the **RIGHT** magneto, then briefly select to the **OFF** position without allowing the engine to stop, then back to both.*

*When the ignition switch is moved from **BOTH** to **LEFT**, then **RIGHT**, the engine should continue running, albeit at reduced rpm. This confirms that both magnetos are operating correctly. Then move the switch **briefly** to **OFF**, then back to **BOTH**. The engine should cut out while the switch is in the **OFF** position. This confirms that there is no short circuit and that the ignition wiring is correct.*

*If the engine dies when the **LEFT** or **RIGHT** magneto is selected then that magneto (and the aircraft) is unserviceable. If the engine runs when the ignition is selected to **OFF**, then there is a fault in the ignition system and the aircraft is unserviceable.*

CAUTION

If the engine cuts out when the switch is on LEFT or RIGHT, or continues to run when the switch is OFF, shut the engine down and investigate the cause prior to any further start attempts.

Exercise extreme caution around the aircraft in this condition, as the magnetos may be live.

PCS Propeller Control .... Exercise

Check that the Propeller Control CB (on the left hand side of the lower instrument panel near the Propeller Control Subpanel (PCS)) is IN and that the Electrical Distribution Board (EDB) Propeller Control Switch is ON.

Using the PCS Manual control, adjust the propeller to Coarse Pitch. Check the illumination of the red light on the PCS which indicates increasing propeller pitch. Also listen for the corresponding reduction in engine rpm until the propeller reaches the coarse pitch stop, then no further change in rpm should be noted.

Using the PCS Manual control, adjust the propeller to Fine Pitch. Check the illumination of the green light on the PCS which indicates reducing propeller pitch. Also listen for the corresponding increase in engine rpm until the propeller reaches the fine pitch stop, then no further change in rpm should be noted and the engine should have returned to 1100 rpm.

Propellor Control Subpanel (PCS)

Electronic Distrinution Board (EDB)

When this exercise is completed, turn the lower (Manual / Automatic) switch on the PCS to OFF (central), disengage the Propeller Control CB, and turn the EDB Propeller Control Switch to OFF for the rest of the warm up and taxiing. The propeller controls will not be used again until the engine run-up, pre-takeoff checks and then in flight.

Avionics .... On; 121.5 checked; Set

Altimeter .... Set

Transponder .... Set

Set **Standby** and check that the correct transponder code.

ATC... Request taxi

The aircraft should not be taxied until the engine has warmed up. The Renault engine does not put much heat into the oil when idling on the ground and the oil temperature gauge is unlikely to register until in flight. The temperature of the oil can be judged for suitability to taxi by either:

~The oil temperature gauge coming off the lowest mark; or,

~The oil pressure having dropped by 0.5 hpz from the pressure noted at 800 rpm immediately after start (if the engine was cold); or,

~By feeling the temperature of the scavenge oil return pipe which runs laterally, just below the front of the pilot's seat squab.

Brakes .... Release; Test

When in a clear area, apply the toe 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 fully the aircraft will swing in the direction of the good brake.

NOTE

The brake test does not have to bring the aircraft to a complete stop.

ENGINE RUN - UP

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 .... Checked

Check that the oil temperature is indicating a minimum of 40°C, and be sure that area behind 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 .... Applied and held

As the Nord has no parking brake, firm positive pressure must be held on the toe brakes to ensure the aircraft remains stationary during the run-up.

Throttle.. 1400 rpm

EDB Propeller Switch .... On

Propeller Control CB .... Engaged

PCS Propeller Switch .... Manual

Throttle.. 1800 rpm

Prior to increasing the engine power, re-assert full pressure on the toe brakes and position and hold the stick FULLY BACK.

Temps and Pressures.. Checked

Whilst at high power, the engine oil pressure and temperature gauges should be read again to ensure that both are giving steady indications within the green arcs. This is a more appropriate stage for this check, as any malfunction of the oil system will be more likely to manifest itself after a period of engine operation at high power.

CC Propeller Control .... Exercise

Using the Propeller Pitch Control Switch (PPCS) on the top of the control column, cycle the propeller through coarse by first moving the switch to the rear, then back to fine by moving the control column propeller pitch control switch forward.

When the switch is moved to the rear check that the engine rpm reduces and that the red light on the PCS illuminates indicating increasing propeller pitch.

When the switch is moved forward check that the engine rpm increases and that the green light on the PCS illuminates indicating reducing propeller pitch. The engine should recover to 1800 rpm.

PCS Propeller Switch .... Automatic (Fine)

Using the PPCS on the top of the control column, move the switch rearward to move the pitch to fully coarse. Then turn the Propeller Control Switch on the PCS to Automatic. The green light on the PCS should illuminate and the engine should recover to 1800 rpm.

Leave the PCS Propeller Selector in Automatic (Fine) for takeoff.

Ignition .... Checked (L – R – Both)

Check **LEFT; BOTH; RIGHT; BOTH.**

*Move the ignition switch first to the **LEFT** magneto position and note the rpm drop (from 1800) Next move the switch back to **BOTH** to clear the other set of spark plugs. The rpm should return to 1800 rpm. Then move the switch to the **RIGHT** magneto, note the rpm drop and return to **BOTH**.*

Do not linger on only one magneto. The magneto drop should be between 50 and 175 RPM, with a maximum drop of 200 RPM, and a maximum of 100 rpm difference between each magneto.

On occasions it is possible to experience rough running when magneto checks are carried out. This plug fouling may be due to accumulations 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.*
- ✈ *Run the engine at 2000 rpm for up to 30 seconds then try a further magneto check.*
- ✈ *If rough running persists run the engine at **full power** for 5 to 10 seconds then throttle back to 2000 rpm and carry out a further magneto 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 **DO NOT** reselect the ignition back to **BOTH** to try to keep the engine running, as this may lead to a serious backfire and engine damage. Rather, leave the ignition in the position it is in when the engine died, close the throttle and allow the engine to stop rotating.

Carb Heat .... Checked

Select the carb heat ON for 10 seconds by pulling yellow T handle and turning it through 90 degrees to lock it. There should be a small but noticeable drop of between 20 and 100 rpm when this happens, as a thin jet of hot air is directed onto the butterfly of each carburettor. The rpm should return to normal when the carb heat is selected OFF.

NOTE

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

An excessive rpm drop (>200 rpm) may indicate an exhaust system fault.
In either case, **do not takeoff.**
Investigate the cause prior to further flight.

CAUTION

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.

Electric Fuel Pump.. Checked

Turn the electric fuel pump ON and check for an increase of fuel pressure to 22 hpz. Switch the electric fuel pump OFF and check that the fuel pressure returns back to between 19.5 and 20 hpz.

Voltmeter .... Checked

By the run-up stage, the charge rate should be very small or zero. A zero-left ammeter shows the generator output, and should be just off the left of the scale. A centre-zero ammeter shows the flow of current into and out of the battery and should be very near the centre of the scale.

NOTE

If the ammeter shows a discharge during run-up, cycle the master switch once. The fault may have been caused by a sticking voltage regulator.

Throttle.. Check idle
Reset 1100 rpm

Smoothly and completely close the throttle and check that the engine idles at between 500 and 650 rpm. Reset the throttle to 1100 rpm.

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-TAKEOFF CHECKS (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; Prop; and Engine Ts and Ps is all that needs to be carried out.

T - Trim .... Set

Check the elevator trim for free movement both sides of the neutral position, then set to neutral. There is no need to exercise the elevator trim through the full range of movement. The trim is automatically set for takeoff when the flaps are set.

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).

P - Propeller .... Automatic (Fine)

Set the PCS Propeller Pitch Selector to Automatic (Fine). The Automatic position should normally be used for takeoff, and is equivalent to fine pitch.

F - Fuel .... Selector Both On / Main;
Contents sufficient;
Pump On; Pressure checked

F - Flaps. .... 15 degrees

Select the flaps to 15 degrees (half way between 1 and 2 on the indicator). When selecting flap, grasp the elevator trim control wheel simultaneously and move it in the same direction as the flap wheel. The geometry of both is set in such a way that, if the trim and flap wheels are moved together, the trim is correctly adjusted to the new flap setting.

I - Ignition.. Both On

Check that the magnetos are both ON (1+2).

I - Instruments .... Checked

Check that the engine temperatures and pressures remain within limits. Check that the ASI and VSI are reading zero, and that the altimeter is correctly set.

The flight instrument gyroscopes are all driven by a venturi which generally doesn't generate enough vacuum until the aircraft is in flight. However, in preparation for flight, on the Vacuum Selector Panel, to the right of the instrument panel, adjacent to the EDB, select the DI and Turn & Slip ON but leave the AI OFF. There is insufficient vacuum to drive more than two of the three flight instruments simultaneously.

H - Hatches; Harness .... Locked; Fastened

Lock the canopy hatches with the toggle at the top centre of the windscreen. Close the sliding windows to a couple of inches. The cabin is very warm and it would take an extremely cold day for there not to be a need some ventilation.

Check that the harnesses are fastened and tight or tied back and secure. The pilot will need a small amount of shoulder mobility to raise the manual undercarriage after take off.

C - Carb Heat.. Exercise

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

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

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

CAUTION
Forcing the rudder pedals may damage connecting the rods and linkages.

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.

Landing Light / Strobes... On

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 80 kph and 200 feet AGL)

Once at a safe airspeed, greater than 80 kph and clear of obstacles (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.

Undercarriage.. As required

If remaining in the circuit, the undercarriage should remain DOWN. If vacating the circuit, at above 1,000 feet AGL, the undercarriage should be retracted.

To retract the undercarriage, momentarily apply the toe brakes to ensure wheel rotation has ceased, then holding the control column lightly in the left hand, grasp the undercarriage lever and twist it 120 degrees clockwise and cycle the lever fore-and-aft vigorously through its full range of travel. This will require up to 40 strokes and takes 30 to 40 seconds. It is important not to inadvertently transfer the undercarriage lever movement to the control column, as the resulting pilot induced oscillation (PIO) will be uncomfortable for the occupants. Maintain a good lookout throughout.

Fuel Pump... Off

If you are remaining in the circuit, the electric fuel pump should be left ON. If you are departing the circuit, the electric fuel pump should be turned OFF passing 1000 feet agl in the climb. The fuel pressure should be checked to ensure that the engine driven pump is working correctly.

> **CAUTION**
>
> If the fuel pressure drops suddenly when you turn the electric fuel pump OFF, or the engine runs rough or dies, immediately reselect the electric fuel pump back ON, as the engine driven fuel pump may have failed. Maintain the climb if possible and recircuit to land as soon as possible.

Power .... Reset

Temps and Pressures.. Checked

PRE-LANDING CHECKS

B - Brakes.. Checked

Apply sufficient pressure to the toe brakes to determine that there is resistance and that there is pressure for them to operate.

U - Undercarriage .... Down

M - Mixture.. Rich

P - Propeller .... Automatic (Fine)

Set the PCS Propeller Pitch Selector to Automatic (Fine). The Automatic position, if functioning properly, should normally be used for takeoff, and is equivalent to fully fine pitch.

F - Fuel .... Selector as required;
Contents sufficient;
Pump On; Pressure checked

H - Harness.. Checked

Waypoints AVIATION

FINALS CHECKS

Undercarriage.. Down

Propeller .... Automatic (Fine)

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-around 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 90% of full power.

AFTER LANDING CHECKS

Flaps.. Up

Flaps should be up when taxiing as they may be damaged by stones or other objects.

Trim .... Neutral

Fuel Pump... Off

Propeller Control.. Off

Turn the lower (Manual / Automatic) switch on the PCS to OFF (central), disengage the Propeller Control CB, and turn the EDB Propeller Control Switch to OFF.

Landing Light / Strobe.. Off

At night the landing lights should remain on until the aircraft has come to a final stop. However, consideration must be shown to other users of the aerodrome to ensure they are not dazzled.

Transponder.. Standby

Waypoints AVIATION

SHUTDOWN CHECKS

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

Brakes .... Applied and held

Throttle... 800 rpm

Allow the engine to idle for at least one to two minutes, at between 800 and 1000 rpm. This allows the engine oil to cool, and also allows even cooling of the entire engine generally.

Avionics .... 121.5 checked; 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 (L – R – Off – Both)

*This check is the same as after engine start. Check **LEFT; RIGHT; OFF; BOTH**. The engine should continue to run in the **LEFT** and **RIGHT** positions, and should cut out when it is in the **OFF** position, if it does not then the ignition has a serious fault and this should be rectified immediately.*

Throttle... Reduce to a slow idle

Idle Cut Off... Pull out and hold

Hold the idle cut off out until the engine stops.

Ignition .... Off

Never shut down the engine for any normal operation by switching off the magnetos.

Fuel.. Off

Beacon / Nav Lights.. Off

Master Switch.. Off

Control Locks.. As required

If parking for any period of time, and the aircraft is left outside, install the control locks.

HASELL CHECKS

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

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

A - Airframe.. Flaps as required

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

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

L - Location.. Not over built up areas

L - Lookout... Around, above and below

SADIE CHECKS

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

S - Suction.. Checked

The suction reading should be in the green range. If it is too low the instruments may not function reliably, if it is too high the instruments may be damaged.

A - Amps.. Checked; Generator charging

Check to ensure that the generator is charging. Also compare the actual load shown with the load you are drawing.

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.

Chapter Five

Aircraft Handling

Introduction

Every aircraft quickly becomes identified through its salient features and characteristics. The Nord 1002, stemming from the Bf108 lineage, has produced an extraordinary reaction from those who have had the opportunity to get to know the aircraft well.

The Nord's sensitivity, sureness and swift positive response to the controls have consistently delighted pilots. Fighter pilots with 20 and 30 years in the air have stated that the Nord 1002 has fighter-like response, and some have described the aircraft as a thoroughbred.

The Nord 1002 aircraft has a maximum speed of 306 kph IAS (165 knots / 190 mph), a long range sustained cruising speed of 285 kph IAS (155 knots / 178 mph), and a stalling speed of only 84 kph IAS (45 knots / 52 mph).

However, the Nord 1002 demands skilful handling on the ground. It does not enjoy the characteristics of the modern light aircraft with wide-set, tricycle undercarriage, and so demands particular pilot skill. Yet its characteristics are quickly mastered by any pilot of basic competence, who pays attention to what they are doing. There is a saying that an aircraft is made to perform in the air and not on the ground, and the basic Messerschmitt design hews closely to this philosophy.

One reason for the close set undercarriage, is that the wings are able to pivot at near the wing root and fold back along the fuselage. By folding and pivoting the wings the span shrinks from 34 feet 5 inches to only 10 feet 7 inches.

General Handling

The Nord 1002 is an excellent machine to fly, it is very clean in its design, and thus it is pleasant and responsive with no hidden vices through all its manoeuvres. The rate of roll is crisp and excellent in response, and the controls are very well balanced at all speeds. During slow flight or climb out right rudder is needed to counteract torque and at high speeds, corrective left rudder is needed. Under cruise flight conditions the aircraft is perfectly balanced and does not require any corrective rudder input.

At the normal cruising IAS of 250 kph IAS (135 knots / 155 mph) the Nord 1002 is in trim with respect to rudder and aileron. Under this condition the aircraft is perfectly balanced and may be flown hands off.

In a dive, speed builds up very quickly, and the engine rpm should be closely monitored to avoid exceeding the engine's limitations. It is very easy to unintentionally approach the airspeed limitations and caution must be exercised at all times when engaged in descending manoeuvres. The need for left rudder is most pronounced in a dive at high speed.

Airspeeds for Safe Operations (IAS)

The following airspeeds are those which are significant to the operation of the Nord 1002 / Bf108. 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, airframe and equipment, atmospheric conditions and piloting technique.

Initial Climb after Takeoff .... 100 kph IAS (54 knots / 62 mph)

Normal Climb .... 130 kph IAS (70 knots / 80 mph)

Normal Base and initial Final Approach Speed .... 160 kph IAS (87 knots / 100 mph)

Final Approach Speed – full flaps extended .... 115 kph IAS (60 knots / 70 mph)

Maximum demonstrated crosswind ....

Taxiing

General

The Nord 1002 is easily taxied, and on a smooth level surface, requires only moderate or little use of power once it is rolling. However, owing to the narrow track of the undercarriage (4' 11") and the effect of engine torque, the pilot must exercise caution in ground handling, most especially when turning. The greatest difficulty is encountered under conditions of a strong surface wind. There are occasions when, because of torque and the strength and direction of the wind, it becomes difficult to institute a turn to the right. At such times the aircraft turns with great ease to the left and the application of a little left brake enables the plane to be pivoted about on the left tip in a very small turning circle. In strong and gusty winds it is sometimes advisable to have the assistance of a wing walker on the wingtip. This adds safety and makes handling much easier.

While rough ground with deep ruts or holes should be avoided, the aircraft actually handles better on grass or dirt than it does on a very smooth surface.

Above all, the pilot should remember that the aircraft will swing to the left with rapid application of power, and under normal taxiing conditions there will be greater use of the right brake than the left.

Braking and Steering

The aircraft has differential toe brakes on the main wheels. The brakes are reasonably powerful at taxiing speeds so the aircraft is reasonably manoeuvrable on the ground. However, the brakes are small drums and will heat up and lose effectiveness if used excessively when taxiing slowly with too much engine power, so they should be used with some caution. Likewise, taxiing across a strong wind will place a great load on the downwind brake which may overheat and lose effectiveness.

For long taxiing distances, the pilot will find the most effective power setting to be approximately 1200 RPM.

The aircraft has no park brake facility.

> **CAUTION**
>
> The excessive and sudden application of brake may cause sufficient deceleration for the nose to come down so sharply that the propeller blade tip may strike the ground.
>
> If this occurs, the corrective action is to immediately apply power with the stick full back, being ready to ease off power as the tailwheel reaches the ground.

The aircraft is steered by differential toe brakes on the main wheels. The tailwheel is fully castoring with no lock and is spring loaded. The last part of the rudder pedal travel moves the tailwheel to a slight extent, providing some additional assistance in tight turns.

If in doubt about the turning radius of the aircraft and consequent obstacle clearance, brake to a STOP.

If in doubt about the effectiveness of the brakes, steer clear of obstacles and STOP using any means available including shutting down the engine.

Vision While Taxiing

Despite the high nose position, visibility while taxiing is generally quite good. However, the pilot's view in the three point attitude is restricted by the engine in the right front quarter, so it is advisable to weave in an S-turning or zigzag manner to provide complete forward vision when taxiing.

Oil Temperature

The aircraft should not be taxied until the engine has warmed up. The Renault engine does not put much heat into the oil when idling on the ground and the oil temperature gauge is unlikely to register until in flight. The temperature of the oil can be judged for suitability to taxi by either:

~The oil temperature gauge coming off the lowest mark; or,

~The oil pressure having dropped by 0.5 hpz from the pressure noted at 800 RPM immediately after start (if the engine was cold); or,

~By feeling the temperature of the scavenge oil return pipe which runs laterally, just below the front of the pilot's seat squab.

Engine Cooling

The Renault 6Q engine is an inverted straight six. Like most aero engines, it is designed to be cooled effectively in flight. The engine temperatures on the ground need to be managed to ensure overheating does not occur when the cooling airflow is drastically reduced, especially to the rear two cylinders. Particular care should be taken to avoid:

~Long taxiing downwind when the wind direction and the prop wash could counteract each other leaving critically reduced cooling airflow through the engine bay;

~Allowing the aircraft to remain stationary when pointing significantly out of wind for prolonged periods, particularly when performing power checks or pre-takeoff checks;

~Taxing slowly with excessive engine speed where speed is being controlled with the brakes;

~Use of carburettor heat (alternate air) except to clear carb ice or to check the effectiveness of the function; or,

~Operating the engine in any way other than with the mixture at fully rich while on the ground.

Takeoff

The Nord does not have any particularly distinctive handling characteristics of which to be aware other than those of any tailwheel configuration. It is a well balanced, nicely coordinated and a pleasure to fly. The Nord engine is an even numbered variant of the Renault 6Q series so turns clockwise when looking forward from the rear. Thus it will need substantial input of right rudder during takeoff and climb. There is no rudder trim.

Align the aircraft on the runway and roll forward a couple of metres to be sure that the tailwheel is straight. Secure the tailwheel lock if one is installed.

Ensure the feet are off the toe brakes.

Open throttle with a gentle and steady movement, applying right rudder in proportion as the power increases. The rudder becomes effective at about 16 kph IAS (9 knots / 10 mph).

Check for increasing indicated airspeed.

The carburettors have accelerator pumps, so over brisk advancing of the throttle in any flight (or ground) condition can cause the engine to baulk or misfire, and in extreme conditions, to rich cut. If the engine baulks or misfires, retard the throttle promptly and re-advance it more cautiously.

Check 2500 rpm if AUTOMATIC (Fine) or MANUAL - FINE pitch set. Check that the oil and fuel pressures are within limits.

The aircraft becomes light on the undercarriage reasonably quickly, it can demonstrate controlled flight down to 53 kph IAS (29 knots / 33 mph). Consequently the tail should be raised promptly, before full throttle is applied, to improve visibility, keep weight on the main wheels and aid in the maintenance of directional control. As tail is raised, keep applying a sufficient amount right rudder pressure to maintain directional control. The tail will come up at about 45 kph IAS (25 knots / 28 mph).

The Nord has a pronounced swing to left on raising the tail during the takeoff run, more pronounced with crosswind from left. However it is perfectly manageable as the rudder is powerful and has sufficient authority to keep the aircraft straight in all flight conditions. If there is a strong crosswind from the left, be prepared to use light brake pressures when and if required. Use ailerons only when absolutely necessary to prevent imposing undue side loads and strain on the undercarriage.

What little gyroscopic couple there is on raising the tail is reinforced by the aerodynamic effects of the propeller slipstream on the tail. However the engine is not sufficiently powerful for there to be a risk of torque induced roll, even if the throttle is opened rapidly (which, as stated above, is not recommended). That said, over the years there have been a number of aircraft accidents when directional control has been lost on takeoff, so constant attention to the maintenance of directional control is required on all takeoffs.

The aircraft may be flown off at 100 kph IAS (54 knots / 62 mph), however at MAUW takeoff is more sure and responsive if it is flown off at about 120 kph IAS (65 knots / 75 mph) to prevent any sinking tendencies.

{NOTE We had the fine pitch stop set so that the engine would run at 2050 static on the ground. This equated to 2500 rpm at 120 kph, which meant that all circuit flying could be done with the propeller fixed in the fully fine setting. I controlled the engine rpm with the airspeed until the flaps and undercarriage were all up, then reset the pitch in the cruise. Setting the pitch so that 0.8 ATA of boost gave 2300 rpm let the aircraft fly at between 210 to 230 kph IAS depending upon the density altitude with full fuel and 1-2 pax. At this pitch setting full throttle gave 2500 rpm (up to about 2500 feet) and 0.7 ATA boost gave 2100 rpm and 180 to 200 kph IAS. I never had the AUTOMATIC propeller control working satisfactorily and we found that leaving the pitch control circuits energised in the cruise seemed to burn out the carbon brushes fairly quickly.}

Climb

In the initial climb after takeoff, climb at 100 kph IAS (54 knots / 62 mph), monitoring the engine rpm throughout the climb.

Slowly retract the flaps at a safe speed of 100 kph IAS (54 knots / 62 mph) and safe height of 200 feet above obstacles, remembering to move the trim wheel at the same time as the flap wheel. Control engine rpm with airspeed until the flaps are fully stowed.

If remaining in the circuit, the electric fuel pump should remain ON. If vacating the circuit, at above 1,000 feet AGL, turn the electric fuel pump OFF.

If remaining in the circuit, the undercarriage should remain DOWN. If vacating the circuit, at above 1,000 feet AGL, the undercarriage should be retracted.

To retract the undercarriage, momentarily apply the toe brakes to ensure wheel rotation has ceased, then holding the control column lightly in the left hand, grasp the undercarriage lever and twist it 120 degrees clockwise and cycle the lever fore-and-aft vigorously through its full range of travel. This will require up to 40 strokes and takes 30 to 40 seconds. It is important not to inadvertently transfer the undercarriage lever movement to the control column, as the resulting pilot induced oscillation (PIO) will be uncomfortable for the occupants. Maintain a good lookout throughout.

Monitor the undercarriage visual position indicator at the base of the lever. As it approaches the RETRACT position, the movement becomes stiffer and needs to be made more deliberately. Do not jam undercarriage in the up position. Once retracted, the mechanism is self locking by leaving the lever twisted clockwise in the RETRACT position.

Reset the boost and rpm by use of the throttle and control column pitch control switch to achieve 0.9 ATA and 2500 rpm. The normal climb speed at maximum all up weight (MAUW) is 130 kph IAS (70 knots / 80 mph). Higher airspeeds are preferable for engine cooling during the sustained (cruise) climb, if the all up weight will permit a reasonable rate of climb.

Cruise

Once the desired cruise altitude has been reached, level off and allow the aircraft to accelerate to cruise speed of 200 to 240 kph (110-130 knots / 125-150 mph). With propeller in AUTOMATIC, reset boost to 0.7 to 0.8 ATA.

Use of excessive boost, i.e. >0.8 ATA at altitudes above 3500 feet, risks the accelerator jets being opened in the carburettors with the attendant fuel consumption penalties, as fuel is syphoned through the accelerator pumps.

Once the aircraft has settled down in the cruise and been trimmed, the electric propeller pitch control can be turned off.

In the cruise, the Renault engine is exceptionally smooth. It does not display any of the classic symptoms of carburettor icing, however any occasional missed beat or hesitation is usually carb ice and can be remedied by selecting the carb heat ON. There does not seem to be any measurable penalty for this and the engine can be run with carb heat selected ON until the conditions causing the initial problem have passed.

Effects of In Flight Trim Changes

POWER ON causes a NOSE UP change of trim.

POWER OFF causes a NOSE DOWN change of trim.

With constant power, an INCREASE OF SPEED causes a NOSE UP change of trim and a YAW TO THE RIGHT, requiring left rudder correction.

With constant power, a DECREASE OF AIRSPEED causes a NOSE DOWN change of trim and a YAW TO THE LEFT, requiring right rudder correction.

FLAPS DOWN causes a NOSE DOWN change of trim.

FLAPS UP causes a NOSE UP change of trim.

UNDERCARRIAGE DOWN causes a SLIGHT NOSE DOWN change of trim.

UNDERCARRIAGE UP causes a SLIGHT NOSE UP change of trim.

Stalling

A clean stall presents no problems, either with power on or power off, and control is excellent throughput the stall envelope. Power off stalls with undercarriage and flaps up are very gentle, with full control responsiveness throughout. The stick must be held full back, there is full aileron control, the slats pick up the stalling wing through lateral movements, and the aircraft is constantly trying to recover by itself. It must be held deliberately in the stall.

The Nord retains conventional elevator, rudder and aileron control right down to the stall in any flap configuration with the attendant roll and yaw control because the Handley Page slats do not allow fully stalled flow separation to propagate to or beyond the slats.

The power off stall with undercarriage and flaps down is again a straightforward manoeuvre. There is more warning of the approaching stall, more buffeting, and a wing drop is unlikely likely to occur.

However, the power on stall creates torque and the probability of a wing drop due to this force. The greater the power, the more likely the chance of a wing drop at the point of stall, and the more pronounced will be this reaction.

A great deal of power is needed to maintain height with full flaps down. If a power on stall is flown, almost invariably there will be a wing drop. If the wing drops at the point of stall, the wing may drop either way, but throughout the stall and wing drop the ailerons remain very effective and, to a certain extent, the drop may be countered by aileron movement. However, this control application may eventually aggravate the tendency of the wing to drop.

Since stall recovery is straight forward, there is no necessity to pick up the wing in this manner with the ailerons. The nose drops quickly at the point of stall, and the recovery consists simply of releasing the back pressure and easing out of the dive in a gentle fashion to avoid precipitating a secondary or high speed stall.

During the stall, the slats will open at about 112 kph IAS (60 knots / 70 mph), and if they open unevenly there is some slight lateral instability. The warning of the stall comes in gentle buffeting and slats operation.

Stall speeds:

Clean	105-112 kph IAS (56-60 knots / 65-70 mph)
Undercarriage/Flap Down	85-96 kph IAS (46-52 knots / 53-60 mph)

The most outstanding feature of the Nord 1002 is found in its resistance to stalls in what is considered the most dangerous attitude, i.e. a stall when in a tight, power-on, high-speed turn. Under these conditions of a high speed stall, the normal tendency of an aircraft, is for the lower wing to stall first, leading to a violent reaction and an uncontrolled snap manoeuvre. The inner or lower wing will usually stall first in a turn, as it is moving more slowly than the outer or higher wing. The consequent loss of lift will cause it to drop, thus bringing the outer wing over and possibly precipitating the snap manoeuvre.

The Nord 1002 avoids this snap manoeuvre by virtue of its free moving, independently operating leading edge slats. As the aircraft is brought under harsh manoeuvre into the stall, the slat of the low wing drops forward (outward), imparting additional lift to the wing. The aircraft may be held in the incipient stall condition, still in the high-power, steep-bank, tight-turn manoeuvre. There will be a vigorous movement of the slats and the aircraft will remain in the turn without fully entering the stall.

Aerobatics

I am aware of no legitimate documentation which authorises aerobatics in the Nord 1002. Nor am I aware of any structural integrity testing having been carried out. Consequently I am not aware of any structural load limits having been published. The Messerschmitt Bf108 Taifun was originally designed as a communications/transport aircraft.

It is recommended that aerobatics NOT be carried out in the Nord 1002.

That said the Nord 1002 has, in various configurations, been employed by several nations as a pilot trainer, and its history is to swiftly inspire confidence in student pilots.

Descent and Circuit Pattern Entry

In any descent from altitude, the Nord 1002 builds up speed quickly. Little power is required in the descent. For a high rate of descent without excessive airspeed, the aircraft should be brought to a speed of 175 kph IAS (95 kts / 110 mph), and the flaps and undercarriage extended. With power well back, the aircraft will exceed 3500 fpm rate of descent, well within the 180 kph IAS (97 kts / 112 mph) "never exceed" speed for flaps and undercarriage extended.

> **NOTE**
>
> Always apply carburettor heat before starting a descent with low power set.

Entering the circuit pattern, complete the Pre-landing Checks at an appropriate time. The recommended airspeed on the downwind leg is 160 kph IAS (87 kts / 100 mph).

To lower the undercarriage, twist the pump handle counter-clockwise and pump the handle fore and aft vigorously until it will move no further. Do not over force the handle. Confirm the position of the undercarriage by checking the visual indicator.

Base Turn Procedure

Mid to late downwind identify a feature on the ground over which you wish to have your 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 level 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 Procedure

Recheck that the propeller is selected to AUTOMATIC (Fine) or MANUAL - FINE, that the mixture is selected to FULL RICH, that the fuel booster pump is selected to ON, and that the undercarriage is fully DOWN.

Select the flaps to 30° and maintain 150-160 kph IAS (83-87 kts / 95-100 mph).

Final Approach and Landing Procedure

When established on final approach select the flaps to 48° DOWN (maximum). Trim immediately for proper attitude because of great flaps drag. Make shallow descent in power-ON approach to reduce the glide angle and the need for any sudden flare-out over the runway.

Allow the aircraft to initially decelerate to 135 kph IAS (74 kts / 85 mph). Continue reducing speed slowly, and begin the round-out (or flare) at 110 kph IAS (60 kts / 70 mph). In gusty or strong crosswinds, maintain 130 kph IAS (70 kts / 80 mph) until at the round-out (or flare) height.

Maintain the descending attitude until at the round-out (or flare) height. This height is 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. Keep the aircraft properly aligned with runway, the wings level (with aileron) and fly parallel to and just above the ground (about ½ to 1 metre), slowly and continuously raising the nose to the landing attitude.

Hold the aircraft off to settle gently on main undercarriage in a level-attitude touchdown. DO NOT ALLOW AIRCRAFT TO TOUCHDOWN IN A CRABBING ATTITUDE. Use rudder as needed to keep the aircraft rolling straight down the runway. Allow the tail to settle slowly. Once the tailwheel is down, bring the stick FULL BACK.

Be ready for quick rudder corrections. Unless there is a need for braking action because of crosswind, allow the aircraft to roll under its reducing momentum until engine power is needed to taxi off the runway. During the landing roll, use brake only if necessary to counter a crosswind, or if a short landing is necessary.

Clearing the active runway increase the power to 800-1000 rpm and use the brakes for speed control. Raise the flaps immediately to avoid damage to their surfaces and complete the After Landing Checks. Loosen the throttle friction if necessary for taxiing.

Go-Round

If a go-round is required from an approach or following some other exercise, with the aircraft in any given configuration, advance the throttle to full power, select an appropriate nose attitude for a climb speed of 100 kph IAS (54 knots / 62 mph), and trim as required to maintain the desired attitude. Then check that the carb heat is selected OFF.

Climb away at the normal initial climb speed of 100 kph IAS (54 knots / 62 mph) and once established with a positive rate of climb, and at a safe speed of >100 kph IAS (54 knots / 62 mph) and safe height of >200 feet above obstacles, slowly retract the flaps. Then complete the After Takeoff checks.

The undercarriage may be retracted, but this is not necessary, as the full circuit can be flown with the undercarriage extended, within the appropriate speed limitations.

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 at least one minute, at 800-1000 rpm. The correct method of shutting down is detailed in the Shutdown Checks and should be adhered to.

While idling, hold full brake pressure. Check the magnetos for dead cut, and the engine mechanical fuel pumps for operation individually. Throttle back to slow idle and pull out the idle cut out. Hold out until engine stops. Switch off the magnetos, place the main fuel on-off cock to OFF, turn off all systems switches, and radio and navigation equipment.

On leaving aircraft, secure the cabin doors. Ensure aircraft is chocked securely and tied down properly if required. If parking for any period of time, and the aircraft is left outside, install the control locks.

NOTE

The engine should be idled for at least one to two minutes to allow the heated oil to cool, before stopping. This also allows even cooling of the entire engine generally.

WARNING

NEVER shut down the engine for any normal operation by switching off the magnetos.

Chapter Six

Limitations

Airframe Limitations

Never Exceed Speed	350 kph IAS (190 knots / 219 mph)
Flaps Extended Speed	180 kph IAS (97 knots / 112 mph)
Undercarriage Down Speed	180 kph IAS (97 knots / 112 mph)

CAUTION

During descent from high altitude, caution should be exercised in respect to very high airspeeds.

The Nord 1002 is so clean in design that the airspeed builds up rapidly. If a high rate of descent is required, the aircraft should be allowed to decelerate with power off and nose held level with or slightly above the horizon. Undercarriage and flaps may be lowered, some power added to keep the engine clear and running smoothly, and a high rate of descent accomplished within the proper airspeed limitations.

Operations in Turbulence

In severe turbulence, the best operating speed for structural and pilot control considerations is 160 to 190 kph IAS (87 to 102 kts / 100 to 117 mph).

Maximum Operating Weight

The normal maximum weight is 3200 lbs (1450kgs).

The maximum permissible overload weight is not to exceed 3310 lbs (1500kgs), and then only providing that the CofG is within limits.

Engine Limitations

Conditions	rpm	HP	ATA's of Boost	Maximum Oil Temperature
Takeoff	2500	230	0.97	100°C
Climb/Normal	2350	180	0.9	100°C
Climb/Maximum Rate	2500	220	0.95	100°C
Cruise/Normal	2300	170	0.8	100°C
Cruise/Max Continuous	2500	220	0.95 (at >1500 feet)	100°C
Cruise/Rapid	2400	190	0.92	100°C

Notes:

~AVOID RAPID THROTTLE MOVEMENTS AT ALL TIMES.

~Avoid running the engine between1900 and 2000 rpm.

~Engine rpm should be monitored closely when flying at a high IAS, as the speed and revs (rpm) can build up rapidly and the maximum recommended limitations may be exceeded.

~The normal maximum oil temperature is 80°C to 85°C, but it may rise with full safety, for short periods, up to 100°C.

~Oil pressure should be maintained at a minimum of 34 psi (2.5 hpz) at all times except when operating under low rpm on the ground, and under low rpm conditions.

~Oil temperature must be a minimum of 35°C before the engine is advanced to any high rpm. The temperature should be at least 45°C before attempting takeoff.

~The engine should not be operated with less than 8 litres (2.1 US gallons) in the oil reservoir.

~Minimum fuel pressure for proper operation is to be at least 2.75 psi (0.2 hpz).

~The minimum fuel octane rating is 80/87 octane; if unavailable use 100 octane.

Waypoints AVIATION

Airframe Load Limitations

As with any aircraft, manoeuvres at high speed or under high g forces should be conducted only with the greatest caution, and with all safety precautions followed (tight seat belt, secure shoulder harness, parachutes, etc).

Under slow IAS conditions, the Nord 1002 requires right rudder for proper flight. Under high IAS conditions, the aircraft requires the application of left rudder. The left rudder at high speed is to overcome the forces of vertical-fin displacement. The rudder is offset by 1.5° left to combat the torque problems of takeoff. At high speeds, this offset position necessitates the application of left rudder to fly in balance.

Flight with negative g forces will cause the engine to miss and/or to cut out.

Some Indications of Manoeuvre Performance

Flight tests, up to and beyond the accepted flight envelope, were performed by Flight Lieutenant John R. Hawke, former Chief Aerobatic Instructor of the RAF.

~At 5000' at 160 mph IAS, (about 185 mph TAS), the aircraft has a rate of roll, to the left or to the right, of 64° per second. The Nord 1002 may be brought cleanly, with crisp aileron action, through a complete roll in less than 6 seconds.

~At 7000', with full power, indicating 150 mph, the aircraft may be placed into a steep bank with a 75° angle of bank. The aircraft under these conditions will complete a 360° turn in 19 seconds. Aileron control under all conditions remain crisp and very effective.

Nord 1002 - Pingouin II
EMERGENCY CHECKLISTS

FIRE DURING START

Starter.............................. Keep winding

If the engine starts:

Throttle ....Set 1200 for two minutes
Engine ....Shutdown and seek engineering support

If the engine fails to start or the fire continues:

Fuel......................................Off
Magnetos.............................Off
Throttle .... Full Open
Electrical Systems.................Off

Abandon the Aircraft

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

ENGINE FIRE IN FLIGHT

Fuel......................................Off
Throttle .... Full Open
Propeller................................Full Coarse
Magnetos..............................Off

Proceed with the forced landing.
If fire persists, make a high speed emergency descent.

ELECTRICAL FIRE IN FLIGHT

Master Switch ....Off

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
Master Switch .... On

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

If unidentified smoke/fire reoccurs:

Master Switch ....Off

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

LOW OIL PRESSURE

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

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, proceed to the nearest suitable airfield and land. Maintain altitude and be prepared for complete power loss.

LOW FUEL PRESSURE

Fuel Pump .... On
Fuel Selectors .... Check

ENGINE ROUGH RUNNING

Carb Heat......................... On

If rough running continues after 1 minute:

Carb Heat.............................Off
Fuel Contents & Pressure .....Check
Fuel Pump............................On
Fuel Selector ....Check

Ignition ....Try left, right, & both.

ENGINE FAILURE DURING TAKEOFF ROLL

Throttle .... Closed
Brakes............................. As required to stop

Advise ATC
Complete the **After Landing Checks**

If the engine completely stopped:

Complete the **After Landing Checks**

If signs of fire:

Complete the appropriate actions

ENGINE FAILURE IMMEDIATELY AFTER TAKEOFF

Nose.................................Lower
Airspeed ....120 kph IAS (65 knots / 75 mph)
Throttle ....Closed

Select a landing field and plan your approach.

Undercarriage....................... Locked Down (if possible)
Fuel Selectors....................... Off
Magnetos............................. Off
Flaps.................................... As required
Master Switch .... Off

ENGINE FAILURE IN FLIGHT (Restart procedure)

Airspeed ....145 kph IAS (78 knots / 90 mph)
Throttle ....Closed
Propeller...........................Coarse
Flap 15º

Pick a forced landing area, and plan the approach.

Carb Heat ....On
Fuel Pump ....On
Fuel Selector .... Check appropriate tanks
Magnetos............................. Try left, right, & both;

Start if the propeller has stopped and it is considered necessary and reasonable to attempt a restart:

Starter...............................Engage
Throttle ....Open

If power cannot be restored carry out a forced landing.

Chapter Eight

Safety and Emergency Expanded Procedures

Introduction

This section provides the pilot with procedures that enable them to cope with emergencies that may be encountered in operating the Nord 1002.

Should any non-normal or emergency situation develop, as an overriding priority…

FLY THE AIRCRAFT AT ALL TIMES!

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.

Airspeeds for Safe Operations (IAS)

Engine failure after takeoff	120 kph IAS (65 knots / 75 mph)
Manoeuvring speed (At MAUW)	260 kph IAS (140 knots / 160 mph)
Maximum glide range speed (At MAUW)	140 kph IAS (75 knots / 85 mph)
Precautionary landing with power	1.3 V_{SO} for the actual weight

Engine Fire During Start

Engine fires during start are usually the result of over priming 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:

~Pull out the idle cut-off;

~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 starter 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 vacated immediately, and the fire should be extinguished by the best available means.

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

Engine Fire On The Ground

If taxiing, STOP the aircraft. Shut it down by:

~Cutting off the fuel supply IMMEDIATELY by switching off the main fuel cock;

~Switching off the magnetos;

~Advancing the throttle FULL FORWARD; and,

~Switching OFF all electrical systems.

Vacate the aircraft at once. Have ground fire extinguishers standing by.

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.

Attempt to locate the source of the fire.

Engine Fire

If an engine fire is present its source is more than likely the fuel, consequently the fuel should be 'starved' from the fire.

This can be achieved by:

~Cutting off the fuel supply IMMEDIATELY by switching off the main fuel cock;

~Advancing the throttle FULL FORWARD;

~Place the propeller pitch to full coarse (low rpm);

~As soon as the engine stops switch the magnetos to OFF; and,

~Switch off all unnecessary electrical systems.

Remove hand extinguisher from behind front seats for use if necessary.

Proceed with the power off forced landing procedure. DO NOT ATTEMPT TO RESTART THE ENGINE.

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.

Electrical Fire

If an electrical fire is indicated (smoke in the cabin), if you can identify the source of the fire/smoke and turn it off, then do so. Otherwise:

~Remove the hand extinguisher from behind the front seat for use if necessary;

~Close any panels which are open, to reduce the available oxygen for the fire and to concentrate the extinguishant;

~Operate the hand extinguisher as needed to eliminate the fire;

~Transmit a Mayday call;

~Turn the master switch OFF ("Ground"); and,

~When the fire is out, open the cabin windows in an effort to clear the cabin of smoke and fumes.

BE PREPARED TO OPEN THE WINDOWS AT ANY MOMENT.

Regardless of which, if any of the above actions are completed in a given situation, if a fire is experienced in flight, a landing should be made AS SOON AS POSSIBLE.

Electrical Faults

Any malfunction of the electrical system should be treated with caution. A short circuit may result in a fire through the wiring systems.

The loss or reduction of generator output is indicated by a left deflection on the ***centre-zero*** ammeter. Before executing the following procedure, ensure that the ammeter reading is actually negative by actuating an additional electrically powered device, such as the lights. If an increase in the left deflection of the ammeter is noted, a generator failure can be assumed.

The loss of generator output is detected through zero reading on the ***left-zero*** ammeter and the illumination of the GEN light. Before executing the following procedure, ensure that the reading is zero and not merely low - by actuating an additional electrically powered device, such as the lights. If no increase in the ammeter reading is noted, a generator failure can be assumed.

The electrical load should be reduced as much as possible. Check the generator circuit breakers for a popped breaker.

The next step is to attempt to reset the overvoltage relay. This is accomplished by moving the GEN switch to OFF for one second and then ON. If the trouble was caused by a momentary overvoltage condition (16.5 volts and over) this procedure should return the ammeter to a normal reading.

If the ammeter continues to indicate a failure, or if the generator will not remain reset, turn off the GEN switch, maintain minimum electrical load and land as soon as practicable. All electrical load is being supplied by the battery.

If you lose all electrical power, "total electrics failure", the aircraft will still fly perfectly well. However your radios will not function, so 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 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, regardless of whether you see light signals.

If you are in a circuit, maintain your position (order) in the pattern of other aircraft and land off the next approach. If the aerodrome is controlled, 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.

Electrical Overload (Alternator over 20 amps above known electrical load)

If an abnormally high generator output is observed (more than 20 amps above known electrical load for the operating conditions), it may be caused by a low battery, a battery fault or other abnormal electrical load. If the cause is a low battery, the indication should begin to decrease toward normal within 5 minutes. If the overload condition persists, attempt to reduce the load by turning off non-essential equipment.

Turn the battery (BAT) switch OFF and the ammeter should decrease. Turn the battery (BAT) switch ON and continue to monitor the ammeter. If the alternator output does not decrease within 5 minutes, turn the battery (BAT) switch OFF and land as soon as possible. All electrical loads are being supplied by the generator.

> **NOTE**
>
> Due to higher voltage and radio frequency noise, operation with the ALT switch ON and the BAT switch OFF should be undertaken only when required by a generator failure.

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. 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.

Loss Of Fuel Pressure

If loss of fuel pressure occurs, turn ON the electric fuel pump and check that the fuel selector position is appropriate.

If the problem is not an empty tank, land as soon as practicable and report the defect to an engineer.

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 through the carburettor venturi and absorption of heat from this air by vaporisation of the fuel.

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

Engine Rough Running

Engine roughness is most 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 (See Note). The rpm will decrease slightly and roughness will increase. Wait for a decrease in engine roughness and/or an increase in rpm, indicating ice removal. If there is no change in approximately one minute, return the carb heat to OFF.

If the engine is still rough, a check of the fuel contents and pressure should be made. The electric fuel pump should be switched to ON to see if fuel contamination is the problem. Check the engine gauges for abnormal readings. If any gauge readings are abnormal, proceed in accordance with the appropriate Emergency Checklist actions. Select the magneto switch to L then to R, then back to BOTH. If operation is satisfactory on either magneto, proceed on that magneto at reduced power, to a landing at the first available aerodrome.

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

NOTE

Partial carburettor heat may be worse than no heat at all, since it may melt part of the ice which will refreeze in the intake system. Therefore, when using carburettor heat always use full heat and when ice is removed and the engine is running smoothly, return the control to the full cold position. In severe icing conditions carb heat should be left on and the mixture should be re-leaned accordingly.

Engine Failure During the Takeoff Roll

If the engine should run rough or fail during the takeoff roll, smoothly close the throttle and bring the aircraft to a complete stop, while maintaining directional control, as you would following a landing.

Advise ATC, as soon as possible, that you are stopping, i.e. **"Alpha Bravo Charlie STOPPING"**.

Look for signs of fire, and if you have any doubt, immediately turn the fuel selector to off, shut the engine down, turn the ignition and master switch to off and vacate the aircraft without delay.

If you are comfortable there is no fire, complete the After Landing Checks.

If the engine has completely stopped inform the tower and secure the aircraft by completing the Shutdown Checks. Vacate the aircraft and wait for assistance in a safe place by the aircraft.

If the engine is still running, but you are not sure of its serviceability for further flight, either shut it down as above, or request a clearance to return to dispersal.

Engine Failure Immediately After Takeoff

If you have an engine problem immediately after takeoff the most important thing is to keep flying the aircraft.

If the engine stops completely you must lower the nose to maintain a safe flying speed - at least 120 kph IAS (65 knots / 75 mph), close the throttle and prepare to land in the most suitable place available.

Where you land will depend on your situation, however you should NOT expect to be able to turn back to the runway you took off from. It is far better to pick a field pretty much in front of you. As your experience increases you should develop the ability to judge where the aircraft can reach, and a more 'imaginative' handling of the situation may be possible.

Your ability to complete any subsequent checks will depend on your situation and presence of mind. It is far better to control the aircraft to a safe landing, having done no other checks, than to complete all of the checks but to fail to fly the aircraft to the best landing site.

If the engine does not stop completely and partial power is available, you may be able to nurse the aircraft around the circuit, or to a position from which a glide approach to an alternate landing site is possible. Use any power that the engine is developing to manage your situation.

When you can, make a MAYDAY call.

Undercarriage Position

If the engine fails during the climb out from the runway, the outcome and action required depends very much on where the engine failure occurs. This condition is created by the manual/mechanical undercarriage retraction system. If the engine fails when the undercarriage is just starting beginning retraction, the correct procedure is to lower it immediately.

Retract the undercarriage if possible, especially if the landing space is limited. The rule of thumb is to avoid if at all possible landing with the undercarriage partially retracted. An attempt should be made to land with the undercarriage either fully retracted or fully extended. The aircraft can be belly landed with full control and with little damage if the manoeuvre is well executed.

If the undercarriage is retracted the landing will be smooth, the slide on the ground will be brief, and little damage will occur. If the undercarriage is partly down, there is a good chance of the aircraft nosing over.

After landing evacuate the aircraft normally and quickly. If necessary, the hatches may be opened while the aircraft is slowing to a stop, but only after smooth contact with the ground has been made.

Obviously everything depends on height, local conditions, speed and so forth, in determining just what the pilot will do if he/she encounters engine failure immediately after takeoff.

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 145 kph IAS (78 knots / 90 mph), place the propeller in coarse pitch and lower the flaps to 15°. The aircraft will descend at a rate of about 600 fpm.

Start to 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.

Follow normal engine failure procedures for a forced landing by selecting a suitable area for the landing. Unless an airport or clearly identified long and level and smooth area is within gliding distance, leave the undercarriage retracted.

If the forced landing seems inevitable, while still gliding switch OFF the fuel and magneto switches, and all electrical systems.

Keep the flaps at 15°, and reduce the speed to 140 kph IAS (75 knots / 85 mph) on final approach. Flare out very gently to touchdown at 120 kph IAS (65 knots / 75 mph).

After touchdown evacuate the aircraft quickly.

NOTE

If suitable flat ground is located for a wheels down landing, remember that it requires about 30 seconds of rapid pumping to bring the undercarriage fully down and locked.

Again, 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 you suspect the engine have stopped due to fuel starvation, follow this procedure:

~Close the throttle;

~Select the electric fuel pump ON; and.

~Select the fuel as necessary for proper flow.

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.

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 16-24 kph IAS (9-13 knots / 10-15 mph) faster than usual. Because of the higher approach speed and less aerodynamic and ground drag, brakes should be applied for stopping during the landing roll.

If the flaps cannot be retracted, maintain full power and climb at a safe flying speed to a safe height. Use 110 kph IAS (60 knots / 70 mph). 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 Door

The cockpit/cabin door is double latched, so the chances of one of them springing open in flight is remote. However if you should forget or do not secure the door adequately the door may spring partially open. This will usually happen on takeoff or soon afterward. A partially open door will not affect normal flight characteristics, and a normal landing can be made with the door open.

The doors will trail slightly open, and airspeed will be reduced slightly for the same power and attitude. Do not attempt to close the door until you are well clear of the ground, at least above 500 feet AGL.

To close these door in flight, slow the aeroplane to 120 kph IAS (65 knots / 75 mph), close the cabin vents and open any windows. Then close and secure the door correctly.

Remember to **FLY THE AIRCRAFT** at all times!

Insecure Seatbelt

Passengers seatbelts (or parts thereof) can sometimes be inadvertently shut in the door leaving a loose section lying outside the fuselage.

If, when shortly after airborne, you hear loud "banging" on the fuselage, continue to fly the aeroplane, at a safe height (above 500 feet AGL), check the passenger seatbelts. Should you confirm the above situation, return for a landing and correct the situation.

Remember, if it is a seatbelt causing the noise, little damage or danger will result.

Remember to **FLY THE AIRCRAFT** at all times!

Brake Failure Taxiing

If one or both 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 with the rudder pedals 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, preferably grass vector available. This will help improve deceleration.

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

Waypoints AVIATION

Circuit Breakers and Fuses

Circuit breakers and fuses are used to protect electrical components from an over-voltage or over-current condition, by automatically ‘popping’ (opening the circuit) and interrupting the current flow. They are designed to pop when specific conditions of time and current are reached. Those conditions generate heat and circuit breakers are designed to pop before this heat damages either the wiring or connectors.

Circuit breakers are thermal-mechanical in nature with bimetallic elements, where one metal expands more under heating than the other, popping the breaker open. This also enables them to be reset, albeit only after they have cooled down. However, there are good reasons why it may not be advisable to do so and it is wise to think twice before resetting any circuit breaker in flight.

A popped circuit breaker or fuse is telling you that something is wrong - that there has been a serious electrical event. Extreme caution should be exercised. Resetting a circuit breaker that has tripped by an unknown cause should normally be a maintenance function on the ground. The old rule of thumb to automatically try one reset attempt is no longer considered prudent.

Often resetting a circuit breaker is met with no adverse results, however the opposite is sometimes true. Smoke, burning wires, electrical odours, arcing, and loss of related systems are possible outcomes.

In general, circuit breakers and fuses which have popped should not be reset/replaced in flight unless the system which they are associated with is essential, and then do so only once. Wherever possible, this should only be done after consulting the relevant resources, e.g. the aircraft flight manual, emergency checklists, and/or radioing for advice. In most cases it is advisable to delay the reset until the service is needed. For instance, there is no need to reset a radio circuit breaker that trips until you are approaching an aerodrome at which it is required.

The electro-mechanical construction of a circuit breaker was not designed for use as a switch, and using it for this purpose causes premature wear and the risk of failure. If a circuit breaker fails it may pop when it shouldn’t or remain set when it should have popped, neither option is desirable if flight.

Once a fuse has ‘popped’ it should not be reused and should be replaced.

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);

~Check that the microphone selector is on the correct COM set, to ensure that lack of a reply is not due to your transmitting on the wrong COM radio;

~Check the AUTO button is selected correctly;

~Check SPEAKER and/or PHONE buttons for correct positioning;

~Change headsets and/or plugs if possible; and,

~Use the hand-mike if one is available.

Remember, should both COMM sets be tuned to the same, or close to the same frequency and both SPEAKER and/or PHONE COMM buttons are engaged, when transmitting on one COMM set, it will interfere with the reception of the other, giving "feedback" through the audio system. This can give an erroneous indication of radio failure.

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 a standard overhead rejoin if you can 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 120 kph IAS (65 knots / 75 mph) 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 16-24 kph IAS (9-13 knots / 10-15 mph) 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:

~Reduce speed to the minimum slow flight speed possible; and,

~Shut down the engine and switch off all electrical switches.

To jettison the cockpit/cabin doors:

~Unlock the top centre handle;

~PLACE HEADS DOWN; and,

~Grasp the red handles on the front sides of the hood and PUSH FORWARD AND DOWN.

The doors should jettison. However if they do not:

~Release the bottom rear safety locks;

~Pull down on the opening cables; and,

~Push the doors outward.

With the doors off, the cockpit is windy and dust will swirl about. The front seats are relatively wind free and the aircraft may still be flown in this configuration.

Release the seat belts and harnesses. Dive over the side of the cockpit toward the trailing edge of the wing. The right hand front seat occupant first, the right hand rear seat occupant second, the left hand rear seat occupant, over the right hand side third, and finally the pilot.

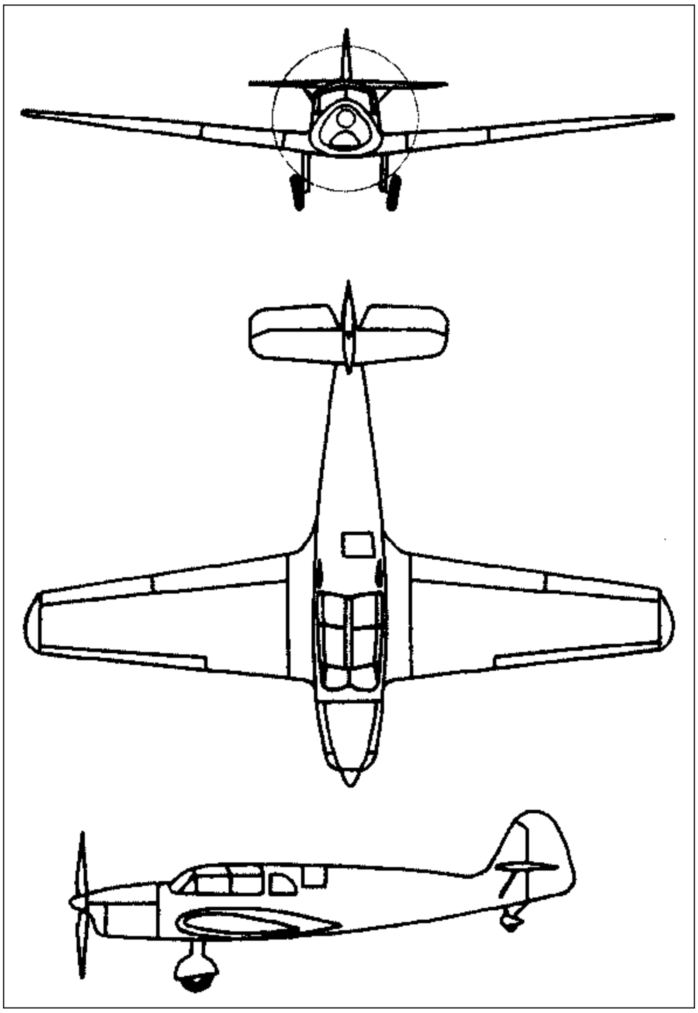
Chapter Nine

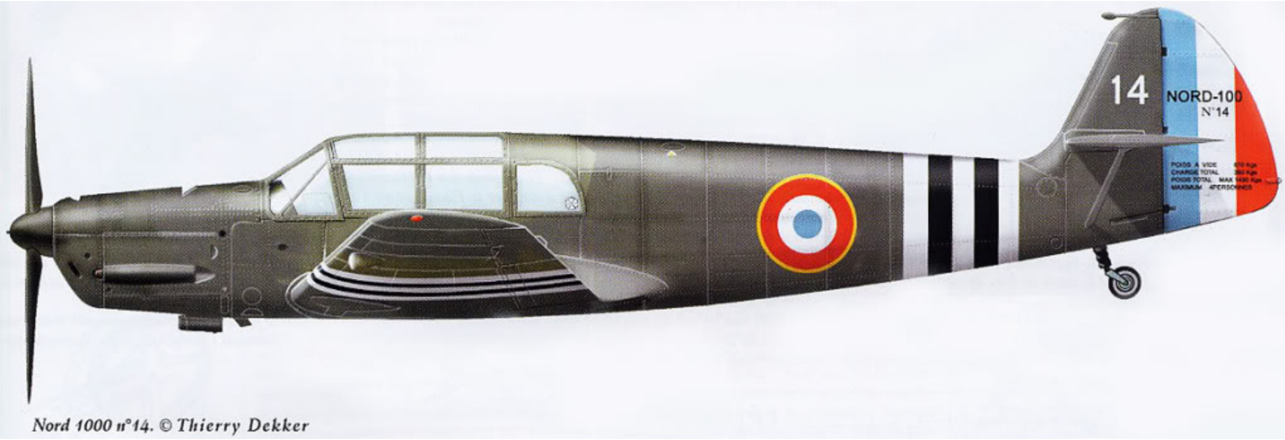
Systems Description

General Description

Nord 1002 Pingouin II specifications:

Engine:	Single 179 kW (230 hp) Renault 6Q 10B
Crew:	Pilot only
Capacity:	3 passengers
Length:	8.28 m (27 ft 2 in)
Wingspan:	10.61 m (34 ft 10 in)
Height:	2.29 m (7 ft 6½ in)
Empty weight:	880 kg (1940 lb)
Gross weight:	1356 kg (2987 lb)
Cruising speed:	257 km/h (138 kts / 160 mph)
Range:	1000 km (540 nm / 620 statute miles)





Nord 1000 n°14. © Thierry Dekker

Fuselage

The fuselage is of all-metal, monocoque, stressed-skin construction. Flanged oval hoops are spaced by open-section stringers, over which the duralumin stressed skin is riveted in vertical panels, with a join down the centreline of the underside.

Wings

The Nord / Bf 108 is a low wing cantilever monoplane. The wings taper in chord and thickness from the roots to the tips, with 6° 40' of dihedral. Construction is trapezoidal, single box spar, with leading and trailing edge ribs. The whole wing is covered with smooth metal sheet. The wings may be folded at the roots if desired for storage (see details below).

Ailerons

The ailerons are of the slotted type, are fabric covered, rear mounted and are not fitted with a pilot controlled trim tab, however there is a ground adjustable trim tab to correct any serious out-of-trim imbalances. The ailerons are mass balanced. The ailerons are differential, with movement from 29° up to 13.5° down.

Trailing Edge Flaps

The trailing edge flaps are of standard design, fabric covered and of large span. They are slotted, and provide both excellent additional lift and/or drag, as desired. The flaps are mechanically operated by a chain and gear system, by use of a large wheel on the left hand side of the cabin, by the pilot's seat, outboard of the wheel for controlling the horizontal stabiliser trim.

The flaps are infinitely adjustable from fully up to 48° when fully down. Any degree of flap may be selected by the pilot, from 1° through to 48°.

Leading Edge Slats

Bundesarchiv, Bild 146-1980-005-05
Foto: Höss | 1940/1944 ca.

The wings are fitted with Handley-Page slats along the leading edges. Operation of the slats is fully automatic and they are of non-locking design. The slats are mounted along the outer portion of the leading edges of each wing and can operate independently of the other. They extend automatically at between about 100 and 110 kph (55 and 60 knots / 63 and 69 mph) depending on the type of manoeuvre being performed. The slats not only give excellent low speed control, but provide a positive warning of the aircraft approaching the stall.

The Handley Page automatic leading edge slats on the outboard sections of each wing are entirely self deploying and stowing. They have a very progressive action which relates to angle of attack only. They do generate more drag when deployed but by preventing flow separation near the wing tips at high angles of attack, mean the designer has not had to incorporate “washout” into the wing with the attendant compromises in lift, drag and performance profiles.

Horizontal Stabiliser

The horizontal stabiliser is of single spar metal construction and is adjustable in incidence by means of a chain screw drive, connected to a large wheel on the left hand side of the cabin, by the pilot’s seat. This horizontal stabiliser trim is moved manually by the pilot. The incidence change is used to trim the aircraft in flight. The conventional fabric covered elevators are aerodynamically and mass balanced, and work independently of the variable incidence horizontal stabiliser. The horizontal stabiliser movement is from 2° up to 9° down. Elevator movement is from 27° up to 25° down.

Vertical Fin

The vertical fin is of single type, metal construction, offset by 1° 30’ to the left, to counteract the effect of engine slipstream effect. The rudder is conventional, fabric covered, and not fitted with a pilot controlled trim tab, however it is fitted with a ground adjustable fixed trim tab. The rudder is aerodynamically and mass balanced. Rudder movement is from 27° left to 24° right.

Access and Inspection Panels

The Nord / Bf108 is fitted with a large number of access and inspection panels to enable servicing and checks to be performed on an extensive basis without need for dismantling any parts or sections. In addition to these panels, various sections of the airframe may be removed for major inspections, by means of removing specific securing screws. It is recommended that some time be spent in familiarisation with these panels, as they are of distinct service to the pilot.

Undercarriage

The undercarriage is of the so called tail dragger type, being two main undercarriage legs and a single tail wheel. The two main undercarriage legs are reasonably close set and are outward retracting. They are well forward of the centre of gravity (CofG). The tail wheel is non-retractable and is of the spring loaded, castoring type. The tail wheel does not lock but does engage into an detent when in the straight ahead position. The tail wheel may be modified to a locking design.

The main undercarriage is retracted by means of a manually operated rack-and-pinion system, driven through a screw system, and operated by a hand lever with a reversible ratchet. The hand lever must be twisted through approximately 50° to determine the direction of movement of the entire undercarriage system, thereby controlling the retraction or the extension of the undercarriage. The number of fore-and-aft hand pumping cycles of the hand lever to lower or raise the undercarriage is approximately 40.

All of the Nord / Bf 108 wheels are fitted with tubed tires and equipped with hydro-pneumatic oleos for shock absorption.

Main Wheels	500 x 150 tubed	52 psi at max weight
Tail Wheel	260 x 85 tubed	38 psi at max weight

Brakes

The Nord / Bf108 brakes are toe operated, hydraulic type, with brake pedals only fitted to the rudder pedals on the left hand side of the cockpit. Each brake pedal allows fully independent braking to the respective main wheel. The brake master cylinders are on the rear part of the brake pedals. The actual brakes are of the drum type.

The brakes are not particularly powerful and are more suited to steering and manoeuvring. When in ideal adjustment, they will hold the aircraft static on the ground at full power when on concrete or tarmac. However, as there is no positive lock (park brake) for the brakes, this does require very considerable effort from the pilot, who has the only access to the brake facility through the left hand front seat rudder pedal toe brakes. If extended engine running at high power and fine pitch settings is required, it is recommended that the wheels be securely chocked. If the control column is held back against the stop, the elevator authority is more than sufficient to keep the tail down when stationary on the ground at all power settings.

Engine

The standard engine fitted to the Nord 1002 is the RENAULT 6Q-10B, six cylinder, inverted, air cooled, inline aero engine. The 6Q-10B delivers 230 HP for takeoff. The engine is of the single shaft, dry sump type, with two carburettors.

Propeller

G-ATBG is fitted with the RATIER 1523-3, two-bladed, metal, variable pitch propeller, without reduction undercarriage. The pitch control is electrical, with manual and automatic control settings. The propeller rotates clockwise, as viewed from the pilot’s seat.

Propeller Pitch Change Mechanism

The Ratier pitch change mechanism is electrically operated and mechanically activated to turn the propeller blades to varying pitch settings. The Propeller Control Subpanel (PCS) is on the left hand side of the instrument panel. There are two three-position switches on the PCS, neither of which is operative unless the Propeller Control circuit breaker is in and the Propeller Control Switch on the Electrical Distribution Board (EDB) is on.

Propellor Control Subpanel (PCS)

The lower of the two switches on the PCS operates in the vertical mode and is a three position switch, which remains in whichever position is selected.

The three positions are:

Top	Manual
Centre	Off
Bottom	Automatic

Electronic Distrinution Board (EDB)

When the lower switch is selected to Automatic, the rpm is controlled automatically at 2500 rpm, provided that sufficient power is applied through the throttle to reach this rpm figure, and that airspeed is not excessive. The Automatic position should always be used for takeoff and landing, and is equivalent to fine pitch.

When the lower switch is selected to Manual the upper switch is energised. This switch is spring loaded to the centre-off position. Moving it to the left or to the right manually alters the propeller pitch and consequently the engine rpm. Placing the switch to the left increases the rpm until the propeller pitch is to its maximum fine pitch. The upper switch must be held manually to the left to achieve fine pitch. If released, the switch automatically moves back to the centre. The illumination of the green light on the PCS indicates reducing propeller pitch.

Placing and holding the switch to the right will decrease engine rpm until the propeller pitch is fully coarse. The illumination of the red light on the PCS indicates increasing propeller pitch.

If the manual switch is moved to either the left or the right, held there for a brief time and then released, the propeller pitch angle and engine rpm will remain as selected. However, should the speed of the aircraft be increased, thus reducing propeller torque leading to an increase in the engine rpm, the rpm will then remain at the increased rate unless the rpm is reselected by the manual position switch.

The Nord 1002 does not have a Constant Speed Propeller system, but one that is purely a variable pitch control system. When not in use, the both the lower and upper switches on the PCS should always be in the OFF position. This is to avoid the possibility of a runaway propeller if a short circuit ever occurs.

Fuel System

The fuel system in the Nord / Bf 108 consists of five tanks, which are interconnected and fully vented and drainable. The total capacity of the five tanks is a 52 US gallon (194 litres / 43 Imperial gallons). All tanks have external quick drain systems.

Fuel Tank Capacities:

Main fuselage tank	16 US gallons (including a reserve of 8 gallons)	
Front wing tanks	Right:	13 US gallons
	Left:	6 US gallons
Rear wing tanks	Right:	8.5 US gallons
	Left:	8.5 US gallons

The refuelling point is located in the top of the fuselage tank, on the upper left hand side of the fuselage, just to the rear of the baggage compartment.

Fuel from the tank system is fed through a general collector box to two ZENITH GS carburettors. There are two engine driven mechanical fuel pumps, an electric (electro-mechanical) fuel pump, a hand (or wobble) pump, a filter, and a pressure sensing device. A fuel selector cock, fire cutoff, pump selector, and a main ON/OFF fuel cock, are in the lines at the appropriate places.

There is a fuel level gauge arranged vertically in the cockpit, on the right hand side of the cockpit wall. The gauge reads correctly ONLY when the aircraft is in level flight. When nose up, the gauge under reads and when nose down, the gauge over reads. The gauge does not indicate the 8 gallons reserve fuel, thus when the gauge reads “empty” there is 8 US gallons remaining for emergency descent, approach and landing.

The fuel selector cock selects either NORMAL or RESERVE as indicated on the sidearm control between the front seats. When the fuel is selected to NORMAL the main tanks are all gravity fed into a main collector box in the aircraft underbelly. Various connections to this collector box protrude beneath the fuselage line, and are enclosed within a flattened blister along the bottom fuselage centreline.

The fuel reserve is kept in the fuselage by two tank standpipes, which are isolated from the main system. When the fuel selector cock is moved from NORMAL to RESERVE, this permits the 8 gallons of reserve fuel to feed through its own pipe directly into the engine system, avoiding the collector box.

The main ON/OFF fuel cock, located on the left hand side of the instrument panel, also serves as a selector for the two engine driven mechanical fuel pumps. The cock is a four position lever. The bottom position is OFF, the second upward position is RIGHT PUMP ON, the full-up position is BOTH PUMPS ON.

Under normal operations the cock is selected to the BOTH PUMPS ON position and left there at all times.

The electric fuel pump is located behind the right front seat, and is used only to maintain necessary fuel pressure for takeoff and landing (or for unusual manoeuvres or circumstances to be determined by the pilot). It may also be used to build up fuel pressure for priming purposes. The electric fuel pump is activated by means of a circuit breaker push switch on the right side of the cockpit wall, directly alongside the main bank of circuit breakers.

The two engine driven pumps also have a hand operated pull-push pump, for building up pressure for priming purposes, to avoid using the electrical system. These are located under the engine cowlings, one on each rear side of the engine. The cockpit priming pull-push lever operates a separate pump.

Other basic engine controls are the throttle (one each side of the cockpit wall), mixture control, throttle control friction, engine idle cut-off, and choke control for cold weather starts.

Carburettor Heat

The Renault 6Q-10B engine is fitted with a manual carburettor heat system, which is in the form of a stainless steel pipe, brought from ahead of the exhaust manifold, through the manifold, and up to the air intakes near the carburettors. It is split before entering the air intake, to evenly distribute the warm air to each of the two carburettors.

There is an outlet to free air, which has a spring loaded rocker, normally leaving the outlet open. When carburettor heat is required, the appropriate (yellow & blue) T handle in the cockpit is pulled and held against the spring. This closes off the outlet and channels hot air through to the air intakes near the carburettors.

While variable amounts of carburettor heat may be obtained, the yellow & blue T handle must be manually held in position by hand, unless it is brought to the full out position, turned through 90° and locked in the full out position, whereon full (HOT) carburettor heat is provided.

Carburettor Heat Control

Oil System

The Renault engine is fitted with a single gear-type oil pressure pump and two scavenge pumps, located at the rear of the engine. The oil tank is located in the left wing root, just behind the leading edge. There is an oil tank drain and vent in the wing bottom just beneath the tank. There is a filler cap and a pressure relief valve on the top of the wing. There is an oil cooler on the right lower part of the engine.

The oil cooler has a ram air intake and a bypass valve. The system is equipped with an oil filter, an oil pressure sensing device, and their appropriate gauges on the instrument panel.

Oil tank capacity:	3.5 US gallons
Oil type:	50 US

Engine Starting System

The engine is started with a compressed air system. The system also has its own air compressor for recharging the Compressed Air Bottle after starting. The Compressed Air Bottle is located in the rear fuselage, just aft of the right wing root. There is also an outside recharging point for the compressed air bottle.

The compressed air is fed from the air bottle through an isolating valve to a master valve, via a distributor and release valve, to all cylinders of the engine. The function of the isolating valve is to prevent leakage from the compressed air bottle when the engine is shut down.

The release valve can ONLY be operated when the master valve is unscrewed. Both the master and release valves are mounted in the right rear fuselage. The system will recharge after starting, but ONLY if the master valve has been rescrewed in (by hand knob) to its closed position.

Vacuum System

An engine driven vacuum pump is mounted on the top rear of the engine. This is to drive the gyros for several flight instruments (see Flight Instruments below). There is also a vacuum gauge on the right hand side of the instrument panel to indicate the proper functioning of the vacuum system.

Waypoints AVIATION

Electrical System

The Nord 1002 is fitted with a 24 volt electrical system and an engine driven generator, which charges a large capacity accumulator (battery) in the rear fuselage, behind the rear seat. The battery is selected through a circuit breaker, as is the generator. There is an ammeter and a voltmeter, both of which may be individually selected to indicate the state of the battery or the charge being given by the generator.

Electronic Distrinution Board (EDB)

The following systems (where fitted) are electrically operated, and take the current noted:

Propeller control	20 amps
Pitot heat	6 amps
Navigation lights	6 amps
Cockpit lighting (original)	6 amps
Landing light (25 volts/125 watts)	6 amps
Fuel booster pump	15 amps (approx)

All of these items are brought into circuit through circuit breakers and, in addition to these, the ammeter and voltmeter each also draw a small amount of current. The engine ignition system is also electrically operated.

Pitot System

The Nord 1002 has a pressure head fitted under the left wing, for indications feeding the ASI, Altimeter, and VSI. It may be equipped with a heater for use in icing conditions, in which case a red warning light, at the top centre of the instrument panel, illuminates when the pitot heater is switched ON.

Cockpit/Cabin Canopy

There are two separate cockpit/cabin door canopy shells. Each door hinged at the front side and opens outward horizontally in a clamshell action. For entry and exit the doors fold forward to rest against the engine cowling on each side. Each door has a handle and catch at the rear side and when fully closed the doors are further secured within the cockpit by means of a toggle type handle at the top centre. This handle hooks over two separate latches, one from each door, and secures them firmly.

Both doors are fully jettisonable for emergency exit on the ground or in flight. Each door is provided with a separate key lock for security purposes when parking overnight.

The doors each have a sliding panel in the front bottom section, for increased cabin airflow and aiding direct vision. There is also a direct vision panel in the front windscreen, on the left front quarter panel.

Seating

The Nord is a four seat aircraft, designed originally for cross-country touring, and consequently the seats are well cushioned and very comfortable. The Nord was certified as a four seat personal touring aircraft under its original French certification. Seating two front and two back. The front seats are individual bucket seat design, and may be moved fore and aft for pilot convenience. The front seats are fully equipped with lap strap and shoulder harness with quick release attachments. The rear seat restraint straps are standard.

Cockpit/Cabin Heating and Defogging

The Nord 1002 is not equipped with a cockpit/cabin heater system, although there is considerable warmth from radiated engine heat. A cockpit/cabin heating system may be easily adapted from the excess heated air of the carburettor heat intake.

The defogging and cold air system is very basic. It consists of a filter equipped ram air intake under the fuselage, with a pipe entering the cockpit and terminating at the right side windscreen. It may be closed by a metal slide which is manually operated. The ram air serves for both ventilation and for defogging.

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 of the front seats. However the right seat pilot is restricted to the flight controls and throttle only.

The controls are tubular form in the cockpit area, becoming double cable wire type later in their progress towards the actual control surfaces.

> **CAUTION**
>
> The knees of the pilot and/or right seat occupant tend to restrict full aileron movement somewhat, especially in the stick back and over condition.

Other controls include:

- Engine Idle Cut-Out
- Carburettor Heat
- Starter Choke
- Hand (Wobble) Fuel Pump
- Starter
- Compressed Air Master Valve
- Compressed Air Isolation Valve
- Circuit Breakers

Instruments

The instrument panel has full IFR capability, and includes:

Airspeed Indicator	Kilometres per hour (kph)
Altimeter	Calibrated in feet
Artificial Horizon	Air driven gyro
Turn and Bank	Air driven gyro
Compasses	Magnetic
Vertical Speed Indicator	Feet per minute
Directional Gyro	Air driven gyro

In addition to the flight instruments, there are also (as fitted):

RPM Gauge
Manifold Pressure Gauge (ATA: Atmosphere of Boost)
Fuel Pressure Gauge
Oil Pressure Gauge
Air Pressure Gauge (Compressed Air)
Suction (Vacuum) Gauge
Voltmeter / Ammeter
Fuel Gauge (Float Type)
Visual Undercarriage Position Indicator

Chapter Ten

Performance

Performance of the Nord 1002

Takeoff speed	110 kph IAS (60 knots / 70 mph)
Takeoff ground roll / 3000 lbs	950 feet (290 metres)
Takeoff over 50 foot obstacle / 3000 lbs	1120 feet (341 metres)
Takeoff ground roll / 3200 lbs	1000 feet (305 metres)
Takeoff over 50 foot obstacle / 3200 lbs	1400 feet (426 metres)
Cruising speed/8000 feet @ 2200 rpm	257 kph IAS (139 knots / 160 mph)
Cruising speed/8000 feet @ 2350 rpm	283 kph IAS (153 knots / 176 mph)
Maximum speed/5000 feet @ 2500 rpm	305 kph IAS (165 knots / 190 mph)
Speed in severe turbulence	160-190 kph IAS (87-102 knots / 100-117 mph)
Manoeuvring speed	160-260 kph IAS (87-140 knots / 100-160 mph)
Velocity Never Exceed	350 kph IAS (190 knots / 220 mph)
Stall speed/undercarriage and flaps up	104 kph IAS (56 knots / 65 mph)
Stall speed/undercarriage and flaps down	85 kph IAS (46 knots / 53 mph)
Flaps-extended speed	180 kph IAS (97 knots / 112 mph)
Undercarriage-extended speed	180 kph IAS (97 knots / 112 mph)
Landing speed	104 kph IAS (56 knots / 65 mph)
Landing speed/flaps up	120 kph IAS (65 knots / 75 mph)
Landing speed/3-point	89 kph IAS (48 knots / 55 mph)
Landing roll from touchdown	750 feet (230 metres)
Landing roll/distance over 50 foot obstacle	1100 feet (335 metres)
Rate of climb/maximum	1200 fpm (6 mps)
Rate of climb/normal @ 105 mph IAS	800 fpm (4 mps)
Ceiling/4 people, 110 lbs baggage, 3000 lbs T/O	23500 feet (7160 metres)
Normal range (52 US gallons, no reserve)	1045 km (565 nm / 650 sm)
Ferry range (100 US gallons usable, no reserve)	1933 km (1044 nm / 1200 sm)

Waypoints AVIATION

Takeoff Performance

Takeoff tests (conducted by John R. Hawke, former Flight Lieutenant, Royal Air Force, and by Gregory R. Board, Aero Associates, Inc., of Tucson, Arizona, former test pilot for Commonwealth Aircraft Corporation) have been made under varying weight conditions.

Under normal maximum gross weight conditions (3200 lbs) at takeoff into zero wind conditions the Nord 1002 will have a ground roll of 1000 feet, and will clear a 50 foot obstacle in 1400 feet from the start of the takeoff roll (as measured from the ground). The maximum permissible takeoff weight is 3310 lbs.

At 3000 lbs gross weight, the Nord 1002 into zero wind conditions make a normal takeoff with a ground roll of 950 feet, and clears a 50 foot obstacle in 1120 feet from the start of the takeoff roll.

More realistic tests were run with the aircraft weighing 2600 lbs (pilot only, no baggage, maximum fuel and oil, plus special equipment aboard). The wind was at 18 kts blowing in a 70° crosswind from the left. The runway was very slippery with slush, water and melting snow, and was unusually bumpy. Under these conditions, the aircraft performed remarkably well. In ten consecutive takeoffs the aircraft was off the ground in less than 800 feet, and cleared a 50 foot obstacle in 1000 feet from the start of the takeoff roll.

A series of tests to determine climbing times to specified altitudes was run with the takeoff weight at 2600 lbs. Under the conditions previously described – 18 kt crosswind from 70°, 45° F, runway slushy. Performance was timed by stopwatch from the moment of releasing the brakes.

Under these conditions, the Nord 1002 reached:

~1000 feet in 52 seconds;

~2400 feet in 2 minutes;

~3600 feet in 3 minutes; and,

~4800 feet in 4 minutes.

During long ferry flights, with a 55 gallon fuel drum in the rear seat, two pilots, heavy radio, survival gear and other equipment, the Nord 1002 was overloaded to a weight of 3500 lbs. Takeoffs were made with a 5 kt headwind component, with a ground roll of approximately 2300 feet. No attempts were made to lift the machine into the air, they were allowed to fly off by themselves.

Cruise Performance

Stability is outstanding throughout the regions of very low to very high airspeed.

After takeoff with a weight of 3000 lbs the maximum speed achieved in level flight at 5000 feet at 2500 rpm, was 305 kph IAS (165 knots / 190 mph).

With a takeoff weight of 3200 pounds, under still air conditions during the cruise at 8000 feet, the aircraft may be cruised at 257 kph IAS (139 knots / 160 mph). This should deliver a still air range of about 1000 km (540 nm / 620 sm) with about 30 minute fuel reserve. Endurance in this configuration should be about 3.2 hours.

It is recommended that normal flights be limited to a still air range of 800 km (440 nm / 500 sm). Under these conditions the aircraft should arrive over the destination with enough fuel remaining for at least 30 minutes flight time.

Under flight conditions with a takeoff weight (ferry range conditions) of 3500 lbs, and a slow climb to a cruising height of 8000 feet, the Nord 1002 delivers excellent cross-country performance. At 8000 feet and 2200 rpm, delivering almost 80% power, the aircraft cruised with its heavy load at 257 kph IAS (139 knots / 160 mph), consuming fuel with a rate of 14 US gallons per hour.

Under ferry range conditions, with a takeoff of 3500 lbs, carrying a total of 102 US gallons fuel (100 usable), range achieved was 1933 km (1044 nm / 1200 sm) with a flying time of 7.5 hours.

WEIGHTS AND PERFORMANCE STATISTICS				
Type		Bf 108 B-1	Bf 108 B-2	Bf 108 D-1
Role Seating		Touring 4	Liaison 4	Liaison 4
Engine Type 5 Min Takeoff MP 30 Minutes Cruise	 PS(HP) PS(HP) PS(HP)	As 10 C-3 240/2000 RPM 220/1940 RPM 200/1880 RPM	As 10 C-3 240/2000 RPM 220/1940 RPM 200/1880 RPM	As 10 R 240/2000 RPM 220/1940 RPM 200/1880 RPM
Prop type Diameter/blade number	 mm (ft-in)	Schwartz light wood 2350/2 (7-8½)	Me P 7 2350/2 (7-8½)	Argus 2350/2 (7-8½)
Fuel supply/grade	L(US gal)	219 (58) B4	219 (58) B4	219 (58) C3
Empty weight Equipped weight Crew weight Passengers (3) Fuel weight Lubricants weight Takeoff weight	kg (lb) kg (lb) kg (lb) kg (lb) kg (lb) kg (lb) kg (lb)	880 (1,940) 500 (1,102) 80 (176) 240 (529) 161 (355) 14 (31) 1380 (3,042)	880 (1,940) 500 (1,102) 80 (176) 240 (529) 161 (355) 14 (31) 1380 (3,042)	951 (2113) 438 (973) 77 (170) 230 (510) 161 (355) 14 (31) 1380 (3,085)
Range at cruise Maximum speed Cruise speed Landing speed Takeoff distance Landing distance	km (mi) km/h (mph) km/h (mph) km/h (mph) m (ft) m (ft)	1000 (600) 303 (188) 265 (165) 85 (53) 185 (611) 130 (429)	1000 (600) 303 (188) 265 (165) 85 (53) 185 (611) 130 (429)	1000 (600) 290 (180) 265 (165) 85 (53) 180 (600) 130 (429)
Climb from 0 m to	m (ft)	1000 (3,300) 4.00 min 2000 (6,600) 9.5 min 3000 (9,900) 16.70 min 4000 (13,200) 29.00 min	1000 (3,300) 3.10 min 2000 (6,600) 7.00 min 3000 (9,900) 14.70 min 4000 (13,200) 28.00 min	1000 (3,300) 2.9 min 200 (6,600) 6.3 min 3000 (9,900) 10.0 min 4,000 (13,200) 30.7 min
Service ceiling	m (ft)	4800 (15,840) 46.00 min	4800 (15,840)	6102
Fuel consumption at cruise	L/hr (gal/hr)	60.5-71.9 (16-19)	60.5-71.9 (16-19)	60.5-71.9 (16-19)
Flight endurance		3 hr - 45 min.	4 hrs	4 hrs

SPECIFICATIONS					
Type		Bf 108 A	Bf 108 B-1	Bf 108 C	Bf 108 D-1
Wing span	mm (ft-in)	10,312 (33-9 7/8)	10,612[1] (34-9 7/8)	10,612 (34-9 7/8)	10,612 (34-9 7/8)
Length overall	mm (ft-in)	8060 (26-5 3/8)	8291[2] (27-2 3/8)	8206[3] (27-1 3/8)	8292[3] (27-5 3/4)
Ground length	mm (ft-in)	2100 (7-2 3/4)	2020 (6-7 1/2)	2020 (6-7 1/2)	2020 (6-7 1/2)
Stabilizer span	mm (ft-in)	3250 (10-7 7/8)	3240 (10-7 1/2)	3240 (10-7 1/2)	3240 (10-7 1/2)
Prop diameter	mm (ft-in)	2350 (7-8 1/2)	2350 (7-8 1/2)	2350 (7-8 1/2)	2350 (7-8 1/2)
Wheel track	mm (ft-in)	1600 (5-2 7/8)	1492 (4-11 7/8)	1492 (4-11 7/8)	1492 (4-11 7/8)
Surface area	m 2 (ft 2)	16.000 (172.16)	16.400 (176.46)	16.400 (176.46)	16.400 (176.46)
Seating		2	4	4	4

1 Other BFW dimensions included: 10500 mm, 10610 mm, 10620 mm.
2 Other BFW dimensions included: 8300 mm (27 ft-2¾ in).
3 Approximate dimension.

Chapter Eleven

Weight and Balance

Weight and Balance Limits

Empty weight	1940 lbs / 880 kgs
Gross weight/normal	3200 lbs / 1455 kgs
Gross weight/maximum	3310 lbs / 1505 kgs
Baggage compartment/ maximum loading weight	140 lbs / 63 kgs
Useful load @ 3000 lbs gross weight	1060 lbs / 480 kgs
Useful load @ 3200 lbs gross weight	1260 lbs / 570 kgs
Useful load @ 3310 lbs gross weight	1370 lbs / 620 kgs

Fuel and Oil Loadings

FUEL:	52 US gallons @ 6 lbs/gallon	312 lbs
OIL:	3.5 US gallons @ 7.5 lbs/gallons	26.25 lbs
Normal maximum fuel & oil weight:		338.25 lbs

Waypoints AVIATION

Chapter Twelve

Ground Handling

Parking and Tying Down

If possible, park the aircraft so that it faces into the prevailing or expected wind. Close and lock the cockpit/cabin doors and windows. Chock the wheels on both sides. Put the pitot head cover on.

If the aircraft is to remain parked outdoors for any period of time put on the engine cover, and cockpit/cabin 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 ground tie down points. Then place in position the control locks.

Strap down slats, linking to tie down hole. ???????

Towing and Pushing

It is recommended that the aircraft be pushed by hand, unless a towbar, built specifically for the Nord 1002 is available. A suitable forked towbar may be attached to the tailwheel, and may be used for turning the wheel up to 60° left or right.

When pushing the aircraft forwards by hand, push at the wing roots. When pushing the aircraft rearwards by hand, push at the leading edge. The struts of the tailplane may also be used.

DO NOT PUSH on the flaps, ailerons, slats, elevators, or 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.

Folding the Wings

The Nord 1002 is designed with folding wings, and the system is both simple and efficient. To fold the wings, the locking bars are withdrawn from the inner top forward part of the wing surface. The pulling bars are extracted from the wingtips (spanwise), and the wings are pulled outwards about 4 inches. The wings are then rotated through 90° until the edges are vertical, and folded back to the tailplane. The pulling bars fit into holes in the leading edge of the tailplane.

The reserve is carried out to unfold the wings. Since the control rods have roller friction bearings/mountings, there is no disconnection of all of any control rods. The various electrical wiring systems and pitot tubes have built-in “give” to eliminate the need for any disconnections.

Waypoints AVIATION