PILOTS OPERATING HANDBOOK
AND
CIVIL AVIATION AUTHORITY OF NEW ZEALAND
APPROVED FLIGHT MANUAL AIR 2973
FOR THE
R2160D

Aircraft S/N 001 to 378

Manufacturer's Serial No: 177

Registration: D-EIWR

CAANZ Type Certificate No: A-15

THIS HANDBOOK INCLUDES THE MATERIAL REQUIRED TO BE FURNISHED TO THE PILOT BY THE CIVIL AVIATION AUTHORITY OF NEW ZEALAND AND ADDITIONAL INFORMATION PROVIDED BY THE MANUFACTURER, AND CONSTITUTES THE CIVIL AVIATION AUTHORITY OF NEW ZEALAND APPROVED AIRPLANE FLIGHT MANUAL.

Civil Aviation Authority of New Zealand approved in the Acrobatic and Utility Category based on FAR 23. This document must be carried in the airplane at all times.

Accepted by: **EUROPEAN AVIATION SAFETY AGENCY**

Approved by: **CIVIL AVIATION AUTHORITY OF NEW ZEALAND**

By: _____ Manager Aircraft Certification
(NAME) (TITLE)

Date: 16 JUN 2006

Manufacturer's Name: ALPHA AVIATION MANUFACTURING LTD
INGRAM ROAD
R D 2,
HAMILTON
NEW ZEALAND
Telephone: (64) 07 843 7070
Facsimile: (64) 07 843 8040

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Rev.	Description	Modified Pages	Date of Approval
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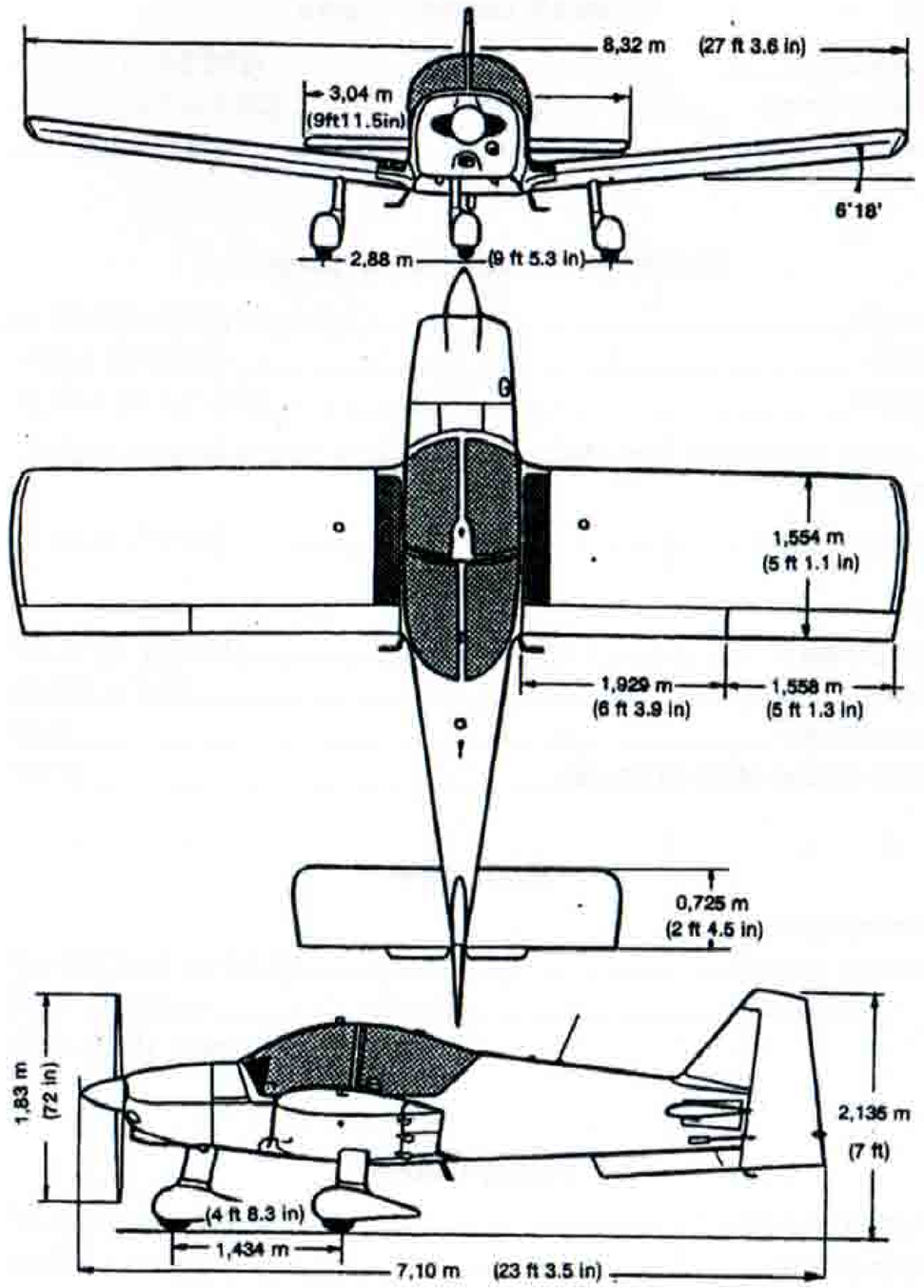

3 View Drawing

Overall Dimensions

Wing Span ..... (27ft 3.6 in) 8.32m
Overall length ..... (23 ft 3.5 in) 7.10 m
Overall height ..... (7 ft) 2.135 m

Internal Cabin Dimensions

Length ..... (6 ft 8.7 in) 2.05 m
Width ..... (3ft5.7in) 1.06m
Height ..... (4 ft 1.2 in) 1.25 m

2 seats, accessible from both sides by a jettisonable forward sliding canopy.

Luggage Hold ..... 0.4 m^3 (14 cu ft)

Wings

Wing area ..... (140 sq. ft) 13 m^2
Airfoil ..... NACA 23015
Aspect ratio 5.42
Wing setting (40% of chord) ..... 6°18'

Ailerons

Slotted type
Surface (each) ..... (5.54 sq. ft) 0.515 m^2
Deflection ..... up 20° (± 1.5°)
down 15° (± 1.5°)

Wing Flaps

Surface (each) ..... (6.8 sq. ft) 0.635 m^2
Span (each) ..... (6 ft 3.9 in) 1.929 m
Deflection ..... 0° to 35° (± 2.0°)

Horizontal Stabilizer

Total control area ..... (25.2 sq ft) 2.35 m^2
of which anti-balance tab ..... (2 x 0.6 sq if) 2 x 0.063 m^2
Span ..... (9ftll.5in) 3.04m
Deflection ..... up 10° (± 0.5°)
..... down 12.5° (± 0.5°)
Anti-tab deflection:
Elevator up ..... 33° ± 3°, tab up
..... 5 °± 3°, tab down
Elevator down ..... 14° ± 3°, tab up
..... 22° ± 3°, tab down

Vertical Stabilizer

Stabilizer ..... (3.7 sq ft) 0.35 m^2
Rudder ..... (12.7 sq ft) 1.18 m^2
Deflection ..... 0° to 30° (± 2.0°)

Landing Gear

Fixed Tricycle Type
Oleo-pneumatic dampers ..... stroke (6.3 in) 160 mm
Track ..... (9 ft 5.3 in) 2.88 m
Wheel base ..... (4 ft 8.3 in) 1.434 m
Tyre size ..... 380 x 150
Oil/Air shock strut Hydraulic Oil ..... MIL H 5606-A or AIR 3520

Nose Gear
Tyre pressure ..... (23 psi) 1.6 bar
Shock strut pressure ..... (58 psi) 4 bar

Main landing gear

Tyre pressure ..... (26 psi) 1.8 bar
Shock strut pressure. ..... (116 psi) 8 bar

Brakes

The disc brakes are operated by an independent hydraulic circuit on each main gear wheel. Brakes can be applied by either pilot.

Hydraulic oil..... MIL H 5606-A or AIR 3520

Power Plant

Engine

Manufacturer ..... LYCOMING
Model 0-320-D
Type .....Horizontally opposed, 4 cylinders, normally aspirated
Maximum continuous power ..... 160 HP at 2700 rpm
Maximum normal operating power ..... 2600 rpm

Propeller

Manufacturer .....Sensenich
Type 74-DM-6S5-2-64
or 74-DM-6S5-2-66
Diameter..... 1.83 m (72 in)*
Pitch ..... 1.62 m (64 in)
or 1.67 m (66 in)
Minimal Static RPM, Full Throttle at sea level..... 2150 rpm
Maximum RPM ..... 2700 rpm
Maximum normal operating rpm..... 2600 rpm

- **Any reduction in diameter during repair is forbidden**

Fuel

Aviation petroleum[1] .....AVGAS 100 LL
Fuel grade[1]..... (octane) 100 minimum

Single fuselage tank :

Standard Fuel Tank 120 litre

Total fuel capacity .....(26.3 Imp. gal/31.7 US gal) 120 l
Total usable fuel..... (26.0 Imp. gal/31.2 US gal) 118 l
Unusable fuel .....(0.4 Imp. gal/0.7 US gal) 2 l

Optional Fuel Tank 160 litre

Total fuel capacity .....(35.2 Imp. gal/42.2 US gal) 160 l
Total usable fuel..... (34.7 Imp. gal/41.7 US gal) 158 l
Unusable fuel .....(0.4 Imp. gal/0.7 US gal) 2 l

Oil

Total engine capacity .....(8 US quarts) 7.5l
Usable capacity.....(6 US quarts) 5.7l

During the first 50 hours of operation:
Use Only Pure mineral oil

After the first 50 hours of operation:
Dispersant oil

[1] Refer to the last edition of the Service Instruction Lycoming n°1070

Grades[2]

Oil	Dispersant	Pure Mineral
All temperatures	SAE 15W50 or 20W50	.....
Above +25°C (80°F)	SAE 60	SAE60
Above +15°C (60°F)	SAE 40 or SA E50	SAE50
From 0°C to +30°C (30°F to 90°F)	SAE 40	SAE40
From -15°C to +20°C (0°F to 70°F)	SAE 40, 30 or 20W40	SAE30
Below -10°C (10°F)	SAE30 or 20W30	SAE20

Maximum Authorised Weights

	"U" category	"A" category
On take off	(1984 lb) 900kg	(1764 lb) 800kg
On landing	(1984 lb) 900kg	(1764 lb) 800kg

Flight Controls

- Dual control, with rigid interconnection.
  Conventional, closed loop cable transmission.
- Rudder bar actuating the rudder control surface and front wheel (via spring rods)
- Elevator compensator actuated by means of a knurled handwheel located on the central console.
- Electrically operated flaps.

[2] Refer to Service Instruction Lycoming 1014 latest edition.

List of Abbreviations

sq ft ..... Square foot
ft ..... Foot
in ..... Inch
nm ..... Nautical mile
km ..... Kilometre
m ..... Meter
cm ..... Centimetre
kt ..... Knot
m/s ..... Meter per second
rpm ..... Revolution per minute
Va ..... Manoeuvring speed
Vc ..... Design cruise air speed
Vfe ..... Maximum Flaps extended speed
Vne ..... Never exceed speed
Vno ..... Maximum cruising speed
Vso ..... Stalling speed landing position
Vs1 ..... Stalling speed flaps up configuration
Vi ..... Indicated airspeed
Km/h ..... Kilometre per hour
HP ..... Horse power
hPa ..... Hectopascal
in.Hg ..... Inch of mercury
mbar ..... Millibar
Zp ..... Pressure altitude
l ..... Litre
imp gal ..... Imperial gallon
us gal ..... US gallon
psi ..... Pound per square inch
lb ..... Pound
kg ..... Kilogram
°C ..... Degrees Celsius
°F ..... Degrees Fahrenheit
V ..... Volt
A ..... Ampere

List of Radio Abbreviations

ADF	Automatic Direction Finder
ATC	Air Traffic Control
COM	Communication Transceiver
DME	Distance Measuring Equipment
ELT	Emergency Locator Transmitter
IFR	Instrument Flight Rules
ILS	Instrument Landing System
MKR	Marker Beacon Receiver
NAV	Navigation Indicator and Receiver
AUDIO	Audio Control Panel
VFR	Visual Flight Rules
VHF	Very High Frequency
VOR	VHF Omni-Range (beacon)

Conversion Factors

nautical mile	x	1.852	=	kilometres
feet	x	0.305	=	metres
inches	x	0.0254	=	metres
inches	x	25.4	=	millimetres
feet/minute	x	0.00508	=	metre/second
gallons (US)	x	3.785	=	litres
gallons (Imp)	x	4.546	=	litres
quarts (US)	x	0.946	=	litres
knots	x	1.852	=	km/h
psi	x	0.0689	=	bar
in.Hg	x	33.86	=	mbar
lb	x	0.453	=	kg
(°F-32)	x	5/9	=	°C

kilometres	x	0.539	=	nautical mile
meters	x	3.281	=	feet
meters	x	39.37	=	inches
millimetres	x	0.03937	=	inches
meter/second	x	197	=	feet/minute
litres	x	0.264	=	gallons (US)
litres	x	0.220	=	gallons (Imp)
litres	x	1.057	=	quarts (US)
km/h	x	0.539	=	knots
bar	x	14.51	=	psi
mbar	x	0.02953	=	in.Hg
kg	x	2.205	=	lb
°C	x	9/5 + 32	=	°F

Barometric Pressure Conversion Table

Below pressure in MILLBAR or HECTOPASCAL, the pressure in INCHES of MERCURY is indicated.

□ → mbar or hPa
in.Hg

950 28.05	960 28.35	970 28.64	980 28.94	990 29.23	1000 29.53	1010 29.63	1020 30.12	1030 30.42	1040 30.71
951 28.08	961 28.38	971 28.67	981 28.97	991 29.26	1001 29.56	1011 29.85	1021 30.15	1031 30.45	1041 30.74
952 28.11	962 28.41	972 28.70	982 29.00	992 29.29	1002 29.59	1012 29.88	1022 30.18	1032 30.47	1042 30.77
953 28.14	963 28.44	973 28.73	983 29.03	993 29.32	1003 29.62	1013 29.91	1023 30.21	1033 30.50	1043 30.80
954 28.17	964 28.47	974 28.76	984 29.06	994 29.35	1004 29.65	1014 29.94	1024 30.24	1034 30.53	1044 30.83
955 28.20	965 28.50	975 28.79	985 29.09	995 29.38	1005 29.68	1015 29.97	1025 30.27	1035 30.56	1045 30.86
956 28.23	966 28.53	976 28.82	986 29.12	996 29.41	1006 29.71	1016 30.00	1026 30.30	1036 30.59	1046 30.89
957 28.26	967 28.56	977 28.85	987 29.15	997 29.44	1007 29.74	1017 30.03	1028 30.33	1037 30.62	1047 30.92
958 28.29	968 28.58	978 28.88	988 29.18	998 29.47	1008 29.77	1018 30.06	1028 30.36	1038 30.65	1048 30.95
959 28.32	969 28.61	979 28.91	989 29.20	999 29.50	1009 29.80	1019 30.09	1029 30.39	1039 30.68	1049 30.98

Reminder:

The standard pressure of 1013.2 mbar or hPa equals 29.92 in.Hg.

Section 2 : Limitations

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Certification Standards

The R2160D aircraft has been certified in the "ACROBATIC" and "UTILITY" categories conforming to the following technical conditions:

- Standard technical conditions: FAR 23, Amendments 1 to 9 included
- Complimentary conditions AIR 2052, 3.397 and 3.399
- Special condition: the canopy must be jettisonable.

NOTE

All speeds in this manual are indicated airspeeds unless otherwise specified.

Approved Operation

VFR by day & night in non-icing conditions.

AIRSPEED LIMITATIONS	kt	km/h
Vne (never exceed)	178.5	331
Vno (max. cruise)	127	236
Va (max. manoeuvre)	127	236
Vfe (max. flaps extended)	97	180
Vc (Design cruising speed)	127	236
Stalling Speeds:		
Vs1 (flaps retracted)	63	117
Vs0 (35° flaps)	51	94

AIRSPEED INDICATOR MARKINGS		kt	km/h
Red line (never exceed)	V_{ne}	178.5	331
Yellow arc (operate with caution and only in "smooth air")	V_{no}-V_{ne}	127-178.5	236-331
Green arc (normal operating range)	V_{s1}-V_{no}	63-127	117-236
White arc	V_{so}-V_{fe}	51-97	94-180

Stall Warning Devices

Set to operate at a speed 5 to 10 kts (9 to 18 km/h) before stalling occurs.

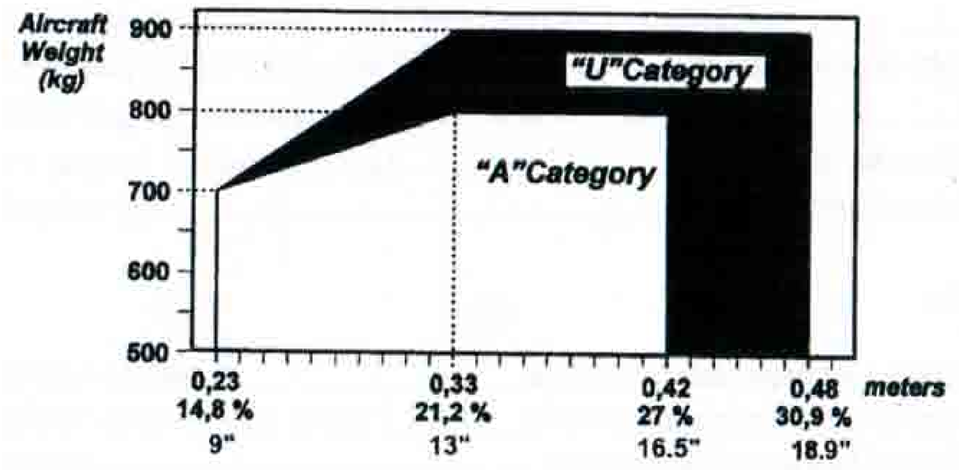
Flight Load Factor Limits at Gross Weight

	"U" category	"A" category
Flaps up	+ 4.4 g -1.76 g	+ 6 g -3 g
Flaps down	+2 g	+2 g

Maximum Authorised Weights

	"U" category	"A" category
On take off	(1984 lb) 900kg	(1764 lb) 800kg
On landing	(1984 lb) 900kg	(1764 lb) 800kg

Weight and Balance Envelope



Levelling ..... upper fuselage longeron
Datum ..... leading edge at rib n°5
Chord ..... (61.2 in) 1.554 m

NOTE

It is the responsibility of the aircraft owner and the pilot to ensure that the aircraft is properly loaded. See Section 6 Weight & Balance for proper loading instructions.

Engine Limitations

Continuous starter operation ..... 15 to 20 sec.
Maximum rpm (red line) ..... 2600 rpm

Tachometer Markings

Green arc ..... 2300 to 2600 rpm
Red line ..... 2600 rpm

Fuel

Aviation petroleum[3] ..... AVGAS 100 LL
Fuel grade[3] .....(octane) 100 minimum
Total fuel capacity .....(26.3 Imp. gal/31.7 US gal) 120 l
..... (optional 160l tank) (35.2 Imp. gal/42.2 US gal) 160 l
Total usable capacity .....(26.0 Imp. gal/31.2 US gal) 118 l
.....(optional 160l tank) (34.7 Imp. gal/41.7 US gal) 158 l
Unusable fuel .....(0.4 Imp. gal/0.7 US gal) 2 l
Normal pressure.....0.5 to 8 psi

Oil

Maximum temperature (red line).....(245°F) 118°C
Normal temperature (green arc).....(105 to 245°F) 40 to 118°C
Minimal idle pressure (red line) ..... 25 psi
Yellow arc..... 25 to 55 psi
Normal pressure (green arc) ..... 55 to 95 psi
Yellow arc (ground warm up) ..... 95 to 115 psi
Maximum pressure cold start and take-off (red line)..... 115 psi
Cylinder Head Temp (CHT) .....65 to 260°C

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[3] Refer to Service Instruction Lycoming n° 1070.

Payload Load Limits

Number of occupants.....2
Maximum authorized weight of baggage (in Utility category ONLY)
.....(77 lb) 35 kg

Operational Limits in "U" Category

Within the limits of this category, the following manoeuvres are authorized:

Turn at more than 60° bank ..... entry speed 108 kt (200 km/h)
Lazy eight..... entry speed 130 kt (240 km/h)
Chandelle..... entry speed 130 kt (240 km/h)

Low Temperature Operations

The aircraft can be used down to a temperature of -25 C (-13 F) on the ground.

Refer to oil grade chart on page 1-7 when operating at low temperatures.

When ambient air temperatures less than 5°C or if the oil temperature remains below 80°C for sustained periods it is recommended that the winterisation plate P/N 54.23.17.010 is fitted to the oil cooler in accordance with the maintenance manual.

Operation Placards

In full view of the pilot

THIS AIRCRAFT MUST BE USED IN *ACROBATIC* OR *UTILITY* CATEGORY, IN ACCORDANCE WITH THE APPROVED FLIGHT MANUAL

ON THIS AIRCRAFT, ALL PLACARDS CORRESPOND TO *ACROBATIC* UTILISATION.

FOR *UTILITY* OPERATION, REFER TO THE APPROVED FLIGHT MANUAL

MANEUVERING SPEED 127 kt - 235 km/h

VFR FLIGHT BY DAY
IN NON-ICING CONDITIONS

NO SMOKING

SPIN FORBIDDEN IN UTILITY CAT.

INVERTED SPIN FORBIDDEN

For aircraft fitted with oil recuperation system and dry battery in A cat.

DEMONSTRATED CROSS WIND COMPONENT: 19 kt

ACROBATIC CATEGORY APPROVED MANEUVERS

SPIN (Flaps up)	54 KIAS	CHANDELLE	120 KIAS
POSITIVE LOOP	130 KIAS	HALF LOOP and ROLL OUT	135 KIAS
ROLL	108 KIAS	FLICK ROLL	98 KIAS
STALL TURN	120 KIAS	LAZY EIGHT	120 KIAS
45° HALF ROLL and DIVE OUT	120 KIAS	STEEP TURN	108 KIAS

SPIN RECOVERY PROCEDURE
RUDDER IN FULLY OPPOSITE DIRECTION
ELEVATOR CONTROL FULL AFT
AILERONS NEUTRAL
AFTER ROTATION HAS STOPPED, RETURN ELEVATOR TO NEUTRAL POSITION

Optional

DEMONSTRATED CROSSWIND COMPONENT : 19 kt

ACROBATIC CATEGORY APPROVED MANEUVERS

SPIN (Flaps Up)	54 KIAS	CHANDELLE	120 KIAS
POSITIVE LOOP	130 KIAS	HALF LOOP and ROLL OUT	135 KIAS
ROLL	108 KIAS	FLICK ROLL	98 KIAS
STALL TURN	120 KIAS	LAZY EIGHT	120 KIAS
45° HALF ROLL and DIVE OUT	120 KIAS	STEEP TURN	108 KIAS

SPIN-RECOVERY PROCEDURE

RUDDER IN FULLY OPPOSITE DIRECTION
ELEVATOR CONTROL FULL AFT
AILERONS NEUTRAL

For non fitted aircraft

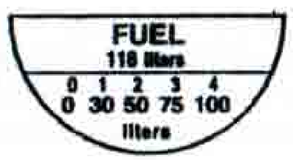
INVERTED FLIGHT PERMITTED DURING 20 SECONDS

INVERTED FLIGHT FORBIDDEN

Near fuel filler cap

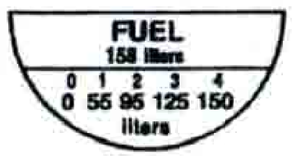
AVGAS 100LL
120 liters
31.7 US Gal

On the fuel quantity indicator



For aircraft fitted with 160 l (42.2 us gal) optional fuel tank

AVGAS 100LL
160 liters
42.3 US Gal



MAX. FUEL 120 l (31.7 us gal) IN ACROBATIC CAT.

Operation placards (cont)

Near the control pull knob

FUEL SHUT OFF
PULL

On the handle

CANOPY
JETTISONNING
PULL
HANDLE

Optional

CANOPY
JETTISONING
PULL
HANDLE

On baggage compartment aft bulkhead

BAGGAGE MAX. LOAD
35 kg - 77 lb
NO BAGGAGE ALLOWED
DURING ACROBATIC FLIGHTS

Optional

MAXIMUM WEIGHT
77 lbs
NO LUGGAGE ALLOWED
DURING
ACROBATIC FLIGHTS

Section 3 :Emergency Procedures

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Engine Failure During Take-Off (roll)

With sufficient runway remaining:

Throttle..... idle (pull)
Brakes.....as required
Mixture .....off (pull out)
Magneto switch .....OFF
Alternator switch .....OFF
Battery switch.....OFF

Without sufficient runway remaining:

Throttle..... idle (pull)
Brakes..... apply heavily
Mixture .....off (pull out)
Magneto switch .....OFF
Alternator switch .....OFF
Battery switch.....OFF

Engine Failure Immediately After Take-Off

Glide speed.....(800 kg) 78 kt (145 km/h)
(900 kg) 83 kt (154 km/h)
Mixture ..... cut-off (pull out)
Fuel shut off control ..... pull out
Magneto switch .....OFF
Alternator switch .....OFF
Battery switch.....ON (in order to use the flaps)

IMPORTANT

Land straight ahead, with only small direction changes to avoid obstructions.

Never try to turn back to the runway, as altitude after take-off is seldom sufficient.

Engine Failure In Flight

If altitude is evaluated to be sufficient to try an engine restart:

Establish maximum glide speed, flaps up 78 kt (145 km/h) for 800 kg or 83 kts (145 km/h) for 900 kg. In these conditions and without wind, the aircraft covers approximately 8.7 times its altitude.

Fuel shut off control ..... push in
Electric fuel pump ..... ON
Mixture ..... full push in
Throttle ..... ¼ travel forward
Magneto switch ..... on BOTH

If the propeller still turns, the engine should restart.

If the propeller is stopped, operate the starter.

If the engine still does not start, prepare for a forced landing, following the procedure below.

Power Off Forced Landing Off Airfield

Look for a suitable landing area:

Airspeed ..... (800 kg) 78 kt (145 km/h)
(900 kg) 83 kt (154 km/h)
Belts and harnesses ..... tight
Electric fuel pump ..... OFF
Mixture ..... off (pull out)
Throttle ..... to idle (pull)
Magneto switch ..... OFF
Fuel shut off control ..... pull out
Alternator switch ..... OFF
Battery switch (for flap operation) ..... ON

Final

Flaps ..... full down
Battery switch ..... OFF
Canopy ..... unlocked

Precautionary Power Landing Off Airfield

Fly over the chosen field several times at low speed, 78 kt (145 km/h) for 800 kg or 83 kts (145 km/h) for 900 kg, in order to locate the most suitable landing area, flaps in "take-off' position (10°), then make a precautionary approach at, 66 kt (122 km/h) for 800 kg or 71 kt (131 km/h) for 900 kg, flaps in "landing" position (35°).

On final, unlock the canopy.

Before touchdown

Magneto switch ..... OFF
Battery switch ..... OFF

NOTE IN CASE OF CANOPY JAMMING

Canopy handle in "open" position.

Free the two canopy release levers located on the arm rests, on both sides of the instrument panel, and place them in vertical position activating the canopy jettison system.

Canopy should be reinstalled in accordance with the aircraft service manual.

Fire

Engine fire during starting

Keep the engine turning with starter:

Fuel shut off control ..... pull out
Electric fuel pump ..... OFF
Throttle ..... full power (push)
Mixture ..... off (pull out)

The aim of this procedure is to make the engine "swallow" the accumulated fuel in the inlet pipes (generally following an excess of fuel priming during a difficult engine start).

If the fire continues

Magneto switch ..... OFF
Battery switch ..... OFF
Alternator switch ..... OFF

Abandon the aircraft and try to extinguish the fire with the aids available: fire extinguishers, covers, clothing or sand.

Engine fire in flight

Fuel shut off control ..... pull out
Throttle ..... full power until engine stops
Mixture ..... off (pull out)
Electric fuel pump ..... OFF
Alternator switch ..... OFF
Cabin heat and ventilation ..... off
Speed ..... 86 kt (160 km/h)

Prepare for a forced landing off airfield, following the procedures in the chapter "Power off forced landing off airfield"

Do not attempt to restart the engine.

Cabin Fire

Extinguish the fire by all means possible (optional extinguisher).

To eliminate smoke, apply maximum ventilation.

In case of an electrical fire (fumes indicating insulation burning):

Cabin ventilation ..... reduce
Alternator switch ..... OFF
Battery switch ..... OFF
Battery circuit breaker ..... pull out
Alternator circuit breaker ..... pull out

Land immediately if the fire continues.

Vibration and Rough Engine Operation

Vibrations and rough engine operation are generally due to (verify in this order):

- Carburettor icing: see paragraph "ICING" on next page.
- Mixture set too rich or too lean: adjust the mixture (see section 4)
- Contamination in the fuel system: verify fuel pressure. Switch on the electric fuel pump
- Ignition failure: magneto switch on "L", then "R", then return to "BOTH". Select the position providing the best engine operation and fly to the nearest airfield, at reduced power and mixture set to obtain the smoothest engine operation possible.

Low Oil Pressure

In case of low oil pressure indication, check oil temperature and if it is too high (red arc):

- Reduce power

  If oil pressure does not recover:-

- Fly to the nearest airfield, and/or prepare for an off airfield landing.

Canopy Jettisoning

Remove the safety locking device from central Jettison Handle

Pull handle down and aft.

If the central jettison handle fails.

Free the two canopy release levers located on the arm rests, on both sides of the instrument panel, and place them in vertical position activating the canopy jettison system.

Push canopy up

Icing

Although is forbidden to fly in icing conditions, proceed as follows when inadvertently encountering icing:

- Carburettor heat on (pull)
- Increase power in order to reduce ice build-up to minimum
- Switch on pitot heat (if installed)
- Select maximum cabin heat and direct the total output to the windscreen ("defrost" position) in order to remove the ice quickly
- Turn back or change altitude, to obtain an outside air temperature less conducive to icing
- Plan to land at the nearest airfield.
- Do not use the flaps

With an extremely rapid ice build-up, carry out a forced landing.

Remember that a layer of 0.5 cm (0.2 in) on the wing leading edge will increase stall speed. If needed, use a higher than normal approach speed: 140 to 150 km/h (75 to 81 kt).

REMARKS

If continuous carburettor heat is judged necessary, it is imperative to adjust the mixture control to obtain normal engine operation.

Always use carburettor heat fully on or fully off", in certain cases, an intermediate position could increase icing.

Electrical Power Supply Malfunction

Alternator failure is indicated when the amber "LOW VOLT" light on the warning panel is lit, and a progressive drop in voltage appears on the voltmeter. The "LOW VOLT" light indicates that the battery is supplying power to the bus-bar.

If the "LOW VOLT" amber light is on

Switch off the alternator, then switch it back on.

This operation resets the overvoltage relay which may have cut-out due to a transient overvoltage.

NOTE

Warning light may come on during low engine rpm. Check that increasing rpm makes the light go out.

If the "LOW VOLT" light remains on

- Switch off the alternator.
- Switch off all the electrical equipment not essential to the continuation of the flight.
- Land as soon as possible and have the electrical system inspected.

NOTE

An alternator failure does not prevent the engine from operating normally.

Inadvertent Spin

Should a spin occur, use the following procedure:

Throttle ..... idle (pull)
Rudder ..... full opposite to direction of rotation
Elevator ..... forward to neutral
Ailerons ..... neutral

Once the rotation stops, rudder to neutral position and recover within flight limitations.

NOTE

If the flaps are down when the spin begins, retract them immediately.

Loss of Elevator Control

In case of a loss of elevator control (accidental disconnection):

- Stabilize the aircraft in level flight, flaps at 35°, at 75 kt (138 km/h), using the elevator trim and throttle.
- Do not change the elevator trim setting and control the angle of descent with throttle only. Reduce throttle only when in short final and near to the ground.

Section 4 : Normal Procedures

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Loading

Before each flight, insure that the total weight and the load balance are within the established limits. For this, use the weight and balance chart in Section 6.

Normal Operating Speeds

The speeds identified hereunder are indicated Airspeeds recommended for normal operations.

They are based on a standard aircraft, operated at gross weight, in standard atmosphere, at sea level. They can change from one aircraft to another, depending on the installed equipment, aircraft and engine condition, atmospheric conditions and pilot proficiency.

Best rate of climb speed

Flaps in take-off position (10°) .....(800 kg) 70 kt (130 km/h)
(900 kg) 75 kt (139 km/h)
Flaps up .....(800 kg) 78 kt (145 km/h))
(900 kg) 83 kt (154 km/h)

Best angle of climb speed

Flaps in take-off position (10°) .....(800 kg) 65 kt (120 km/h))
(900 kg) 70 kt (130 km/h)
Flaps up .....(800 kg) 70 kt (130 km/h))
(900 kg) 75 kt (139 km/h)

Maximum operating speed in turbulence

Flaps up .....127 kt (238 km/h)

Maximum speed

Flaps in landing position (35°).....97 kt (180 km/h)

Landing speed, final approach

Flaps in landing position (35°).....(800 kg) 65 kt (120 km/h))
(900 kg) 70 kt (130 km/h)

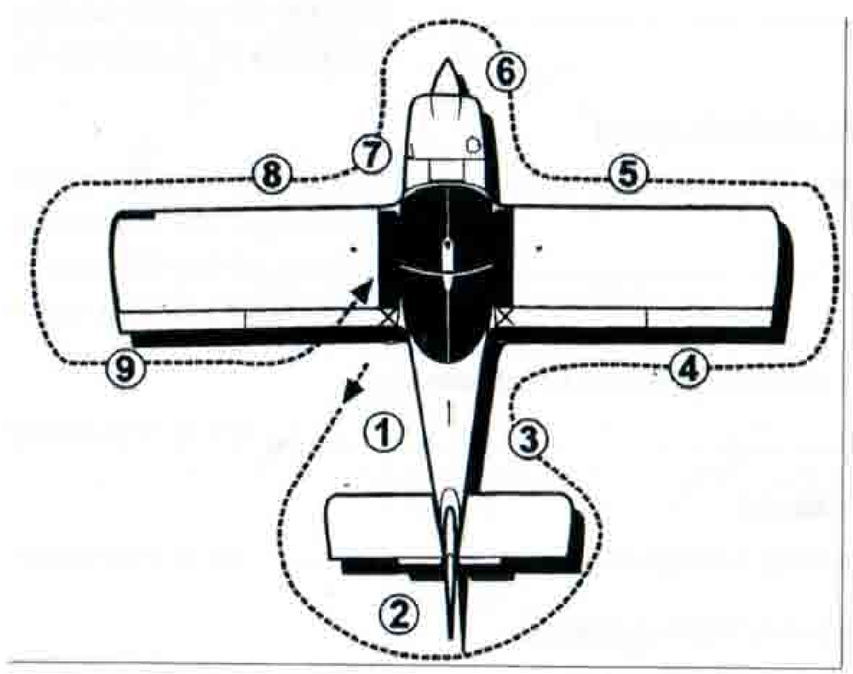
Pre-Flight Inspection

To be performed before each flight.

This inspection may be reduced after intermediate en route landings.

Magneto switch ..... OFF
Controls ..... free
Control surface deflections ..... check
Battery switch ..... ON
Flaps ..... check operation
Fuel quantity ..... check
Battery switch ..... OFF
Fuel shut off control: pushed in and cover closed ..... check
Aircraft documents ..... check availability on board
Baggage ..... check stowed

Make an aircraft walk-around inspection (as shown below) beginning at the fuselage left side.



1	Fuel quantity ..... check with dip stick Fuel filler cap ..... in place, locked Static vent ..... clean, unobstructed Purge the fuel tank ..... ensure accumulated water is removed Canopy jettisoning handle ..... check lock wire attachment
2	Horizontal stabilizer ..... surface condition, hinges without play Rudder ..... check hinges and play
3	Static vent ..... clean, unobstructed
4	Flap, aileron ..... check condition and hinges Wing tip, strobe and navigation lights ..... check condition
5	Stall warning ..... clean, check displacement Right main landing gear ..... check attachment and fairing condition normal shock absorber compression, tyre inflated
6	Oil level ..... check, oil cap secured, panel closed ..... Min. 2 qts, Max. 8 qts Engine cowl attachments ..... check Propeller ..... clean, in good condition, check for no cracks Propeller spinner ..... no play, clean, in good condition, no cracking Air inlets ..... clean, unobstructed Landing Lights ..... window clean
7	Nose gear ..... check attachment and fairing condition normal shock absorber compression, tyre inflated, tow-bar removed Exhaust pipes ..... rigid Canopy cleanliness ..... check
8	Left main landing gear ..... check attachment and fairing condition normal shock absorber compression, tyre inflated Pitot ..... clean, unobstructed
9	Wing tip, navigation-, taxi- landing-lights ..... check condition Flap, aileron ..... check condition and hinges
10	Check all surfaces (look for missing rivets, cracks, permanent buckling in panels) Remove the snow or ice that may be present on the wings and tail unit. Remove the chocks and tethering gear.

Cabin Interior Check Prior Start-Up

Canopy ..... closed and locked
Parking brake ..... ON and locked
Seats ..... adjusted and locked
Belts and harnesses ..... adjusted and fastened
Flight controls ..... free, without play or excessive friction (check rudder on taxi)
Elevator trim ..... verify travel, and return to take-off position
Fuel shut-off control (pushed in and cover closed) ..... checked
Battery switch ..... ON
Fuel Flow Indicator ..... adjust as necessary, select FLOW mode

Before Starting Engine

Cabin Equipment ..... Secure
Pilot (& passenger) ..... Harness On
Avionics Master ..... OFF

Parking Brake Use

Brake on

Press on both pedals. Keep pressure on, while pulling the parking brake control out. Then, release the pressure on the pedals (the parking brake control remains in the pulled position).

Brake off

Push the control in.

Starting the Engine

Normal procedure

Carburettor heat ..... off (push in)
Mixture ..... pushed full rich
Strobe light ..... ON
Gauges ..... check
Magneto switch ..... on BOTH
Electric fuel pump ..... ON
Throttle ..... carry out 2 or 3 pumps, then ¼ travel forward
Propeller area ..... clear
Starter ..... turn and push on (15 to 20 sec. maxi.)

Hot engine procedure

Same as "Normal procedure", but without pumping throttle.

Cold weather procedure (Below 5 C)

Same as "Normal procedure", but keep pumping throttle up to 900 or 1000 rpm until engine runs smoothly.

Engine "flooded"

Electric fuel pump ..... OFF
Mixture ..... lean (pull out)
Throttle ..... full power (push in)
Alternator ..... OFF
Starter ..... operate for 10-15 seconds

As soon as the engine fires, reduce throttle to ¼ and advance mixture control to "rich" and resume the normal procedure without pumping throttle.

ATTENTION: Avoid operating the starter for more than 20 seconds. Wait at least a minute before operating it again.

As soon as the engine is running, check the engine oil pressure. If it is zero after 15 to 20 seconds, switch off and investigate the cause.

After Engine Start

RPM 1200
Electric fuel pump ..... OFF
Alternator switch ..... ON
Voltmeter ..... green range
Vacuum gauge ..... green range
Annunciator Lights ..... test and select brightness
Avionics Master ..... ON
COM/NAV, navigation instruments ..... set
Altimeter ..... set

Taxiing

Parking brake ..... released
Brakes ..... test
Turn co-ordinator ..... check
Directional gyro ..... check setting

Avoid exceeding 1200 rpm while oil temperature is in yellow arc.

Engine Run-Up

Parking brake ..... applied
Oil pressure and temperature ..... green range
Fuel pressure ..... green range
Mixture ..... (full rich) in
Carburettor heat ..... off (push in)

Magneto check

Throttle ..... 1800 rpm
Magneto selection:
Max. drop between "L" or "R" and "BOTH" ..... 175 rpm
Max. difference between "L" and "R" ..... 50 rpm

Carburettor heat check

Carburettor heat (at 1800 rpm) ..... full on
Check rpm drop ..... between 20 and 200 rpm
Carburettor heat ..... off (push in)

Mixture check

Lean until rpm reduction, then return to "full rich".

Engine idle check

Throttle ..... 600 to 650 rpm

Before Take-Off

Controls ..... free
Magneto switch ..... BOTH
Cabin (seats and belts) ..... check
Fuel shut off control: pushed in and cover down ..... check
Electric fuel pump ..... ON
Elevator trim ..... take-off position
Instruments ..... check, set
Transponder ..... as required
Flaps ..... (10°) take-off position
Throttle ..... 'holding" at 1200 rpm
Canopy ..... closed and locked

Take-Off

Normal take-off

Take-off minimum rpm 2150
Rotation speed ..... (800 kg) 55 kts (102 km/h)
(900 kg) 58 kts (107 km/h)
Initial climb speed ..... (800 kg) 75 kts (139 km/h)
(900 kg) 79 kts (147 km/h)

After obstacles clearance,

Reduce angle of climb to obtain ..... (800 kg) 78 kts (145 km/h)
(900 kg) 83 kts (154 km/h)
Electric fuel pump ..... OFF
Fuel pressure ..... check (.5 to 5 psi)
Flaps ..... up

Short field take-off

Flaps ..... (10°) take-off position
Apply full power, brakes applied,
then release the brakes ..... minimum 2150 rpm
Rotation speed ..... (800 kg) 55 kts (102 km/h)
(900 kg) 58 kts (107 km/h)
Then, if necessary (to clear an obstacle)
Best angle of climb speed ..... (800 kg) 70 kts (128 km/h)
(900 kg) 73 kts (135 km/h)

Crosswind take-off (greater than 12 kts crosswind)

Flaps ..... take-off position (10°)
Ailerons ..... into the wind

Take-off at 10% higher airspeed than normal. Correct drift in the normal way (max bank angle close to the ground: 15°).

Demonstrated crosswind velocity: 18 kts (33 km/h)

Climb

Normal climb (flaps up)

Set climb speed:

800 kg – 78 kts (145 km/h); 70 kts (130 km/h) at 10,000 ft.
900 kg – 83 kts (154 km/h); 75 kts (139 km/h) at 10,000 ft

Above 5 000 ft, adjust mixture.

Best angle of climb

The best angle of climb is obtained at, 70 kts (130 km/h) at 800 kg or 75 kts (139 km/h) at 900kg, flaps up and, 65 kts (120 km/h) at 800kg or 70 kts (130 km/h) at 900kg, flaps in take-off position (10°).

NOTE
This type of climb should only be used only as necessary, due to poor engine cooling.

Cruise

Refer to Section 5 for rpm setting and cruise performance.

Operation of mixture control

Maintain mixture control in the "full rich" position during take-off and in the climb.

In certain conditions (high altitude take-off,or long climb above 5000 ft), this setting may be too rich and could result in irregular engine operation or loss of power.

In these cases, adjust the mixture to recover regular engine operation, and not for fuel economy.

Mixture adjustment in stable cruise:

Progressively lean the mixture until a slight reduction in rpm is noted; then lightly enrich to re-establish power and normal operation.

NOTE

Take care not to lean the mixture too much, which would cause engine overheating.

ALWAYS ENRICH THE MIXTURE BEFORE INCREASING POWER.

Use of Carburettor Heater

WARNING

Never keep the carburettor heater ON, when taking off.

If, while cruising at constant altitude and in smooth air, with a given power setting, there is a drop in rpm; or a reduction of the manifold pressure (on aircraft equipped with a manifold pressure gauge).

- Pull the carburettor heater control fully ON for 30 seconds
- Note the effect on rpm; or on the manifold pressure

If they increase the carburettor was beginning to ice up.

- Push OFF the carburettor heater and check that the initial engine parameters are recovered
- Repeat this operation at regular intervals, according to the meteorological conditions

Do not set the carburettor heater control in an intermediate position, as the action of the heater is not proportional to the travel of the control.

When landing in cold or damp weather, pull the carburettor heater control ON one or two minutes before closing the throttle.

Descent

Rapid Descent

Power .....as required to maintain the desired descent path
Carburettor heat .....as required

Each 1500 ft, apply power to avoid excessive engine cooling and to clean the spark plugs.

Approach or down wind

Mixture ..... full rich
Electric fuel pump..... ON
Carburettor heat (before reducing throttle)..... full on
Cabin (belts and seats) ..... check
Flaps ..... below 97 kts (180 km/h) in take-off position (10°)
Speed.....reduce to 70 to 76 kts (130 to 140 km/h)
Elevator trim .....set

On Final

Carburettor heat ..... full cold
Flaps .....landing position (35°)
Approach speed(power on)...(800 kg) 65 to 68 kts (120 to 125 km/h)
(900 kg) 70 to 73 kts (130 to 135 km/h)
Elevator trim .....set

Maximum demonstrated cross wind 18 kts

Landing

Short landing

Flaps ..... landing position (35°)
Approach speed (with power on) ..... (800 kg) 62 kts (115 km/h)
(900 kg) 67 kts (124 km/h)

After touchdown, brake heavily keeping nose up with elevator and retract flaps.

Landing in crosswind or gusty conditions

Flaps ..... (10°)
Approach..... (800 kg) 73 kts (135 km/h) + ½ gust speed
(900 kg) 78 kts (144 km/h) + ½ gust speed
Drift .....correct in the normal way
Demonstrated crosswind ..... 18 kts (33 km/h)

Overshoot procedure

Carburettor heat full cold ..... check
Throttle..... full
Speed.....(800 kg) 65 kts (120 km/h)
(900 kg) 70 kts (130 km/h)
Flaps .....(10°) take-off position
Normal climb speed .....(800 kg) 70 kts (130 km/h)
(900 kg) 75 kts (139 km/h)

After Landing

Electric fuel pump .....OFF
Flaps .....up
Navigation instruments .....off
Transponder..... standby

Engine Shut-Down

Park brake ..... on
ELT ..... Check not triggered
Avionics master ..... OFF
Electrical equipment ..... off
Canopy ..... closed, locked
Magneto cut-off check at idle ..... OFF then BOTH
RPM 1000
Mixture ..... idle cut-off

After the engine stops

Magneto switch ..... OFF
Alternator switch ..... OFF
Battery switch ..... OFF
When wheel chocks in place ..... release the parking brake

Acrobatic Flights

IMPORTANT NOTES

- This aircraft is not provided with a fuel or oil system allowing sustained inverted flight.
- The lubrication does not take place while the aircraft is in the inverted position. An air-oil separator is provided to prevent the oil flowing through the engine breather.
- The luggage hold must be empty and no object may be loose in the cabin.
- Make sure that the aircraft C of G is within the permissible limits.

Spinning

It is recommended to perform the spin in the following manner:

- Flaps must be retracted
- Start the spin at an adequate height above the safety altitude, taking into consideration that the loss of altitude is about 230 ft per revolution and that the final recovery takes about 1300 ft.
- Throttle back in level flight, decrease the speed with a slightly positive vertical position
- When close to the stalling point (54 kts):
  Pull the elevator control fully back, ailerons in neutral and simultaneously apply rudder in the direction of required rotation
- When 2 or 3 rotations have been completed, apply the following recovery procedure:
  Rudder in fully opposite direction, elevator control to neutral and ailerons in neutral
- When spin rotation stops, recover to normal flight taking care to remain within operating limits.

Example to recovery from a LH spin

- Apply and maintain full Right rudder, ailerons in neutral
- Stick to neutral
- After 3 revolutions, recovery is performed in approximately three quarters of a revolution.

Only one action is important - Keep the rudder fully in opposite direction!

- In a spin of more than 3 revolutions, the engine is likely to stall. This raises no difficulty: the propeller should wind mill once airspeed is restored and re-start the engine.
  (**Caution**: do not engage starter if propeller is still rotating.)
- With a 4 revolution (or more) spin, recovery is performed in 1 ½ revolutions.
- During the recovery phase, keep a watch on the A.S.I. and on the accelerometer, to keep within the operating limits.

Authorized acrobatic figures	Initial speed
Positive spin	54 kts (100 km/h)
Positive loop	130 kts (240 km/h)
Roll	108kts (200 km/h)
Stall turn	120 kts (220 km/h)
45° half roll and dive out	120 kts (220 km/h)
Chandelle	120 kts (220 km/h)
Half loop and roll out	135 kts (250 km/h)
Flick roll	86 kts (160 km/h
Lazy eight	120 kts (220 km/h)
Turns at more than 60° bank	108 kts (200 km/h)

Authorized "U" category figures	Initial speed
Chandelle	130 kts (220 km/h)
Lazy eight	130 kts (240 km/h)
Turns at more than 60° bank	108 kts (200 km/h)

Intentional spins are prohibited in utility category operations

If, during one of the figures the engine stops, it is preferable to close throttle during the recovery only. The above figures can be performed without causing the engine to stop and at a load factor not exceeding 4 g.

INVERTED SPIN PROHIBITED.

Inverted flight

Inverted flight is only permitted for aircraft fitted with an oil recuperation system and dry battery.

Inverted flight is only permitted for up to 20 seconds.

In order to prevent engine roughness apply following procedure:

Entry Speed ..... 119 kts (220 km/h)
As aircraft becomes inverted .....close throttle
For 20 seconds only..... maintain speed above 80 kts (150 km/h)
After return to normal flight .....open throttle smoothly

All aircraft are fitted with an oil recuperation system and dry battery.

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Section 5 : Performance

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Noise Limitation

In compliance with the decree dated April 3, 1980 the maximum noise level permissible for the R2160D aircraft, corresponding to the approved maximum gross weight of 1764 lb (800 kg), is equal to 70.7 dB(A)

The noise level determined in the conditions laid down in the above-mentioned Decree, at maximum continuous power, is equal to 69.8 dB(A).

In compliance with this Decree dated July 30 1975 the R2160D aircraft has been granted the type Certificate of Noise Limitation No. 70 on October 24 1980.

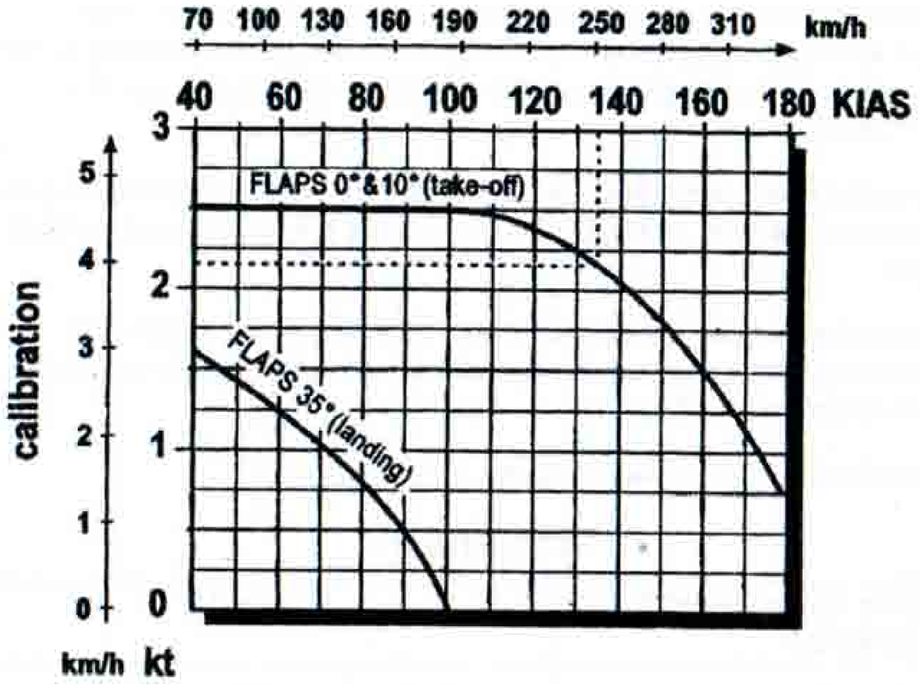
Demonstrated cross-wind limit: 18 kt (33 km/h)

Stall Speeds

Engine idling, weight: 800 kg (1764 lb)	**kt (km/h)**		
Bank angle	0°	30°	60°
Flaps up	58 (107.5)	68 (126)	89 (165)
Flaps 10°, take off position	55 (102)	66 (121)	86 (160)
Flaps 35°, landing position	48 (89)	55 (101)	72 (133)

Engine idling, weight: 900 kg (1984 lb)	**kt (km/h)**		
Bank angle	0°	30°	60°
Flaps up	63 (117)	68 (126)	89 (165)
Flaps 10°, take off position	61 (113)	66 (121)	86 (160)
Flaps 35°, landing position	51 (94)	55 (101)	72 (133)

Airspeed Installation Calibration



Example

If KIAS is 135 kts (250 km/h), flaps up then KCAS will be 137 kts (254 km/h)

NOTE

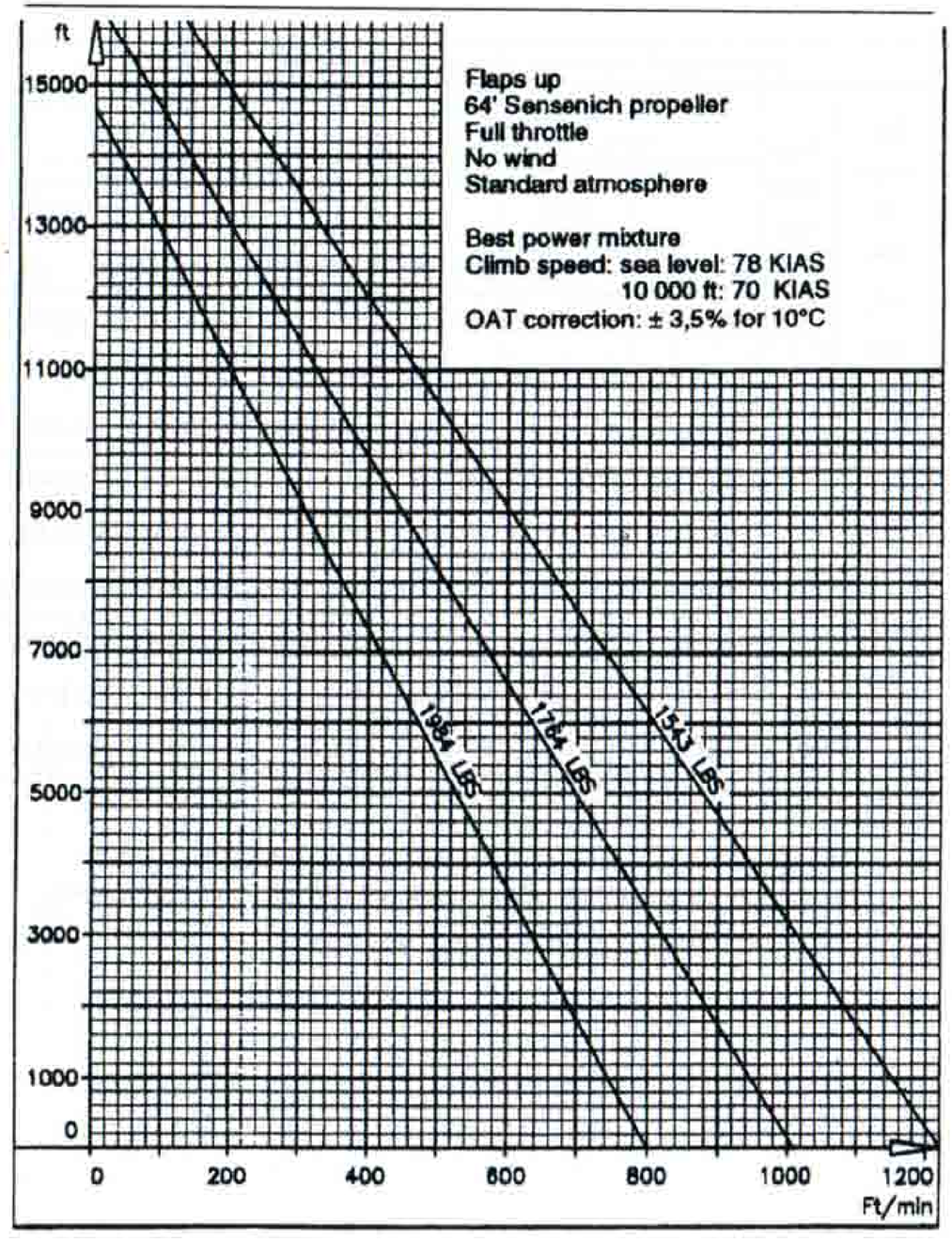
All speeds in this manual are indicated airspeeds unless otherwise specified.

Take-Off Performance

Concrete level dry runway. Flaps in take-off position. Full throttle							
Max. weight kg (lb)	Head Wind (kt)	Sea level +15°C		2500 ft – (760 m) +10°C		5000 ft – (1525 m) +5°C	
		Run m (ft)	15 m (50 ft) clear m (ft)	Run m (ft)	15 m (50 ft) clear m (ft)	Run m (ft)	15 m (50 ft) clear m (ft)
900 (1984)	0	320 (1050)	574 (1883)	400 (1312)	700 (2297)	490 (1608)	870 (2854)
	10	224 (735)	476 (1562)	280 (919)	590 (1936)	340 (1115)	730 (2395)
	20	147 (482)	385 (1263)	180 (590)	470(1542)	224 (735)	590 (1936)
800 (1764)	0	230 (754)	410 (1345)	285 (935)	500 (1640)	350 (1148)	620 (2034)
	10	160 (525)	340 (1115)	200 (656)	420 (1377)	245 (804)	520 (1706)
	20	105 (344)	275 (902)	130 (427)	335 (1099)	160 (525)	420 (1377)
700 (1543)	0	160 (525)	285 (935)	200 (656)	350 (1148)	245 (804)	430 (1410)
	10	110 (361)	240 (787)	140 (459)	290 (951)	170 (558)	360 (1181)
	20	70 (230)	190 (623)	90 (295)	235 (771)	110 (361)	290 (951)

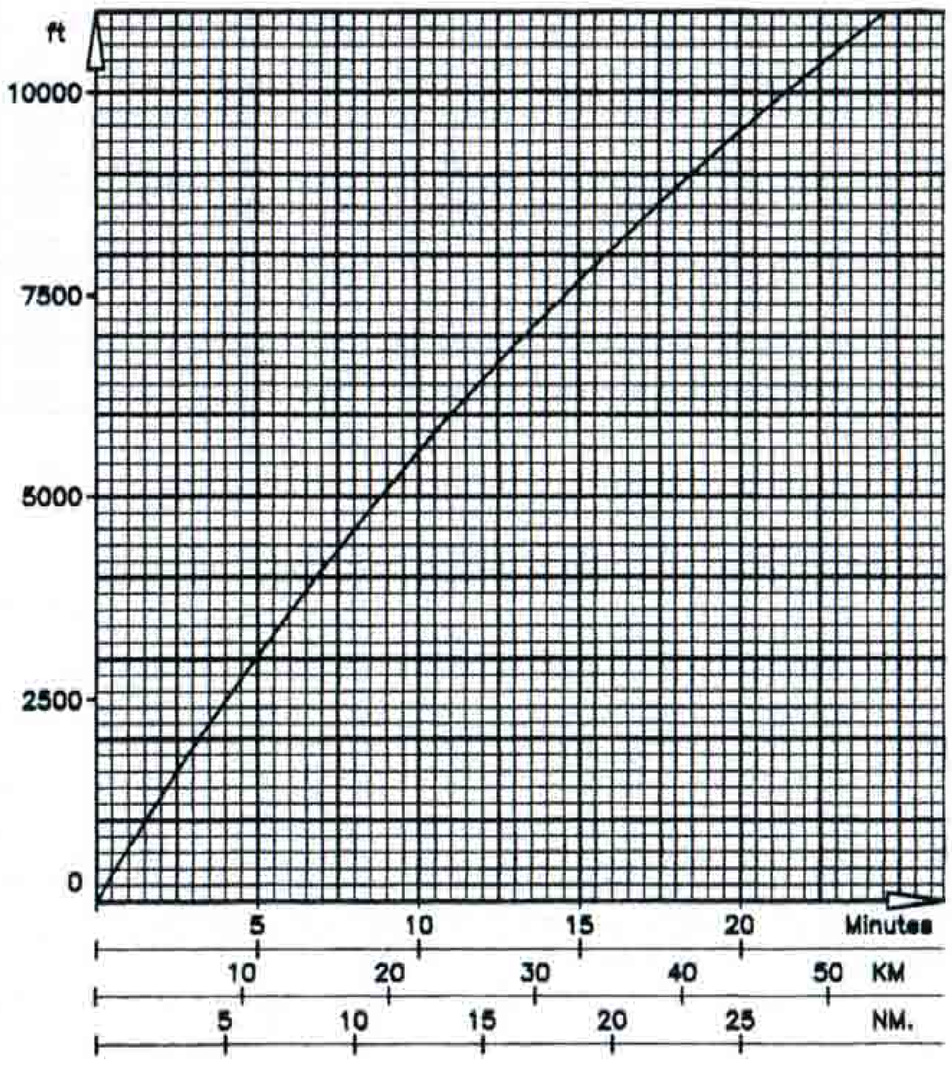
- Increase distances by 8% for every 10°C increase of the standard temperature, at the appropriate altitude concerned.
- Take-off from dry grass runway: add 8%.

Climb Performance



Climb Time/Climb Distance

Standard atmosphere
Flaps up
Full throttle
MTOW 800 kg
Climb speed (IAS): 78 kt (145Km/h)
Consumption 30 l/h



Cruise Performance

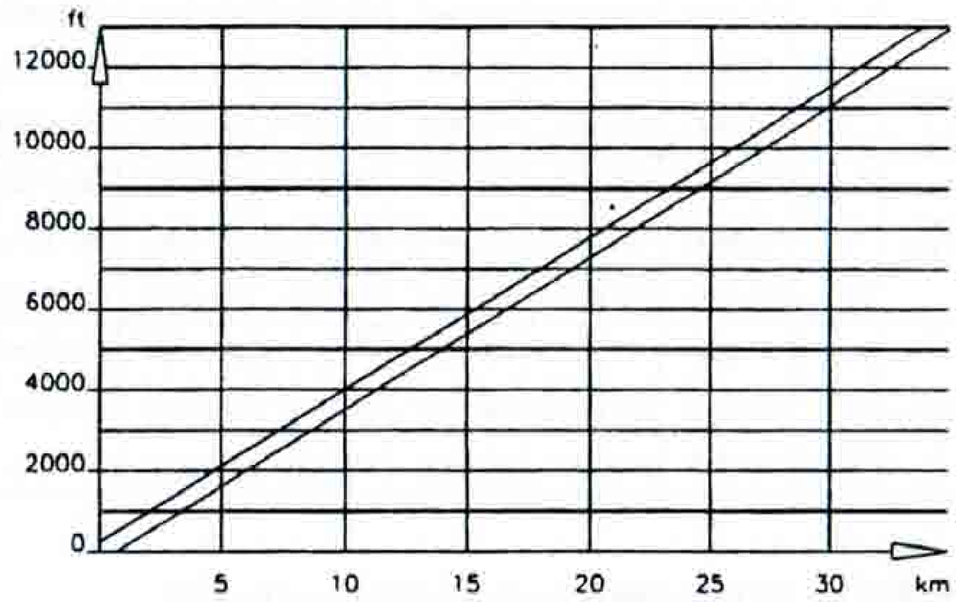
MTOW 800 kg (1764 lb)
Flaps up
Standard atmosphere
No wind
Mixture at best power setting

Altitude	Power		True Air Speed	Fuel Consumption	Endurance	Range	
ZP ft	%	RPM	Kt (km/h)	l/h (us gal)	H:min	Km	Nm
SEA LEVEL	75	2550	116 (215)	35 (9.2)	3:20	725	390
	65	2450	111 (206)	30 (7.9)	3:55	810	435
3000	75	2625	121 (224)	35 (9.2)	3:20	755	405
	65	2525	116 (215)	30 (7.9)	3:55	845	455
5500	75	2650	125 (232)	35 (9.2)	3:20	780	420
	65	2550	119 (220)	30 (7.9)	3:55	865	465
7500	70	2675 (*)	126 (233)	32 (8.7)	3:40	860	460
	65	2600	122 (226)	30 (7.9)	3:55	890	480

(*) full throttle

Glide Performance

Airspeed.....(800 kg) 78 kt (145 km/h)
(900 kg) 83 kt (154 km/h)
Propeller..... windmilling
Flaps ..... up
Without wind



Altitude and temperature do not have a noticeable influence.

In wind-less conditions, with engine of, flaps up, propeller spinning and Vi = 78 kt (145 km/h), the aircraft will glide over a distance equal to 8.7 times the altitude. Altitude and temperature have no substantial effect.

Landing Performance

Dry, hard runway, flaps 35°, power off							
Max. weight kg (lb)	Head Wind (kt)	Sea level +15°C		2500 ft – 760 m +10°C		5000 ft – 1525 m +5°C	
		Run m (ft)	Distance to clear 15 m (50 ft) m (ft)	Run m (ft)	Distance to clear 15 m (50 ft) m (ft)	Run m (ft)	Distance to clear 15 m (50 ft) m (ft)
900 (1984)	0	233 (764)	440 (1444)	250 (820)	465 (1526)	265 (869)	490 (1607)
	10	165 (541)	365 (1197)	175 (574)	390 (1279)	185 (607)	413 (1355)
	20	120 (394)	295 (968)	130 (426)	310 (1017)	140 (459)	335 (1099)
800 (1764)	0	220 (722)	415 (1361)	235 (771)	440 (1443)	250 (820)	465 (1525)
	10	155 (508)	345 (1132)	165 (541)	370 (1214)	175 (574)	390 (1279)
	20	115 (378)	280 (918)	125 (410)	295 (968)	130 (426)	315 (1033)
700 (1543)	0	190 (623)	375 (1230)	205 (672)	400 (1312)	215 (705)	420 (1378)
	10	135 (443)	315 (1033)	145 (476)	335 (1099	150 (492)	350 (1148)
	20	100 (328)	250 (820)	110 (361)	270 (886)	115 (378)	280 (918)

Landing on grass runway: increase distances by 20%.

Approach speed: 65 kt (120 km/h)

Touch-down speed: 58 kt (107 km/h)

Landing with flaps retracted:

Landing speed 76 kts (140 km/h)

Increase landing distances by 50%

Section 6 : Weight and Balance

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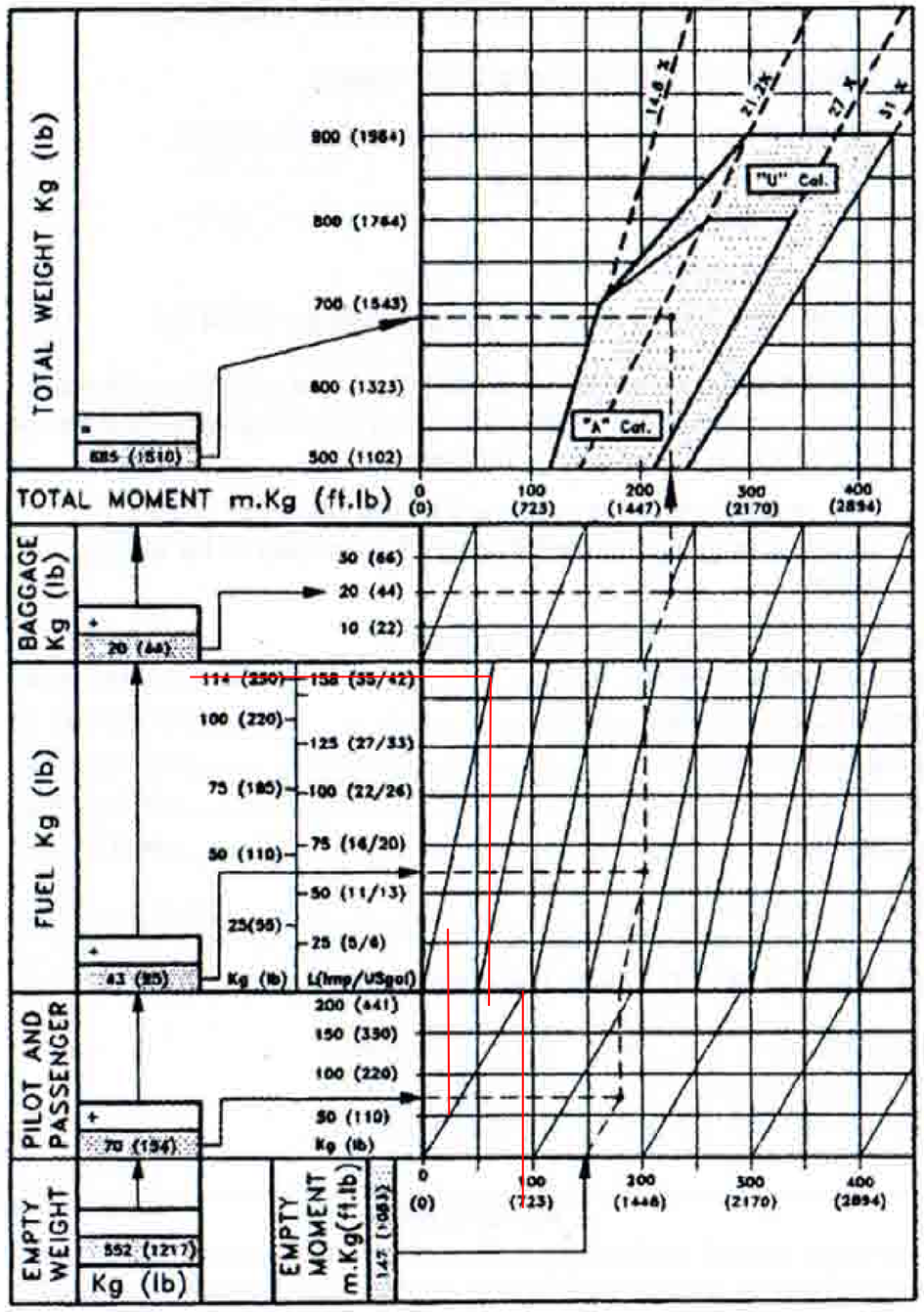

Weight & Balance Work Sheet

Use of Weight and Balance Diagram

1 Calculate the total loaded aircraft weight:

Empty weight (from the weight and balance sheet)

- Pilot and passenger
- Baggage
- Standard fuel

Ensure that total weight does not exceed 900 kg (1984 lb).

2 Place the empty aircraft moment (from the weight and balance sheet) on the upper scale of the previous diagrams, and follow the example indicated by the dashed line.

The resulting point must be within the centre of gravity moment envelope (shaded area) for the load to be within limits.

EXAMPLE*(dashed line on work sheet)

Empty aircraft moment .....(1063 ft.lb) 147 m.kg
Empty aircraft weight.....(1217 lb) 552 kg
Pilot and passenger .....(154 lb) 70 kg
Fuel 60 l (13 imp/16 US gal) .....(95 lb) 43 kg
Baggage.....(44 lb) 20 kg

TOTAL WEIGHT .....(1510 lb) 685 kg

CENTRE OF GRAVITY: with the envelope

1 litre AVGAS = 0.72 kg (1.6 lb)
1 imp gal AVGAS = 3.27 kg (7.2 lb)
1 US gal AVGAS = 2.7 kg (6 lb)

*** ATTENTION**

For your aircraft centre of gravity calculation, please do not use values of empty aircraft weight and empty aircraft moment indicated in the above example! Use the values indicated in the last weight and balance sheet of your aircraft.

Fitted Equipment List

Serial No:-	Registration:	Date:

Item No	Item	Mark if Installed	Weight (kg)	ARM (m)
1	First Aid Kit			
2	Fire Extinguisher			
3	Axe			
4	Airspeed Indicator			
5	Altimeter			
6	Compass			
7	Fuel Contents Gauge			
8	Fuel Flow/Pressure Gauge			
9	Super Clock			
10	Oil Pressure/Temperature Gauge			
11	Vacuum Gauge			
12	Carburettor Temp/OAT			
13	Volt/Ammeter Gauge			
14	Airspeed indicator (secondary)			
15	Artificial Horizon			
16	Altimeter (secondary)			
17	Turn & Slip			
18	Directional Gyro			
19	Vertical Airspeed			
20	Tachometer			
21	Intercom			
22	Voice Annunciator			
23	Encoder			
24	Avionics Cooling Fan			
25	GPS			
26	COM 1			
27	COM 2			
28	Transponder			
29	Emergency Locator Beacon			

Item No	Item	Mark if Installed	Weight (kg)	ARM (m)
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				

Section 7 : Description of Aircraft & Systems

Contents

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Airframe

The Robin R2160D is a low wing, tricycle undercarriage, aerobatic two seat trainer. It is an all metal design of conventional semi monocoque construction. The undercarriage is fitted with fairings to aid drag reduction.

Access to the cabin is via a built in step, hand grabs and a forward sliding bubble canopy.

Cabin

The cabin has provision for pilot, passenger and luggage. The luggage deck has built in tie down points to secure the luggage.

The seats are adjustable fore and aft. A five point aerobatic harness is fitted as standard.

Cabin width	1.06 m (42")
Length	2.06 m (81")
Height	1.25 m (49")

Engine

Lycoming O-320 D	160 BHP @ 2700 rpm

The engine is fitted with a carburettor and carburettor heat. An air/oil separator is fitted in the breather line. Recovered oil is returned to the sump. A "Slick Start" magneto system is installed to improve starting. Also fitted is a "Skytech" light weight starter.

Propeller

Sensenich metal propeller	74DM6S5-2-64
	or 74DM6S5-2-66

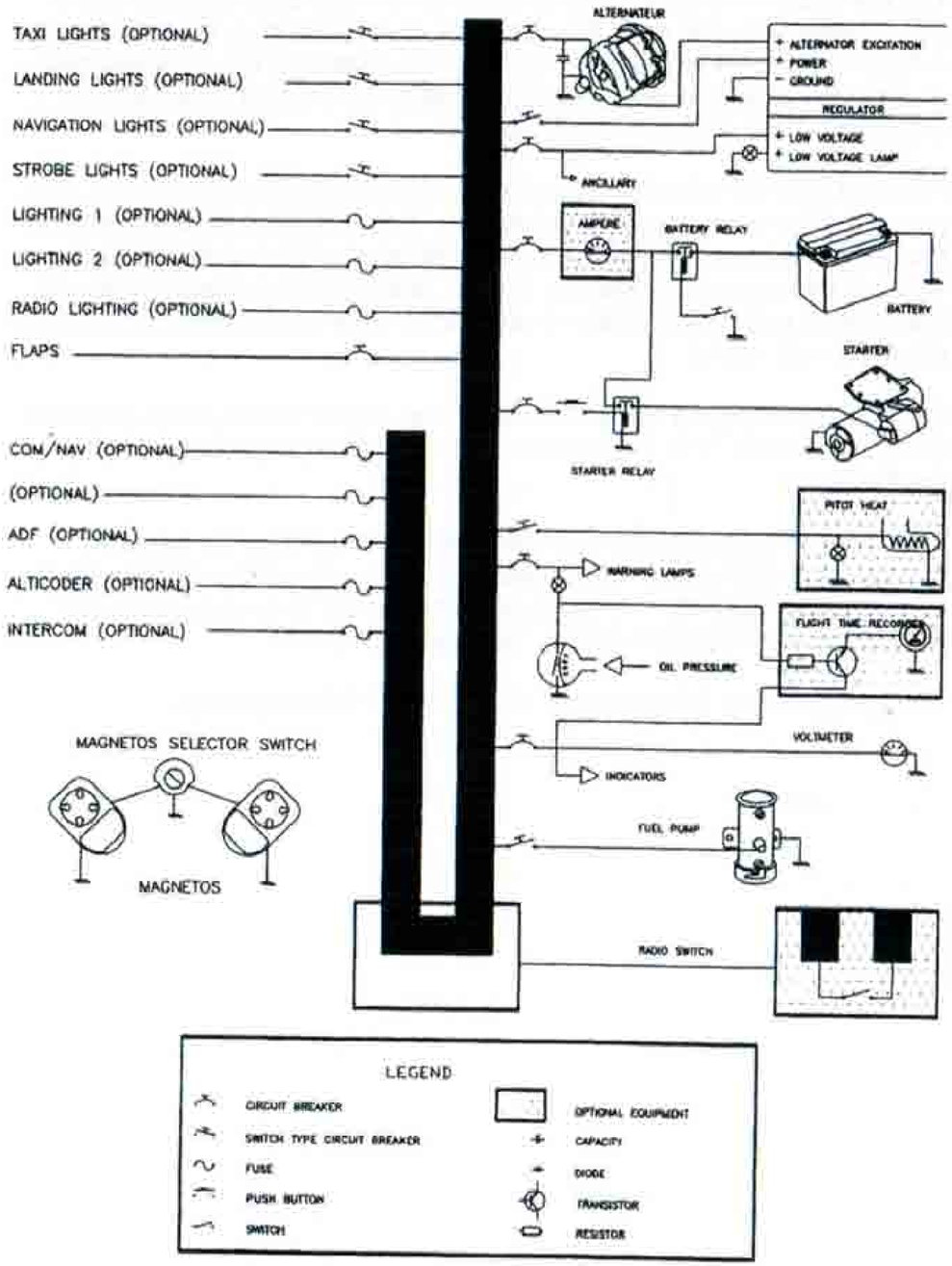
Electrical System

The electrical system is conventional 12 volt with a GelCell lead acid battery and charged by an alternator of 40 Amp output (or 60 Amp output for SN 265 and on). The system is protected by Circuit Breakers of varying capacity. A dual volt/ammeter is provided to monitor the electrical system.

In the event of a failure of the alternator an amber "LOW VOLT" light illuminates in the annunciator panel.

The electrical system includes electrically actuated flaps, along with the following optional equipment: navigation lights, anti collision strobe lights, landing lights and cockpit/instrument lighting.

Electrical System Schematic



Fuel System

The fuel system consists of either a 120 or 160 litre tank mounted under the luggage deck and aft of the seat back. Fuel flows from the tank through a mesh finger strainer via a flexible line to the fuel shut off valve mounted on the lower fuselage skin. The shut off valve is actuated by a push/pull control mounted on the centre consol.

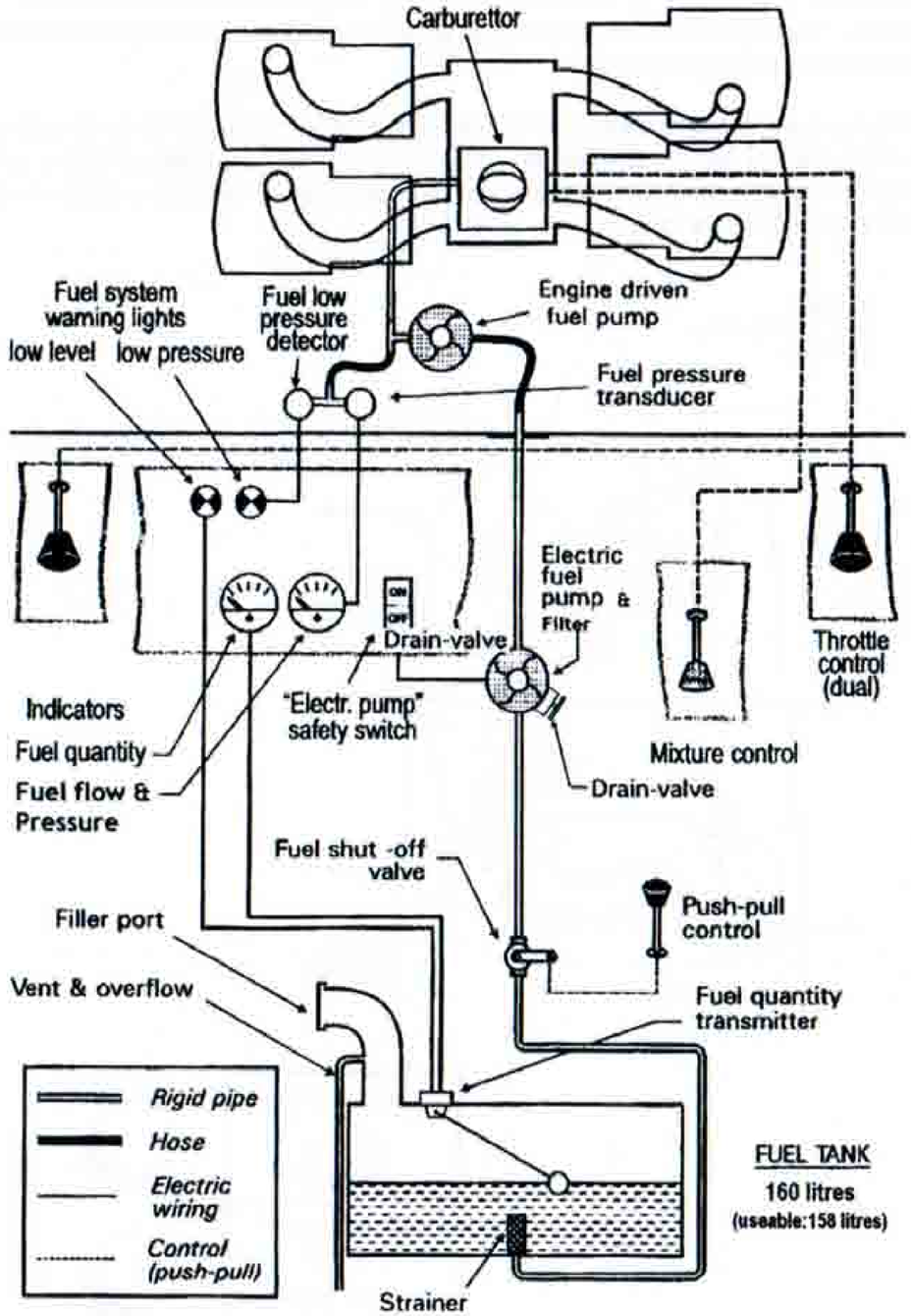
From the shut off valve fuel flows to the adjacent electric boost pump. This pump is at the lowest point in the system. The removable filter housing on the pump has been enlarged to provide an appropriate volume to trap any water or sediment in the system. A quick drain valve has been installed in the housing and permits water drain checks to be carried out during normal pre-flight walk round.

From the pump piping carries the fuel to the engine driven pump and then to the carburettor. The electric fuel pump is actuated by a switch on the centre consol.

Two warning lights in the annunciator panel are provided for the fuel system. One advises low fuel pressure (Fuel Pres) and the other low fuel level (Fuel Low Level). A fuel gauge is fitted to the lower sub panel and adjacent is a combined fuel flow / pressure instrument.

The fuel system is schematically shown on the following page.

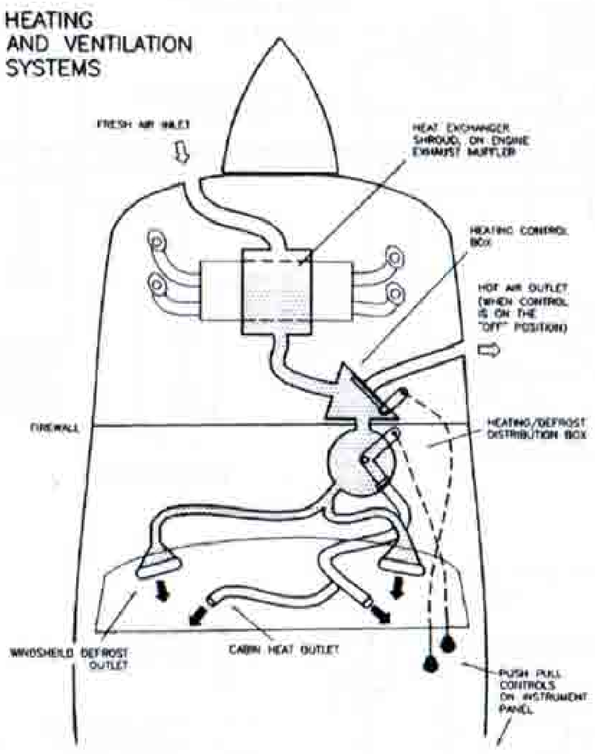
Fuel System Schematic

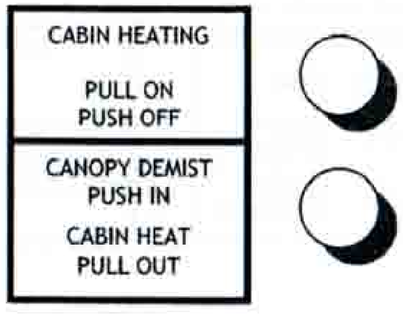


Heating & Ventilation

Fresh air is provided by face level air vents integral with the instrument panel. Heating and demisting is also provided and selected by controls on the lower instrument panel.

The heat source is a heat muff around the muffler. The hot air is directed to a heat control box on the firewall. This on off control permits air to the heat distribution box which in turn can direct heated air to either the cabin or to the windscreen for demisting.





Flight Controls

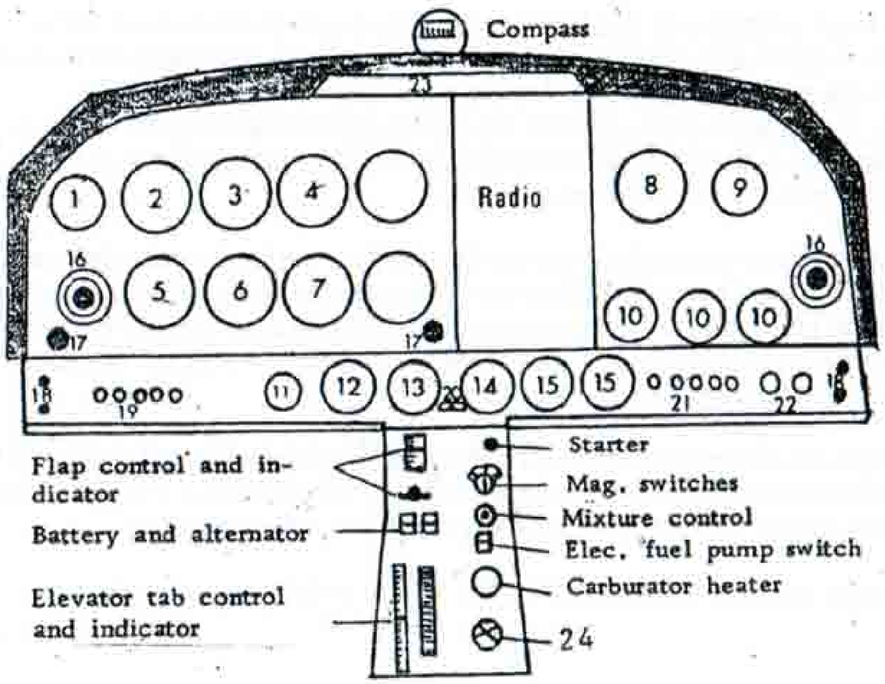
The aircraft is fitted with dual flight controls and can be flown from either the left or right hand seat. The control surfaces are of all metal construction and all are statically balanced. The control surfaces are operated by cables. In the case of the ailerons the cables operate a bellcrank which in turn moves a push rod attached to the aileron. This arrangement provides for differential movement of the ailerons.

Pitch control is provided by a horizontal stabiliser and is provided with anti-servo tabs. Apart from controlling the horizontal stabiliser the tabs are also part of the trim system. The trim system is operated by a knurled trim wheel in the centre consol and via a Telflex cable controls the angular relationship between the tabs and the stabiliser.

The flaps are electrically actuated with three preset positions 0°, 10°, and 35° selected via a three position switch on the centre consul. Flap position is shown on the indicator bar adjacent to the flap selector switch.

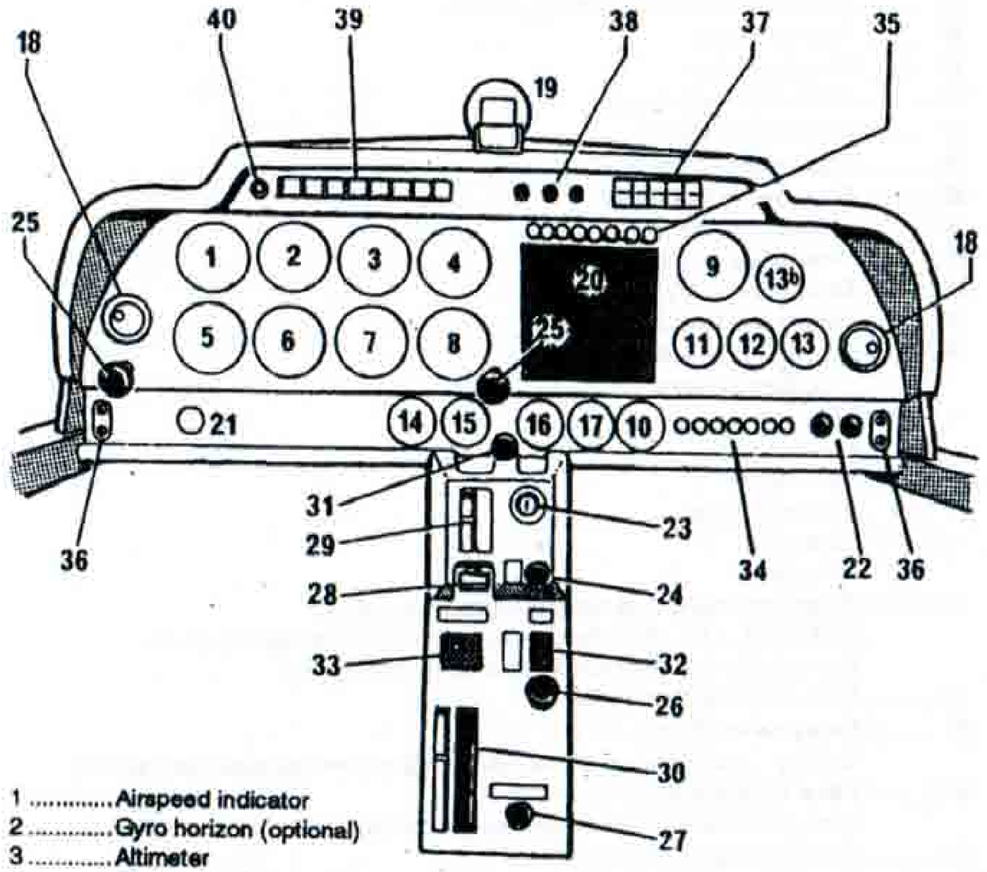
Nose gear steering is controlled by the rudder pedals.

Instrument Panel (SN 001-264)



1 - Stop watch (option)
2 - A.S.I.
3 - Artificial horizon
4 - Altimeter
5 - Bank/turn indicator
6 - Directional (optional)
7 - Rate of climb indicator
8 - RPM indicator
9 - Outside temp. indicator
10 - Options: cylinder temp air temp (carb), EGT accelerometer, or hour counter.
11 - Vacuum gauge
12 - Oil temperature indicator
13 - Oil pressure indicator
14 - Amp or Voltmeter
15 - Fuel content indicator
15 - Fuel pressure (optional)
16 - Fresh air vent
17 - Throttle control
18 - Radio jack plugs
19 - Switches-circuit breakers
20 - Handbrake
21 - Circuit breakers
22 - Heating / demisting
23 - Warning lights (optional)
24 - Fuel shut-off control

Instrument Panel (SN 265 and on)



1 .....Airspeed indicator
2 .....Gyro horizon (optional)
3 .....Altimeter
4 .....Optional equipment
5 .....Turn coordinator (turn and bank indicator optional)
6 .....Directional gyro (optional)
7 .....Rate of climb indicator (optional)
8 .....Tachometer (or optional equipment)
9 .....Optional equipment (or tachometer)
10 .....Fuel pressure
11 to 13 ..Optional equipment
14 .....Oil pressure
15 .....Oil temperature
16 .....Fuel quantity indicator
17 .....Voltmeter
18 .....Cabin ventilators
19 .....Magnetic compass
20 .....COM/NAV (optional)

Section 9 : Supplements

Contents

Ground Handling

To enable the aircraft to be moved by hand without pushing on the airframe, a tow bar is provided. When steering the aircraft with the tow bar care should be taken to ensure the limit stops are not forced.

NOTE

The outer two thirds of the propeller and/or spinner should not be used to push against while manoeuvring the aircraft.

Mooring

Mooring points are provided under the wings near the tips. The third point is the tail spring fitting. When mooring, the controls should be prevented from moving by utilising the lap straps to secure the control stick. Care should be taken to ensure the controls are not forced by using only sufficient tension to prevent movement of the surfaces in the wind.

Routine Maintenance

This aircraft is to be maintained in accordance with section 3 of the R2000 Service Manual.

Pilot maintenance may be permitted if the Rules of the Civil Aviation Authority of the country in which the aircraft is operated provides for such maintenance.

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SUPPLEMENT 1: Night VFR Equipment

Table of Contents

SECTION 1- GENERAL

The R2160Daircraft can be used in Night VFR during non-icing conditions after implementation of "Modification majeure No. 34". This major modification provides for the installation of an instrument panel lighting system.

List of compulsory regulation equipment to enable NIGHT VFR flight.

- Artificial horizon
- Turn indicator (ball, needle)
- Directional gyro
- Vertical speed indicator
- Navigation lights
- Flashing beacon (anti-collision)
- Landing light
- Instrument panel adjustable lighting
- Electrical torch
- Night VFR placard
- Cat. 2 VHF
- Car. 2 VOR or radio compass
- Spare fuses

SECTION 2- LIMITATIONS

The limitations applicable to the NIGHT VFR aircraft are identical to those applicable to the standard aircraft, as indicated in Section 2 of this manual.

The following warning plate must be fixed on the instrument panel:

NIGHT and DAY VFR
in NON-ICING conditions

SECTION 3- EMERGENCY PROCEDURES

The following procedures supplement those applicable to the standard aircraft described in Section 3.

Lighting Failure

Lighting 2..... on
Lighting 1 fuse.....verify

If the failure persists, the lighting 2 and torch can be used as emergency lighting.

Landing Lights Failure

Taxi lighting switch-type circuit breaker..... verify
Landing without lights does not raise any particular difficulties.

Battery Failure

If the ammeter or voltmeter display is abnormal:

- Check the charge circuit breaker: if set, trip it. If tripped, try to reset it once
- When the circuit breaker is finally tripped, switch off the navigation lights. Switch off one by one all items of electrical equipment not essential for the continuation of the flight.

Total Electrical Failure

Check all the switches, as well as the charge and alternator circuit breakers.

If the charge circuit breaker alone has tripped:

- Switch off the electrical equipment not essential for the continuation of flight.
- Reset the charge circuit breaker.

If the circuit breaker and switches are in position:

- Trip the charge and alternator circuit breakers.
- Switch off all electrical equipment and, if required, use the emergency electrical torch.

SECTION 4- NORMAL PROCEDURES

These procedures supplement those applicable to the standard aircraft described in Section 4.

Preparation

Study the metrological report to avoid flying in dangerous conditions (min. visibility, icing....)

Check fuel tank contents to ensure that regulations are observed.

Preflight

Check the operation of:

- Flashing beacon.
- Navigation lights.
- Cabin and instrument panel lighting.
- Landing light
- Make sure that an emergency electrical torch is present and in working order.

Taxiing

Flashing beacon, navigation light ..... on
Landing light..... on
Gyroscopic instruments .....check operation
Horizon.....set model – horizontal bar
Directional gyro..... correct rotation
Ball/needle .....correct direction

Before Take-Off

Vacuum pressure for instruments..... check
VHF equipment .....test
VOR or radio compass equipment.....test
Heating – demisting ..... as required

Take-Off

Vertical speed indicator..... keep positive
At night, switch off the landing lights at the end of the runway.

Climbing and Cruising

It must be remembered that above 8000 ft the pilot may experience night vision trouble.

Use of Lighting Equipment

General lighting system 1 (adjust brightness as required) ..... switch on
Adjust with general lighting system 2

SECTION 5- PERFORMANCE

Unchanged.

SECTION 6- WEIGHT & BALANCE

Unchanged.

SUPPLEMENT 2: CENTURY II B Autopilot Roll Stabilizer

Table of Contents

SECTION 1- GENERAL

The CENTURY II B is an all electric, single axis (roll) autopilot system. It provides course intercept, tracking and coupler for VOR/ILS optional equipment.

Operational procedures for the autopilot system are detailed in the pilot's guide furnished with the instrument.

SECTION 2- LIMITATIONS

Do not use the roll stabilizer during take-off or landing.

Minimum use height 500ft
Maximum use speed ..... 260 km/h (140 kts)

IMPORTANT
Do not use the roll stabilizer in case of Directional Gryo, vacuum pump or system failure

SECTION 3- EMERGENCY PROCEDURES

In case of incorrect operation, the roll stabilizer may be disengaged either by means of the push-button located on the control stick, or by means of the main switch located on the control console.

Furthermore, the stabilizer may be easily overridden by actuating the manual flight controls.

SECTION 4- NORMAL PROCEDURES

Pre-flight Checks.

With Engine running and gyro operating:
Vacuum pressure ..... 4.75 – 5.0 in Hg
Mode selector ..... HDG
Turn control knob and heading indicator ..... central
Auto-pilot ..... on
Turn control knob ..... L/R
Control stick movement correct ..... checked
Heading mode ..... on
Heading selector ..... L/R
Control stick movement correct ..... checked
A.P. release button ..... pressed
A.P. disengaged ..... checked

Before Take-ff and Landing

Stabilizer main switch on OFF

Climb, Cruise, and Descent

Elevator trim ..... set
Wings horizontal ..... checked
Turn control knob ..... central
HDG mode ..... selected
Heading selector ..... central
A.P. ..... engaged
Navigation mode ..... selected

NOTE

To fly horizontally and without any heading drift, ensure that the stabilizer trim is correctly set and keep the ball of the indicator perfectly central.

SECTION 5- PERFORMANCE

Unchanged.

SECTION 6- WEIGHT & BALANCE

Refer to Weight and Balance data detailed in modification accomplishment instructions.

SUPPLEMENT 3: Aircraft without Wheel Spats

Table of Contents

SECTION 1- GENERAL

Removal of the wheel spats is permitted.

SECTION 2- LIMITATIONS

Unchanged.

SECTION 3- EMERGENCY PROCEDURES

Unchanged.

SECTION 4- NORMAL PROCEDURES

Unchanged.

SECTION 5- PERFORMANCE

Take off performance
The 50 ft (15 m) clearance distance must be increased by 2.1%.

Climb Performance
The climb rate must be decreased by 2%.

Cruise Performance
Level flight speeds must be decreased by 6%.

SECTION 6- WEIGHT & BALANCE

The empty weight must be decreased by the weight of the wheel spats.

The movement of the Centre of Gravity is insignificant.

SUPPLEMENT 4: GPS

Table of Contents

SECTION 1- GENERAL

The description of the GPS and the operational procedures are detailed in the GPS pilot's guide furnished with the instrument.

SECTION 2- LIMITATIONS

The following placard completes those detailed in Section 2.

GPS LIMITED TO VFR USE ONLY

SECTION 3- EMERGENCY PROCEDURES

Unchanged.

SECTION 4- NORMAL PROCEDURES

Unchanged.

SECTION 5- PERFORMANCE

Unchanged.

SECTION 6- WEIGHT & BALANCE

Refer to Weight and Balance data detailed in modification accomplishment instructions.

SUPPLEMENT 5: Enlarged Canopy

Table of Contents

SECTION 1- GENERAL

In order to improve the habitability of the cockpit, the R2160 can be fitted with an enlarged canopy by the incorporation of "Modification majeure No. 99".

SECTION 2- LIMITATIONS

Unchanged.

SECTION 3- EMERGENCY PROCEDURES

Speeds must be increased by 5%.

SECTION 4- NORMAL PROCEDURES

Unchanged with the addition of

Spin Recovery

The spin recovery could equally be accomplished by following the optional procedure:

Throttle..... idle
Flaps .....up
Rudder .....fully opposed to direction of spin
Elevator control.....full forward until rotation stops
Ailerons.....neutral

SECTION 5- PERFORMANCE

Unchanged.

SECTION 6- WEIGHT & BALANCE

Refer to Weight and Balance data detailed in modification accomplishment instructions.