Aircraft Flight Manual

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1st Edition – Rev. 4
2021, December 22th

TECNAM P92 Echo MKII

MANUFACTURER: *COSTRUZIONI AERONAUTICHE* ***TECNAM****S.p.A.*
AIRCRAFT MODEL:***P92 Echo MKII***

SERIAL NUMBER: …….....

BUILD YEAR: …….....

REGISTRATION MARKINGS: ……..

This manual must always present on board the aircraft.

The aircraft is to be operated in compliance with information and limitations contained herein.

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Section 0

INDEX

1. RECORD OF REVISIONS

Any revision to the present Manual, except actual weighing data, is recorded: a Record of Revisions is provided at the front of this manual and the operator is advised to make sure that the record is kept up-to-date.

The Manual issue is identified by Edition and Revision codes reported on each page, lower right side.

The revision code is numerical and consists of the number "0"; subsequent revisions are identified by the change of the code from "0" to "1" for the first revision to the basic publication, "2" for the second one, etc.

Should be necessary to completely reissue a publication for contents and format changes, the Edition code will change to the next number (“2” for the second edition, “3” for the third edition etc).

Additions, deletions and revisions to existing text will be identified by a revision bar (black line) in the left-hand margin of the page, adjacent to the change.

When technical changes cause expansion or deletion of text which results in unchanged text appearing on a different page, a revision bar will be placed in the right-hand margin adjacent to the page number of all affected pages providing no other revision bar appears on the page.

These pages will be updated to the current regular revision date.

In order to be constantly updated on change on this document from TECNAM, It is the responsibility of the owner to register on TECNAM website at:

www.tecnam.com

NOTE: It is the responsibility of the owner to maintain this handbook in a current status when it is being used for operational purposes.

Rev	Revised page	Description of Revision
0	All	First issue
1	0-1,4,5 7-1,9,10	System description optimization Typo error
2	0-1,4,5,7 1-6 4-9,10,11 9-1,2,3,4	Normal Procedure and Performance Optimization Update Oil stick minimum recommended level Updated of Normal Procedure Speed and Supplements List
3	0-1,4,5 2-3,4 5-6,9,10 6-1	Cover, RoR and LoEP update Limitation and Performance Optimization Typo error
4	0-1,4,5 3 - 17 7 – 17 9 - 3	Cover, RoR and LoEP update Emergency Procedures Optimization Airframe and systems update Supplement List update

2. LIST OF EFFECTIVE PAGES

The List of Effective Pages (LOEP), applicable to manuals of every operator, lists all the basic AFM pages: each manual could contain either basic pages or one variant of these pages when the pages of some Supplements are embodied.

1st Edition ***July 03h 2020***

Section	Pages	Revision
Section 0	0-2,3,6,8	Rev 0
	0-7	Rev 2
	0-1,4,5	Rev 4
Section 1	1-1 thru 5,7 thru 14	Rev 0
	1-6	Rev 2
Section 2	2-1, 2, 5 thru 12	Rev 0
	2-3, 4	Rev 3
Section 3	3-1 thru 16, 18	Rev 0
	3-17	Rev 4
Section 4	4-1 thru 8,12	Rev 0
	4-9,10,11	Rev 2
Section 5	5-1 thru 5, 7, 8, 11, 12	Rev 0
	5-6, 9, 10	Rev 3
Section 6	6-2 thru 16	Rev 0
	6-1	Rev 3
Section 7	7-2 thru 8, 11 thru 16, 18	Rev 0
	7-1,9,10	Rev 1
	7 – 17	Rev 4
Section 8	All	Rev 0
Section 9	1, 2, 4	Rev.2
	3	Rev.4

3. FOREWORD

The P92 MKII is a twin seat, single engine light aircraft with a strut braced high wing and tricycle fixed landing gear with steerable nose wheel.

Section 1 supplies general information and it contains definitions, symbols explanations, acronyms and terminology used.

Before using the airplane, you are recommended to read carefully this manual: a deep knowledge of airplane features and limitations will allow you for operating the airplane safely.

For further information, please contact:

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4. SECTION LISTS

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Section 1 - GENERAL

INDEX

1 INTRODUCTION

The Aircraft Flight Manual has been implemented to provide the owners with information for a safe and efficient use of the aircraft TECNAM P92 Echo MKII.

The **P92 Echo MkII** is a twin seat, single engine light aircraft with a strut braced high wing and tricycle fixed landing gear with steerable nose wheel.

This Flight Manual has been prepared to provide pilots and instructors with information for the safe and efficient operation of this aeroplane.

1.1 WARNING – CAUTION – NOTE

Following definitions apply to warnings, cautions and notes used in the Aircraft Flight Manual.

WARNING

The non-observation of the corresponding procedure can lead, as immediate effect, to a significant reduction of the flight safety.

CAUTION

The non-observation of the corresponding procedure can lead to an equipment damage which leads to a reduction of the flight safety in a short or longer time interval.

NOTE

Draws the attention to a procedure not directly related to safety of flight.

2 THREE VIEW AND DIMENSIONS

2.1 THREE VIEW

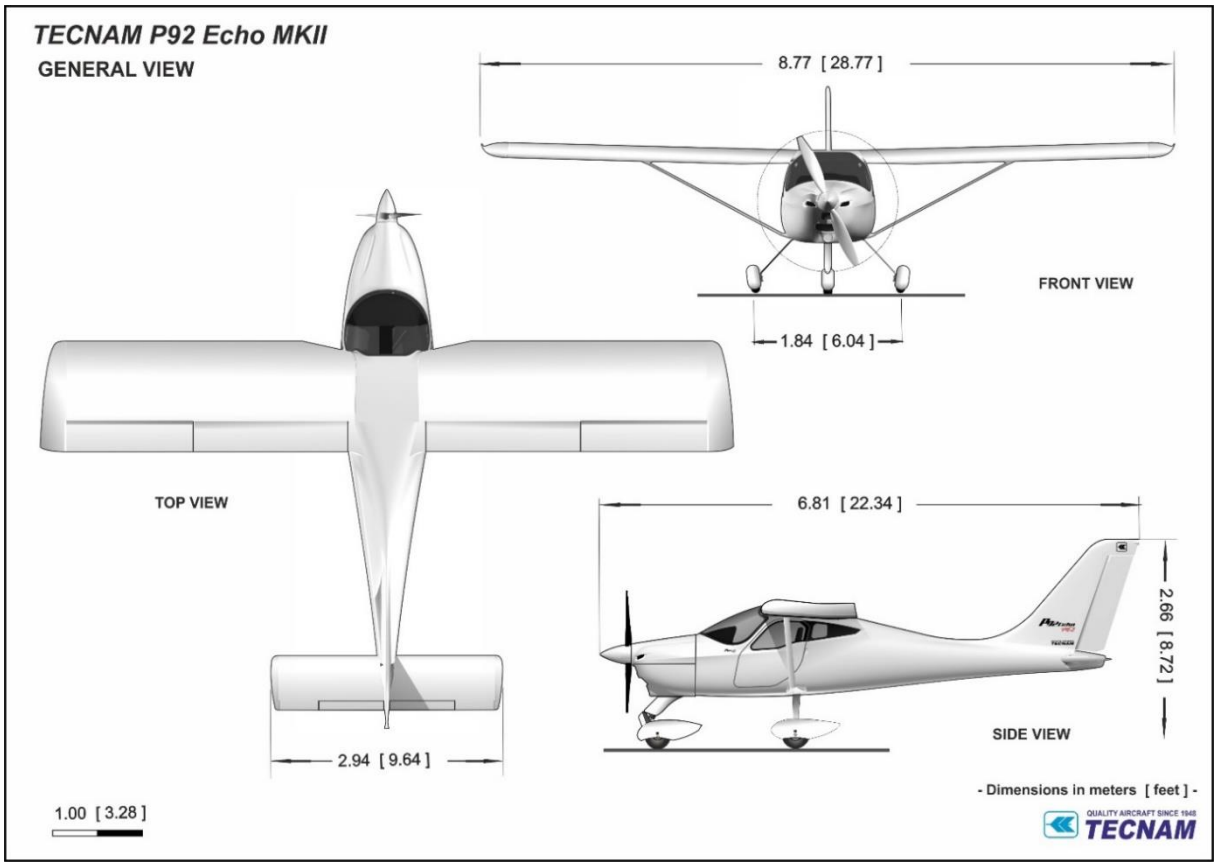

Fig. 1.1 – General views

- Dimensions shown refer to normal operating tire pressure.
- Propeller ground clearance *336 mm*
- Propeller ground clearance with deflated front tire and nose wheel shock absorber compressed *84mm*

2.2 DIMENSIONS

Overall dimensions	
Wingspan	8.77 m /28.77 ft
Length	6.81 m/22.34 ft
Overall height	2.66 m/8.72 ft
Wing	
Wing surface	12.1 m^2/130.24 ft^2
Mean Geometric Chord	1.40 m/4.59 ft
Dihedral	1°30’
Aspect ratio	6.35
Main Landing Gear	
Wheel Track	1.84 m/6.04 ft
Wheelbase	1.74 m
Tire (Air Trac)	5.00-5
Nose Landing Gear	
Tire (Air Trac)	5.00-5

3 GENERAL FEATURES

3.1 CONTROL SURFACES TRAVEL LIMITS

The control surfaces travel limits are reported in the Aircraft Maintenance Manual.

3.2 ENGINE

Manufacturer	Bombardier Rotax GmbH
Model	912 ULS2
Engine type	4 cylinder horizontally-opposed twins with overall displacement of 1352 c.c., mixed cooling, (water-cooled heads and air-cooled cylinders), twin carburetors, integrated reduction gear with torque damper.
Maximum power (at declared rpm)	73.5kW (98.5hp) @5800rpm (max.5') 69.0kW (92.5hp) @5500rpm (cont.)

3.3 PROPELLER

Manufacturer	Sensenich
Model	W68T2ET-70J
Number of blades:	2
Diameter	1730 mm (no reduction allowed)
Type	Fixed pitch – wood

3.4 FUEL

Approved fuel:	MOGAS ASTM D4814 MOGAS EN 228 Super/Super Plus (Min RON 95) AVGAS 100LL (ASTM D910) *(see also Section 2)*
Fuel tanks	Two wing tanks integrated within the wing's leading edge. Equipped with finger strainers outlet and with drain fittings.
Capacity of each wing tank	45 litres
Tanks overall capacity	90 litres
Overall usable fuel	86.9 litres
Overall unusable fuel	3.1 litre

3.5 LUBRICATION

Lubrication system	Forced type with external reservoir
Oil	Lubricant specifications and grade are detailed into the "Rotax Operators Manual" and in its related documents.
Oil capacity	Max. 3 litres – min. 2.0 litres(*)

(*) :In accordance with SB-912-040 R1 the minimum oil level is recommended to 2.50 liters.

3.6 COOLING

Cooling system	Mixed air and liquid pressurized closed circuit system
Coolant liquid	Coolant type and specifications are detailed into the "Rotax Operator's Manual" and in its related documents.

THE CONTROL SURFACES TRAVEL LIMITS ARE REPORTED IN THE AIRCRAFT MAINTENANCE MANUAL.

3.7 WEIGHTS

See Section 2.

3.8 STANDARD WEIGHTS

Empty Weight: see weighing record on Section 6.

3.9 SPECIFIC LOADING

	MTOW 472.5 kg
Wing Loading	39.0 kg/m^2
Power Loading	4.8 kg/hp

THE CONTROL SURFACES TRAVEL LIMITS ARE REPORTED IN THE AIRCRAFT MAINTENANCE MANUAL.

4 ACRONYMS AND TERMINOLOGY

4.1 GENERAL AIRSPEED TERMINOLOGY AND SYMBOLS

CAS	Calibrated Airspeed is the indicated airspeed, corrected taking into account the errors related to the instrument itself and its installation.
IAS	Indicated Airspeed is the speed shown on the airspeed indicator.
TAS	True Airspeed is the CAS airspeed corrected taking into account altitude and temperature.
V_A	Design Manoeuvring speed is the speed above the which it is not allowed to make full or abrupt control movement.
V_{FE}	Maximum Flap Extended speed is the highest speed permissible with flaps extended.
V_{NO}	Maximum Structural Cruising Speed is the speed that should not be exceeded, except in smooth air and only with caution.
V_{NE}	Never Exceed Speed is the speed limit that may not be exceeded at any time.
V_S	Stall Speed.
V_{S0}	Stall Speed in landing configuration (full flaps).
V_{S1}	Stall speed in the given flap configuration.
V_X	Best Angle-of-Climb Speed is the speed which allows best ramp climb performances.
V_Y	Best Rate-of-Climb Speed is the speed which allows the best gain in altitude over a given time.
V_R	Rotation speed: is the speed at which the aircraft rotates about the pitch axis during take-off

4.2 METEOROLOGICAL TERMINOLOGY

ISA	International Standard Atmosphere: is the air atmospheric standard condition at sea level, at 15°C (*59°F*) and at 1013.25hPa (*29.92inHg*).
QFE	Official atmospheric pressure at airport level: it indicates the aircraft absolute altitude with respect to the official airport level.
QNH	Theoretical atmospheric pressure at sea level: is the atmospheric pressure reported at the medium sea level, through the standard air pressure-altitude relationship, starting from the airport QFE.
OAT	Outside Air Temperature is the air static temperature expressed in degrees Celsius (°C).
T_S	Standard Temperature is 15°C at sea level pressure altitude and decreased by 2°C for each 1000 ft of altitude.
H_P	Pressure Altitude is the altitude read from an altimeter when the barometric subscale has been set to 1013 mb.

4.3 ENGINE POWER TERMINOLOGY

RPM	Revolutions Per Minute: is the number of revolutions per minute of the engine.

4.4 AIRCRAFT PERFORMANCE AND FLIGHT PLANNING TERMINOLOGY

Crosswind Velocity	is the velocity of the crosswind component for which adequate control of the airplane during take-off and landing is assured.
Usable fuel	is the fuel available for flight planning.
Unusable fuel	is the quantity of fuel that cannot be safely used in flight.
G	is the acceleration of gravity.

4.5 WEIGHT AND BALANCE TERMINOLOGY

Datum	"Reference datum" is an imaginary vertical plane from which all horizontal distances are measured for balance purposes.
Arm	is the horizontal distance of an item measured from the reference datum.
Moment	is the product of the weight of an item multiplied by its arm.
C.G.	Center of Gravity is the point at which the airplane, or equipment, would balance if suspended. Its distance from the reference datum is found by dividing the total moment by the total weight of the aircraft.
Standard Empty Weight	is the weight of the aircraft with engine fluids and oil at operating levels.
Basic Empty Weight	is the standard empty weight to which it is added the optional equipment weight.
Useful Load	is the difference between maximum take-off weight and the basic empty weight.
Maximum Take-off Weight	is the maximum weight approved to perform the take-off.
Maximum Landing Weight	is the maximum weight approved for the landing touchdown (for ***P92 Echo MKII*** it is equivalent to the Maximum Takeoff Weight).
Tare	is the weight of chocks, blocks, stands, etc. used when weighing an airplane, and is included in the scale readings. Tare is deducted from the scale reading to obtain the actual (net) airplane weight.

5 UNIT CONVERSION CHART

MOLTIPLYING		*BY →*	*YIELDS*	
TEMPERATURE				
Fahrenheit	[°F]	$\frac{5}{9}\cdot(F-32)$	Celsius	[°C]
Celsius	[°C]	$\left(\frac{9}{5}\cdot C\right)+32$	Fahrenheit	[°F]
FORCES				
Kilograms	[kg]	2.205	Pounds	[lbs]
Pounds	[lbs]	0.4536	Kilograms	[kg]
SPEED				
Meters per second	[m/s]	196.86	Feet per minute	[ft/min]
Feet per minute	[ft/min]	0.00508	Meters per second	[m/s]
Knots	[kts]	1.853	Kilometres / hour	[km/h]
Kilometres / hour	[km/h]	0.5396	Knots	[kts]
PRESSURE				
Atmosphere	[atm]	14.7	Pounds / sq. in	[psi]
Pounds / sq. in	[psi]	0.068	Atmosphere	[atm]
LENGTH				
Kilometres	[km]	0.5396	Nautical miles	[nm]
Nautical miles	[nm]	1.852	Kilometres	[km]
Meters	[m]	3.281	Feet	[ft]
Feet	[ft]	0.3048	Meters	[m]
Centimetres	[cm]	0.3937	Inches	[in]
Inches	[in]	2.540	Centimetres	[cm]
VOLUME				
Litres	[l]	0.2642	U.S. Gallons	[US Gal]
U.S. Gallons	[US Gal]	3.785	Litres	[l]
AREA				
Square meters	[m^2]	10.76	Square feet	[sq ft]
Square feet	[sq ft]	0.0929	Square meters	[m^2]

6 LITRES / US GALLONS CONVERSION CHART

Litres	US Gallons
5	1.3
10	2.6
15	4.0
20	5.3
25	6.6
30	7.9
35	9.2
40	10.6
45	11.9
50	13.2
60	15.9
70	18.5
80	21.1
90	23.8

US Gallons	Litres
1	3.8
2	7.6
3	11.4
4	15.1
6	22.7
8	30.3
10	37.9
12	45.4
14	53.0
16	60.6
18	68.1
20	75.7
22	83.3
24	90.9

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Section 2 – LIMITATIONS

INDEX

1. INTRODUCTION

Section 2 includes operating limitations and instrument markings of ***P92 Echo MKII*** aircraft, its engines and standard systems and equipment.

2. SPEED LIMITATIONS

The following table addresses the airspeed limitations and their operational significance:

SPEED		IAS [km/h]	IAS [kts]	REMARKS
V_{NE}	Never exceed speed	**260**	**140**	Never exceed this speed in any operation.
V_{NO}	Maximum Structural Cruising Speed	**200**	**108**	Never exceed this speed unless in smooth air, and then only with caution.
V_A	Maneuvering speed	**150**	**81**	Do not make full or abrupt control movements above this speed as this may cause stress in excess of limit load factor
V_{FE}	Maximum flap extended speed	**110**	**59**	Never exceed this speed for any given flap setting.

3. AIRSPEED INDICATOR MARKINGS

Airspeed indicator markings and their colour code are explained in the following table.

MARKING	IAS [km/h]	IAS [kts]	EXPLANATION
White arc	**72-110**	**39-59**	Positive Flap Operating Range (lower limit is $1.1V_{SO}$, at specified maximum weight and upper limit is the maximum speed permissible with landing flaps extension).
Green arc	**81-200**	**44-108**	Normal Operating Range (lower limit is $1.1V_{S1}$ at specified maximum weight and most forward c.g. with flaps retracted and upper limit is maximum structural speed V_{NO}).
Yellow arc	**200-260**	**108-140**	Manoeuvres must be conducted with caution and only in smooth air.
Red line	**260**	**140**	Maximum speed for all operations.
Blue flag	**150**	**81**	Maneuvering speed

4. POWERPLANT LIMITATIONS

Following table reports the operating limitations for aircraft engine installed:

ENGINE MANUFACTURER: Bombardier Rotax GmbH.

ENGINE MODEL: 912 ULS2

MAXIMUM POWER:

	Max Power kW *(hp)*	**Max RPM. Prop. RPM *(engine)***	**Time max. (minutes)**
Max. T.O.	73.5 *(98.5)*	2388 *(5800)*	5
Max. Cont.	69 *(92.5)*	2265 *(5500)*	-

NOTE *With full throttle, at fixed point in no wind conditions, the maximum propeller's RPM should be 2100 ± 100.*

Temperatures:

Max CHT*	135°C
Max CT:	120°C
Min/Max Oil:	50 °C / 130 °C
Oil normal operating range (approx.):	90 °C / 110 °C

* *applicable for Engines up to serial no. 4924543(included) and repaired engine which doesn't change the cylinder head n°3 with new one (part no. 413195)*

Oil Pressure:

Minimum:	0.8 Bar / 12 psi
Normal:	2-5 Bar / 29-73 psi
Maximum:	7 Bar / 102 psi

Engine starting: allowable temperature range

OAT Min	-25° C
OAT Max	+50° C

WARNING *In event of cold starting operation, it is permitted a maximum oil pressure of 7 bar for a short period.*

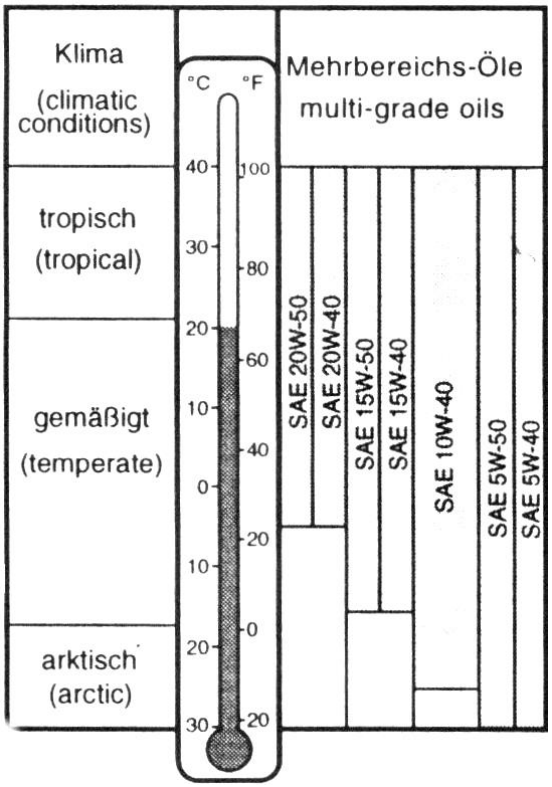
Fuel pressure:

Minimum:	2.2 psi (0.15 Bar)
Normal:	5.8 psi (0.40 Bar) or 7.26 psi* (0.5 Bar)

* only applicable for fuel pump part no. 893110, 893114 and 893115

5. LUBRICANT

Use viscosity grade oil as specified in the following table:



6. COOLANT LIQUID

Coolant type and specifications are detailed into the “Rotax Operator’s Manual” and in its related documents.

7. PROPELLER

MANUFACTURER:	Sensenich Propeller
MODEL:	W68T2ET-70J
TYPE:	Wood twin blade fixed pitch
DIAMETER:	1730 mm (no reduction permitted)

8. MAXIMUM OPERATING ALTITUDE

Maximum operating altitude is 14000 ft (4260 m) MSL.

CAUTION *Flight crew is required to use supplemental oxygen according to Air Operation Rules.*

9. AMBIENT TEMPERATURE

Ambient temperature: from -25°C to +50°C.

WARNING *Flight in expected and/or known icing conditions is forbidden.*

10. POWERPLANT INSTRUMENTS MARKINGS

Powerplant instrument markings and their colour code significance are shown below:

INSTRUMENT		RED RANGE Minimum limit	GREEN RANGE Normal operating	YELLOW RANGE Caution	RED RANGE Maximum limit
Propeller	RPM	----	580 - 2265	2265 - 2388	>2388
Engine	RPM	----	1410- 5500	5500-5800	>5800
Oil temp.	°C	<50	90 - 110	50 - 90 110 - 130	>130
CT	°C	---	0 - 120	---	>120
CHT(1)	°C	---	0 - 135	---	>135
Oil pressure	bar	<0.8	2 - 5	0.8 - 2 5 - 7 (2)	7
Fuel press.	psi	<2.2	2.2-5.8 or 7.26(3)	----	5.8 or 7.26(3)
	bar	<0.15	0.15-0.4 or 0.5(4)	----	0.4 or 0.5(3)
Fuel Q.ty	litres	<0(5)	----	----	----

11. OTHER INSTRUMENTS MARKINGS

INSTRUMENT	RED RANGE Minimum limit	GREEN RANGE Normal operating	YELLOW RANGE Caution	RED RANGE Maximum limit
Voltmeter	<10.5 Volt	12 - 14 Volt	----	----

1 - Applicable for Engines up to serial no. 494543 (included) and repaired engine which doesn't change the cylinder head n°3 with new one (part no. 413195)

2 - In event of cold starting operation, it is permitted a maximum oil pressure of 7 bar for a short period.

3 - when fuel pump part no. 893110, 893114 and 893115 is installed

4 - when fuel pump part no. 893110, 893114 and 893115 is installed

5 - "0" indication shows the unusable fuel quantity (1.55 litres)

12. WEIGHTS

Condition	Weight
Maximum take-off weight	*472.5 kg*

13. CENTER OF GRAVITY RANGE

Forward limit	19% MAC
Aft limit	30% MAC
Datum	Propeller support flange w/o spacer
Bubble Level	Cabin floor

WARNING

The pilot is responsible for ensuring that the airplane is properly loaded. Refer to Section 6 for appropriate instructions.

14. APPROVED MANEUVERS

The aircraft is intended for non-aerobatic operations only.

Non aerobatic operations include:

- Any manoeuvre pertaining to “normal” flight
- Stalls (except whip stalls)
- Lazy eights
- Chandelles
- Turns in which the angle of bank is not more than 60°

WARNING

Aerobatic manoeuvres, including spins and turns with angle of bank of more than 60°, are not approved for such a category.

WARNING

Limit load factor could be exceeded by moving abruptly flight controls at their end run at a speed above V_A.

15. MANEUVERS LOAD FACTOR LIMITS

Maneuver load factors limits are as follows:

Positive	Negative
+ 4.0 g	**- 2.0 g**

Maneuver load factors limits with flaps extended are as follows:

Positive	Negative
+ 2.0 g	**0 g**

CAUTION

Prolonged use of Aviation Fuel Avgas 100LL results in greater wear of valve seats and greater combustion deposits inside cylinders due to higher lead content. Make reference to Rotax Maintenance Manual which prescribes dedicated checks due to the prolonged use of Avgas.

16. FUEL

TWO TANKS:	*45 liters each*
TOTAL FUEL CAPACITY:	*90 liters.*
USABLE FUEL Q.TY:	*86.9 liters*
UNUSABLE FUEL Q.TY:	*1.55 liters each (3.1 litres total)*

Compensate uneven fuel tank levels by acting on the fuel selector valve located into the cabin.

APPROVED FUEL:

- ✓ MOGAS ASTM D4814
- ✓ MOGAS EN 228 Super/Super plus (min. RON 95)
- ✓ AVGAS 100 LL (ASTM D910)

Section 3–EMERGENCY PROCEDURES

INDEX

1. INTRODUCTION

Section 3 includes checklists and detailed procedures to be used in the event of emergencies. Emergencies caused by a malfunction of the aircraft or engine are extremely rare if appropriate maintenance and pre-flight inspections are carried out.

Before operating the aircraft, the pilot should become thoroughly familiar with the present manual and, in particular, with the present section. Further, a continued and appropriate training and self-study should be done.

In case of emergency the pilot should act as follows:

1. *Keep control of the aeroplane*
2. *Analyse the situation*
3. *Apply the pertinent procedure*
4. *Inform the Air Traffic Control if time and conditions allow.*

Two types of emergency procedures are hereby given:

a. "Bold faces" which must be known by heart and executed in the correct and complete sequence, as soon as possible as the failure is detected and recognized;

   These procedures characters are boxed and highlighted, an example is shown below:

BEFORE ROTATION: ABORT TAKE OFF

1.	**Throttle**	***IDLE***
2.	**Rudder**	***Keep heading control***
3.	- -	
4.	- -	

b. Other procedures which should be well theoretically known and mastered, but that are not time critical and can be executed entering and following step by step the AFM appropriate checklist.

NOTE

In this Chapter, following definitions apply:
Land as soon as possible*: land without delay at the nearest suitable area at which a safe approach and landing is assured.*
Land as soon as practical*: land at the nearest approved landing area where suitable repairs can be made.*

2. AIRPLANE ALERTS

2.1. ELECTRIC POWER SYSTEM MALFUNCTION

Generator message alert

NOTE

Generator message alert *(ALT)* may appear on PFD for a faulty alternator or when voltage is above 16V, in this case the over-voltage sensor automatically shuts down the alternator

1. Generator switch: *OFF*
2. Master switch: *OFF*
3. Generator switch: *ON*
4. Master switch: *ON*

If the problem persists

5. Generator switch: *OFF*
6. Non-vital electric equipment: *Shed*

2.2. ELECTRICAL FUEL PUMP FAILURE

1. Electrical fuel pump switch: *OFF*
2. Electrical fuel pump switch: *ON*
3. Fuel pressure: *CHECK raise*

If fuel pressure doesn't build up:

4. **Land as soon as possible** monitoring fuel pressure.

2.3. TRIM SYSTEM FAILURE

Locked Control

Should trim control be inoperative, act as follows:

1. Breakers: *CHECK*
2. Trim switch LH/RH: *CHECK for correct position*
3. Speed: *adjust to control aircraft without excessive stick force*
4. **Land aircraft as soon as possible**.

Runaway

In event of trim runaway, act as follows:

1. Pull TRIM Breaker as soon as possible
2. Speed: *adjust to control aircraft without excessive stick force*
3. **Land aircraft as soon as possible**.

2.4. AIRPLANE EVACUATION

With the engine secured and propeller stopped (if practical):

1. **Parking brake:** ***ON***
2. **Seat belts:** ***unstrap completely***
3. **Headphones:** ***REMOVE***
4. **Door:** ***OPEN***
5. **If door is locked or doesn't open:** ***break using the hammer (if available)***
6. ***Escape away from flames/ hot engine compartment/ spilling fuel tanks.***

3. ENGINE SECURING

Following procedure is applicable to shut-down the engine in flight:

1. Throttle Lever	***IDLE***
2. Magnetos	***OFF***
3. Fuel Selector	***OFF***
4. Electrical fuel pump	***OFF***
5. Generator switch	***OFF***

4. ENGINE FAILURE

4.1. ENGINE FAILURE DURING TAKE-OFF RUN

1.	**Throttle:**	***IDLE (fully out)***
2.	**Rudder**	***Keep heading control***
3.	**Brakes:**	***apply as needed***

When safely stopped:

4.	Magnetos:	*OFF*
5.	Fuel selector valve:	*OFF*
6.	Electric fuel pump*:*	*OFF*
7.	Generator & Master switches:	*OFF*

4.2. ENGINE FAILURE IMMEDIATELY AFTER TAKE-OFF

1. **Find a suitable place to land safely.**
2. **Flaps: as needed**

WARNING

The immediate landing should be planned straight ahead with only small changes in directions not exceeding 45° to the left and 45° to the right.

3.	**Flaps:**	***as needed***

WARNING

Stall speed increases with bank angle and longitudinal load factor. Acoustic stall warning will in any case provide a correct anticipated clue of incipient stall.

At, or right before touch down

4.	**Throttle:**	***IDLE***
5.	**Magnetos:**	***OFF***
6.	**Fuel selector valve:**	***OFF***
7.	**Electric fuel pump:**	***OFF***
8.	**Generator & Master switches:**	***OFF***

WARNING

A single engine aircraft take off should always be preceded by a thorough take off emergency pilot self-briefing. Decision to try an engine emergency restart right after take-off should be taken only if environmental situation requires it: pilot shall never ignore the priority of attentively follow an immediate emergency landing.

After possible mechanical engine seizure, fire or a major propeller damage, engine restart attempt is not recommended.

4.3. ENGINE FAILURES DURING FLIGHT

4.3.1 Low Fuel Pressure

If the fuel pressure indicator falls below the **2.2 psi** *(0.15 bar)*:

1. Electric fuel pump: *ON*
2. Fuel selector valve: *change the fuel feeding tank*
3. Check both fuel quantity indicators

If fuel pressure doesn't build up:

4. **Land as soon as possible** monitoring fuel pressure.

If engine stops:

5. **Land as soon as possible** applying forced landing procedure (See Para. 7)

4.3.2 Oil Pressure limits exceedance

If oil pressure exceeds upper limit (7 bar):

1. Throttle Lever *REDUCE engine power as practical*
2. OIL PRESS and OIL TEMP *CHECK within limits*
3. **Land as soon as practical**

If oil pressure is under the lower limit (0.8 bar):

1. Throttle Lever *REDUCE Minimum practical*
2. **Land as soon as practical**

If oil pressure continues to decrease:

3. **Land as soon as possible** applying forced landing procedure (See Para. 7)

4.3.3 High Oil Temperature

If oil pressure is low see para. 4.3.2 Low Oil Pressure.

If oil pressure is within limits:

1. Throttle Lever *REDUCE Minimum practical*

If oil temperature does not decrease

2. Airspeed *INCREASE*

NOTE

If oil temperature does not come back within limits, the thermostatic valve (if embodied), regulating the oil flow to the heat exchangers, could be damaged or an oil leakage can be present in the oil supply line.

3. **Land as soon as practical**

If engine roughness, vibrations, erratic behaviour, or high CHT /CT is detected:

4. **Land as soon as possible** applying forced landing procedure (See Para. 7)

4.3.4 CHT/CT limit exceedance

If CHT is above 135°C or CT is above 120 °C:

1. Throttle Lever *REDUCE Minimum practical*
2. **Land as soon as practical**

If CHT/CT continues to rise and engine shows roughness or power loss:

3. **Land as soon as possible** applying forced landing procedure (See Para. 7)

5. IN-FLIGHT ENGINE RESTART

WARNING

After a mechanical engine seizure, fire or a major propeller damage engine restart is not recommended.

1.	Electrical fuel pump	*ON*
2.	Fuel quantity indicator	*CHECK*
3.	Fuel Selector	*change the fuel feeding tank*
4.	Magnetos	*BOTH*
5.	Magnetos	*START*
6.	Throttle lever	*SET as required*

CAUTION

After engine restart, if practical, moderate propeller RPM and throttle increase to allow OIL and CHT/CT temperatures for stabilizing in the green arcs.

NOTE

If the fuel quantity in the tank which feeds the stopped engine is low, select the opposite side fuel tank by means of the fuel selector.

In case of unsuccessful engine restart:

1. Engine — *SECURE (see engine securing procedure on Para. 3)*
2. **Land as soon as possible** applying forced landing procedure (See Para. 7)

6. SMOKE AND FIRE

6.1. ENGINE FIRE ON THE GROUND

1.	**Fuel Selector**	***OFF***
2.	**Electrical fuel pump**	***OFF***
3.	**Magnetos**	***OFF***
4.	**Throttle lever**	***FULL POWER***
5.	**Cabin Heat**	***OFF***
6.	**Generator & Master Switches**	***OFF***
7.	**Parking Brake**	***ENGAGED***
8.	**Aircraft Evacuation**	***carry out immediately***

6.2. ENGINE FIRE DURING TAKE-OFF

BEFORE ROTATION: ABORT TAKE OFF

1.	**Throttle Lever**	**IDLE**
2.	**Rudder**	***Keep heading control***
3.	**Brakes**	***As required***

With aircraft under control

4.	**Fuel Selector**	***OFF***
5.	**Electrical fuel pump**	***OFF***
6.	**Magnetos**	***OFF***
7.	**Cabin Heat**	***OFF***
8.	**Generator & Master Switches**	***OFF***
9.	**Parking Brake**	***ENGAGED***
10.	**Aircraft Evacuation**	***carry out immediately***

6.3. ENGINE FIRE IN-FLIGHT

1.	**Cabin heating:**	***OFF***
2.	**Fuel selector valve:**	***OFF***
3.	**Electric fuel pump:**	***OFF***
4.	**Throttle:**	***FULL FORWARD until the engine stops***
5.	**Magnetos:**	***OFF***
6.	**Cabin vents:**	***OPEN***

WARNING

Do not attempt engine restart

7. **Land as soon as possible** applying forced landing procedure (See Para. 7).

6.4. CABIN FIRE / ELECTRICAL SMOKE IN CABIN DURING FLIGHT

1.	**Cabin heating:**	***OFF***
2.	**Cabin vents:**	***OPEN***
3.	**Door:**	***OPEN, if necessary***
4.	**Try to choke the fire. Direct the fire extinguisher (if on board) towards flame base**	

If smoke persists:

1. Generator & Master switches: *OFF*
2. **Land as soon as possible** and evacuate the aircraft

CAUTION

If the MASTER SWITCH is set to OFF, consider that flaps extension and pitch trim operation would be not possible.

6.5. ELECTRICAL SMOKE/FIRE IN CABIN ON THE GROUND

1.	**Generator Switch:**	***OFF***
2.	**Throttle Lever:**	***IDLE***
3.	**Magnetos:**	***OFF***
4.	**Fuel Selector Valve:**	***OFF***
5.	**MASTER SWITCH:**	***OFF***
6.	**Aircraft Evacuation**	***carry out immediately***

7. LANDING EMERGENCY

7.1. FORCED LANDING WITHOUT ENGINE POWER

1. Flap: UP
2. Airspeed (Best glide speed): *65 kts IAS*
3. Find a suitable place to land safely, plan to approach it upwind.
4. Fuel selector valve: *OFF*
5. Electric fuel pump: *OFF*
6. Magnetos: *OFF*
7. Safety belts: *Tighten*

When certain to land

8. Flaps: *as necessary*
9. Generator and Master switches: *OFF*.

NOTE

*Glide ratio is about **10.2** therefore in zero wind conditions every 1000ft Above Ground Level it is possible to cover about 1.5 NM (about 3 km).*

7.2. POWER-ON FORCED LANDING

1. Airspeed (Best glide speed): *65 kts IAS*
2. Flaps: *UP*
3. Locate the most suitable terrain for emergency landing, plan to approach it upwind.
4. Safety belts: *Tighten*
5. Canopy locks: *CHECK LOCKED*

When certain to land, right before touch down

6. Flaps: *as necessary*
7. Fuel selector valve: *OFF*
8. Electric fuel pump: *OFF*
9. Magnetos: *OFF*
10. Generator and Master switches: *OFF*

8. STALL RECOVERY

At the first indication of stall, for example, uncontrolled lateral departure, pitch down, stall warning:

1.	Pitch nose down:	*APPLY until impending stall indications are eliminated*
2.	Wings level	*Obtain and Maintain*
3.	Power:	*As required*
4.	Return to the desired flight path	

CAUTION

Apply smooth and coordinated flight control movements to return the airplane to the desired flight path being careful to avoid a secondary stall.

9. RECOVERY FROM UNINTENTIONAL SPIN

If unintentional spin occurs, the following recovery procedure should be used:

1. **Throttle:** ***IDLE***
2. **Flaps:** ***UP***
3. **Rudder:** ***full, in the opposite direction of the spin***
4. **Stick:** ***forward***

As the spin stops:

5. **Rudder:** ***SET NEUTRAL***
6. **Aeroplane attitude:** ***smoothly recover averting speeds in excess of V_{NE} and maximum load factor (n=+4.0)***
7. **Throttle:** ***Readjust to restore engine power.***

WARNING

Keep full rudder against rotation until spin has stopped.

10. RESCUE SYSTEM DEPLOYMENT

Rescue system should be deployed in the event of a life-threating emergency where parachute activation is determined to be safer than continued flight and landing.

CAUTION

Full deployment of parachute is achieved in about 4 seconds.

Rescue system should only be activated when any other means of handling the emergency would not protect the occupants from serious injury.

CAUTION

Successful deployment depends on aircraft attitude and air-speed: greater deployment altitude yields better chances for successful deployment

Shown below the procedure to be followed:

1. **Airspeed** — **MINUM POSSIBLE** (max speed 140 kts IAS)
2. **Pull activation handle firmly and to end-travel**

After deployment

3. **Fuel selector:** — **OFF**
4. **Magnetos:** — **OFF**
5. **Master Switch:** — **OFF**
6. **Seat Belts and Harnesses:** — **TIGHTEN**

Before impact

7. **Assume emergency landing body position**

The emergency landing body position is assumed by placing both hands on the lap, clasping one wrist with the opposite hand, and holding the upper torso erect and against the seat backs.

8. **After the airplane comes to a complete stop, evacuate quickly and move upwind**

11. OTHER EMERGENCIES

11.1. UNINTENTIONAL FLIGHT INTO ICING CONDITIONS

WARNING

Carburettor ice is possible when flying at low engine rpm in visible moisture (outside visibility less than 5 km, vicinity of fog, mist, clouds, rain, snow or hail) and OAT less than 10°C.

1. Immediately fly away from icing conditions (changing altitude and direction of flight, out of clouds, visible moisture, precipitations)
2. Controls surfaces: *continue to move to maintain their movability*
3. Engine: *increase rpm.*

WARNING

In case of ice formation on wing leading edge, stall speed would increase.

Section 4 – NORMAL PROCEDURES

INDEX

1. INTRODUCTION

Section 4 contains checklists and the procedures for the conduction of normal operation.

2. PRE-FLIGHT INSPECTIONS

Before each flight, it is necessary to carry out a complete aircraft check comprising an external inspection followed by a cockpit inspection as below detailed.

2.1. CABIN INSPECTION

A Weight and balance: *calculate (ref. this AFM sect. 6) check within limits*

B Safety belts: *connected to hard points, check condition*

C Magnetos: *OFF, keys extracted*

D Master switch: *ON*

E Voltmeter: check (10-12 V); Ammeter check (red).

F Lights (*if installed*): *all ON, check operation*

G Acoustic stall warning: *check operation*

H Master switch: *OFF*

I Baggage: *check ELT, luggage stowage and fastened with restraint net.*

2.2. AIRCRAFT WALK-AROUND

To perform the aircraft walk-around, carry out the checklist according to the station shown in Figure 4-1.

WARNING

Visual inspection is defined as follows: check for defects, cracks, detachments, excessive play, unsafe or improper installation as well as for general condition. For control surfaces, visual inspection also involves additional check for freedom of movement and security. Red lubber lines on bolts and nuts shall be intact.

WARNING

Fuel level indicated by the avionics system indication should be verified by visual check of actual fuel quantity embarked in the tanks.

NOTE

Fuel drainage operation must be carried out with the aircraft parked on a level surface. Set Cockpit Fuel Selector Valve to open prior to drain fuel circuit nose section valve.

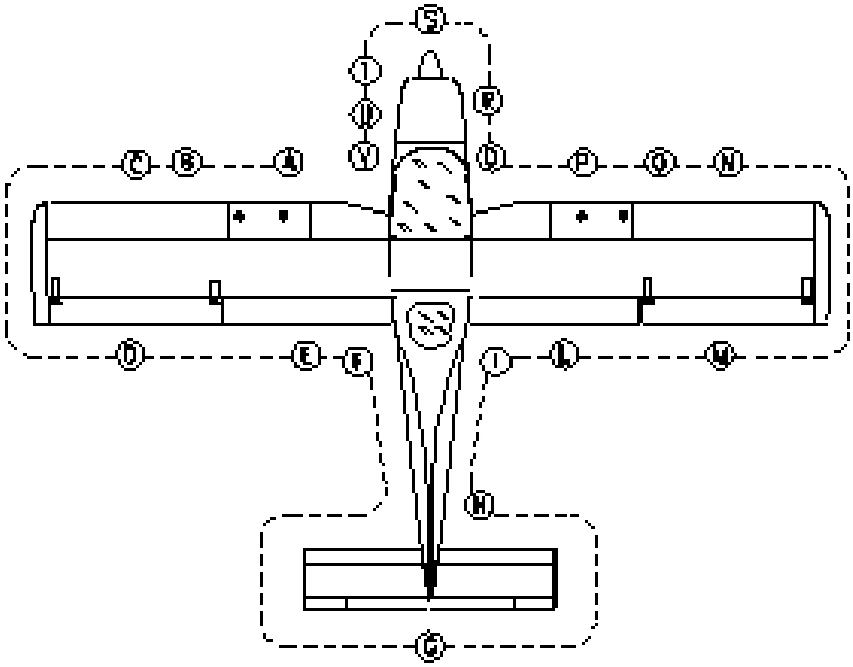


FIG. 4-1

A Left hand fuel filler cap: check visually for desired fuel level and secure. Left tank vent: check for obstructions.

B Remove protection cap and check pitot mounted on left strut is unobstructed, do not blow inside vents, place protection cap inside aircraft.

C Left side leading edge and wing skin: visual inspection

D Left aileron: visual inspection

E Left flap and hinges: visual inspection

F Left main landing gear; check inflation 14 psi (1.0 bar), tire condition, alignment, fuselage skin condition.

G Horizontal tail and tab: visual inspection.

H Vertical tail and rudder: visual inspection.

I Right side main landing gear; check inflation 14 psi (1.0 bar), tire condition, alignment, fuselage skin condition.

L Right flap and hinges: visual inspection.

M Right aileron: visual inspection.

N Right leading edge and wing skin: visual inspection.

O Check freedom of movement of stall detector micro-switch on right side leading edge, activate Master switch and check cabin acoustic warning signal is operative, deactivate Master switch.

P Right side fuel filler cap: check visually for desired fuel level and secure. Right side tank vent: check for obstructions.

Q Right side static port: check for obstructions, do not blow inside vents (read note).

R Nose wheel strut and tire: check inflation 11 psi (0.8 bar), tire condition and condition of rubber shock absorber discs.

S Propeller and spinner condition: check for nicks and security.

T Open engine cowling and perform the following checklist:

I. Check no foreign objects are present.

II. Check the cooling circuit for losses, check coolant reservoir level, insure radiator honeycomb is unobstructed.

III. Check lubrication circuit for losses, check oil reservoir level, insure radiator honeycomb is unobstructed.

IV. Open both fuel shutoff valves, inspect fuel circuit for losses, check integrity of fireproof protection braids, drain circuit using a cup to collect fuel by opening the specific drainage valve located on the firewall, close shutoff fuel valves. Check for water or other contaminants.

U Nose wheel strut and tire: check tire condition and condition of rubber shock absorber discs.

V Left side static port: check for obstructions, do not blow inside vents (read note).

NOTE *Avoid blowing inside Pitot-tube and inside airspeed indicator system's static vents as this may damage instruments.*

3. CHECKLISTS

3.1. BEFORE ENGINE STARTING (AFTER PRE-FLIGHT INSPECTION)

1. Seat position and safety belts adjustment
2. Flight controls: *operate until their stop checking for movement smoothness, free of play and friction.*
3. Parking brake: *engage and brake pedal press/brake lever pull*
4. Throttle friction: *adjust*
5. Circuit Breakers: *check all IN*
6. Master switch: *ON, Check Voltage (at least 10.5 V)*
7. Electric fuel pump: *ON, (check for audible pump noise and fuel pressure build up)*
8. Electric fuel pump: *OFF*
9. Avionic Master switch: *ON, instruments check, then set in OFF*
10. Flap control: *cycle fully extended and then set T/O*
11. Pitch Trim: *cycle fully up and down, from both left and right controls*
12. Pitch trim: *set neutral*

WARNING

Pitch trim other than in neutral position would affect take off performance and take off rotation execution at the correct V_R IAS.

13. Nav. light & Strobe light *(if installed)*: *ON*
14. Fuel quantity: *compare the fuel indication of avionic system with fuel quantity visually checked into the tanks (see Pre-flight inspection – External inspection)*

NOTE

In absence of RH seat occupant: fasten seat belts around the seat so as to prevent any interference with the aeroplane flight control operation and with rapid egress in an emergency.

15. Doors: *Closed and locked*

3.2. ENGINE STARTING

1. Master switch ON.
2. Engine throttle: *idle*
3. Choke: *as needed*
4. Fuel selector valve: *select the tank with less fuel*
5. Electric fuel pump: *ON*
6. Propeller area: *call for CLEAR and visually check*

WARNING

Check to insure no person or object is present in the area close to the propeller. Forward lower sector visibility is not possible from inside the cockpit.

7. Magnetos: *BOTH*
8. Magnetos: *START*
9. Check oil pressure rise within 10 sec. (maximum cold value 7 bar)
10. Generator switch "ON"
11. Check *ALT* message disappears.
12. Voltmeter: check more than 14V
13. Engine parameters: Check
14. Choke: *OFF*
15. Throttle lever: *2430-2915 rpm*
16. Electric fuel pump: *OFF*
17. Check fuel pressure (min 2.2 psi)

3.3. BEFORE TAXIING

1. Radio and Avionics: *ON*
2. Altimeter: *set*
3. Direction indicator: *set in accordance with the magnetic compass*
4. Parking brake: *OFF and taxi*

3.4. TAXIING

1. Brakes: *check*
2. Steering: *check*
3. Flight parameters: *check operation*

3.5. PRIOR TO TAKE-OFF

1. Parking brake: *ON, brake pedal press / brake lever pull*
2. Engine parameters: *Check within limits*
   - Oil pressure: 2-5 bar *(above 3400 rpm)*; 0.8 bar *(below 3400 rpm)*
3. Ammeter check: "green".
4. Electric Fuel pump: *ON*
5. Fuel valve: *select the fullest tank*
6. Fuel pressure: *check*
7. Throttle lever: *advance to 4000 rpm*
   a. Ignition magnetos test: *select LEFT, check RPM drop within 315 rpm;*
   b. Select BOTH: *check propeller speed 4000 rpm;*
   c. Select RIGHT: *check RPM drop within 315 rpm;*
   d. *Maximum difference of speed between LEFT and RIGHT 120 rpm,*
   e. Select BOTH: *check engine 4000 rpm.*
8. Flaps: *set T/O*
9. Pitch trim: *check neutral*
10. Flight controls: *check free*
11. Seat belts: *checked fastened*
12. Doors: *check closed and locked*

3.6. TAKE-OFF AND CLIMB

WARNING

On uncontrolled fields, before line up, check runway wind direction and speed and check for traffic on final

1. Parking brake: *OFF*
2. Throttle lever: *Full Forward*
3. Engine parameters: *check*
4. Rotation at V_R :

	MTOW 472.5 kg
Rotation Speed (V_R)	77 km/h / 41 kts IAS

At safe altitude:

5. Flaps: retract

	MTOW 472.5 kg
Best Rate-of-Climb Speed (V_Y)	120 km/h / 65 kts IAS

6. Electric fuel pump: *OFF*
7. Fuel pressure: *check green arc*
8. Propeller speed: *reduce at or below 5500 rpm*

NOTE

Take-off into crosswind is performed with the flaps normally set at 15° (T/O).

With the ailerons deflected into the wind, accelerate the airplane to a speed slightly higher than normal while decreasing the aileron deflection as speed increases then - with authority - rotate to prevent possible settling back to the runway while drifting. When clear of the ground, make a coordinated turn into the wind to correct for drift.

3.7. CRUISE

1. Set power at or below maximum continuous: *5500 rpm*
2. Check engine parameters within limits

3.8. BEFORE LANDING

1. Electric fuel pump: *ON*
2. Fuel valve: select the fullest tank
3. Landing Light *(if applicable)*: *ON*
4. On downwind, leg abeam touch down point:

   Flaps: set T/O
5. On final leg:

   Flaps: set Land

	MTOW 472.5 kg
Final Approach Speed (V_{REF})	85 km/h / 46 kts IAS

6. Optimanl touchdown speed: 75 km/h / 40 kts IAS

NOTE

Normal crosswind landings are made with full flaps. Avoid prolonged slips. Increase airspeed depending on wind intensity and direction as required above normal approach and landing speeds to accommodate increased stall speed when side slip is added.

After touchdown, hold a straight course with rudder and brakes as required.

The maximum allowable crosswind velocity is dependent upon pilot capability as well as aircraft limitations(refer to Sec 2).

3.9. BALKED LANDING

1. Throttle lever: Full Forward
2. Attitude: attain climb speed
3. Flaps position: retract to *TO* as practical
4. Electric fuel pump: *ON*

3.10. AFTER LANDING

1. Flaps: *UP*
2. Electric Fuel Pump*: OFF*
3. Landing light *(if installed)*: *OFF*

3.11. ENGINE SHUT DOWN

1. Parking brake: *engage*
2. Keep engine running at about 2900 rpm for about one minute in order to reduce latent heat.
3. Avionic equipment: *OFF*
4. Magnetos: *OFF, keys extracted*
5. Strobe light *(if installed)*: *OFF*
6. Master & Generator switches: *OFF*
7. Fuel selector valve: *OFF*

3.12. POSTFLIGHT CHECK

1. Flight controls/surfaces: *lock by means of gust lock (if available)*
2. Wheel chocks and wing mooring lines: *Set (if available)*
3. Parking brake: *release*
4. Doors: *Close and lock*
5. Protection covers: *install*

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Section 5 - PERFORMANCES

INDEX

1. INTRODUCTION

This section provides all necessary data for an accurate and comprehensive planning of flight activity from take-off to landing.

Data reported in graphs and/or in tables were determined using:

- ✓ aircraft and engine in good condition
- ✓ average piloting techniques

Each graph or table was determined according to ICAO Standard Atmosphere (ISA - s.l.); evaluations of the impact on performances were carried out by theoretical means for:

- ✓ Airspeed
- ✓ External temperature
- ✓ Altitude
- ✓ Weight
- ✓ Runway type and condition

2. USE OF PERFORMANCES CHARTS

Performances data are presented in tabular or graphical form to illustrate the effect of different variables such as altitude, temperature and weight. Given information is sufficient to plan the mission with required precision and safety.

Additional information is provided for each table or graph.

3. AIRSPEED INDICATOR SYSTEM CALIBRATION

The difference between indicated airspeed and calibrated airspeed is within of ± 5% or 8 km/h, whichever is greater, for all speeds above 1.3 Vs.

4. ICAO STANDARD ATMOSPHERE

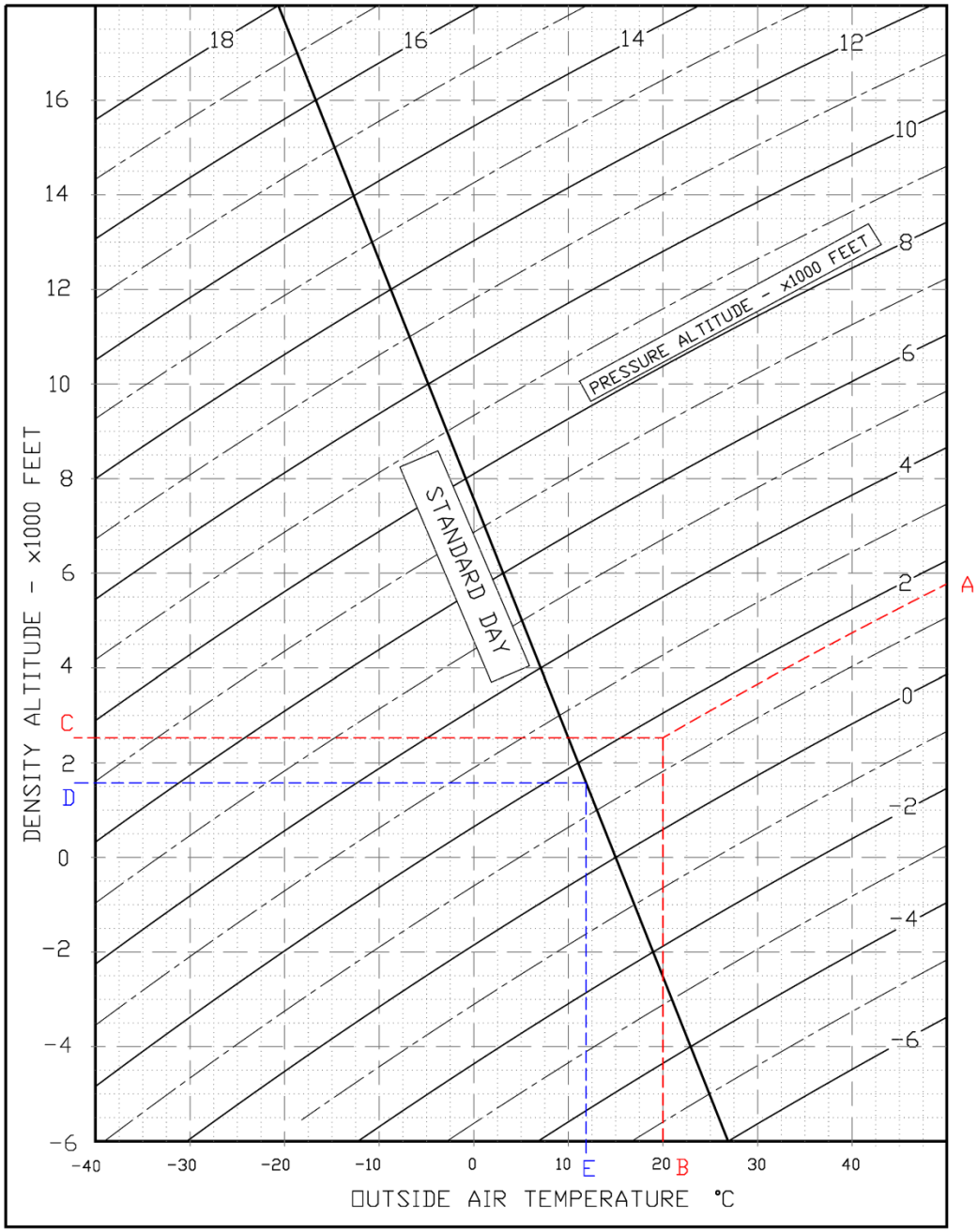


FIG. 5-2. ICAO CHART

Examples:

Scope	***Given***		***Find***
Density Altitude:	**A: Pressure altitude = *1600ft* B: Temperature = *20°C***	→	**C: Density Altitude = *2550ft***
ISA Temperature:	**D: Pressure altitude = *1600ft***	→	**E: ISA Air Temperature = *12°C***

5. STALL SPEED

CONDITIONS:
- weight 450 kg
- engine idle
- no ground effect

	LATERAL BANKING			
	0°	*30°*	*45°*	*60°*
FLAPS	IAS Km/h	IAS Km/h	IAS Km/h	IAS Km/h
0°	**74**	**78**	**84**	**101**
15°	**69**	**76**	**79**	**97**
35°	**65**	**69**	**78**	**91**

	LATERAL BANKING			
	0°	*30°*	*45°*	*60°*
FLAPS	KIAS	KIAS	KIAS	KIAS
0°	**40**	**42**	**45**	**54**
15°	**37**	**41**	**43**	**52**
35°	**35**	**37**	**42**	**49**

NOTE

Altitude loss during conventional stall recovery, as demonstrated during flight tests is approximately 200 ft with banking below 20°.

For Stall Recovery procedure, see Section 3.

6. CROSSWIND

Maximum demonstrated crosswind is 15 Kts

⇒ *Example:*

Given	***Find***
Wind direction (*with respect to aircraft longitudinal axis*) = 30°	Headwind = 17.5 Kts
Wind speed = 20 Kts	Crosswind = 10 Kts

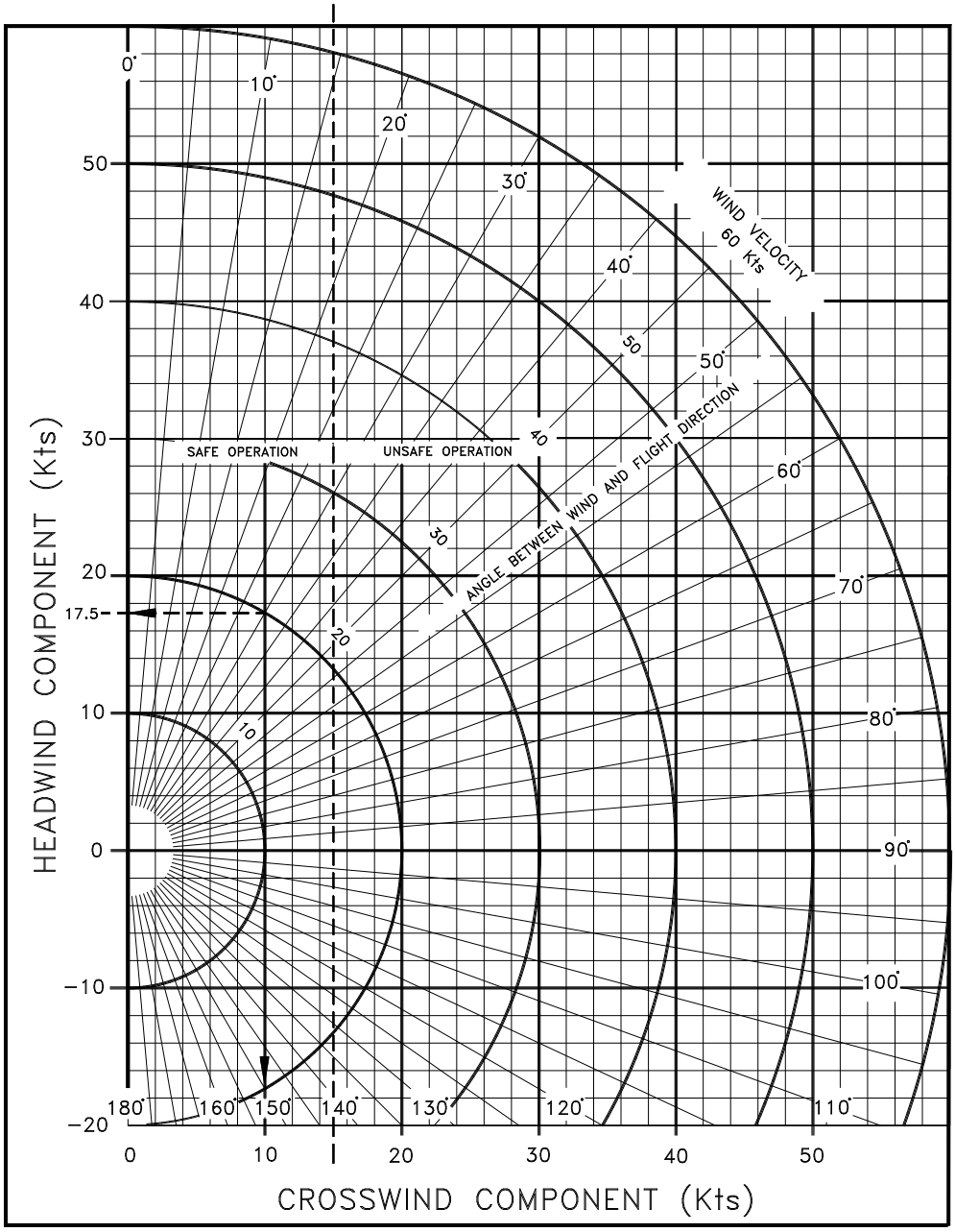


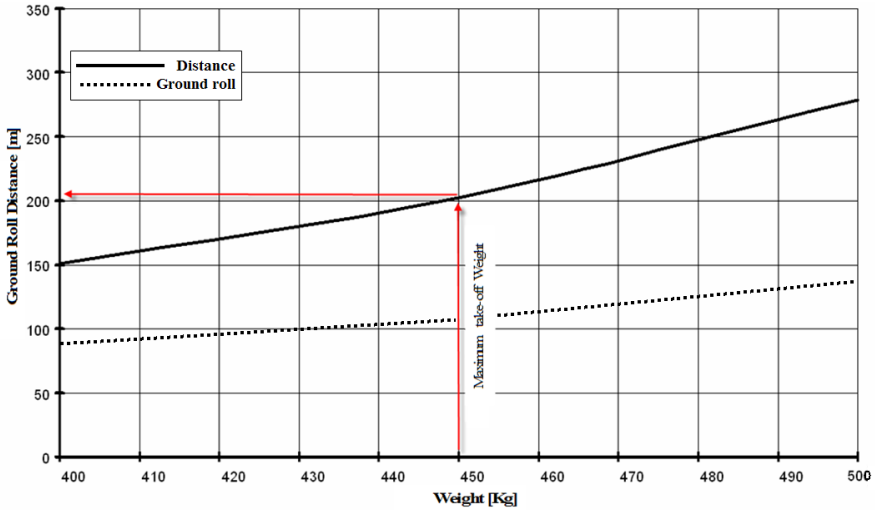
FIG. 5-3. CROSSWIND CHART

7. TAKE-OFF PERFORMANCE

TAKEOFF DISTANCE

CONDITIONS:

- ISA
- Engine: full throttle
- Runway: dry, compact, grass
- Flaps: 15°
- Slope: 0° Wind: zero

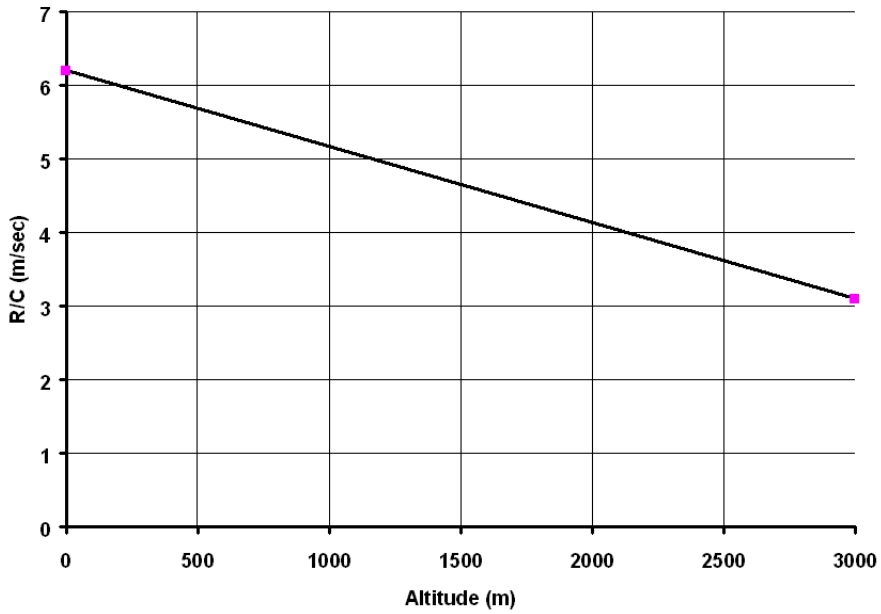


8. RATE OF CLIMB

CLIMB RATE IN CLEAN CONFIGURATION

CONDITIONS:

- ISA
- Flaps: 0°
- Weight 450 kg
- Engine: full throttle



V_Y = **120** Km/h / **65** kts

9. CRUISE PERFORMANCE

Pressure altitude H_P: **0** *ft OAT: +15°C*

Engine RPM	Speed TAS [km/h]	Speed TAS [kts]	Consumption (lt/h)
4300	189	102	14
4800	198	107	18
5200	204	110	21

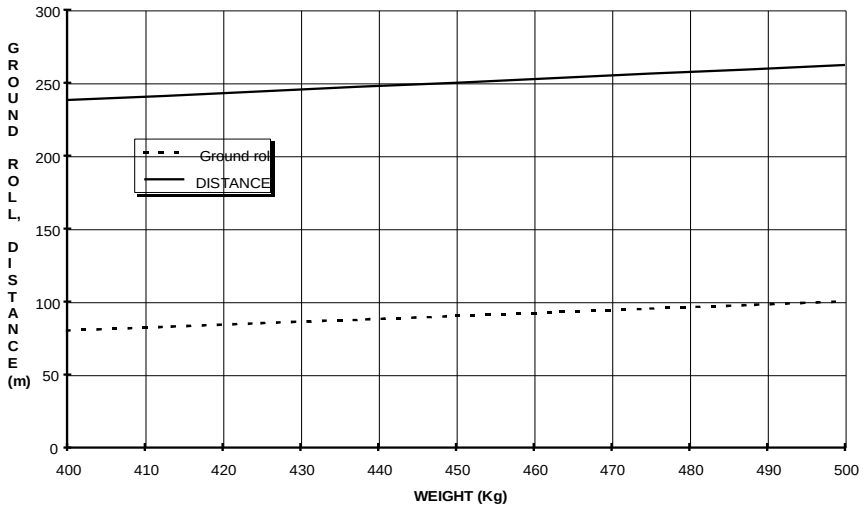
10. LANDING PERFORMANCE

GROUND ROLL DISTANCE AND LANDING DISTANCE

CONDITIONS:

- Flaps: land
- Runway: dry, compact, grass
- Engine: throttle idle
- Slope: 0° Wind: zero

Distance over a 15 m obstacle



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SECTION 6 – WEIGHT and BALANCE

INDEX

1 INTRODUCTION

This section describes the procedure for establishing the basic empty weight and the moment of the aircraft. Loading procedure information is also provided.

NOTE

Aircraft must be operated in accordance with the limits concerning the maximum take-off weight and CG excursion as reported in Flight Manual Section 2.

Pilot is responsible for checking the weight and CG excursion are compliant with the related limits. CG excursion and weight limits are reported in Section 2 – Limitations.

2 WEIGHING PROCEDURE

2.1 PREPARATION

- Carry out weighing procedure inside closed hangar
- Remove from cabin any objects left unintentionally
- Insure on board presence of the Flight Manual
- Align nose wheel
- Drain fuel via the specific drain valve.
- The unusable fuel for each tank must be considered (1.55 liter)
- Oil, hydraulic fluid and coolant to operating levels
- Raise flaps to fully retracted position (0°)
- Place control surfaces in neutral position
- Place scales (min. capacity 200 kg) under each wheel

2.2 LEVELLING

- Level the aircraft.

  Reference for levelling: remove a seat and then place a level between the two seat's fwd and aft supporting trusses.
- Center bubble on level by deflating nose tire

2.3 WEIGHING

- Record weight shown on each scale
- Repeat weighing procedure three times
- Calculate empty weight

2.4 DETERMINATION OF C.G. LOCATION

- Drop a plumb bob tangent to the leading edge (at 15mm inboard respect the rib#7 riveting line) and trace reference mark on the floor.
- Repeat operation for other wing.
- Stretch a taught line between the two marks
- Measure the distance between the reference line and main wheel axis
- Using recorded data it is possible to determine the aircraft's C.G. location and moment (see following table)

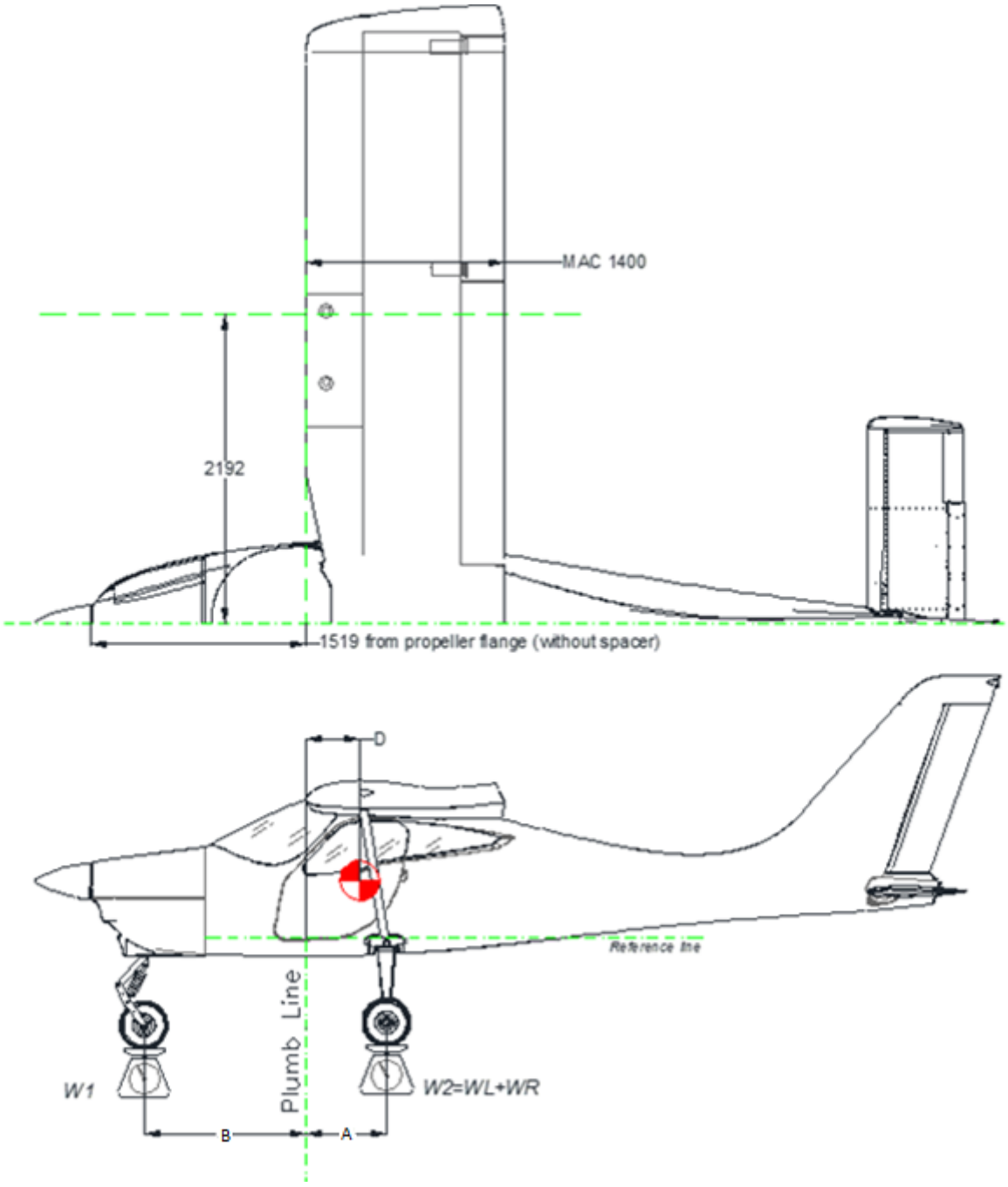
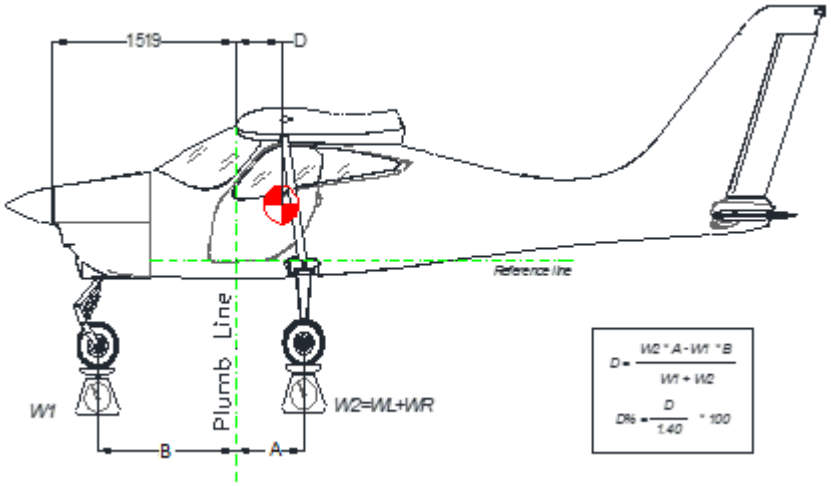


Fig.6-1-P92 Echo MkII

3 WEIGHING REPORT (I)

Model ***P92Echo MKII*** *S/N*:____ *Weighing no.*_____ *Date*:_____

Datum: Propeller support flange without spacer.



	Kg
Nose wheel weight	W_1 =
LH wheel weight	W_L =
RH wheel weight	W_R =
$W_2 = W_L + W_R$ =	

	meters
Plumb bob distance(1) LH wheel	A_L =
Plumb bob distance(1) RH wheel	A_R =
Average distance $(A_L + A_R)/2$	A =
Bob distance from nose wheel(1)	B =

Empty weight We = $W_1 + W_2$ =

$$D = \frac{W_2 \cdot A - W_1 \cdot B}{We} = m$$

$$D\% = \frac{D}{1.400} \cdot 100 =$$

Empty weight moment: M = [(D+1.519) ·We] = *Kg · m*

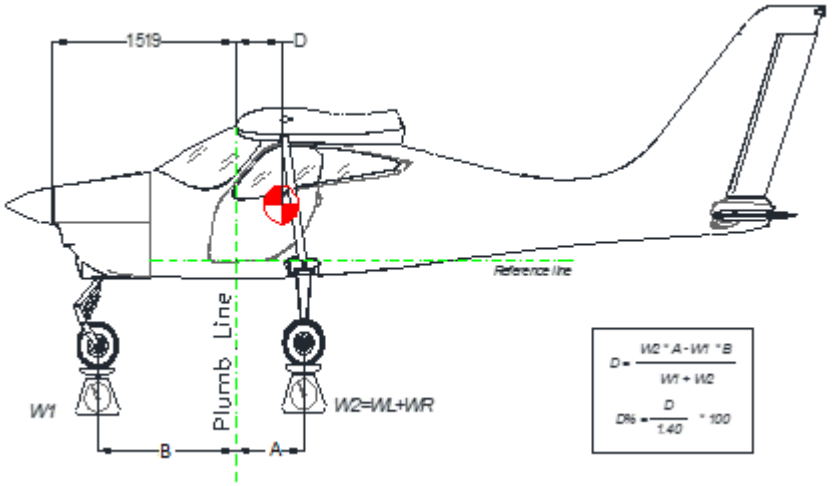
Maximum takeoff weight	W_T =	Kg
Empty weight	We =	Kg
Maximum payload W_T - We	Wu =	Kg

(1) To determine the Mean Aerodynamic Chord (MAC) and the plumb line see FIG.6-1.

4 WEIGHING REPORT (II)

Model ***P92Echo MKII*** *S/N*:____ *Weighing no.*_____ *Date*:_____

Datum: Propeller support flange without spacer.



	Kg
Nose wheel weight	W_1 =
LH wheel weight	W_L =
RH wheel weight	W_R =
$W_2 = W_L + W_R$ =	

	meters
Plumb bob distance(1) LH wheel	A_L =
Plumb bob distance(1) RH wheel	A_R =
Average distance $(A_L + A_R)/2$	A =
Bob distance from nose wheel(1)	B =

Empty weight $We = W_1 + W_2$ =

$$D = \frac{W_2 \cdot A - W_1 \cdot B}{We} = m$$

$$D\% = \frac{D}{1.400} \cdot 100 =$$

Empty weight moment: $M = [(D + 1.519) \cdot We] = Kg \cdot m$

Maximum takeoff weight	W_T =	Kg
Empty weight	We =	Kg
Maximum payload W_T - We	Wu =	Kg

(1) To determine the Mean Aerodynamic Chord (MAC) and the plumb line see FIG.6-1.

5 WEIGHT AND BALANCE DETERMINATION FOR FLIGHT

In this subsection, the procedure to be used for the determination of aircraft weight and balance in flight is described. The weight and moment obtained must fall within the approved Weight-Moment Envelope (Figure 6-3). The procedure explained requires the use of:

- Aircraft Weighing Report (I/II)
- Weight and C.G. - Form (Table 6-1)
- Loading Diagram (Figure 6-2)
- Weight-Moment Envelope (Figure 6-3)

An example calculation is provided to help understand the method.

5.1 USE OF "WEIGHT & BALANCE" CHART

To determine weight and balance for flight, proceed as follows:

1. Read the most recent values of the Empty A/C weight and corresponding moment from the Aircraft Weighing Report and write them in the Weight and C.G.- Form (Table 6-1).
2. Write the weight and moment of the pilot/co-pilot in the Weight and C.G. - Form (Table 6-1). Calculate the moment as:

   Moment = weight X arm where the arm is read in Table 6-1.

NOTE *It is strongly recommended to perform a cross-check with Loading Tables (Table 6-3) to assure an accurate loading value.*

3. Repeat the procedure described in 2 for the fuel and baggage loads.
4. The total weight/moment is obtained summing all weights/moments; report take-off condition (weight and CG) in the Weight and Balance C.G. - Form (Table 6-1).
5. If the point falls within the envelope, the loading condition meets the weight and balance requirements

Table 6-1 -Weight and C.G.- Form

	W [kg]	Arm [m]	Moment (M) = W * Arm [kg*m]
Empty weight	**340**	**0.309**	**621.52**
LOADING			
Pilot	**60**	1.948	155.84
Co-pilot		1.948	
Baggage		2.320	
Usable fuel Fuel (liters)*ρ_{fuel} (0.72) [kg]	(40 litres) 28.8	1.774	**51.09**
TAKE-OFF CONDITION			
Take-off condition **W_{TO} = ∑ W**	**428.8**	M_{TO} = ∑ M	**828.45**
	CG[%cma]= [((M/W_{TO})- 1.519)/1.4]*100	**29.5%**	

Table 6-2 -Weight and C.G.- Example

	W [kg]	Arm [m]	Moment (M) = W * Arm [kg*m]
Empty weight			
LOADING			
Pilot		1.948	
Co-pilot		1.948	
Baggage		2.320	
Usable fuel Fuel (liters)*ρ_{fuel} (0.72) [kg]		1.774	
TAKE-OFF CONDITION			
Take-off condition **W_{TO} = ∑ W**		M_{TO} = ∑ M	
	CG[%cma]= [((M/W_{TO})- 1.519)/1.4]*100		

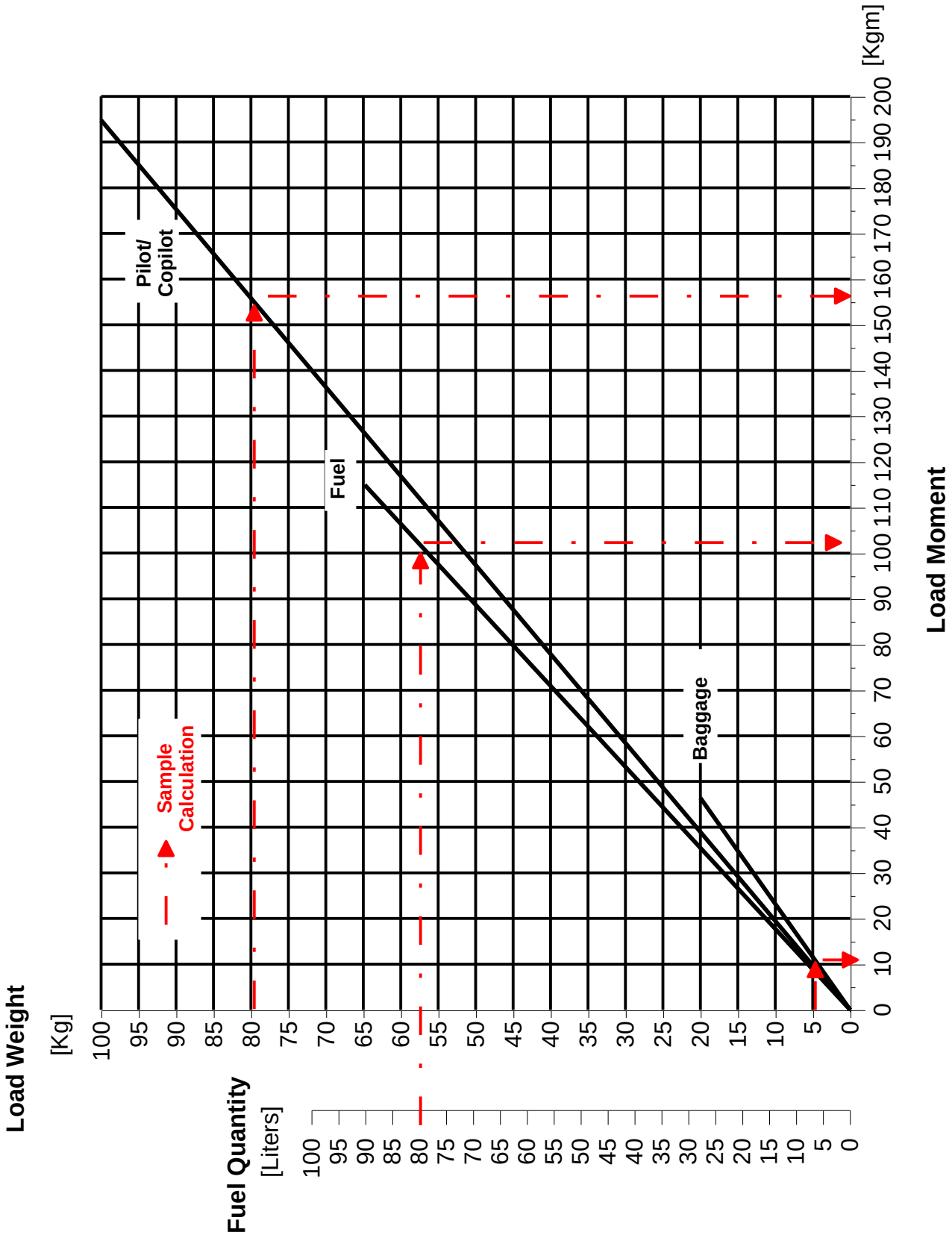


Fig.6.2 LOADING DIAGRAM

Table 6-3 –Loading tables

Pilot/Co-pilot loading	
W [kg]	M [kg*m]
5	9.7
10	19.5
15	29.2
20	39.0
30	58.4
40	77.9
50	97.4
60	116.9
65	126.6
70	136.4
75	146.1
80	155.8
85	165.6
90	175.3
95	185.1
100	194.8

Baggage loading	
W [kg]	M [kg*m]
2	4.6
4	9.3
6	13.9
8	18.6
10	23.2
12	27.8
14	32.5
16	37.1
18	41.8
20	46.4

Fuel loading		
W [litres]	W [kg]	M [kg*m]
10	7.2	12.8
20	14.4	25.5
30	21.6	38.3
40	28.8	51.1
50	36.0	63.9
60	43.2	76.6
65	46.8	83.0
70	50.4	89.4
75	54.0	95.8
80	57.6	102.2
85	61.2	108.6
90	64.8	115.0
95	68.4	12.8
100	72.0	25.5

SEZIONE 7 – AIRFRAME AND SYSTEMS DESCRIPTION

INDEX

1. Introduction

This section provides description and operation of the aircraft and its systems.

2. Airframe

2.1. WING

The wing is of a rectangular planform, with a small tapering of the leading edge near the cabin, allowing an improved visibility, also in steep turn. Its structure consists of a single spar metal torsion box. The aircraft is equipped with half-span slot flaps, with the flap hinge positioned on the lower part of the wing. All structural parts are made of aluminum light alloy (2024-T3 and 6061-T6), except for tips and fairings which are in fiberglass.

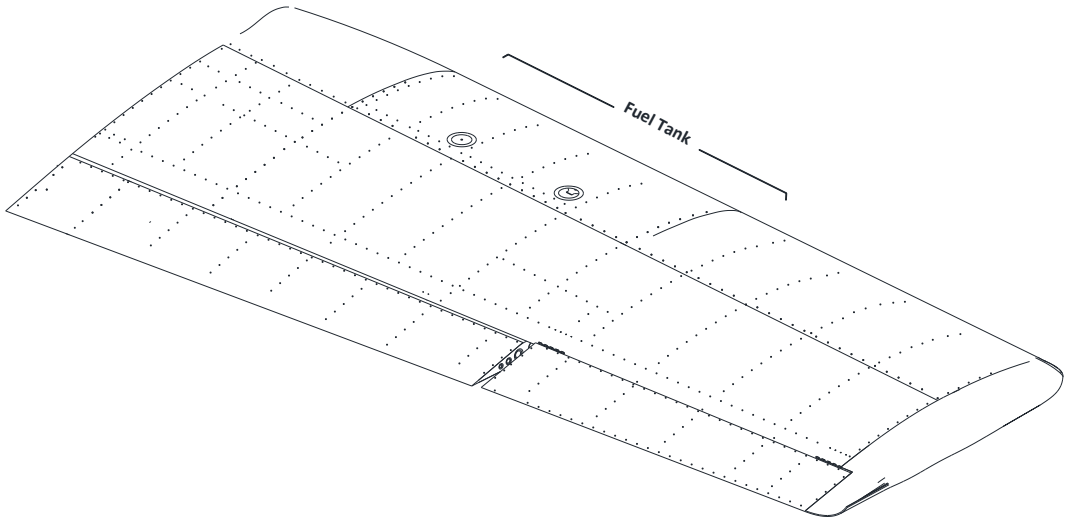


Fig. 7-1. RIGHT WING EXPLODED VIEW

2.2. FUSELAGE

The P92 Echo MkII fuselage is mainly made by carbon fibers composite materials. The fuselage is made by two main shells that are later assembled bonding the two main bodies and the floor (in composite material too) and adding aluminum stiffeners that allow the connection of the main landing gear, seats, wing and instrument panel. In this context the fuselage and vertical fin are a unique body. The following picture shows the main components of the fuselage section.

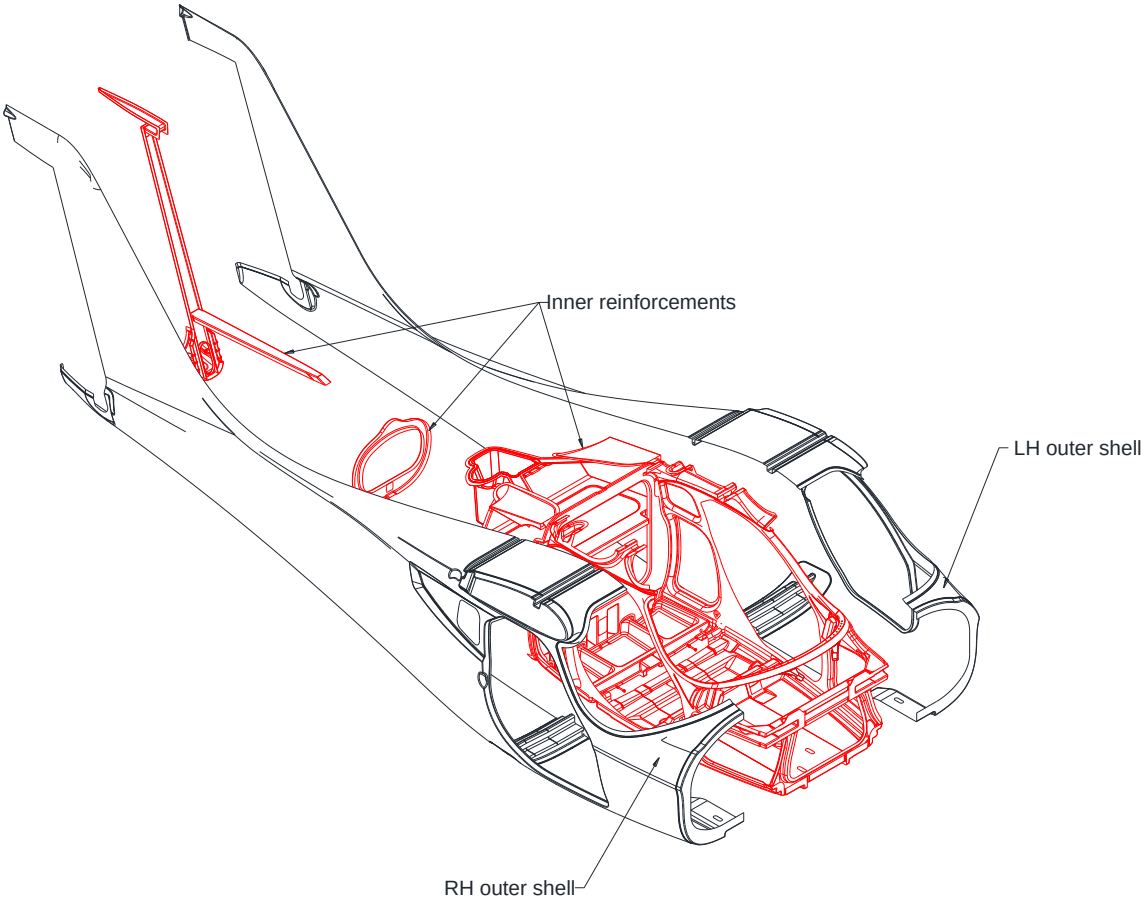


Fig. 7-2.P92 Echo MkII fuselage

2.3. EMPENNAGES

The horizontal trimmable tail plane is all-moving type, which allows a high control authority and a better stick free stability. The vertical tail is conventional fin and rudder type. Both horizontal and rudder structures are aluminum light alloy (2024-T3 and 6061-T6), except fin, which is a carbon fiber unique body with the fuselage, and tips, which are in fiberglass.

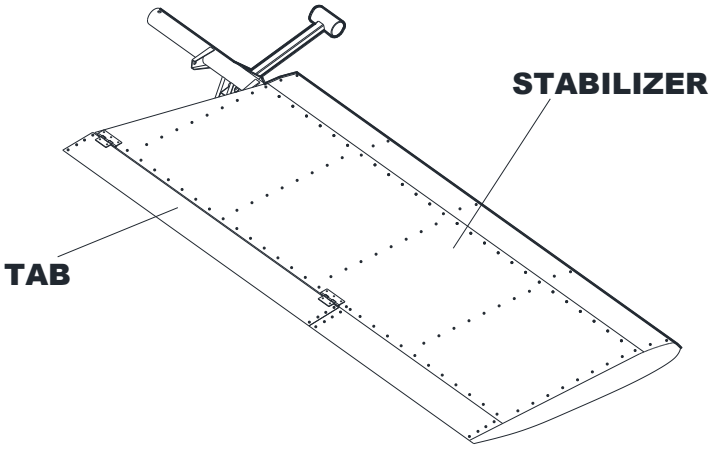


Fig. 7-3. P92 Echo MkII stabilator and tab

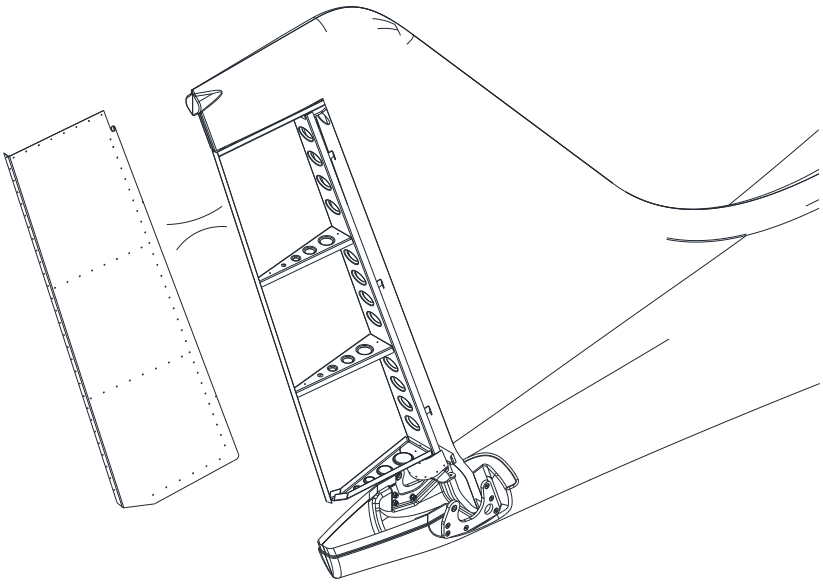


Fig. 7-4. P92 Echo MkII vertical tail and fin

3. FLIGHT CONTROLS

The primary flight controls are of conventional type, operated by control stick and rudder pedals. Stabilator, as per Figure 7-4, is actuated by push-pull rods and cables.

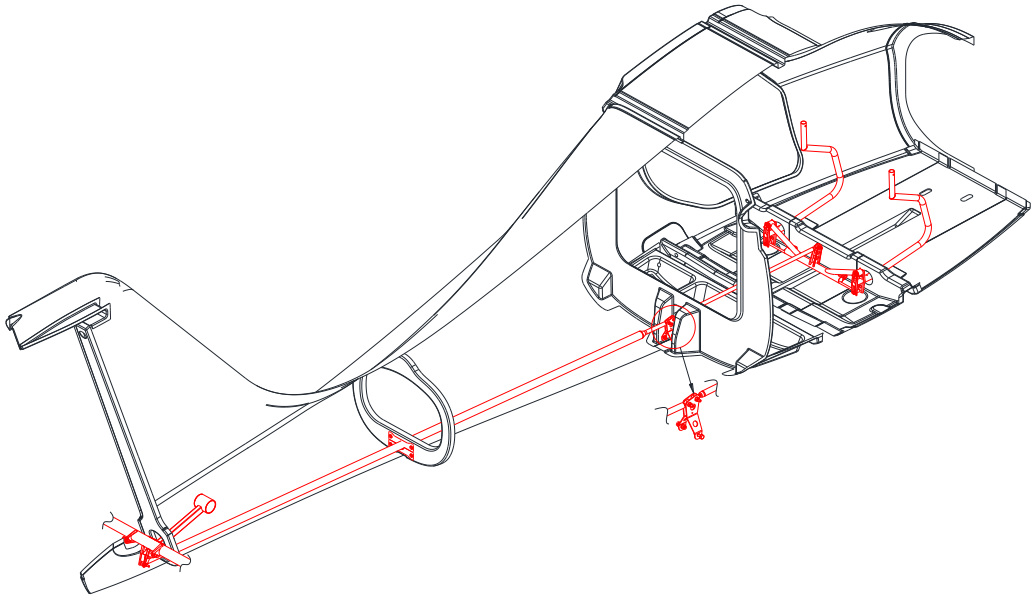


Fig. 7-4. P92 Echo MkII stabilator control line system

Ailerons, as per Figure 7-5, are actuated by push-pull rods on wing and cable in fuselage.

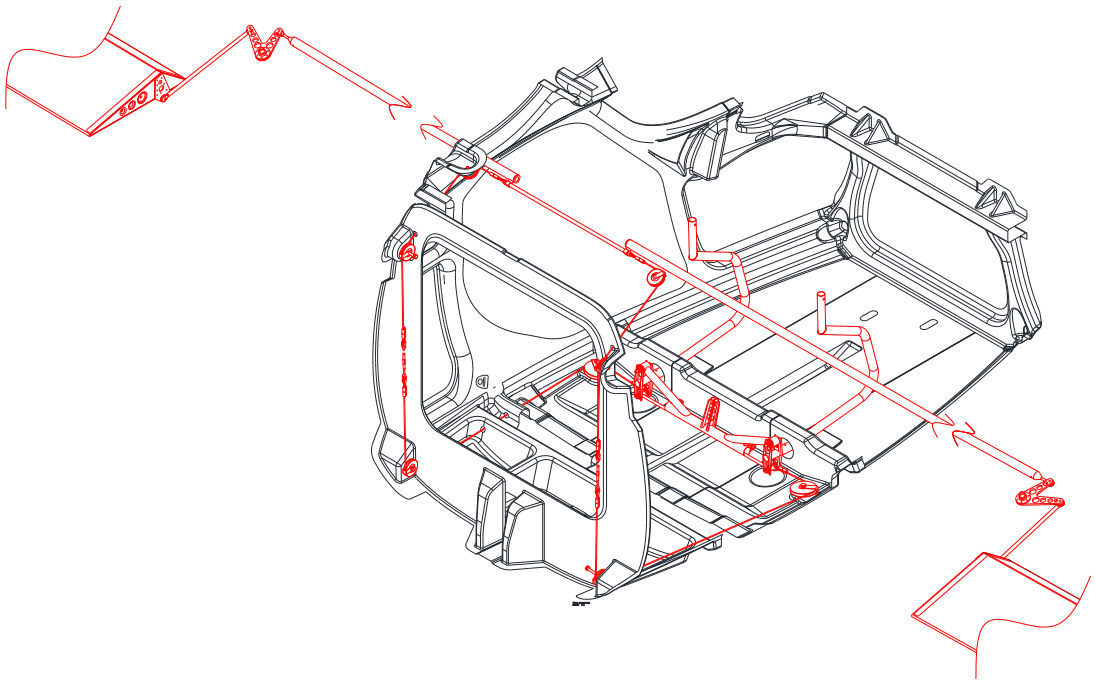


Fig. 7-5. P92 Echo MkII aileron control line

In accordance with Figure 7-6, the rudder is operated by a cable line.

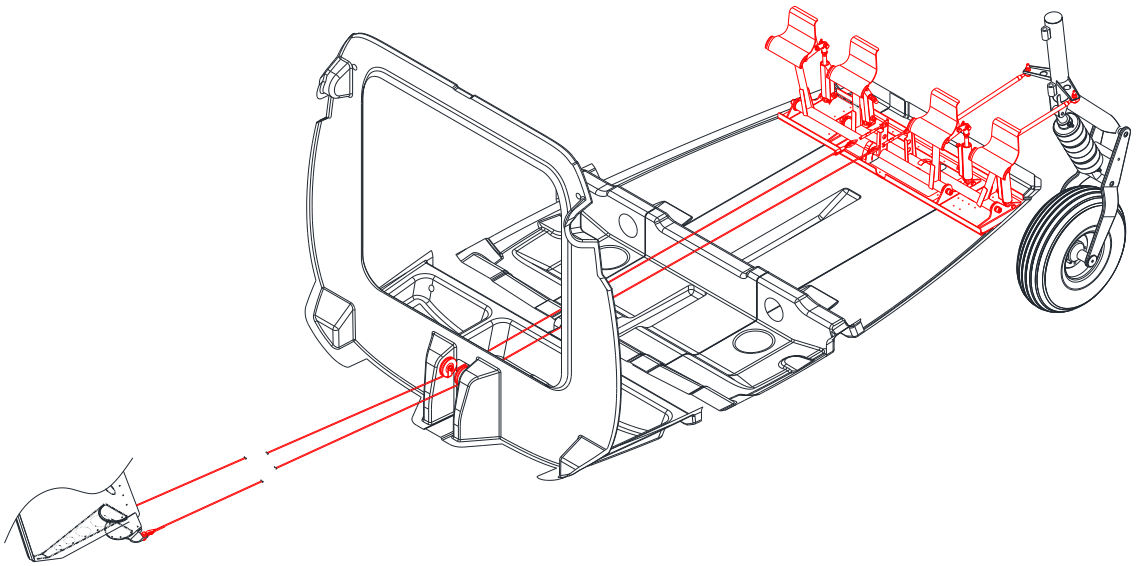


Fig. 7-6. P92 Echo MkII rudder control line

Trimming device for longitudinal is provided by push/pull rod-type system controlled by an electrical actuator. Trim position indicator is installed on A/C cockpit. In the following figure, the pitch trim tab actuation is shown.

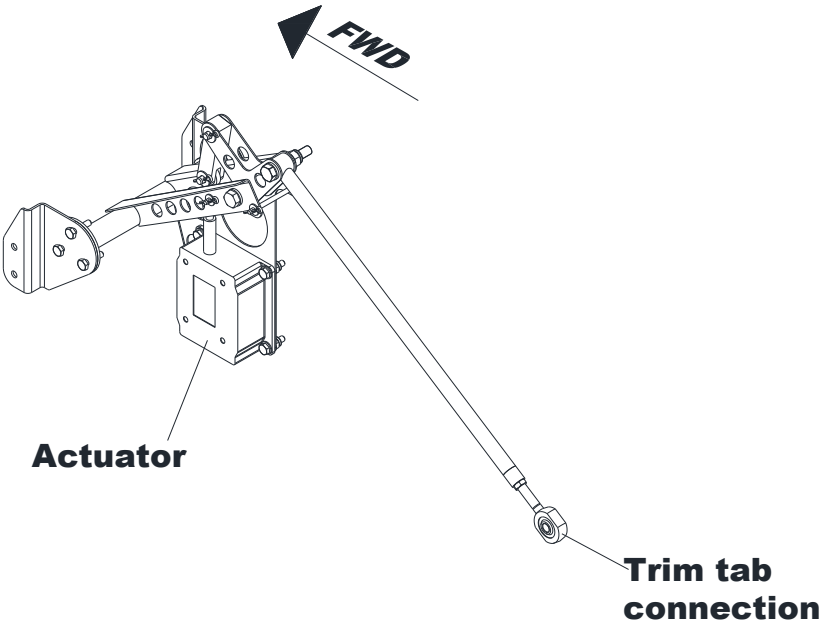


Fig. 7-7. P92 Echo MkII trim tab control line

The flap control system is reported in Figure 7-8. The system is actuated by means of a linear electrical actuator connected to rods transmitting the movement to the flap surfaces.

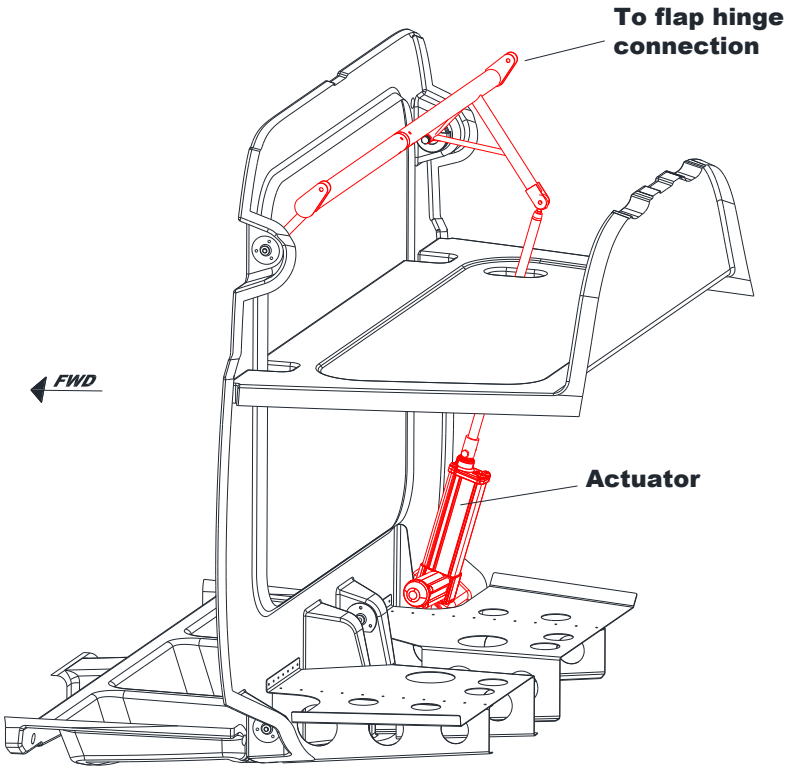


Fig. 7-8. P92 Echo MkII flap control system

4. LANDING GEAR

The main landing gear is realized with simple steel spring-leaves, 5.00x5 wheel and tires, disc brakes, renowed for their operational record of effectiveness and safety.

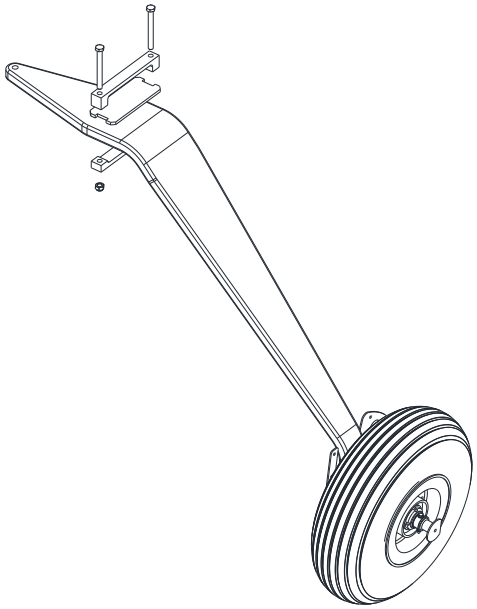


Fig. 7-9. P92 Echo MkII Main Landing Gear

The nose gear features a steerable wheel with a rubber doughnut shock absorber.

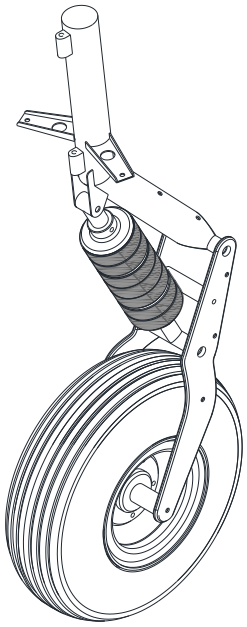


Fig. 7-10. P92 Echo MkII Nose Landing Gear

5. WHEEL AND BREAKES

The brake system installed on P92 Echo MkII consists of an independent hydraulically actuated brake system, one for each main wheel, and is composed of the following items:

- 2 brake calipers, located on the inner sides of the main wheels;
- 4 master cylinders (P/N MC-4), located on the back side of co-pilot pedals;
- 1 parking brake valve (P/N PVPVD), located downstream the master cylinders, used to trap a column of fluid between the valve itself and the brake calipers to firmly stop the wheels.
- 1 oil reservoir with P/N 03-3508-0264-3.

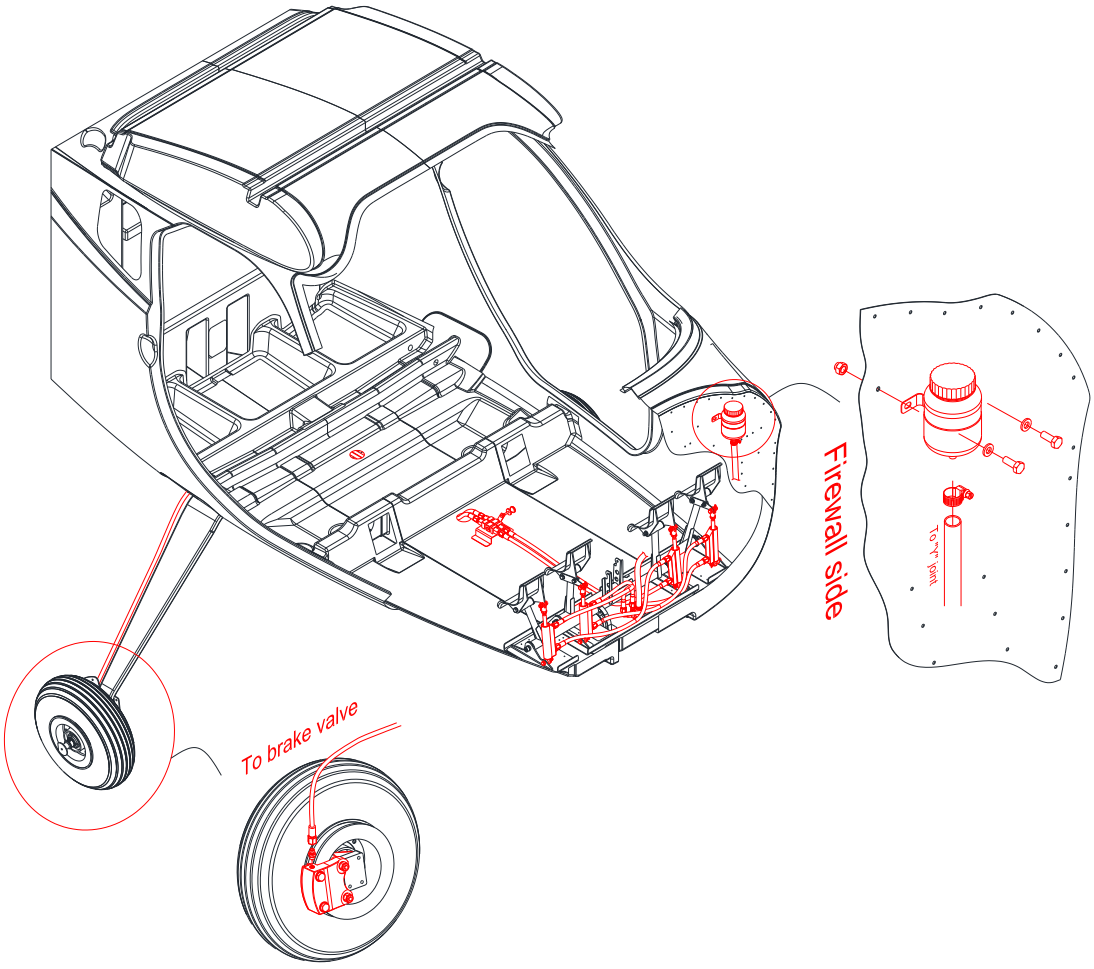


Fig. 7-11. P92 Echo MkII Brake System

NOTE *Flight without wheel fairings can be conducted without significantly affect aircraft performance and handling qualities.*

6. AVIONIC SYSTEM

The electric system installed on P92 Echo MkII is characterized by a rated voltage of 13.5 V DC furnished by a generator of 250 W DC. A 12-volts battery with a capacity of 18 Amph furnishes the power needed for aircraft start up and a reserve energy in case of anomalies to the generator. The generator connected to a regulator/rectifier supplies DC power to the bus bars and to recharge the battery. A red warning light on the instrument panel will turn on indicating to the pilot that the generator is not operating. Circuit protection is through breaker located on right side of instrument panel.
The avionic system installed on P92 Echo MkII is based on Garmin G3X touch integrated avionic suite in a dual screen configuration (GDU 460). It provides flight information (through GSU 25 that records air, attitude and heading data, GMU 22 magnetometer and GTP 59 temperature probe) and primary engine information (through the engine module GSA 24).
Stand-alone external COM/NAV sources (Garmin GTR 225A) is installed. The GTX 35R remote transponder unit is installed. In figure below, the avionic schemes are presented.

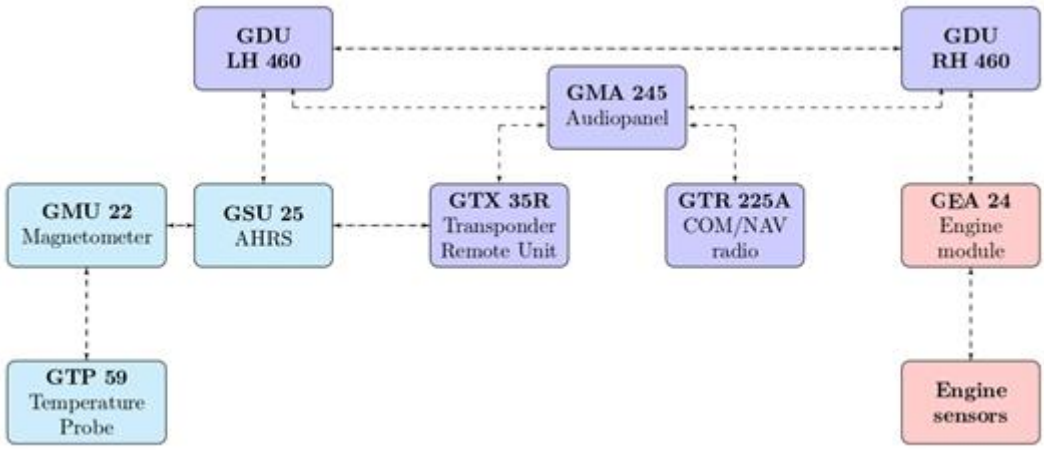


Fig. 7-12. Avionic Scheme

The generator provides DC power also to the following electrical utilities:

1) Fuel pump system
2) Flap actuator
3) Trim tab actuator

In the following figure a scheme of the cockpit configuration is shown.

Fig. 7-13. P92 Echo MkII instrument panel

7. POWERPLANT

7.1. ENGINE

P92 Echo MkII is equipped with a Rotax 912 ULS 2 100 horse powered engine.

Fig. 7-14. Rotax 912 ULS 2 engine

The main engine characteristics are:

- 4 stroke, 4 cylinders. horizontally opposed, spark ignition engine, single central camshaft hydraulic tappets - push rods – OHV;
- Liquid cooled cylinder heads;
- Ram air cooled cylinders;
- Dry sump forced lubrication;
- Dual ignition of breakerless, capacitor discharge design;
- 2 constant depression carburettors;
- Mechanical fuel pumps;
- Electric starter 12 V 0.9 kW;
- Integrated AC generator with external rectifier regulator;
- Propeller drive via integrated gearbox with mechanical shock absorber and overload clutch.

7.2 PROPELLER

P92 Echo MkII is equipped with a Sensenich Wood propeller. The model is W68T2ET-70J and is made by two wooden blades, with fixed pitch. The diameter is 1730mm.

7.3 FUEL SYSTEM

A sketch of the fuel system is given in Figure 7-15. It consists of two fuel tanks integrated in the wing leading edge and having a 45t (11.8 US gal) capacity (total capacity is 90lt (23.7 US gal)). The engine is fed by means of an engine-driven mechanical pump and, as backup, by an electric pump. The fuel system has a sediment bowl or chamber that is accessible for drainage.

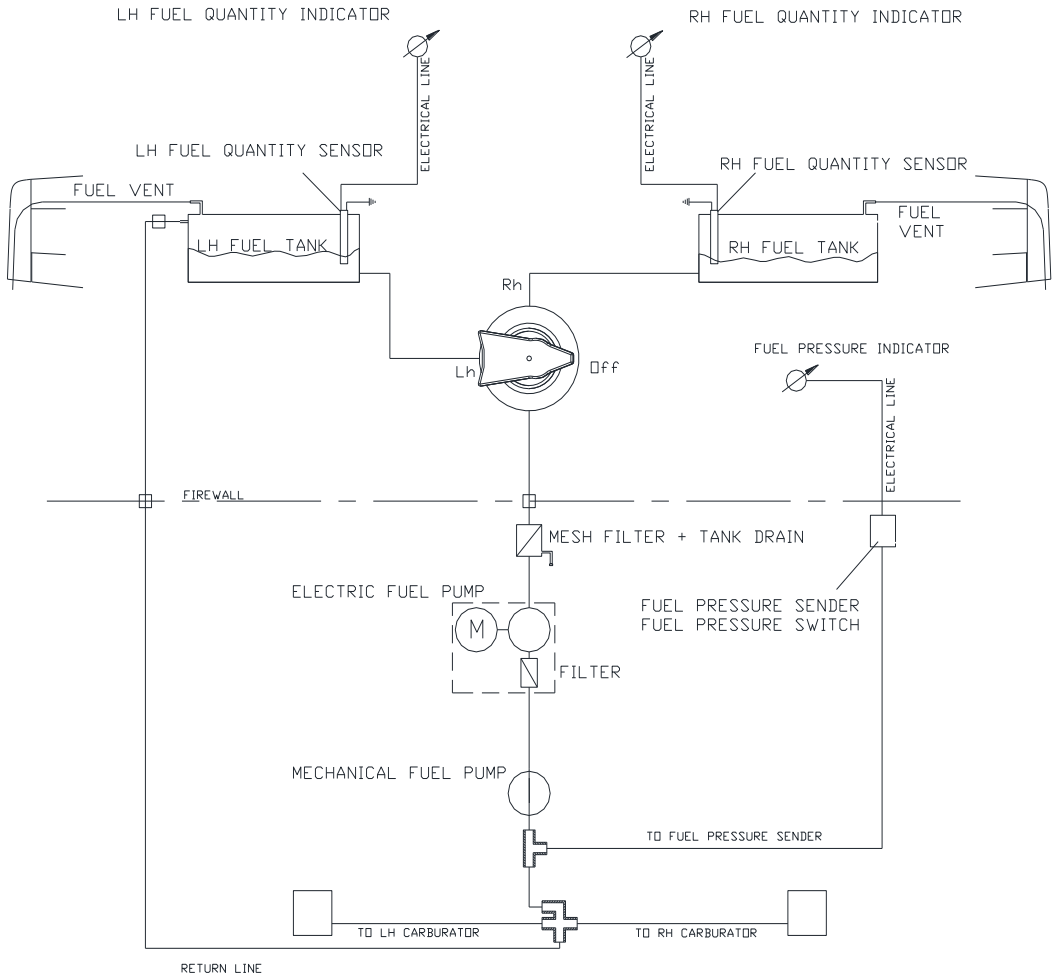


Fig. 7-15. Fuel System

A fuel selector is located in cabin. Two resistive type fuel quantity senders are installed in each tank and provide the fuel indication on the A/C cockpit.

8 LUGGAGE COMPARTMENT

The Luggage compartment is located behind the pilots' seats. Luggage shall be uniformly distributed on utility shelf and its weight shall not exceed 20kg.

WARNING

Before loading luggage, check aircraft's weight and CG location (see Sect. 6)

9 Doors

Two doors are provided for P92 Echo MkII, on pilot and co-pilot side. Given that the propeller is located on the nose of the aircraft, there are no chances to endanger person using those exits.

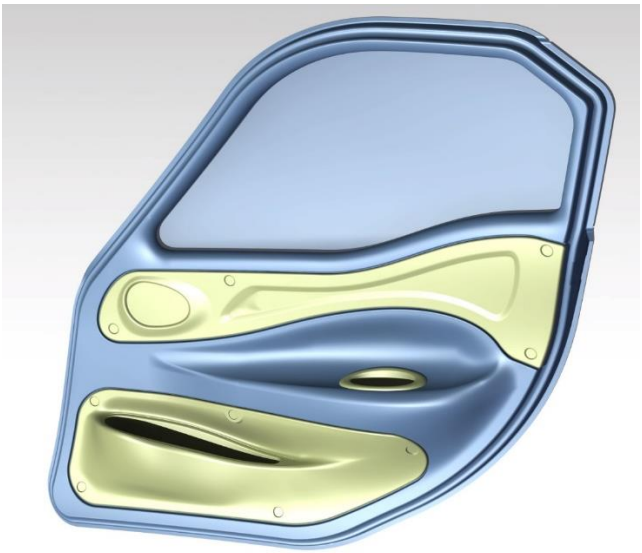


Fig. 7-16. P92 Echo MkII Door

Doors are also considered as emergency exits.

10 SEATS

Pilot and co-pilot seats are characterized by aluminium structure (Al 6061) manufactured by Tecnam. It is covered by a cushion and connected to the fuselage structure.

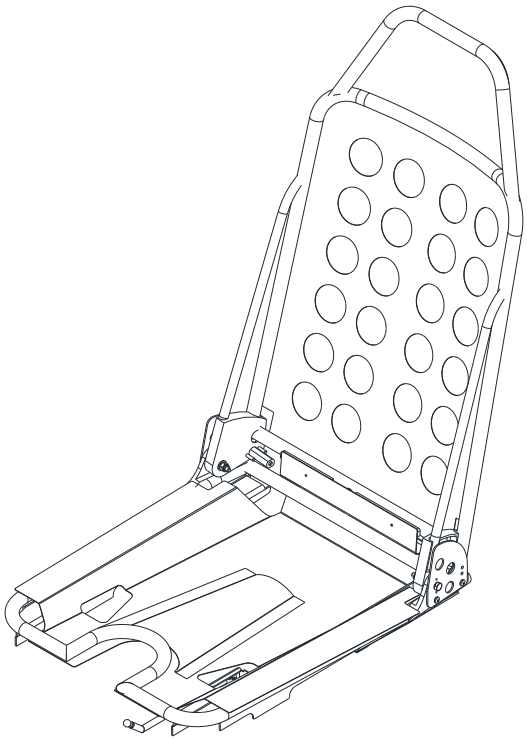


Fig. 7-17. P92 Echo MkII Seat Structure

11 RESCUE SYSTEM

The P92 Echo MkII high wing aeroplanes hang under the parachute by means of four bridles. The front fitting points are dedicated fixations points near the front attachments of the wing. The rear two fitting points are located by the connection between fuselage and the rear wing attachments. The parachute could be a BRS-6-1050, manufactured by BRS aerospace, or a GALAXY GRS SD Speedy model, manufactured by Galaxy.

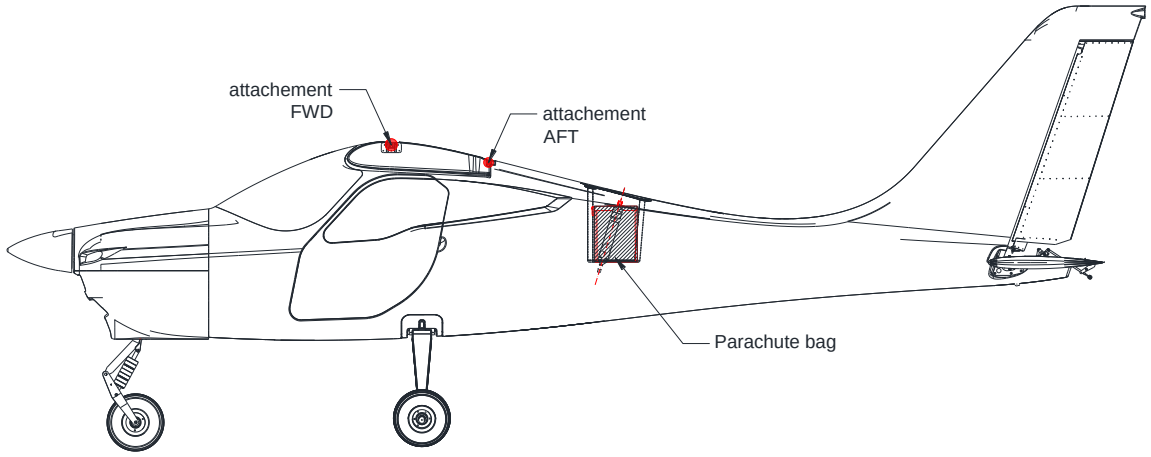


Fig. 7-16. P92 Echo MkII Rescue system

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SEZIONE 8 – AIRCRAFT CARE AND MAINTENANCE

INDEX

1. Introduction

This section contains factory-recommended procedures for proper ground handling and routine care and servicing. It also identifies certain inspection and maintenance requirements, which must be followed if the aircraft is to retain its new-plane performance and dependability. It is recommended to follow a planned schedule of lubrication and preventive maintenance based on climatic and flying conditions encountered locally.

2. Aircraft Inspection Intervals

Correct maintenance procedures are described in the aircraft's Maintenance Manual or in the engine's Maintenance Manual.

3. Aircraft Changes or Repairs

Aircraft changes or repairs must be performed in accordance with Aircraft Maintenance Manual and only by TECNAM authorized personnel.

4. Ground Handling

4.1. Towing

The aircraft is most easily and safely maneuvered by pulling it by its propeller near the axle. Aircraft may be steered by turning rudder or, for steep turns, by pushing lightly on tailcone to lift nose wheel.

4.2. Parking and Tie-Down

When parking airplane outdoors, head it into the wind and set the parking brake. If chocks or wedges are available it is preferable to use the latter. In severe weather and high wind conditions it is wise to tie the airplane down. Tie-down ropes shall be fastened to the lug present on the wing's lower surface. Nose gear fork can be used for front tie-down location. Flight controls shall be secured to avoid possible weather vaning damage to moving surfaces.

4.3. Jacking

Given the light empty weight of the aircraft, lifting one of the main wheels can easily be accomplished even without the use of hydraulic jacks. For an acceptable procedure please refer to the Maintenance Manual.

4.4. Leveling

Aircraft levelling may become necessary to check wing incidence, dihedral or the exact location of CG. Longitudinal levelling verification is obtained placing a level between the front and aft seat's supporting trusses (slide off the seats to get the access to the two trusses).

4.5. Road Transport

It is recommended to secure tightly all aircraft components onto the cart to avoid damage during transport. It is suggested to place wings under the aircraft's bottom, secured by specific clamps. Secondary components like the stabilator shall be protected from accidental hits using plastic or other material. For correct rigging and de-rigging procedure, refer to the Maintenance Manual.

5. Cleaning And Care

To clean painted surfaces, use a mild detergent such as shampoo normally used for car finish; use a soft cloth for drying. The plastic windshield and windows should never be dusted when dry; use lukewarm soapy water and dry using chamois only. It is possible to use special glass detergents but, in any case, never use products such as gasoline, alcohol, acetone or other solvents. To clean cabin interior, seats, upholstery and carpet, it is generally recommended to use foam-type detergents.

SECTION 9 – AFM Supplements

INDEX

1. INTRODUCTION

This Section concerns the supplemental manuals of additional (or optional) instrumentation equipping the ***P92 Echo MKII*** and/or information and limitations related to installed equipment configuration or needed to fit local national rules.

2. SUPPLEMENTS LIST

Aircraft S/N:	**Registration marks:**	**Date:**			
SUPPLEMENTS LIST FOR *P92 Echo MKII*					
Sup. No.	**Title**	**Rev. no.**	**Date**	**APPLICABLE:**	
				YES	**NO**
S1	MTV-33 Variable Pitch Propeller	0	01/03/2021	☐	☐
S2	Sensenich 3 Blades – Fixed Pitch Propeller	0	22/12/2021	☐	☐

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Supplement no. S01

MTV – 33 Variable Pitch Propeller

Record of Revisions

Rev	Revised page	Description of Revision
0	-	First Issue

List of Effective Pages

	Page	Revision
Cover pages	All	*Rev.0*
Section 1	All	*Rev 0*
Section 2	All	*Rev 0*
Section 3	All	*Rev 0*
Section 4	All	*Rev 0*
Section 5	All	*Rev 0*
Section 6	All	*Rev 0*
Section 7	All	*Rev 0*
Section 8	All	*Rev 0*

INDEX

INTRODUCTION

This section contains supplemental information to operate the aircraft in a safe and efficient manner when equipped with MTV-33 Variable Pitch Propeller.

It is the owner's responsibility to replace the mentioned pages in accordance with the instructions herein addressed section by section.

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Supplement S01: pages replacement instructions

SECTION 1 – GENERAL

According A/C configuration apply following pages replacement:

Supplement S01 pages		Basic AFM pages
MTVPP1-5	**REPLACES**	1-5

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3 GENERAL FEATURES

3.1 CONTROL SURFACES TRAVEL LIMITS

The control surfaces travel limits are reported in the Aircraft Maintenace Manual.

3.2 ENGINE

Manufacturer	Bombardier-Rotax GmbH
Model	912 S3
Type Certificate	EASA TCDS no. E.121 dated 1 April 2008
Engine Type	4 cylinders horizontally opposed with 1352 c.c. of overall displacement, liquid cooled cylinder heads, ram-air cooled cylinders, two carburetors, integrated reduction gear box with torsional shock absorber and overload clutch.
Maximum power (at declared rpm)	73.5 kW (98.6hp) @ 5800 rpm –5 minutes maximum. 69.0 kW (92.5hp) @ 5500 rpm (continuous)

3.3 PROPELLER

Manufacturer	MT Propeller
Model	MTV-33-1-A/175-200
Number of blades	2
Diameter	1780 mm (no reduction permitted)
Type	Variable pitch
Reduction ratio (crank to propeller shaft)	2.43:1

3.4 GOVERNOR

Manufacturer	MT Propeller
Model	P-850-12UL
Type	Hydraulic

Supplement S01: pages replacement instructions

SECTION 2 – LIMITATIONS

According A/C configuration apply following pages replacement:

Supplement S01 pages		Basic AFM pages
MTVPP2-5	**REPLACES**	2-5
MTVPP2-7	**REPLACES**	2-7

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4 POWERPLANT LIMITATIONS

Following table reports the operating limitations for aircraft engine installed:

ENGINE MANUFACTURER: Bombardier Rotax GmbH.

ENGINE MODEL: 912 S3

MAXIMUM POWER:

	Max Power kW *(hp)*	**Max RPM. Prop. RPM *(engine)***	**Time max. (minutes)**
Max. T.O.	73.5 *(98.5)*	2388 *(5800)*	5
Max. Cont.	69 *(92.5)*	2265 *(5500)*	-

NOTE *With full throttle, at fixed point in no wind conditions, the maximum propeller's Rpm should be 5100 ± 250.*

Temperatures:

Max CHT*	135°C
Max CT:	120°C
Min/Max Oil:	50 °C / 130 °C
Oil normal operating range (approx.):	90 °C / 110 °C

* *applicable for Engines up to serial no. 4924543(included) and repaired engine which doesn't change the cylinder head n°3 with new one (part no. 413195)*

Oil Pressure:

Minimum:	0.8 Bar / 12 psi
Normal:	2-5 Bar / 29-73 psi
Maximum:	7 Bar / 102 psi

Engine starting: allowable temperature range

OAT Min	-25° C
OAT Max	+50° C

WARNING

In event of cold starting operation, it is permitted a maximum oil pressure of 7 bar for a short period.

Fuel pressure:

Minimum:	2.2 psi (0.15 Bar)
Normal:	5.8 psi (0.40 Bar) or 7.26 psi* (0.5 Bar)

* only applicable for fuel pump part no. 893110, 893114 and 893115

7 PROPELLER

Manufacturer	MT Propeller
Model	MTV-33-1-A/175-200
Number of blades	2
Diameter	1780 mm (no reduction permitted)
Type	Variable pitch

Supplement S01: pages replacement instructions

SECTION 3 – EMERGENCY PROCEDURES

According A/C configuration apply following pages replacement:

Supplement S01 pages		Basic AFM pages
MTVPP3-10	**REPLACES**	3-10
MTVPP3-11	**REPLACES**	3-11

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4.3.4 CHT/CT limit exceedance

If CHT is above 135°C or CT is above 120°C:

1. Throttle Lever — REDUCE *Minimum practical*
2. **Land as soon as practical**

If CHT /CT continues to rise and engine shows roughness or power loss:

3. **Land as soon as possible** applying forced landing procedure (See Para.*7*)

4.4 Propeller Overspeeding

1. Throttle Lever — REDUCE power to minimum practical
2. Propeller Lever — REDUCE as practical
3. Rpm indicator — CHECK

If it is not possible to decrease rpm, land as soon as possible applying *Forced landing* procedure.

CAUTION

Maximum rpm exceedance may cause engine components damage.Propeller and engine shall be inspected in accordance with related Operators Manuals.

Monitor RPM; overspeed shall be prevented by retarding propeller lever.

If it is not possible to decrease rpm, land as soon as possible.

4.5 Defective Propeller Lever Control Cable

If power is sufficient to continue flight:

1. Approach nearest airfield, control engine power with throttle
2. Perform normal landing.

WARNING

Go-around may then be impossible.

If power is not sufficient to continue flight, apply Forced Landing Checklist.

5. IN-FLIGHT ENGINE RESTART

WARNING

After a mechanical engine seizure,fire or a major propeller damage engine restart is not recommended.

1.	Master Switch:	CHECK *ON*
2.	Fuel quantity indicator:	*CHECK*
3.	Throttle lever:	*≈75%*
4.	Propeller Lever*:*	*FULL FORWARD*
5.	Electric Fuel pump:	*ON*
6.	Fuel Selector:	*Change the fuel feeding tank*
7.	Carburetor heat:	*ON*
8.	Magnetos:	*BOTH*
9.	Magnetos:	*START*

CAUTION

After engine restart, if practical, moderate engine rpm and throttle increase to allow OIL and CHT/CT temperatures for stabilizing in the green arcs.

In case of unsuccessful engine restart:

1. Engine: SECURE (*see engine securing procedure on Para. 3*)
2. **Land as soon as possible** applying forced landing procedure(See Para. 7)

Supplement S01: pages replacement instructions

SECTION 4 – NORMAL PROCEDURES

According A/C configuration apply following pages replacement:

Supplement S01 pages		**Basic AFM pages**
MTVPP4-7 THRU 10	**REPLACES**	4-7 THRU 10

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3.2 ENGINE STARTING

1. Master switch ON.
2. Engine throttle: *idle*
3. *Propeller Lever: FULL FORWARD*
4. Choke: *as needed*
5. Fuel selector valve: *select the tank with less fuel*
6. Electric fuel pump: *ON*
7. Propeller area: *call for CLEAR and visually check*

WARNING

Check to insure no person or object is present in the area close to the propeller. Forward lower sector visibility is not possible from inside the cockpit.

8. Magnetos: *BOTH*
9. Magnetos: *START*
10. Check oil pressure rise within 10 sec. (maximum cold value 7 bar)
11. Generator switch "ON"
12. Check *ALT* message disappears.
13. Voltmeter: check more than 14V
14. Engine parameters: Check
15. Choke: *OFF*
16. Throttle lever: *2500 (1000) Rpm*
17. Electric fuel pump: *OFF*
18. Check fuel pressure (min 2.2 psi)

3.3 BEFORE TAXIING

1. Radio and Avionics: *ON*
2. Altimeter: *set*
3. Direction indicator: *set in accordance with the magnetic compass*
4. Parking brake: *OFF and taxi*

3.4 TAXIING

1. Brakes: *check*
2. Steering: *check*
3. Flight parameters: *check operation*

3.5 PRIOR TO TAKE-OFF

1. Parking brake: *ON, brake pedal press / brake lever pull*
2. Engine parameters: *Check within limits*
   - Oil pressure: 2-5 bar *(above 3400 (1400) rpm)*; 0.8 bar *(below 3400 (1400) rpm)*
3. Ammeter check: "green".
4. Electric Fuel pump: *ON*
5. Fuel valve: *select the fullest tank*
6. Fuel pressure: *check*
7. *Propeller Lever FULL FORWARD*
8. Throttle lever: *advance to 4000 (1700) rpm*
   a. Ignition magnetos test: *select LEFT, check Rpm drop within 300 (130) rpm;*
   b. Select BOTH: *check 4000 (1700) rpm;*
   c. Select RIGHT: *check Rpm drop within 300 (130) rpm;*
   d. *Maximum difference of speed between LEFT and RIGHT 115 (50) rpm,*
   e. Select BOTH: *check 4000 (1700) rpm.*
9. Propeller lever : Maximum to minimum travel or three times and check:
   a. MAP increasing
   b. Rpm decreasing
   c. Oil pressure surge
   d. Rpm restored with prop lever at full forward position.
10. Flaps: *set T/O*
11. Pitch trim: *check neutral*
12. Flight controls: *check free*
13. Seat belts: *checked fastened*

3.6 TAKE-OFF AND CLIMB

WARNING

On uncontrolled fields, before line up, check runway wind direction and speed and check for traffic on final

1. Parking brake: *OFF*
2. Propeller lever: *Full forward*
3. Throttle lever: *Full Forward*
4. Engine parameters: *check*
5. Rotation at V_R :

	MTOW 472.5 kg
Rotation Speed (V_R)	77 km/h / 41 kts IAS

At safe altitude:

6. Flaps: retract
7. Fuel pressure: check green arc
8. Throttle: Reduce MAP as required.
9. Propeller lever: reduce at or below 5500 (2265) Rpm
10. Electric Fuel Pump : OFF

NOTE

Take-off into crosswind is performed with the flaps normally set at 15° (T/O).

With the ailerons deflected into the wind, accelerate the airplane to a speed slightly higher than normal while decreasing the aileron deflection as speed increases then - with authority - rotate to prevent possible settling back to the runway while drifting. When clear of the ground, make a coordinated turn into the wind to correct for drift.

CAUTION

Maximum take off power must be limited to 5 minutes. Reduce Throttles MAP power before retracting Propeller lever to 5500 (2265) Rpm or below.

3.7 CRUISE

1. Throttle: BELOW(Max MAP 27 in.HG)
2. Propeller lever: Set to 4600-5500 (1900-2265) Rpm
3. Check engine parameters within limits

CAUTION

MAP reduction should be performed before propeller lever retraction. Conversely, Rpm increase should be set before throttle lever is advanced.

3.8 BEFORE LANDING

1. Electric fuel pump: *ON*
2. Fuel valve: select the fullest tank
3. Landing Light *(if applicable)*: *ON*
4. On downwind, leg abeam touch down point: ***Flaps** set T/O*
5. Propeller lever: FULL FORWARD
6. On final leg: ***Flaps** set Land, **Final Approach Speed:** 85km/h (46 kts) IAS*
7. Optimal touchdown speed: 75km/h (40 kts) IAS

NOTE

Normal crosswind landings are made with full flaps. Avoid prolonged slips. Increase airspeed depending on wind intensity and direction as required above normal approach and landing speeds to accommodate increased stall speed when side slip is added. After touchdown, hold a straight course with rudder and brakes as required. The maximum allowable crosswind velocity is dependent upon pilot capability as well as aircraft limitations(refer to Sec 2).

3.9 BALKED LANDING

1. Throttle lever: Full Forward
2. Attitude: attain climb speed
3. Flaps position: retract to *TO* as practical
4. Electric fuel pump: *ON*

3.10 AFTER LANDING

1. Flaps: *UP*
2. Electric Fuel Pump*: OFF*
3. Landing light *(if installed)*: *OFF*

Supplement S01: pages replacement instructions

SECTION 5 – PERFORMANCE

According A/C configuration apply following pages replacement:

Supplement S01 pages		Basic AFM pages
MTVPP5-8 THRU 10	**REPLACES**	5-8 THRU 10

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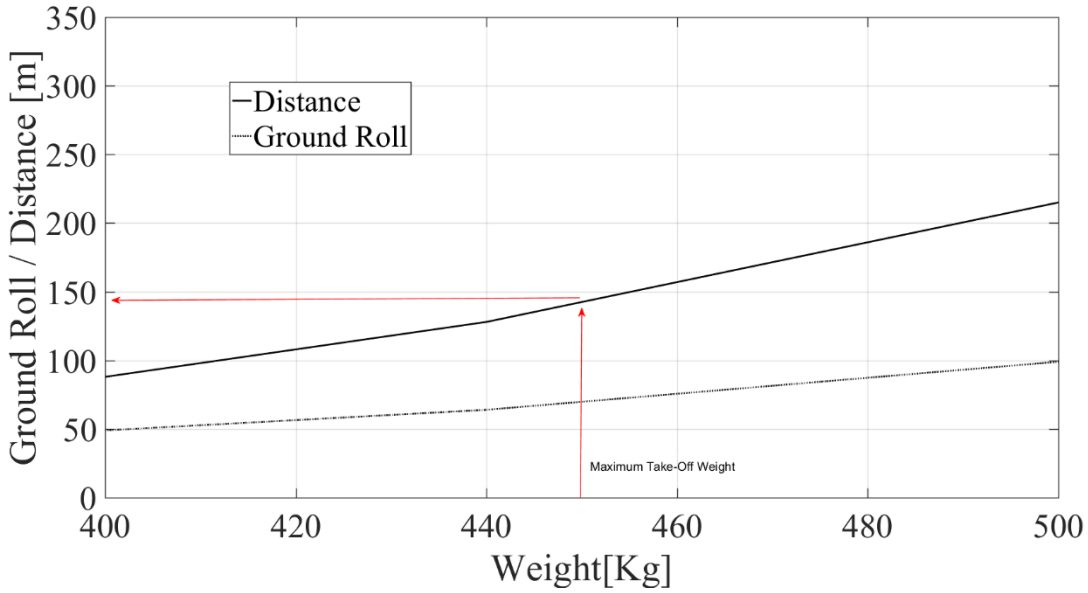
7 TAKE-OFF PERFORMANCE

TAKEOFF DISTANCE

CONDITIONS:

- ISA
- Engine: full throttle
- Runway: dry, compact, grass
- Flaps: 15°

Slope: 0° Wind: zero

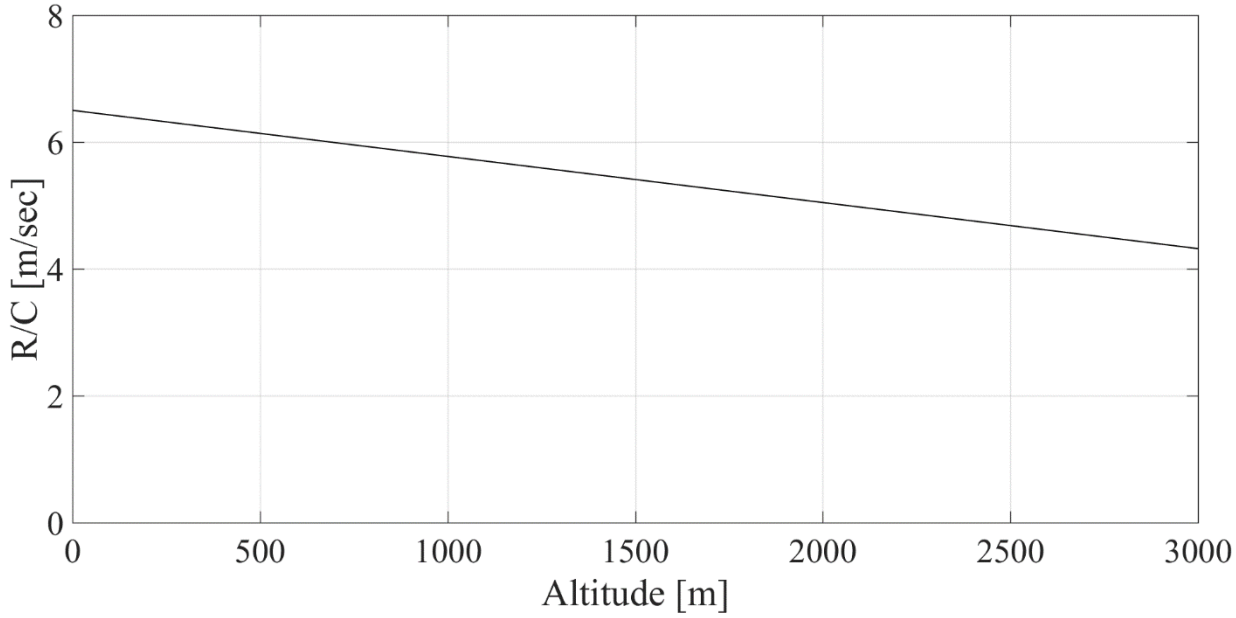


8 RATE OF CLIMB

CLIMB RATE IN CLEAN CONFIGURATION

CONDITIONS:

- ISA
- Flaps: 0°
- Weight 450 kg
- Engine: full throttle
- V_Y = 120 km/h / 65 kts IAS



9 CRUISE PERFORMANCE

Pressure altitude H_P: **0** *ft OAT: +15°C*

Engine RPM	Manifold Pressure (in.Hg)	Speed TAS [km/h]	Speed TAS [kts]	Consumption (lt/h)
4300	24	161	87	13
4800	26	193	104	18
5000	26	200	108	20
5500	27	206	111	25
5800	27.5	213	115	27

SECTION 6 – WEIGHT AND BALANCE

Refer to the basic AFM, Section 6 – WEIGHT AND BALANCE

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SECTION 7 – AIRFRAME AND SYSTEMS DESCRIPTION

Refer to the basic AFM, Section 7 – AIRFRAME AND SYSTEMS DESCRIPTION

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SECTION 8 – AIRCRAFT CARE AND MAINTENANCE

Refer to the basic AFM, Section 8 – AIRCRAFT CARE AND MAINTENANCE

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Supplement no. S02

Sensenich 3 Blades– Fixed Pitch Propeller

Record of Revisions

Rev	Revised page	Description of Revision
0	-	First Issue

List of Effective Pages

	Page	Revision
Cover pages	All	*Rev.0*
Section 1	All	*Rev 0*
Section 2	All	*Rev 0*
Section 3	All	*Rev 0*
Section 4	All	*Rev 0*
Section 5	All	*Rev 0*
Section 6	All	*Rev 0*
Section 7	All	*Rev 0*
Section 8	All	*Rev 0*

INDEX

INTRODUCTION

This section contains supplemental information to operate the aircraft in a safe and efficient manner when equipped with Sensenich 3B0R5/R68C Fixed Pitch Propeller.

It is the owner's responsibility to replace the mentioned pages in accordance with the instructions herein addressed section by section.

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Supplement S02: pages replacement instructions

SECTION 1 – GENERAL

According A/C configuration apply following pages replacement:

Supplement S02 pages		Basic AFM pages
SFPP1-5	**REPLACES**	1-5

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3 GENERAL FEATURES

3.1 CONTROL SURFACES TRAVEL LIMITS

The control surfaces travel limits are reported in the Aircraft Maintenace Manual.

3.2 ENGINE

Manufacturer	Bombardier Rotax GmbH
Model	912 ULS2
Engine type	4 cylinder horizontally-opposed twins with overall displacement of 1352 c.c., mixed cooling, (water-cooled heads and air-cooled cylinders), twin carburetors, integrated reduction gear with torque damper.
Maximum power (at declared rpm)	73.5kW (98.5hp) @5800rpm (max.5') 69.0kW (92.5hp) @5500rpm (cont.)

3.3 PROPELLER

Manufacturer	Sensenich
Model	3B0R5/R68C
Number of blades	3
Diameter	1730 mm (no reduction permitted)
Type	Fixed - ground adjustable pitch
Reduction ratio (crank to propeller shaft)	2.43:1

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Supplement S02: pages replacement instructions

SECTION 2 – LIMITATIONS

According A/C configuration apply following pages replacement:

Supplement S02 pages		Basic AFM pages
SFPP2-7	**REPLACES**	2-7

7 PROPELLER

Manufacturer	Sensenich
Model	3B0R5/R68C
Number of blades	3
Diameter	1730 mm (No Reduction Permitted)
Type	Fixed - ground adjustable pitch

SECTION 3 – EMERGENCY PROCEDURES

Refer to the basic AFM, Section 3 – EMERGENCY PROCEDURES

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SECTION 4 – NORMAL PROCEDURES

Refer to the basic AFM, Section 4 – NORMAL PROCEDURES

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Supplement S02: pages replacement instructions

SECTION 5 – PERFORMANCE

According A/C configuration apply following pages replacement:

Supplement S02 pages		**Basic AFM pages**
SFPP5-9 THRU 10	**REPLACES**	5-9 THRU 10

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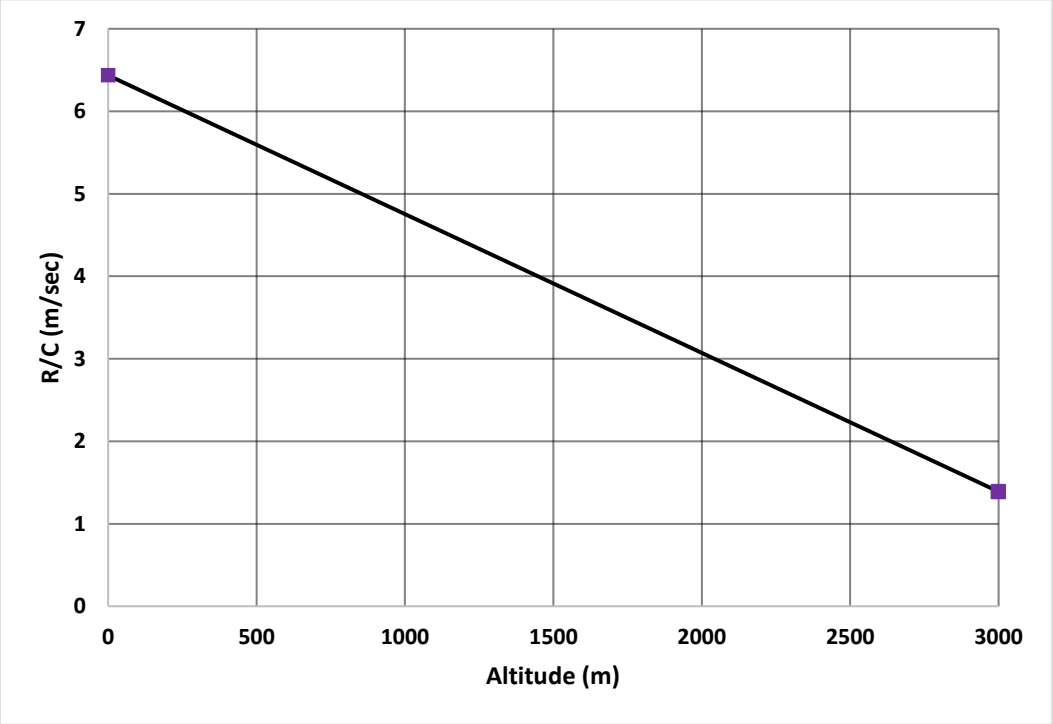
7 RATE OF CLIMB

CLIMB RATE IN CLEAN CONFIGURATION

CONDITIONS:

- ISA
- Flaps: 0°
- Weight 450 kg
- Engine: full throttle



V_Y = 120 km/h / 65 kts IAS

8 CRUISE PERFORMANCE

Pressure altitude H_P: **0** *ft OAT: +15°C*

Engine RPM	Speed TAS [km/h]	Speed TAS [kts]	Consumption (lt/h)
4300	154	83	14
4800	181	98	18
5200	185	100	21

SECTION 6 – WEIGHT AND BALANCE

Refer to the basic AFM, Section 6 – WEIGHT AND BALANCE

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Supplement S02: pages replacement instructions

SECTION 7 – AIRFRAME AND SYSTEMS DESCRIPTION

According A/C configuration apply following pages replacement:

Supplement S02 pages		**Basic AFM pages**
SFPP7 - 12	**REPLACES**	7-12

7. POWERPLANT

7.1. ENGINE

P92 Echo MkII is equipped with a Rotax 912 ULS 2 100 horse powered engine.

Fig. 7-14. Rotax 912 ULS 2 engine

The main engine characteristics are:

- 4 stroke, 4 cylinders. horizontally opposed, spark ignition engine, single central camshaft hydraulic tappets - push rods – OHV;
- Liquid cooled cylinder heads;
- Ram air cooled cylinders;
- Dry sump forced lubrication;
- Dual ignition of breakerless, capacitor discharge design;
- 2 constant depression carburettors;
- Mechanical fuel pumps;
- Electric starter 12 V 0.9 kW;
- Integrated AC generator with external rectifier regulator;
- Propeller drive via integrated gearbox with mechanical shock absorber and overload clutch.

7.2 PROPELLER

P92 Echo MkII is equipped with a Sensenich Wood propeller. The model is 3B0R5/R68C and is made by 3 wooden blades, with fixed- ground adjustable pitch. The diameter is 1730mm.

SECTION 8 – AIRCRAFT CARE AND MAINTENANCE

Refer to the basic AFM, Section 8 – AIRCRAFT CARE AND MAINTENANCE