Aircraft Flight Manual

Doc. No. 2010/100
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2018, April 3

TECNAM P2010

MANUFACTURER: *COSTRUZIONI AERONAUTICHE* ***TECNAM*** *S.r.l.*
AIRCRAFT MODEL: ***P2010***
EASA TYPE CERTIFICATE NO: **EASA.A.576** (DATED 2014, SEPTEMBER 26TH)

SERIAL NUMBER: …….....

BUILD YEAR: …….....

REGISTRATION MARKINGS: ……..

This manual is approved in accordance with 14 CFR 21.29 for US registered aircraft, and is approved by the Federal Aviation Administration.

This Manual must be carried in the airplane at all times.
The airplane has to be operated in compliance with procedures and limitations contained herein.

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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.

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	Tecnam Approval			EASA Approval Or Under DOA Privileges
			DO	OoA	HDO	
0	–	New Edition	D. Ronca	C. Caruso	M. Oliva	Approved under the authority of DOA ref. EASA.21J.335 (MOD2010/067.151030)
1	2-5 thru 16	Amended to add the wording "Approved" in order to better identify the pages approved according to EASA regulation	D. Ronca	C. Caruso	M. Oliva	Approved under the authority of DOA ref. EASA.21J.335 (MOD2010/070.160118)
	9-3	Supplement List Index amended	D. Ronca	C. Caruso	M. Oliva	EASA approval N°10055692
		Add Supplement D04				
2	5-13 thru 14	Amended cruise performance to add fuel consumption for different power setting	D. Ronca	C. Caruso	M. Oliva	Approved under the authority of DOA ref. EASA.21J.335 (MOD2010/103.161026)
	6-12 thru 13	Amended Equipment list				
	9-3	Supplement List Index amended				
		Add Supplement D08				
3	0-1, 4, 7	Cover, RoR and LOEP updated.	A. Sabino	C. Caruso	M. Oliva	Approved under the authority of DOA ref. EASA.21J.335 (MOD2010/131.180403)
	3-4	Reference airspeeds table added.				
	4-7	Airspeeds table revised.				
	4-23	Glide Speed revised				
	9-3	Supplements list updated.				

Rev	Revised page	Description of Revision	Tecnam Approval			EASA Approval Or Under DOA Privileges
			DO	OoA	HDO	

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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.

Pages affected by the current revision are indicated by an asterisk (*) following the revision code.

Should supplements be embodied in accordance with approved instructions, make reference to the LOEP addressed on Supplements themselves.

1st Edition, Rev 0 ..... September 26, 2014
1st Edition, Rev 1 ..... April 8, 2015
2nd Edition, Rev0 ..... October 30, 2015
2nd Edition, Rev1 ..... January 18, 2016
2nd Edition, Rev2 ..... November 25, 2016
2nd Edition, Rev3 ..... April 3, 2018

Section	Pages	Revision
Section 0	2, 3, 5, 6, 8, 9, 10	**Rev 0**
	1, 4, 7	**Rev 3**
Section 1	1 thru 16	**Rev 0**
Section 2	1 thru 4	**Rev 0**
	5 thru 16	**Rev 1**
Section 3	3, 5 thru 12, 14, 18, 20 thru 24, 26, 28, 30	**Rev 0**
	1, 2, ,4, 13, 15, 16, 17, 19, 25, 27, 29	**Rev 3**
Section 4	1 thru 5, 8 thru 26	**Rev 0**
	7, 23	**Rev 3**
Section 5	1 thru 12	**Rev 0**
Section 5	13 thru 14	**Rev 2**
Section 5	15 thru 17	**Rev 0**
Section 6	1 thru 12	**Rev 0**
Section 7	1 thru 38	**Rev 0**
Section 8	1 thru 16	**Rev 0**
Supplement List		
Section 9	1, 2, 4	**Rev 0**
	3	**Rev 3**
Supplements LOEP: make reference to the Supplements Cover Pages		

3. FOREWORD

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. SECTIONS LIST

General (*)	Section 1
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Emergency Procedures (*)	Section 3
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Airframe and Systems description (*)	Section 7
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(*) non-approved Section

(**) approved Section

(***) partially approved Section - approved parts, if any, are reported in the supplements.

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SECTION 1 - GENERAL

INDEX

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1. INTRODUCTION

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

This manual also contains supplemental data supplied by the aeroplane manufacturer.

2. CERTIFICATION BASIS

This type of aircraft has been approved by the European Aviation Safety Agency in accordance with CS-23 including Amendment 2 and the Type Certificate No. EASA.A.576 has been issued on 26th September 2014.

Category of Airworthiness: Normal.

Noise Certification Basis: EASA CS 36 Amendment 2.

This type of aircraft has been validated also in the normal category of 14 CFR part 23 and part 36

3. WARNING – CAUTION – NOTE

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

WARNING means that the non-observation of the corresponding procedure leads to an immediate or important degradation of the flight safety.

CAUTION means that the non-observation of the corresponding procedure leads to a minor or to a more or less long term degradation of the flight safety

NOTE Draws the attention to any special item not directly related to safety but which is important or unusual.

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4. THREE-VIEW AND DIMENSIONS

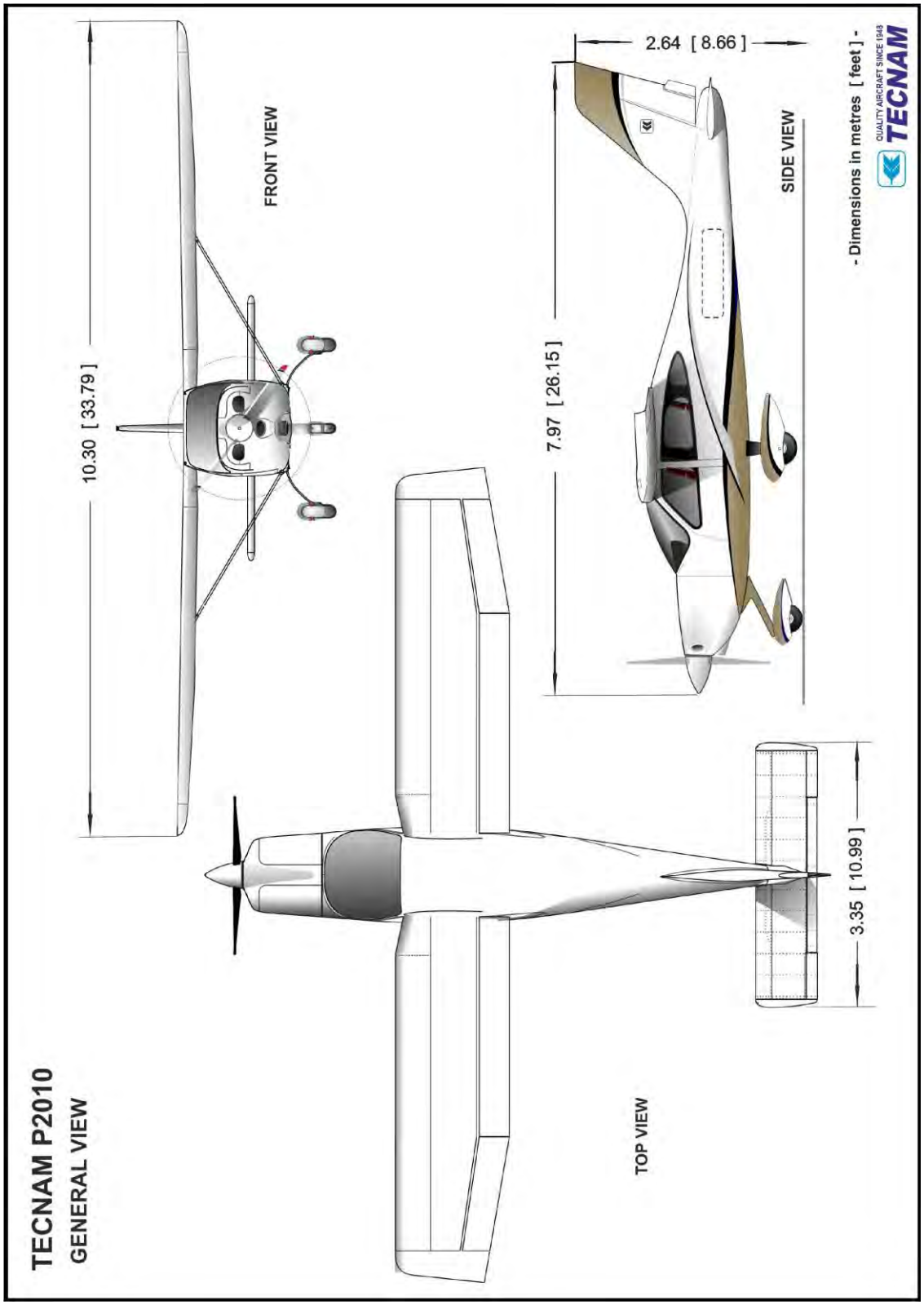

Figure 1 – General views

Dimensions

Overall dimensions

Wing Span …..…….. 10.30 m / 33.79 ft

Overall Length ……. 7.97 m / 26.15 ft

Overall height ……... 2.64 m / 8.66 ft

Stabilator Span ……. 3.35 m / 10.99 ft

Wing

Wing surface ..…….. 13.9 m^2 / 149.6 ft^2

Mean Geometric Chord ...…… 1.349 m / 4.427 ft

Dihedral ……... 1°

Aspect ratio ……. 7.63

Fuselage

Cabin width ..…….. 1.14 m / 3.74 ft

Cabin length..…….. 2.3 m / 7.54 ft

Landing Gear

Wheels Track …….. 2.1 m / 6.89 ft

Wheels base …… 2.15 m / 7.05 ft

Main Gear Tire …… 6.00-6

Nose Gear Tire …… 5.00-5

5. ENGINE

Manufacturer ……	Lycoming Engines
Model ……...	IO-360-M1A
Type Certificate ……...	EASA TCDS no. IM.E.032
Engine type ……..	Fuel injected (IO), direct drive, four cylinder horizontally opposed, air cooled with down exhaust outlets.
Maximum power …….	134.0 kW (180 hp) @ 2700 rpm
Maximum continuous power ……...	134.0 kW (180 hp) @ 2700 rpm

6. PROPELLER

Manufacturer ……..	MT Propeller
Model …….	MT 188 R 145 – 4G
Type Certificate ……..	EASA TCDS no. P.006
Blades/hub ……..	2 wood/composite blades – aluminium hub
Diameter …….	1880 mm (74 in) (no reduction allowed)
Type ……	Fixed pitch

7. FLIGHT CONTROL SURFACES TRAVEL

Ailerons	Up 19°; Down 14 ° (± 2°)
Stabilator*	Up 6°; Down 17° (± 2°)
Stabilator trim tab	Up 3°; Down 15° (± 1°)
Rudder	RH 25°; LH 25° (± 2°)
Rudder trim tab	RH 20°; LH 20° (± 2°)
Flaps	0°; 20°; 40° (± 1°)

*degrees are measured from the Stabilator Leading Edge.

8. SPECIFIC LOADINGS

	MTOW 1160 kg (2557 lb)
Wing Loading	83.45 kg/m^2 (17.09 lb/ft^2)
Power Loading	6.44 kg/hp (14.21 lb/hp)

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9. ACRONYMS AND TERMINOLOGY

KCAS	Calibrated Airspeed is the indicated airspeed expressed in knots, corrected taking into account the errors related to the instrument itself and its installation.
KIAS	Indicated Airspeed is the speed shown on the airspeed indicator and it is expressed in knots.
KTAS	True Airspeed is the KCAS 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_O	Operating Manoeuvring speed is the speed above the which it is not allowed to make full or abrupt control movement
V_S	Stall Speed.
V_{S0}	Stall Speed in landing configuration (flaps and landing gear extended).
V_{S1}	Stall speed in clean configuration (flaps 0°).
V_X	Best Angle-of-Climb Speed is the speed which results in the greatest gain of altitude with respect to a given horizontal distance.
V_Y	Best Rate-of-Climb Speed is the speed which results in the greatest gain in altitude in a given time.
V_R	Rotation speed: is the speed at which the aircraft rotates about the pitch axis during takeoff
V_{LOF}	Lift off speed: is the speed at which the aircraft generally lifts off from the ground.
V_{obs}	Obstacle speed: is the speed at which the aircraft flies over a 15m obstacle during takeoff or landing.

Meteorological terminology

ISA	International Standard Atmosphere: is the air atmospheric standard condition at sea level, at 15 °C (59 °F) and at 1013.25 hPa (29.92 inHg).
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.

Aircraft performance and flight planning terminology

Crosswind Velocity	is the velocity of the crosswind component for the which adequate control of the airplane during takeoff 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.
TOR	is the takeoff distance measured from actual start to MLG wheel liftoff point.
TOD	is total takeoff distance measured from start to 15m obstacle clearing.
GR	is the distance measured during landing from actual touchdown to stop point.
LD	is the distance measured during landing, from 15m obstacle clearing to actual stop.
S/R	is the specific range, that is the distance (in nautical miles) which can be expected at a specific power setting and/or flight configuration per kilo of fuel used.

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 takeoff weight and the basic empty weight.
Maximum Takeoff Weight	is the maximum weight approved to perform the takeoff.
Maximum Landing Weight	is the maximum weight approved for the landing touchdown (for *P2010* it is equivalent to the Maximum Takeoff Weight).

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10. 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 sec-	[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]	1.853	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]

11. 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
100	26.4
110	29.1
120	31.7
130	34.3
140	37.7
150	39.6
160	42.3
170	44.9
180	47.6
190	50.2
200	52.8
210	55.5
220	58.1
230	60.7
240	63.4

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
26	98.4
28	106.0
30	113.6
32	121.1
34	128.7
36	136.3
38	143.8
40	151.4
42	159
45	170.3
47	177.9
50	189.3
55	208.2
60	227.1
63	238.4

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SECTION 2 – LIMITATIONS

INDEX

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1. INTRODUCTION

Section 2 includes operating limitations, instrument markings and basic placards necessary for safe operation of the aeroplane, its engine and standard systems and equipment.

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2. AIRSPEED LIMITATIONS

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

AIRSPEED		KIAS	KCAS	REMARKS
V_{NE}	Never exceed speed	166	164	Do not exceed this speed in any operation.
V_{NO}	Maximum Structural Cruising Speed	132	130	Do not exceed this speed except in smooth air, and only with caution.
V_A	Design Manoeuvring speed	120	119	Do not make full or abrupt control movement above this speed, because under certain conditions the aircraft may be overstressed by full control movement.
V_O	Operating Manoeuvring speed			
V_{FE}	Maximum flaps extended speed	91	92	Do not exceed this speed for indicated flaps setting.

3. AIRSPEED INDICATOR MARKINGS

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

MARKING	KIAS	EXPLANATION
White arc	**50 – 91**	Positive Flap Operating Range (lower limit is V_{SO}, at specified maximum weight and upper limit is the maximum speed permissible with landing flaps extension).
Green arc	**59– 132**	Normal Operating Range (lower limit is V_{S1} at specified maximum weight and most forward c.g. with flaps retracted and upper limit is maximum structural speed V_{NO}).
Yellow arc	**132 – 166**	Manoeuvres must be conducted with caution and only in smooth air.
Red line	**166**	Maximum speed for all operations.

4. POWERPLANT LIMITATIONS

Following table reports the operating limitations the installed engine:

ENGINE MANUFACTURER: Lycoming Engines

ENGINE MODEL: IO-360-M1A

MAXIMUM POWER:

	Max Power (hp)	**Max rpm. Prop. rpm**
Max. T.O.	180	2700
Max. Cont.	180	2700

Temperatures:

Max CHT …….. 500° F (260° C)

Max Oil ……. 245° F (118° C)

Oil Pressure:

Minimum Idling …… 25 psi (1.7 Bar)

Minimum Normal ……. 55 psi (3.8 Bar)

Maximum Normal …… 95 psi (6.5 Bar)

Starting, Warm-up, taxi and take-off (Max) …… 115 psi (7.9 Bar)

Fuel pressure:

- *At Inlet to fuel injector:*

Minimum ..... 14 psi (0.96 Bar)

Maximum ..... 35 psi (2.41 Bar)

5. FUEL

2 TANKS:	120 litres each one (31.7 US gallons)
MAXIMUM CAPACITY:	240 litres (63.4 US gallons)
MAXIMUM USABLE FUEL:	231 litres (61 US gallons)
APPROVED FUEL:	AVGAS Grade 91/96 or 100 LL (ASTM D910)

For additional information, refer to Lycoming Service Instruction No. 1070, latest issue.

6. LUBRICANT

Recommended Grade Oil:

Average Ambient Temperature	**MIL-L-6082B or SAEJ1966 Spec. Mineral Grades**	**MIL-L-22851 or SAEJ1899 Spec. Ashless Dispersant Grades**
All Temperatures	----	SAE15W50 or SAE20W-50
Above 80°F	SAE60	SAE60
Above 60°F	SAE50	SAE40 or SAE50
30°F to 90°F	SAE40	SAE40
0°F to 70°F	SAE30	SAE40, SAE30, SAE20W40
Below 10°F	SAE20	SAE30 or SAE20W30

For additional info, refer to "(L)IO-360-M1A Operation and Installation Manual", latest issue, "Operating instruction" Section.

7. PAINT

To ensure that the temperature of the composite structure does not exceed limits, the outer surface of the aeroplane must be painted with white paint, except for areas of registration marks, placards, and ornament.

Refer to Aircraft Maintenance Manual (AMM), ATA Chapter 4 and 51, for specific paint requirements.

8. PROPELLER

MANUFACTURER: …….. MT Propeller

MODEL: ……..……. MT 188 R 145 – 4G

TYPE: ……..…… wood/composite 2-blade, fixed pitch

DIAMETER: ……... 1880 mm (74 in) (no reduction is permitted)

9. MAXIMUM OPERATING ALTITUDE

Maximum operating altitude is 12000 ft (3658 m) MSL.

CAUTION

At altitudes above 10000 ft (3048 m) up to and including 12000 ft (3658 m), flight crew is recommended to use supplemental oxygen.

10. AMBIENT TEMPERATURE

Ambient temperature: from -25 °C (-13 °F) to +50 °C (122 °F).

WARNING

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

11. POWERPLANT INSTRUMENT MARKINGS

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

INSTRUMENT		RED ARC Minimum limit	WHITE ARC Advisory	GREEN ARC Safe operation	YELLOW ARC Caution	RED ARC Maximum limit
PROPELLER	RPM	/	/	950-2700	0-950	2700-2800
OIL TEMP.	°F	/	/	140-245	0 - 140	245 - 255
CHT	°F	/	435 (line)	150-475	0 – 150 475-500	500-510
EGT	°F	/	1000-1500	/	1375 (line)	1500-1550
OIL PRESS	psi	0-25	/	55-95	25 - 55 95-115	115 - 125
FUEL PRESS	psi	0-14	/	14-35	/	35 - 40
FUEL QTY	litres	0	/	0-115	/	/
	gal	0		0-30,4		
FUEL FLOW	l/hr	/	0-75	/	/	/
	gal/hr		0-20			

12. OTHER INSTRUMENT MARKINGS

INSTRUMENT	RED ARC Minimum limit	GREEN ARC Safe operation	YELLOW ARC Caution	RED ARC Maximum limit
Voltmeter	20-21 Volt	24–30 Volt	21–24 Volt	30-31 Volt

13. WEIGHTS

Condition	Weight	
Maximum takeoff weight	1160 kg	2557 lb
Maximum landing weight	1160 kg	2557 lb
Maximum baggage weight	40 kg	88 lb

Baggage Compartment	Weight	
Maximum weight	40 kg	88 lb
Maximum specific pressure	0.72 kg/dm^2	14.9 lb/ft^2

NOTE *Refer to Section 6 for proper aircraft and baggage loading.*

14. CENTER OF GRAVITY RANGE

Datum	Vertical plane tangent to the wing leading edge (the aircraft must be levelled in the longitudinal plane)
Levelling	Refer to the seat track supporting beams (see procedure in Section 6)
Forward limit	**0.262 m (10.3 in) (19% MAC)** aft of datum for all weights
Aft limit	**0.440 m (17.3 in) (32% MAC)** aft of datum for all weights

WARNING

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

15. FLIGHT CREW

Minimum crew: 1 pilot
Maximum seating configuration: 4 people (including the pilot)

16. APPROVED MANEUVERS

The aircraft is certified in Normal Category in accordance with EASA CS-23and FAA 14 CFR part 23 regulations.

Non aerobatic operations include:

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

WARNING

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

In addition Intentional shutdown of engine in flight is forbidden.

WARNING

Limit load factor could be exceeded by moving flight controls to maximum deflection at a speed above V_A=V_O (120 KIAS, Manoeuvring Speed).

WARNING

Flight in expected and/or known icing conditions, in proximity of storms or in severe turbulence is forbidden.

16.1. TYPES OF SURFACE

This aircraft may operate on both paved and grass surfaces, refer to Section 5 for impacts on performances.

17. MANEUVERS LOAD FACTOR LIMITS

Maneuver load factors limits are as follows:

Positive	Negative
+ 3.8 g	**- 1.52 g**

Maneuver load factors limits with flaps extended are as follows:

Positive	Negative
+ 2 g	**0 g**

18. KINDS OF OPERATION EQUIPMENT LIST (KOEL)

This paragraph reports the KOEL table, concerning the equipment list required on board under CS-23 and Far-23 regulations to allow flight operations in VFR Day/Night and IFR Day/Night.

Flight in VFR Day/Night and IFR is permitted only if the prescribed equipment is installed and operational.

Additional equipment, or a different equipment list, for the intended operation may be required by national operational requirements and also depends on the airspace classification and route to be flown.

The owner is responsible for fulfilling these requirements.

Equipment	VFR Day	VFR Night	IFR Day	IFR Night	Note
External Power					
Circuit Breakers	•	•	•	•	As Required
Battery	•	•	•	•	
Safety Equipment & Furnishing					
First Aid kit	•	•	•	•	
Fire extinguisher	•	•	•	•	
ELT	•	•	•	•	
Torch (with spare batteries)		•		•	
Ice Protection					
Pitot heating system		•	•	•	
Landing Gear					
Wheel pants					Removable
Lights					
Landing/taxi lights	•	•	•	•	
Strobe lights	•	•	•	•	
NAV lights	•	•	•	•	
Cabin lights		•		•	
Instrument lights		•		•	
Emergency light		•		•	
Dimming Devices		•		•	
Day/Night switch		•		•	
COM/Navigation/Engine parameters					
Magnetic compass	•	•	•	•	
GARMIN G1000 Suite	•	•	•	•	
MD 302 suite		•	•	•	
Pitot system	•	•	•	•	
Clock	•	•	•	•	
Flight Controls					
Pitch trim indicator	•	•	•	•	
Flap System	•	•	•	•	
Flaps position lights	•	•	•	•	
Rudder trim system	•	•	•	•	only for VFR operations, rudder trim system may be inoperative provided the trim tab is fixed in the streamlined position and the system is electrically disabled
Stall warning system	•	•	•	•	
	VFR Day	**VFR Night**	**IFR Day**	**IFR Night**	

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19. LIMITATIONS PLACARDS

Hereinafter limitation placards, related to the operating limitations, are placed in plain view on the pilot.

19.1. SPEED LIMITATIONS

On the left side instrument panel, above on the left, it is placed the following placard reporting the speed limitations:

19.2. OPERATING LIMITATIONS

On the central side of the instrument panel, the following placard is placed reminding the observance of aircraft operating limitations according to installed equipment configuration, see KOEL paragraph 18.

19.3. NO SMOKING PLACARD

On the right hand side of the instrument panel the following placard is placed reminding the observance for “no smoking”:

19.4. BAGGAGE COMPARTMENT PLACARD

Behind the baggage compartment door the following placard is placed:

SECTION 3 – EMERGENCY PROCEDURES

INDEX

1. INTRODUCTION

Section 3 includes checklists and detailed procedures for coping with various types of emergency conditions that could arise.

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 should be provided.

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, as 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 know and mastered, but that are not time critical and can be executed entering and following step by step the AFM appropriate checklist.

In case of emergency the pilot should acts as follows:

1. *Maintain aircraft control*
2. *Analyse the situation*
3. *Apply the pertinent procedure*
4. *Inform the Air Traffic Control if time and conditions permit*

NOTE

The 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.*

1.1. REFERENCE AIRSPEEDS FOR EMERGENCY PROCEDURES

Best glide speed (V_{GLIDE})	**85 KIAS**
No-flaps Approach Speed	**80 KIAS**

2. FAILURES INDICATED ON THE ANNUNCIATION WINDOW

The annunciator window is integrated in the GARMIN G1000. The colours are as follows:

GREEN: to indicate that pertinent device is turned ON
AMBER: to indicate no-hazard situations which have to be considered and which require a proper crew action
RED: to indicate emergency conditions

2.1. ALTERNATOR FAILURE

Annunciation window	Alert window
ALT FAIL	Alternator failure

If **ALT FAIL** caution is **ON**:

1. Circuit breaker(s)…….. *Check*
2. Generator SWITCH……..… *OFF*
3. Generator SWITCH…….. *ON*

If **ALT FAIL** CAUTION REMAINS on:

4. Generator SWITCH……..… *OFF*

NOTE *A fully charged battery shall supply electrical power for at least 30 minutes.*

2.2. PITOT HEATING SYSTEM FAILURE

Annunciation window	Alert window
PITOT HEAT ON	Pitot heat on
PITOT HEAT	Pitot heat

When the Pitot Heating system is activated, the green **PITOT HEAT ON** advisory light turns on and the amber **PITOT HEAT** caution light turns **OFF**, indicating that the Pitot Heating system is functioning properly.

If the amber **PITOT HEAT** caution light is **ON** when the green **PITOT HEAT ON** light is on, then the Pitot Heating system is not functioning properly.

In this case apply following procedure:

1. Pitot heat switch …… *OFF*
2. Pitot heat circuit breaker ……..…… *CHECK IN*
3. Pitot heat switch …… *ON*
4. **PITOT HEAT** caution light …….. *CHECK*

NOTE *if the amber light stays ON, avoid visible moisture and OATs below 10° C.*

3. G1000 System Failures

3.1. Loss of information displayed

When a LRU or a LRU function fails, a large red 'X' is typically displayed on the display field associated with the failed data.

NOTE

In most of cases, the red "X" annunciation is accompanied by a message advisory alert issuing a flashing ADVISORY Softkey annunciation which, once selected, acknowledges the presence of the message advisory alert and displays the alert text message in the Alerts Window.

3.2. Loss of airspeed information

	**AIRSPEED FAIL** **(RED X ON DISPLAY FIELD)**
	Display system is not receiving airspeed input from Air Data Computer.

INSTRUCTION: revert to standby instrument

3.3. LOSS OF ATTITUDE INFORMATION

	**ATTITUDE FAIL** **(RED X ON DISPLAY FIELD)**
	Display system is not receiving attitude information from AHRS.

INSTRUCTION: revert to standby instrument

3.4. LOSS OF ALTITUDE INFORMATION

	**ALTITUDE FAIL** **(RED X ON DISPLAY FIELD)**
	Display system is not receiving altitude input from Air Data Computer.

INSTRUCTION: revert to standby instrument

3.5. LOSS OF VERTICAL SPEED INFORMATION

	**VERT SPEED FAIL** **(RED X ON DISPLAY FIELD)**
	Display system is not receiving vertical speed input from Air Data Computer.

INSTRUCTION: determine vertical speed on the basis of altitude information

3.6. LOSS OF HEADING INFORMATION

	**HDG** **(RED X ON DISPLAY FIELD)**
	Display system is not receiving valid heading input from AHRS.

INSTRUCTION: revert to magnetic compass

3.7. DISPLAY FAILURE

In the event of a display failure, the G1000 System automatically switches to reversionary (backup) mode. In reversionary mode, all important flight information is presented on the remaining display in the same format as in normal operating mode. The change to backup path is completely automated for all LRUs and no pilot action is required.

if the system fails to detect a display problem

1. REVERSIONARY MODE button *PUSH*

NOTE *REVERSIONARY MODE button is red and located on the bottom of the audio panel .*

CAUTION *If a display fails, the related Integrated Avionics Unit (IAU) is cut off and can no longer communicate with the remaining display: subsequently the NAV and COM functions provided to the failed display by the associated Integrated Avionics Unit are flagged as invalid on the remaining display.*

4. ENGINE SECURING

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

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

5. AIRCRAFT EVACUATION

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

1.	**Parking brake**	***ON***
2.	**Seat belts**	***UNSTRAP***
3.	**Headphones**	***REMOVE***
4.	**Door**	***OPEN***
5.	**MASTER SWITCH**	***OFF***
6.	***Escape away from flames/hot engine compartment/spilling fuel tanks/hot brakes***	

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6. ENGINE FAILURES

6.1. ENGINE FAILURE DURING TAKEOFF RUN

If engine fails before rotation: ABORT TAKE OFF

1. **Throttle Lever …….. *IDLE (fully out and hold)***
2. **Mixture ……. *CUT OFF***
3. **Brake ……. *AS REQUIRED***

With aircraft stopped

4. Ignition key…….. *OFF*
5. Fuel Selector…… *OFF*
6. Electrical fuel pump…… *OFF*
7. Generator & Master Switches…… *OFF*
8. Parking Brake…… *ENGAGED*
9. Aircraft Evacuation…… *PERFORM if necessary*

6.2. ENGINE FAILURE AFTER TAKE-OFF

If engine fails immediately after becoming airborne:

- ***Abort on the runway if possible.***

In case low altitude precludes a runway stop and / or engine restart:

1. **establish a glide attitude (V_{GLIDE})**
- ***Find a suitable place on the ground to land safely.***

CAUTION

The landing should be planned straight ahead with only small changes in directions not exceeding 45° to the left and 45° to the right.
Any turn would reduce the glide performance.

2. **Throttle Lever…… IDLE (fully out and hold)**
3. **Mixture…… CUT OFF**
4. **Brakes……. As required**

With aircraft stopped

5. Fuel Selector…… OFF
6. Electrical fuel pump…… OFF
7. Ignition key…….. OFF
8. Generator&Master Switches…… OFF
9. Parking Brake…… ENGAGED
10. Aircraft Evacuation…… PERFORM if necessary

6.3. PROPELLER OVERSPEED

In case of propeller overspeeding in flight, apply following procedure:

1. Throttle Lever ……. REDUCE power
2. Mixture Lever ……. AS REQUIRED
3. RPM indicator …… CHECK

If it is not possible to decrease propeller RPM, **land as soon as possible** applying *Forced landing* procedure. *(See Para 0)*

CAUTION

Maximum propeller RPM exceedance may cause engine components damage.

Apply caution while accelerating with power lever close to max and monitor engine RPM; RPM overspeed shall be prevented by retarding power lever.

6.4. IRREGULAR RPM

1. Fuel pump: ……ON
2. Fuel quantity and pressure indicators: …..…CHECK
3. If necessary: …….. SWITCH TANK

If engine continues to run irregularly

- **Land as soon as possible**.

6.5. CHT LIMIT EXCEEDANCE

If CHT exceeds maximum limit:

1. Throttle Lever ……. REDUCE power as practical
2. Mixture Lever ……. Rich as required
3. CHT …… Verify decreasing

If CHT stabilizes in the green arc:

4. Continue flight

If CHT continue to rise and engine shows roughness:

Land as soon as possible applying forced landing procedures *(See Para 0)*

6.6. OIL TEMPERATURE LIMIT EXCEEDANCE

If oil temperature exceeds maximum limit:

NOTE

Maximum oil temperature limit exceedance can be the final effect of different causes: excessive friction between moving engine components, oil leakage from the circuit (with related pressure reduction) etc.

1. Throttle Lever *REDUCE engine power*
2. Mixture lever *Enrich as required*
3. OIL TEMP *CHECK*

<u>if oil temperature does not decrease:</u>

4. Airspeed *INCREASE*
5. OIL TEMP *CHECK*

<u>If oil temperature does not come back within limits:</u>

6. **Land as soon as practical** with engine set to the minimum necessary power

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

Land as soon as possible applying forced landing procedure *(See Para 0)*

6.7. OIL PRESSURE LIMITS EXCEEDANCE

LOW OIL PRESSURE

If oil pressure is under the lower limit

1. Throttle Lever …… *REDUCE to minimum practical*
2. Mixture Lever ..…….. *as required*
3. OIL TEMP …… *CHECK within limits*
4. OIL PRESS …… *CHECK*

If oil pressure does not increase and temperature remains within limits

Monitor oil and cylinder head temperatures.
Land as soon as practicable.

If oil pressure does not increase and temperature exceeds limits

Reduce engine power to minimum required.
Land as soon as possible applying Forced landing procedure. *(See Para 0)*
Be prepared for engine failure and emergency landing.

If oil pressure tends to zero (combined with vibration, loss of oil, unusual metallic smoke and noise)

Apply Forced landing procedure. *(See Para 0)*

HIGH OIL PRESSURE

If oil pressure exceeds upper limit

1. Throttle Lever …… *first REDUCE engine power by 10%*
2. Mixture Lever ……... *as required*
3. OIL PRESS ……... *CHECK*

If oil pressure does not decrease

4. **Land as soon as possible** applying *Forced landing procedure. (See Para 0)*

NOTE *An excessive oil pressure value can be counteracted by decreasing propeller RPM.*

6.8. LOW FUEL PRESSURE

If fuel pressure decreases below the lower limit

1. Electric fuel pump……... ON
2. Fuel selector valve……... Select opposite fuel tank if NOT empty
3. Fuel quantity ……... *CHECK*

If fuel pressure doesn't build up:

1. **Land as soon as practical.** Prepare for potential engine failure and prepare to apply *Forced landing procedure*. *(See Para 0)*

6.9. HIGH FUEL PRESSURE

If fuel pressure increases above the upper limit

1. **Land as soon as possible.** Prepare for potential engine shut down and apply *Forced landing procedure*. *(See Para 0)*

Possible injector failure or obstruction.

6.10. DEFECTIVE ENGINE CONTROLS

Defective Mixture Control Cable

1. Maintain altitude to the nearest airfield
2. During descent, check engine behaviour to a higher power setting. A lean mixture can lead to engine roughness and loss of power.
   Landing approach must be planned accordingly.

WARNING

Go-around may then be impossible.

Defective Throttle Control Cable

If power is sufficient to continue flight:

1. Approach nearest airfield
2. Perform landing with shut-down engine applying *Forced landing procedure*. *(See Para 0)*

If power is not sufficient to continue flight:

1. Carry out *Forced landing procedure*. *(See Para 0)*

7. INFLIGHT ENGINE RESTART

7.1. PROPELLER WINDMILLING

WARNING

In case of engine shutdown, propeller will keep windmilling and will not stop, preventing the use of ignition key. Engine inflight restart must be performed without using ignition key until propeller is windmilling in order to avoid possible engine damages.
Typical indication of a potential engine shutdown, with windmilling propeller, will be low RPM values incompatible with power lever demand, to be confirmed by other engine instruments (OIL Pressure, CHT, EGT running down abnormally).
Flight test results suggest a windmilling propeller speed as low as 600-500 RPM at low speeds in case of flameout.
Inflight engine restart may be performed during 1g flight anywhere within the normal operating envelope of the airplane.

1.	Master switch ……	*Check ON*
2.	Fuel pump …….	*ON*
3.	Fuel quantity indicator ……..	*CHECK*
4.	Fuel Selector …….	*SWITCH TANK*
5.	Throttle Lever ……..	*Minimum 1cm(0,39in) above IDLE*
6.	Mixture ……	*FULL rich*
7.	Throttle lever ……	*SET as required*

In case of unsuccessful engine restart:

- **Land as soon as possible** applying *Forced landing procedure. (See Para 0)*

In case of successful engine restart:

- **Land as soon as possible**

CAUTION

After engine restart, if practical, moderate propeller RPM to allow the temperatures for stabilizing in the green arcs.

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8. SMOKE AND FIRE

8.1. ENGINE FIRE ON THE GROUND

1. Mixture ……	***CUT OFF***
2. Cabin heat and defrost ……..	***OFF***
3. Fuel Selector …….	***OFF***
4. Ignition key ……	***OFF***
5. Fuel pump……...	***OFF***
6. MASTER SWITCH ……..	***OFF***
7. Parking Brake ……....	***ENGAGED***
8. Aircraft evacuation…….....	***PERFORM (Para 4)***

8.2. ENGINE FIRE DURING TAKEOFF

If engine fails before rotation: ABORT TAKE OFF

1. Throttle Lever……..	***IDLE***
2. Mixture…….	***CUT OFF***
***3.* Brakes……**	***AS REQUIRED***

With aircraft under control

4. Fuel Selector……..	***OFF***
5. Electrical fuel pump…….	***OFF***
6. Ignition key……	***OFF***
7. Cabin Heat…….	***OFF***
8. Field & Master Switches……...	***OFF***
9. Parking Brake……	***ENGAGED***
10. Aircraft Evacuation……	***PERFORM (Para 4)***

8.3. ENGINE FIRE IN FLIGHT

1. Cabin heat and defrost ……..	***BOTH OFF***
2. Mixture ……	***CUTOFF***
3. Fuel Selector ……...	***OFF***
4. Throttle Lever ……...	***FULL FORWARD***
5. Ignition key ……....	***OFF***
6. Electrical fuel pump ……..	***OFF***
7. Master Switches ……...	***OFF***
8. Cabin ventilation ……	***OPEN***
9. Land as soon as possible applying Forced landing procedure. (See Para 0)	

8.4. ELECTRICAL SMOKE IN CABIN ON THE GROUND

1.	**MASTER SWITCH ……..**	***OFF***
2.	**Generator Switch ……....**	***OFF***
3.	**Cabin heat and defrost ……**	***OFF***
4.	**Throttle Lever ……**	***IDLE***
5.	**Ignition key ……**	***OFF***
6.	**Fuel Selector ……..**	***OFF***

With propeller stopped, evacuate the aircraft

8.5. ELECTRICAL SMOKE IN CABIN DURING FLIGHT

1.	***Cabin heat ……....***	***OFF***
2.	**Cabin ventilation……**	***OPEN***
3.	***In case of fire, direct the fire extinguisher toward the base of flame***	

If smoke persists:

4.	Generator switch…….	*OFF*

If smoke persists:

5.	Generator switch…….	*ON*
6.	*Keep RPM above 1000*	
7.	Master switch……..	*OFF*

If smoke persists:

8.	Generator switch…….	*OFF*

CAUTION

If the Generator SWITCH is set to OFF, consider that flaps are supplied by battery.

9. RECOVERY FROM UNINTENTIONAL SPIN

If unintentional spin occurs:

1. **Throttle** ..... ***IDLE***
2. **Rudder** ..... ***Fully opposite to the direction of spin***
3. **Control Yoke** ..... ***Centralize and hold neutral***

When rotation stops:

4. **Rudder** ..... ***NEUTRAL***
5. **Attitude** ..... ***RECOVERY promptly but smoothly, averting speed close to/in excess of VNE***
6. **Throttle** .....***AS REQUIRED***

WARNING

Keep full rudder against rotation until spin has stopped.

One complete turn and recovery will take about 800 to 1000 feet altitude loss.

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10. OTHER EMERGENCIES

10.1. LOSS OF ESSENTIAL BUS

In case of loss of essential bus, the following will be lost (related breakers are listed):

PFD	FLAP ACTUATOR
COM1	PITOT HEAT
GPS1/NAV1	STROBE LIGHT
EIS	LANDING LIGHT
FUEL PUMP	AHRS
FIELD	ADC
STALL WARNING	ANN. PANEL

Electrical power from Alternator is lost, battery will automatically provide energy (duration at least 30 min.).
Pilot will need to make reference to standby instrument for primary flight information and parameters.
Pilot will be able to use the audio panel and COM2/NAV2 via MFD.
Engine parameters and related warnings/cautions are lost.
Flaps extension and retraction will be lost, apply Flaps control failure procedure (See Para 10.6).
Strobe and landing lights will be lost, NAV and taxi lights are still available;
taxi light will be the only visual aid for landing in night conditions.

10.2. LOSS OF MAIN BUS

In case of loss of main bus, the main bus voltage will drop to zero.

The following will be lost (related breakers are listed):

AUDIO PANEL	START	AVIONIC
RUDDER TRIM ACTUATOR	INSTR. LIGHT	MFD
A.D.I. (running on internal battery power)	NAV LIGHT	COM2
28/12 VDC CONVERTER (if installed)	TAXI LIGHT	GPS2/NAV2
12VDC SOCKET (if installed)	CABIN LIGHT	ADF
INSTRUMENT (clock, pitch trim indic.)	FAN (G1000)	XPDR
COPILOT SEAT (if installed)	PILOT SEAT (if installed)	DME

Fail safe operation of Garmin G1000 allows pilot to transmit and use COM1 using headphones only; speakers will not be available.

For night flights, all instrument lights will be lost, but emergency light will still be available.

10.3. ELECTRICAL SYSTEM OVERALL FAILURE

In case of electrical system overall failure, apply following procedure:

1. MASTER SWITCH ..... *OFF*
2. Generator Switch ..... *OFF*
3. MASTER SWITCH ..... *ON*
4. Generator Switch ..... *ON*

If failure persists

Land as soon as possible

NOTE *Standby instrument is still available, providing the internal battery is in good charge status (>80%) it will provide at least 1 hr of runtime.*

WARNING *An electrical system overall failure prevents flaps operation: landing distance without flaps increases of about 25% (See also Para 10.6).*

10.4. STATIC PORT FAILURE

In case failure, the alternate static port in the cabin must be activated.

In this case apply following procedure:

1. Cabin ventilation ..... *OFF (hot and cold air)*
2. ALTERNATE STATIC PORT VALVE .... *OPEN*
3. Continue the mission

10.5. UNINTENTIONAL FLIGHT INTO ICING CONDITIONS

1. Pitot heat ……..…….. *ON*
2. *Fly immediately away from icing conditions (changing altitude and direction of flight, out and below of clouds, visible moisture, precipitations).*
3. Control surfaces ……. *MOVE continuously to avoid locking*
4. Throttle……. *INCREASE to prevent ice build-up on propeller blades*

WARNING

In event of ice build-up in correspondence of wing leading edges, stall speed increases and stall may become asymmetric. In case of stabilator ice accretion, it may loose its efficiency, leading to lack of aircraft pitch control and loss of control.

10.6. FLAPS CONTROL FAILURE

DURING TAKEOFF

CAUTION

In case of unintentional flaps retraction, or if the flaps control fails, and if the takeoff cannot be aborted, consider that the distances, without flaps, increase by about 20%.

1. Flap position……. CHECK and confirm
2. Airspeed …….. KEEP below V_{FE}
3. **Land as soon as practical**

DURING APPROACH/LANDING

CAUTION

In case of unintentional flaps retraction or if the flaps control fails, consider that the landing distance without flaps increases by about 25%.

1. Flap position……. CHECK and confirm
2. Airspeed …… ESTABLISH *no-flaps approach speed*
3. **Land as soon as practical**

10.7. ELECTRICAL RUDDER TRIM CONTROL FAILURE

Trim Runaway

In event of trim runaway:

1. Speed: *ADJUST to control aircraft without excessive pedal force*
2. Rudder: *AS REQUIRED*
3. **Land aircraft as soon as practical**.

Trim Jamming

Should trim control be jammed / inoperative:

1. Breaker: *CHECK IN*
2. Speed: *ADJUST to control aircraft without excessive pedal force*
3. Rudder: *AS REQUIRED*
4. **Land aircraft as soon as practical**.

11. LANDING EMERGENCIES

11.1. FORCED LANDING WITHOUT ENGINE POWER

Preparation:

1. Flaps……. *UP*
2. Airspeed ……... *ESTABLISH V_{GLIDE}*
3. Radio …… *Transmit MAYDAY giving location and intentions*
4. Transponder……. *7700*
5. If off airport, ELT …… *ON*
6. Find a suitable place to land safely, plan to approach it upwind
7. Throttle Lever ……. *IDLE*
8. Mixture …… *CUTOFF*
9. Fuel Selector ……... *OFF*
10. Ignition key ……. *OFF*
11. Fuel pump …… *OFF*
12. Seat belts ……. *Tightly FASTENED*

When landing is assured:

13. Flaps …… *AS REQUIRED*
14. Generator and Master switches ..……. *OFF*

NOTE *Be prepared for aircraft evacuation (Para 4).*

11.2. POWER-ON FORCED LANDING

1. Flaps……. *UP*
2. Airspeed ……... *ESTABLISH V_{GLIDE}*
3. Locate the most suitable terrain for emergency landing, plan to approach upwind
4. Safety belts……..…… *Tightly FASTENED*

When landing is assured:

5. Flaps ……... *AS NECESSARY*
6. Fuel selector valve…….. *OFF*
7. Electric Fuel Pump……. *OFF*
8. Ignition Key…… *OFF*
9. Generator and Master switches…….. *OFF*

11.3. LANDING WITH NOSE LANDING GEAR TIRE DEFLATED

1. Pre-landing checklist: *COMPLETE*
2. Flaps: *LAND*
3. Land and maintain aircraft *NOSE HIGH* attitude as long as possible.

As aircraft stops

4. Engine securing: *PERFORM (see Para. 5)*
5. Airplane evacuation: *PERFORM (see Para 4)*

11.4. LANDING WITH A MAIN LANDING GEAR TIRE DEFLATED

1. Pre-landing checklist: *COMPLETE*
2. Flaps: *LAND*
3. Land the aeroplane on the side of runway opposite to the defective tire to compensate the change in direction which is to be expected during final rolling (put the drag in the middle)
4. Touchdown with the GOOD TIRE FIRST and hold aircraft with the flat tire off the ground as long as possible by mean of aileron and rudder control.

As aircraft stops

5. Engine securing: *PERFORM (see Para. 5)*
6. Airplane evacuation: *PERFORM (see Para. 4)*

SECTION 4 – NORMAL PROCEDURES

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1. INTRODUCTION

Section 4 describes checklists and recommended procedures for the conduct of normal operations for ***P2010*** aircraft.

2. IFR FLIGHT: TRAINING PRE-REQUISITES AND INCREMENTAL EXPOSITION TO G1000 SUITE

The aircraft is fully equipped with a Garmin G1000 avionic suite that integrates radio aids navigation with GPS navigation, providing an outstanding capability to support IFR flight, from basic instrument training to complex IFR scenario.

NOTE

Depending on national regulations, in some countries flying IFR with a single engine aircraft without autopilot installation and/or single pilot may or may not be allowed, any customer must pay careful attention to check limitations that may apply.

The use of G1000 software requires full system knowledge (G1000 manual which will also specify peculiar limitations), careful preparation, ground training on the computer-assisted software and pre-flight training before flight.

Furthermore, as a minimum during training, it's strongly recommended using the avionic suite in IFR with incremental steps after initial basic IFR instruction:

1. Initial use of a single radio-aids (No GPS);
2. Use of two radio-aids (No GPS);
3. Use of GPS for point to point navigation (No approaches);
4. Use of VNAV feature;
5. Full use of avionic suite.

The flight training syllabus for IFR instruction will need to address this incremental approach in order to give pilots awareness of full avionic potential, and to highlight the complexity of single pilot usage of G1000 Garmin suite while enroute or high density airspace structure.

CAUTION

Due to precision required on IFR flight, the workload that may develop using full avionic suite, may get excessive in single pilot without the aid of an autopilot.

Considering the complexity of the G1000 suite, sound judgment will be required (weather, airspace complexity, pilot skills) to assess the best option of IFR steer guidance.

NOTE

The necessity to correct or modify flight plans in the Garmin G1000 under these conditions may distract pilots from basic handling causing deviations from assigned parameters, so careful attention must be exercised to avoid deviations on flying parameters.

It's highly recommended to continue cross-checking flight parameters when entering flight data into the G1000, especially when trying to create / insert arrival and departure procedures and / or VNAV profiles as the quantity of actions needed is high and may distract pilots from basic and precise handling.

The following prescriptions, other than those already present in the G1000 manual, shall be observed:

- Use of GPS for precision approach navigation mode is not allowed.
- Use of GPS is prohibited as primary means for navigation. GPS is approved as supplemental means for navigation;
- Use of GPS is prohibited for IFR in terminal area or in non-precision approach operations;

If Receiver Autonomous Integrity Monitoring (RAIM) function becomes unavailable in en route phase of flight, position must be verified every 15 minutes using other IFR approved navigation system.

Turbulence and / or crosswind:

Presence of moderate to heavy turbulence and / or strong crosswind conditions (above 20 kts crosswind) will require high drift angle to correct for wind (above 15° drift) and highly reduce spare capabilities to do other concurrent tasks inside the cockpit other than precise flying.

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3. AIRSPEEDS FOR NORMAL OPERATIONS

The following airspeeds are those which are significant for normal operations.

	FLAPS	**1160 kg (2557 lb)**
Rotation Speed (V_R)	T/O	**60 KIAS**
Best Angle-of-Climb Speed (V_X)	T/O	**65 KIAS**
Best Angle-of-Climb Speed (V_X)	0°	**76 KIAS**
Best Rate-of-Climb speed (V_Y)	0°	**82 KIAS**
Flaps (V_{FE})	T/O & LAND	**91 KIAS**
No flaps approach	0°	**80 KIAS**
Approach speed	T/O	**75 KIAS**
Final Approach Speed	FULL	**70 KIAS**
Optimal Touch Down Speed	FULL	**60 KIAS**
Manoeuvring speed (V_A)	0°	**120 KIAS**
Glide Speed (V_{GLIDE})	0°	**85 KIAS**
Never Exceed Speed (V_{NE})	0°	**166 KIAS**

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4. PRE-FLIGHT INSPECTION

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

4.1. CABIN INSPECTION

1. Aircraft documents (ARC, Certificate of Airworthiness, Noise certificate, Radio COM certificate, AFM): *check current and on board*
2. Weight and balance: *calculate (ref. to Section 6) and check within limits*
3. Breaker: *all IN*
4. Safety belts: *connected to hard points, check condition*
5. Ignition key: *OFF, key extracted*
6. Master switch: *ON*
7. Voltmeter: *check within the limits*
8. Lights: *all ON, check for operation*
9. Acoustic stall warning: *check for operation*
10. Master switch: *OFF*
11. Baggage: *check first aid kit, ELT, fire extinguisher, luggage secured with restraint net.*

4.2. AIRCRAFT WALK-AROUND

To perform the aircraft walk-around, carry out the checklists according to the pattern 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 fuel quantity indicators must be verified by visual check of actual fuel quantity embarked in the tanks: graduated dipstick must be used.

WARNING

If ignitions key is in L/R/BOTH position, a propeller movement can cause the engine starting with consequent hazard for people nearby.

NOTE

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

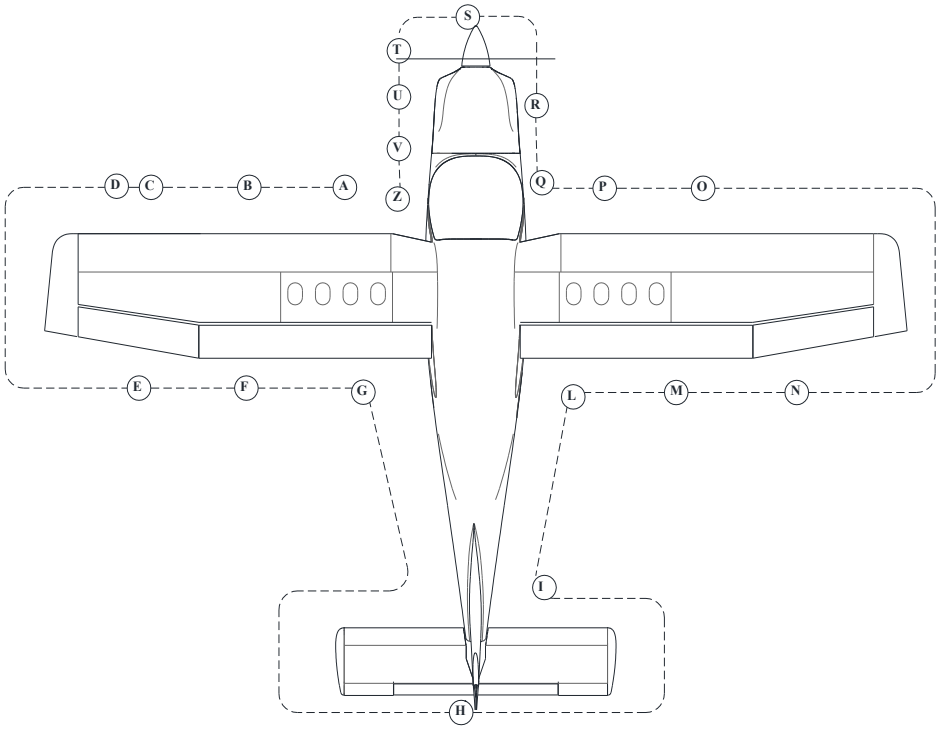

Figure 4.1

A	Left fuel filler cap	*CHECK desired fuel level (use graduated dipstick). Drain the left fuel tank sump by quick drain valve using a cup to collect fuel (drainage operation must be carried with the aircraft parked on a level surface). Check for water or other contaminants. Make sure filler cap is closed.*
B	Pitot tube	*REMOVE pitot plug and check the pitot for obstructions. Do not blow inside pitot tube.*
C	Left side leading edge and wing skin	*Visual inspection, check stall strips (if present)*
D	Left strobe light	*Visual inspection, CHECK for integrity and fixing*
E	Left aileron, hinges and LH tank vent line	*CHECK aileron and hinges for damage, and freedom from plays;* *Copper bonding strips: CHECK for proper connection;* *Left tank vent: CHECK for obstructions.*
F	Left flap and hinges	*Visual inspection;* *Copper bonding strips: CHECK for proper connection.*

G	Left main landing gear	*CHECK inflation, tire condition, alignment, fuselage skin condition. Check fuselage skin status, tire status (cuts, bruises, cracks and excessive wear), slippage markers integrity, gear structure and brakes hoses: there should be no sign of hydraulic fluid leakage.*
H	Stabilator, tab and rear light	*CHECK stabilator leading edge. Check the actuating mechanism of stabilator and the connection with related tab: CHECK free of play, friction. CHECK fuselage bottom and top skin. CHECK antennas for integrity. Check light for integrity.*
I	Vertical tail and rudder	*Visual inspection, check free of play, friction.*
L	Right main landing gear	*CHECK inflation, tire condition, alignment, fuselage skin condition. Check fuselage skin status, tire status (cuts, bruises, cracks and excessive wear), slippage markers integrity, gear structure and brakes hoses: there should be no sign of hydraulic fluid leakage.*
M	Right flap and hinges	*Visual inspection; Copper bonding strips: CHECK for proper connection;*
N	Right aileron, hinges and RH tank vent line	*Visual inspection, check free of play, friction; Copper bonding strips: CHECK for proper connection; Right side tank vent: check for obstructions.*
O	Right strobe light, leading edge and wing skin	*Visual inspection, CHECK stall strips (if present), CHECK strobe light for integrity and fixing*
P	Stall indicator switch	*CHECK for integrity and free of play,*
Q	Right fuel filler cap	*CHECK desired fuel level (use graduated dipstick). Drain the right fuel tank sump by quick drain valve using a cup to collect fuel (drainage operation must be carried with the aircraft parked on a level surface). Check for water or other contaminants. Make sure filler cap is closed.*
R	Nose wheel strut and tire/ RH static port	*CHECK inflation, tire condition and condition of shock absorber: there should be no sign of hydraulic fluid leakage. Check the right static port for obstructions.*

S	Propeller and spinner condition	*CHECK for nicks, cracks, dents and other defects, propeller should rotate freely. Check fixing and lack of play between blades and hub.*

T Check the engine cowling surface conditions, then open engine inspection doors and perform the following checks:

a) Nacelle inlets and exhausts openings must be free of obstructions. Check connection and integrity of air intake system, visually inspect that ram air intake is unobstructed. If inlet and outlet plugs are installed, they must be removed.
b) Check radiator. There should be no indication of leakage of fluid and they have to be free of obstructions.
c) Check for foreign objects
d) Only before the first flight of a day:
  (1) Brake Hydraulic fluid tank: check for correct level and replenish as required
  (2) Check V belt for general condition
  (3) Exhaust: inspect for damages, leakage and general condition.
  (4) Check engine mount and silent-blocks for condition.
e) At cold engine, Check engine oil level and replenish as required. Prior to long flights oil should be added so that the oil level reaches the "max" mark.
f) Drain off Gascolator for water and sediment (drain until no water comes off). Then make sure drain valve is closed.
g) Check drainage hoses free of obstructions
h) Verify all parts are fixed or locked: inspect fuel circuit for leakages.

U	Engine cowling doors	*CLOSE, check for proper alignment of cam-locks*
V	Landing/taxi light and LH static port	*CHECK, Visual inspection for integrity. Right side tank vent: check for obstructions.*
Z	Tow bar and chocks	*REMOVE, stow on board pitot, static ports and stall warning protective plugs.*

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

INTENTIONALLY LEFT BLANK

5. CHECKLISTS

5.1. BEFORE STARTING ENGINE (AFTER PREFLIGHT INSPECTION)

1. Seat position and safety belts: *adjust*
2. Flight controls: operate full stroke checking for movement smoothness, free of play and friction.
3. Parking brake: *engage*
4. Throttle friction: *adjust*
5. Throttle: *IDLE*
6. Mixture control Lever: *LEAN*
7. Circuit Breakers: *check all IN*
8. Master switch: *ON, wait PFD turn on, Check ALT OUT caution ON, Check LOW FP and LOW OP warning ON*
9. Only before the first flight of the day:

   Standby Instrument: Check no red crosses displayed.

   a. Press and hold the control knob (approx. 2 sec)

   b. Rotate the knob selecting "INFO>" page then press it

   c. Select "BATTERY INFO" page then press the knob

   d. Check "CHARGE (%)" to be more than 80%, then exit menu
10. Avionic Master switch: *ON, wait MFD turn on, check instruments, check Voltage on Main and Essential Buses.*
11. Fuel quantity: *compare the fuel quantity indicators information with fuel quantity visually checked into the tanks (see Pre-flight inspection – External inspection, and update the Garmin fuel content in the totalizer accordingly*

NOTE

The totalizer function available on Garmin Engine page allows input only up to 230lts (maximum usable fuel). Fuel calculations on totalizer do not use the aircraft fuel quantity indicators and are calculated from the last time the fuel was reset. Fuel consumption on totalizer is very precise as it take instantaneous fuel flow for the computation.

12. Electric fuel pump: *ON (check for audible pump noise and increase of fuel pressure)*
13. Warning "LOW FUEL PRESSURE"*: extinguished*
14. Electric fuel pump: *OFF*
15. Flap control: *cycle fully extended and then set to T/O*
16. Pitch Trim: *cycle fully up and down, then set to NEUTRAL*
17. Rudder trim: *cycle full right and left, then set to NEUTRAL*

WARNING

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

18. Nav & Strobe lights: *ON*

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.

19. Doors: *Closed and locked*

5.2. ENGINE STARTING

(a) Cold engine

1. Engine throttle: *1cm (1/2 inch) above idle*
2. Fuel selector valve: *select the tank with less fuel*
3. Electric fuel pump: *ON*
4. Mixture: *full open for 3 – 5" (positive fuel flow indication) then CUT-OFF*
5. Propeller area: *check that area is clear of persons / objects*

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.

CAUTION

Do not overheat the starter motor. Do not operate it for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool off for half an hour.

6. Ignition key: *BOTH*
7. Ignition key: *START*
8. Mixture: *rapidly move to FULL RICH*
9. Throttle: *set 1000 – 1200 RPM*
10. Check oil pressure rises within 10 sec.
11. Check "OIL PRESSURE LOW": *extinguished*
12. Electric fuel pump: *OFF*
13. Check fuel pressure: *within limits*
14. Generator switch: *ON*
15. Voltmeter: *increase and check within green arc*
16. ALT FAIL caution: *extinguished*
17. Nav. and taxi light: *ON*

NOTE

Avoid idling operations on the ground for optimum engine operation, maintain 1000-1200 RPM, do not exceed 2200 RPM on the ground.

18. Engine instruments: *Check within limits*
19. Check G1000 for warning / caution messages

(b) Warm engine

1. Engine throttle: *IDLE*
2. Fuel selector valve: *select the tank with less fuel*
3. Electric fuel pump: *ON*
4. Propeller area: *check for area clear of persons / objects*

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.

CAUTION

Do not overheat the starter motor. Do not operate it for more than 10 seconds. After operating the starter motor, let it cool off for 20 seconds. After 6 attempts to start the engine, let the starter cool off for half an hour.

5. Ignition key: *BOTH*
6. Ignition key: *START*
7. Mixture: *rapidly to FULL RICH*
8. Throttle: *set 1000 – 1200 RPM*
9. Check oil pressure rises within 10 sec.
10. Electric fuel pump: *OFF*
11. Check fuel pressure *within limits*
12. Generator switch: *ON*
13. Voltmeter: *increase and check within green arc*
14. ALT FAIL caution: *extinguished*
15. Engine instruments: *check within green arc*
16. Check G1000 for warning / caution messages

Avoid idling operations on the ground for optimum engine operation, maintain 1000-1200 RPM, do not exceed 2200 RPM on the ground.

5.3. BEFORE TAXIING

1. Flight instruments and avionics: *set, TEST functions*
2. Altimeter: *set*
3. Pitot Heat: *ON, test for ammeter indication, then OFF*
4. Parking brake: *OFF*

CAUTION

When taxiing at close range to other aircraft, or during night flight in clouds, fog or haze, the strobe lights should be switched OFF. The NAV lights must always be switched ON during night procedures.

5.4. TAXIING

1. Parking brake: *Release*
2. Brakes: *check*
3. Flight instruments: *check altimeter.*

NOTE *Avoid prolonged idling during taxi.*

CAUTION

Alternator lights may appear when reducing engine RPM below 950 RPM (yellow arc). The light will stay ON until RPM is increased above.
During taxi, it is recommended to maintain propeller speed at 1000RPM or above in order to preserve a full loaded battery, minimise annunciator nuisance and assure maximum battery performance during flight.

CAUTION

Following extended operation on the ground, or at high ambient temperatures, the following indications of fuel vapor lock may appear:
- Arbitrary changes in idle RPM and fuel flow;
- Slow reaction of the engine to operation of throttle;
- Engine will not run with throttle in IDLE position.
Solution:
1. For about 1 to 2 minutes, or until the engine settles, run at a speed of 1800 to 2000 RPM. Oil and cylinder head temperatures must stay within limits.
2. Pull throttle back to IDLE to confirm smooth running.
3. Set throttle to 1200 RPM and mixture for taxiing, i.e., use mixture control lever to set the maximum RPM attainable.
4. Immediately before the take-off run set the mixture for take-off, apply full throttle and hold this position for 10 seconds.

NOTE *Vapor lock can be avoided if the engine is run at speeds of 1800 RPM or more.*

5.5. BEFORE TAKEOFF

1. Parking brake: *brake pedal press, ON*
2. Engine instruments: *Check within limits*
3. ALT OUT caution: *OFF (check)*
4. Electric Fuel pump: *ON*
5. Fuel selector valve: *select the fullest tank*
6. Fuel pressure: *check*
7. Mixture: *FULL RICH*

NOTE *For 5000ft density altitude and above, or high ambient temperatures, a FULL RICH mixture may cause rough running of the engine or a loss of performance. The mixture may be adjusted to obtain smooth engine operations.*

8. Throttle: *set 1500 RPM*
    a. *Alternate Air check:*
    - Alternate Air: *PULL (Check drop 50-100 RPM)*
    b. *Mixture check:*
    - Mixture: *reduce*
    - EGT: *check increase*
    - FF: *check decrease*
    - Mixture: *FULL RICH*
9. Throttle: *2100 RPM*
10. Magneto Check: *L – BOTH – R – BOTH*
    - Max RPM drop: *175 RPM*
    - Max. difference: *50 RPM*
11. Throttle: *Idle*
12. Flaps: check *T/O*
13. Pitch and Rudder trim: *check neutral*
14. Flight controls: *check free*
15. Seat belts: *check fastened*
16. Doors: *check closed and locked*
17. Parking brake: *Release*
18. Landing light: *ON as required*
19. XPDR: *ON*

5.6. TAKEOFF

NOTE

For 5000ft density altitude and above, or high ambient temperatures, a FULL RICH mixt may cause rough running of the engine or a loss of performance. The mixture may be justed to obtain smooth engine operations.
Lean to maximum RPM at Full Throttle prior to take-off where airports are at 5000ft den altitude or higher.
During climb, a rough method of correctly leaning is to slowly reduce mixture lever until increase of appr.ly 50-100 RPM is noticed at constant IAS or EGT reaches 1375°F mark.

1. Pitot HEAT: *ON if required*
2. Fuel pump: *ON*
3. Brakes: *apply*
4. Throttle: FULL *and check approximately 2100 ± 100 RPM*

WARNING

Engine proper performance at full throttle shall be checked early in the ground roll in order to abandon take-off if necessary.
A rough engine, sluggish RPM increase or failure to reach take-off RPM are reasons for abandoning the take-off. If the engine oil is cold, an oil pressure in the yellow sector is permissible.

5. Engine instruments: *check parameters within the limits*
6. Brakes: *Release*
7. Rotation speed V_R: *60 KIAS*

   At safe height:
8. Flaps: *retract (minimum speed 73 KIAS)*

NOTE

Expect to adjust pitch trim (pitch up) when retracting flaps after take-off.

9. Establish Climb rate V_Y: *82 KIAS*
10. Electrical fuel pump: *OFF*
11. Fuel pressure: *check within limits*

5.7. CLIMB

NOTE

Due to position of fuel sensors, during climb fuel gauges in cockpit will indicate a fuel quantity slightly lower than the real amount. Regaining level flight will immediately restore correct indications.

NOTE

For 5000ft density altitude and above, or high ambient temperatures, a FULL RICH mixture may cause rough running of the engine or a loss of performance.
The mixture may be adjusted to obtain smooth engine operations.
Lean to maximum RPM at Full Throttle prior to take-off where airports are at 5000ft density altitude or higher.
During climb, a rough method of correctly leaning is to slowly reduce mixture lever until an increase of appr.ly 50-100 RPM is noticed at constant IAS or EGT reaches 1375°F mark.

1. Flaps: *UP (minimum speed 73KIAS)*

NOTE

Expect to adjust pitch trim (pitch up) when retracting flaps after take-off

2. Establish climb Vy: *82KIAS*
3. Electrical fuel pump: *OFF*
4. Fuel pressure: *check within limits*
5. Throttle: *FULL*
6. MIXTURE: *RICH, above 5000ft keep EGT constant*
7. Engine instruments: *in the GREEN*

NOTE

If the fuel pressure warning light illuminates, or the fuel pressure indication is below green arc, the electrical fuel pump must be switched ON.

5.8. CRUISE

1. Power: *set performance as required, refer to table in section 5 of AFM*
2. Fuel tank selector: *as required to maintain symmetric balance*
3. Mixture: *set in accordance with following para 5.9*

NOTE

To optimize engine life, the cylinder head temperature (CHT) should lie between 150°F and 400°F in continuous operation, and not rise above 435°F in fast cruise.

NOTE

Monitor and manually compensate asymmetrical fuel consumption by switching fuel selector valve. Switch ON the electric fuel pump prior to swap the fuel feeding from one tank to another.

5.9. MIXTURE ADJUSTMENT RECOMMENDATION

CAUTION

The maximum permissible cylinder head temperature (500 °F) must never be exceeded.
The mixture control lever should always be moved slowly.
Before selecting a higher power setting the mixture control lever should, on each occasion, be moved slowly to fully RICH before throttle adjustment.
Care should always be taken that the cylinders do not cool down too quickly.
The cooling rate should not exceed 50 °F per minute.

NOTE

For maximum service life cylinder head temperature should be kept below 475 °F (high performance cruise) and below 435 °F (for economy cruise).

Best Cruise Economy Mixture

The best economy mixture setting may only be used up to a power setting of 75 %. In order to obtain the lowest specific fuel consumption at a particular power setting, proceed as follows:

- *Slowly pull the mixture control lever back towards LEAN until the engine starts to run roughly.*
- *Then push the mixture control lever forward just far enough to restore smooth running. At the same time the exhaust gas temperature (EGT) should reach a maximum.*

Best Cruise Power Mixture

The mixture can be set for maximum performance at all power settings:

- *The mixture should first be set as for best economy.*
- *The mixture should then be enriched until the exhaust gas temperature is approximately 100°F lower.*

This mixture setting produces the maximum performance for a given manifold pressure and is mainly used for high power settings (approximately 75 %).

5.10. DESCENT

NOTE

Due to position of fuel sensors, during descent fuel gauges in cockpit will indicate a j quantity slightly higher than the real amount. Regaining level flight will immediately store correct indications.

1. Mixture control: *slowly full rich*
2. Throttle: *reduce as required*

NOTE

Shock cooling shortens engine life.
When reducing power, the change in cylinder head temperature should not exceed 50°F per minute. In order to ensure best practice and avoid potential illumination of ALT FAIL (due to low propeller speed), the following best practice should be observed:

- *Reducing power to maintain a minimum descent speed of 85 KIAS (best glide) and / or a blade angle to maintain 850 RPM;*
- *Opening the ALTER AIR command to full open (to avoid ice accretion).*

CAUTION

The maximum permissible cylinder head temperature (500 °F) must never be exceeded.

The mixture control lever should always be moved slowly.

Before selecting a higher power setting the mixture control lever should, on each occasion, be moved slowly to fully RICH.

Care should always be taken that the cylinders do not cool down too quickly. The cooling rate should not exceed 50 °F per minute.

5.11. BEFORE LANDING

1. Electric fuel pump: *ON*
2. Fuel valve: *select the fullest tank*
3. Landing Light: *ON*

On downwind, leg abeam touch down point:

4. Flaps: *set T/O (below 90KIAS)*

NOTE *Expect to adjust pitch trim (pitch down) when extending flaps to T/O or LAND*

5. Approach speed: *set*

On final leg, before landing:

6. Mixture control lever: *RICH*
7. Flaps: *LAND*
8. Final Approach Speed: *set*
9. Optimal touchdown speed: *60 KIAS*

NOTE *Upon flaring the aircraft has the tendency to float before touching wheels down. Taking into account local environmental constraints, consider the possibility to adjust aiming point for a better touchdown point control.*

CAUTION *In conditions such as (e.g.) strong wind, danger of windshear or turbulence a higher approach speed shall be selected..*

5.12. BALKED LANDING/MISSED APPROACH

1. Throttle: *FULL*
2. Speed: *keep over 80 KIAS, climb to V_Y or V_X as applicable*
3. Flaps position: *T/O*

Above a safe height:

4. Landing lights: *OFF*

5.13. GO-AROUND

1. Throttle: *FULL*
2. Speed: *keep over 80 KIAS, climb to V_Y or V_X as applicable*
3. Flaps position: *T/O*

5.14. AFTER LANDING

1. Throttle: *Idle*
2. Brakes: *apply*
3. Pitot heat: *OFF (if ON)*
4. Flaps: *UP*
5. Electric Fuel Pump*: OFF*
6. XPDR: *OFF*
7. Landing light: *OFF*

5.15. ENGINE SHUT DOWN

1. Parking brake: *set*
2. Keep engine running at 1200 propeller rpm for about one minute in order to reduce latent heat.
3. Avionic equipment: *OFF*
4. Throttle*: idle*
5. Magnetos*: Check OFF – BOTH*
6. Mixture*: closed*
7. Ignition key: *OFF, key extracted*
8. Strobe light: *OFF*
9. Avionic Master: *OFF*
10. Master & Generator switches: *OFF*
11. Fuel selector valve: *OFF*

WARNING

For safety, verify propeller is fully stopped before any other action.

CAUTION

Instruct passenger to fully open RH door and depart, avoiding contact with wheels and sharp wing control surfaces edges.

5.16. POSTFLIGHT CHECKS

1. Flight controls: *lock by means of seat belts*
2. Wheel chocks and wing mooring lines: *Set*
3. Parking brake: *Release*
4. Doors: *Close and lock*
5. Protection plugs: *set over pitot tube, stall warning, static ports*

5.17. FLIGHT IN RAIN

Performance deteriorates in rain; this applies particularly to take-off distance and maximum Horizontal speed. The effect on flight characteristics is minimal.

5.18. REFUELLING

Before refuelling, the airplane must be connected to electrical ground.

5.19. FLIGHT AT HIGH ALTITUDE

At high altitudes the provision of oxygen for the occupant is necessary. Legal requirements for the provision of oxygen should be adhered to (see para 2.9)

SECTION 5 - PERFORMANCE

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:

- ✓ "Flight Test Data" under conditions prescribed by EASA CS-23 regulation
- ✓ 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 PERFORMANCE 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

Normal Static Source

Graph shows calibrated airspeed V_{IAS} as a function of indicated airspeed V_{CAS}.

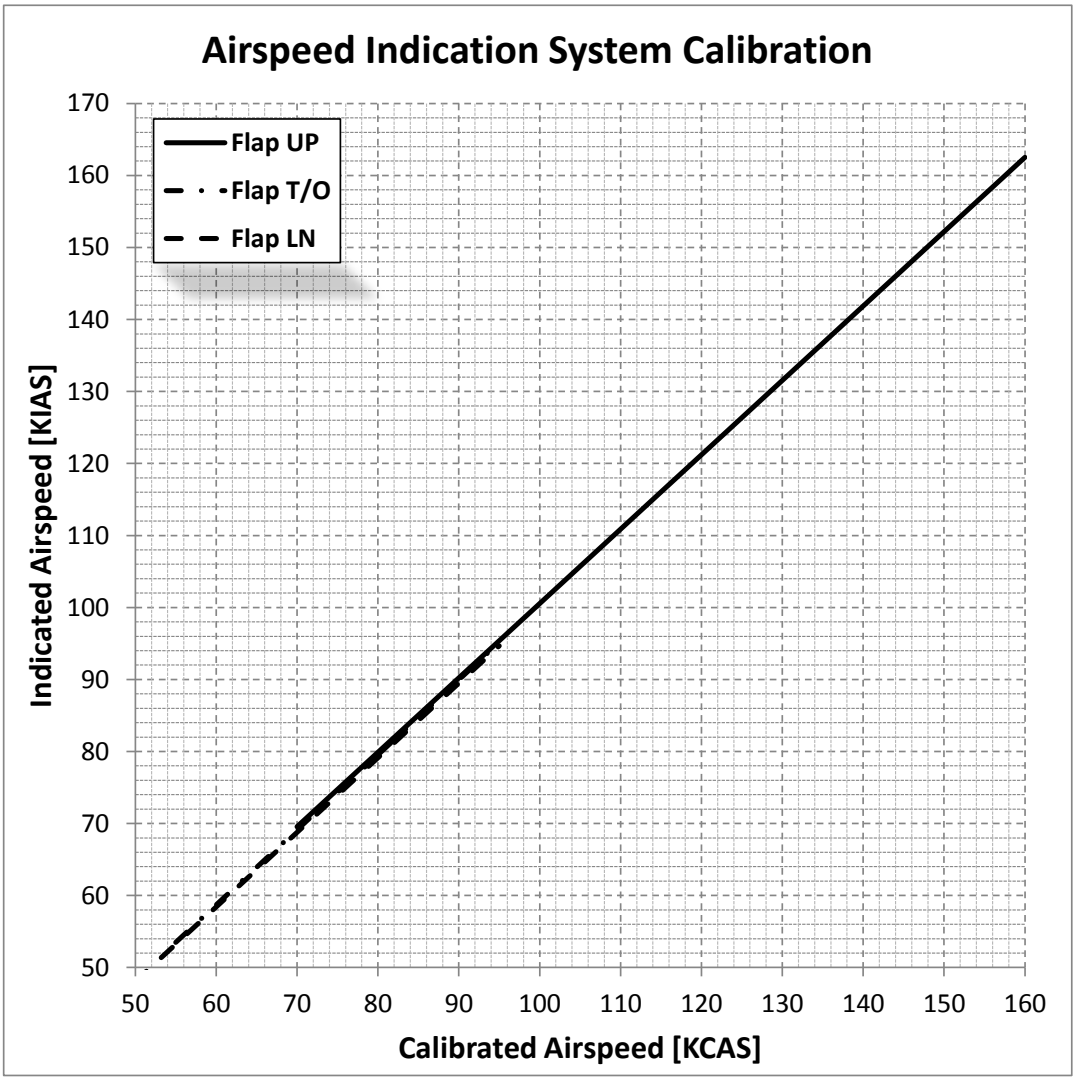

FIG. 5-1. CALIBRATED VS INDICATED AIRSPEED

Example:

Given	***Find***
KIAS *75.0* *Flap: UP*	KCAS *74.7*

NOTE *Indicated airspeed assumes 0 as an instrument error*

Alternate Static Source

		Alternate Static Air Open		Vents Open		Vents and Hot Air Open	
		IAS [kn]	H_P [ft]	IAS [kn]	H_P [ft]	IAS [kn]	H_P [ft]
Pressure Altitude [ft]	**IAS** [kn]	**FLAP UP**					
1000	70	75	1020	72	1010	72	1020
	90	95	1020	92	1030	93	1020
	110	115	1030	113	1020	112	1020
	135	140	1040	139	1030	137	1030
		FLAP T/O					
	60	63	1020	63	1020	62	1010
	70	75	1020	73	1020	72	1020
	90	94	1020	92	1020	92	1020
		FLAP LND					
	60	62	1020	61	1020	61	1020
	70	72	1020	72	1020	71	1020
	90	92	1020	91	1020	91	1020
		FLAP UP					
5000	70	72	5020	72	5020	71	5020
	90	94	5030	93	5020	92	5020
	110	114	5030	113	5020	112	5020
	133	137	5040	136	5030	135	5020
		FLAP T/O					
	60	62	5010	62	5020	61	5010
	70	74	5020	73	5020	72	5020
	90	93	5030	93	5020	93	5020
		FLAP LND					
	60	63	5030	62	5020	61	5000
	70	72	5020	72	5010	71	5010
	90	92	5020	92	5020	91	5010
		FLAP UP					
8000	70	72	8020	72	8020	71	8020
	90	93	8030	92	8020	92	8020
	110	113	8030	112	8020	112	8020
	128	131	8040	130	8030	130	8020
		FLAP T/O					
	60	62	8010	62	8020	61	8010
	70	73	8020	72	8020	72	8020
	90	92	8030	92	8020	92	8020
		FLAP LND					
	60	61	8020	61	8020	61	8000
	70	72	8010	71	8010	71	8010
	90	92	8010	91	8010	91	8010

4. ICAO STANDARD ATMOSPHERE

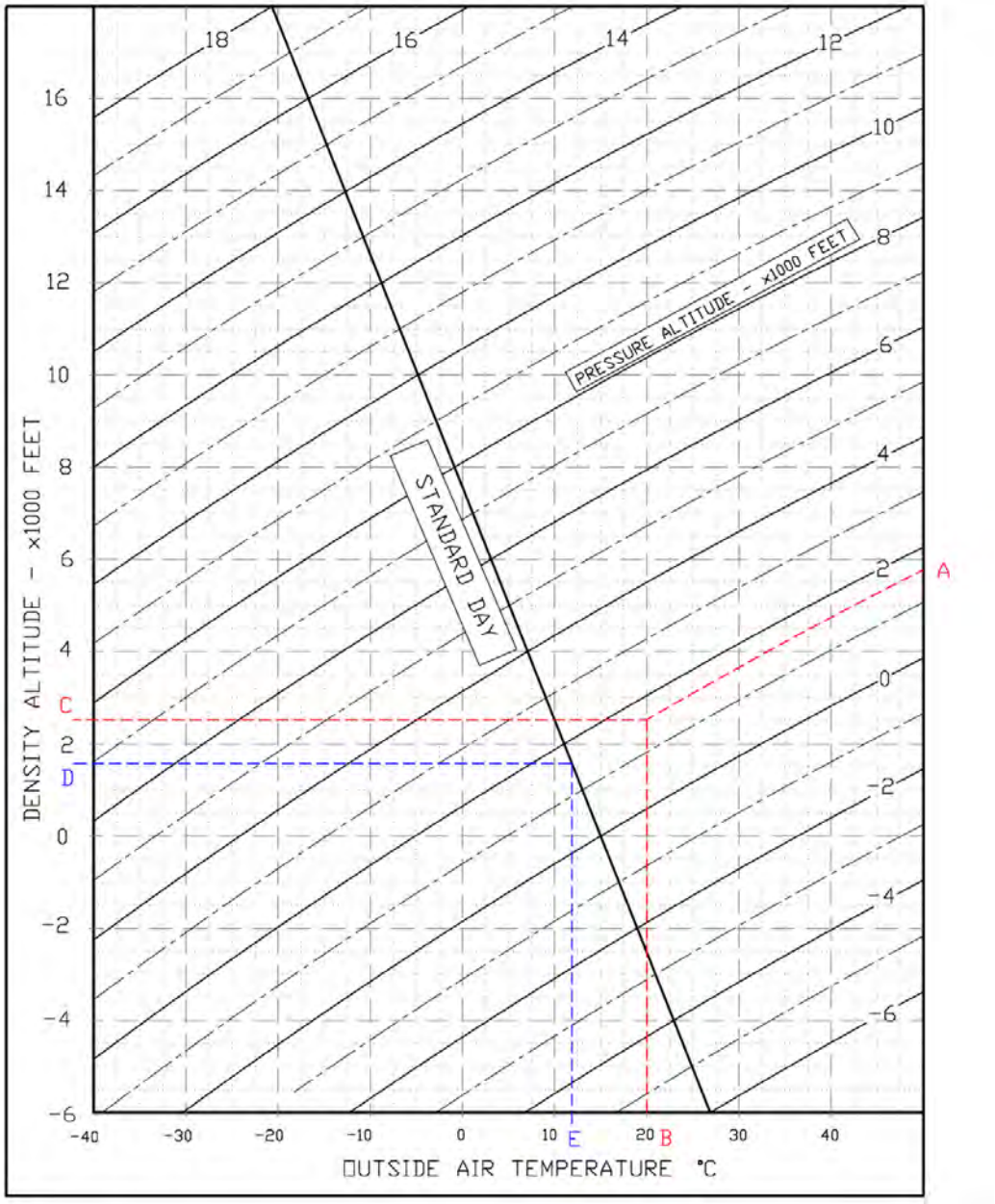

FIG. 5-2. ICAO CHART

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

Weight: 1160 kg (2557 lb)
Throttle Lever: IDLE
CG: Most Forward (19%)
No ground effect

WEIGHT [kg] ([lb])	BANK ANGLE [deg]	STALL SPEED					
		FLAPS 0°		FLAPS T/O		FLAPS FULL	
		KIAS	KCAS	KIAS	KCAS	KIAS	KCAS
1160 (2557) (FWD C.G.)	0	59	60	53	55	50	52
	15	60	61	54	56	51	53
	30	64	65	58	59	54	56
	45	71	71	64	65	61	62
	60	85	85	77	78	73	74

NOTE

Altitude loss during conventional stall recovery, as demonstrated during flight tests is approximately 350 ft with banking below 15°.

6. CROSSWIND

Maximum demonstrated crosswind is 12 kts.

⇒ *Example:*

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

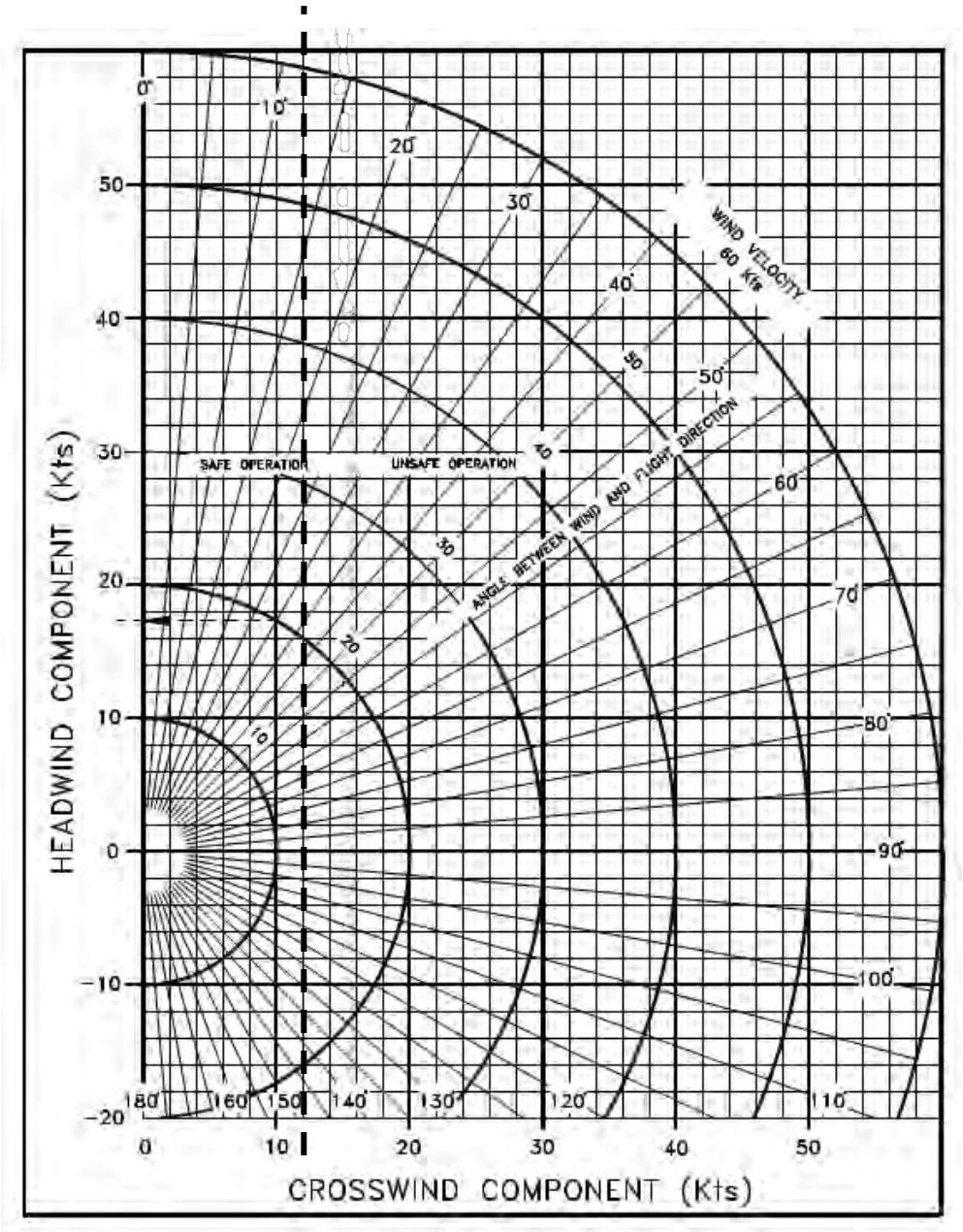

FIG. 5-3. CROSSWIND CHART

7. TAKE-OFF PERFORMANCES

NOTE *To account for likely in service performance variations apply a factored to distances of 1.10*

Weight = 1160 kg (2557 lb)

Flaps: T/O
Speed at Lift-Off = 60 KIAS
Speed Over 50ft Obstacle = 65 KIAS
Throttle Lever: Full Forward
Runway: Paved Runway

Corrections

Headwind: - 10 m (33 ft) for each kn
Tailwind: +20 m (66 ft) for each kn
Grass Runway: + 10% to Ground Roll
Runway slope: +10% to Ground Roll for each +1%

Pressure Altitude [ft]		Distance [m] (Distance [ft]) Temperature [°C] -25	0	25	50	ISA
S.L.	Ground Roll	291 (955)	366 (1201)	451 (1480)	548 (1798)	**416 (1365)**
	At 50 ft AGL	442 (1450)	552 (1811)	678 (2224)	818 (2684)	**626 (2054)**
1000	Ground Roll	317 (1040)	399 (1309)	492 (1614)	597 (1959)	**446 (1463)**
	At 50 ft AGL	481 (1578)	601 (1972)	737 (2418)	890 (2920)	**670 (2198)**
2000	Ground Roll	346 (1135)	436 (1430)	538 (1765)	652 (2139)	**479 (1572)**
	At 50 ft AGL	523 (1716 ft)	655 (2149 ft)	803 (2635 ft)	969 (3179 ft)	**718 (2356)**
3000	Ground Roll	378 (1240)	476 (1562)	587 (1926)	712 (2336)	**515 (1690)**
	At 50 ft AGL	570 (1870)	713 (2339)	875 (2871)	1056 (3465)	**770 (2526)**
4000	Ground Roll	413 (1355)	520 (1706)	642 (2106)	779 (2556)	**553 (1814)**
	At 50 ft AGL	622 (2041)	778 (2552)	954 (3130)	1151 (3776)	**825 (2707)**
5000	Ground Roll	452 (1483)	569 (1867)	702 (2303)	851 (2792)	**595 (1952)**
	At 50 ft AGL	678 (2224)	848 (2782)	1041 (3415)	1256 (4121)	**886 (2907)**
6000	Ground Roll	494 (1621)	622 (2041)	768 (2520)	932 (3058)	**640 (2100)**
	At 50 ft AGL	740 (2428)	926 (3038)	1136 (3727)	1371 (4498)	**951 (3120)**

Weight = 1060 kg (2337 lb)

Flaps: T/O
Speed at Lift-Off = 60 KIAS
Speed Over 50ft Obstacle = 65 KIAS
Throttle Lever: Full Forward
Runway: Paved Runway

Corrections

Headwind: - 10 m (33 ft) for each kn
Tailwind: + 20 m (66 ft) for each kn
Grass Runway: + 10% to Ground Roll
Runway slope: +10% to Ground Roll for each +1%

Pressure Altitude [ft]		Distance [m] (Distance [ft]) Temperature [°C] -25	0	25	50	ISA
S.L.	Ground Roll	234 (768)	295 (968)	364 (1194)	441 (1447)	**335 (1099)**
	At 50 ft AGL	358 (1178)	448 (1470)	549 (1801)	663 (2175)	**507 (1663)**
1000	Ground Roll	255 (837)	321 (1053)	397 (1302)	481 (1578)	**359 (1178)**
	At 50 ft AGL	389 (1276)	487 (1598)	598 (1962)	721 (2365)	**543 (1781)**
2000	Ground Roll	279 (915)	351 (1152)	433 (1421)	525 (1722)	**386 (1266)**
	At 50 ft AGL	424 (1391)	530 (1739)	651 (2136)	785 (2575)	**582 (1909)**
3000	Ground Roll	304 (997)	383 (1257)	473 (1552)	574 (1883)	**414 (1358)**
	At 50 ft AGL	462 (1516)	578 (1896)	709 (2326)	856 (2808)	**624 (2047)**
4000	Ground Roll	333 (1092)	419 (1375)	517 (1696)	627 (2057)	**445 (1460)**
	At 50 ft AGL	504 (1654)	630 (2067)	773 (2536)	933 (3061)	**669 (2195)**
5000	Ground Roll	364 (1194)	458 (1503)	565 (1854)	686 (2251)	**479 (1572)**
	At 50 ft AGL	549 (1801)	687 (2254)	843 (2766)	1018 (3340)	**718 (2356)**
6000	Ground Roll	398 (1306)	501 (1644)	619 (2031)	750 (2461)	**515 (1690)**
	At 50 ft AGL	600 (1968)	750 (2461)	921 (3022)	1111 (3645)	**770 (2526)**

Weight = 960 kg (2116 lb)

Flaps: T/O
Speed at Lift-Off = 60 KIAS
Speed Over 50ft Obstacle = 65 KIAS
Throttle Lever: Full Forward
Runway: Paved Runway

Corrections

Headwind: - 10 m (33 ft) for each kn
Tailwind: + 20 m (66 ft) for each kn
Grass Runway: + 10% to Ground Roll
Runway slope: +10% to Ground Roll for each +1%

Pressure Altitude [ft]		Distance [m] (Distance [ft])				
		Temperature [°C]				
		-25	0	25	50	ISA
S.L.	Ground Roll	185 (607)	232 (761)	287 (942)	348 (1142)	**264 (866)**
	At 50 ft AGL	284 (932)	355 (1165)	436 (1430)	526 (1726)	**402 (1319)**
1000	Ground Roll	201 (659)	253 (830)	313 (1027)	379 (1243)	**283 (928)**
	At 50 ft AGL	309 (1014)	387 (1270)	474 (1555)	572 (1877)	**431 (1414)**
2000	Ground Roll	220 (722)	277 (909)	341 (1119)	414 (1358)	**304 (997)**
	At 50 ft AGL	337 (1106)	421 (1381)	516 (1693)	623 (2044)	**462 (1516)**
3000	Ground Roll	240 (787)	302 (991)	373 (1224)	452 (1483)	**327 (1073)**
	At 50 ft AGL	367 (1204)	459 (1506)	563 (1847)	679 (2228)	**495 (1624)**
4000	Ground Roll	262 (860)	330 (1083)	407 (1335)	494 (1621)	**351 (1152)**
	At 50 ft AGL	400 (1312)	500 (1640)	613 (2011)	740 (2428)	**531 (1742)**
5000	Ground Roll	287 (942)	361 (1184)	446 (1463)	541 (1775)	**378 (1240)**
	At 50 ft AGL	436 (1430)	546 (1791)	669 (2195)	807 (2648)	**570 (1870)**
6000	Ground Roll	314 (1030)	395 (1296)	488 (1601)	592 (1942)	**406 (1332)**
	At 50 ft AGL	476 (1562)	595 (1952)	730 (2395)	881 (2890)	**611 (2005)**

8. TAKE-OFF RATE OF CLIMB

NOTE *To account for likely in service performance variations apply a factored to rate of climb of 0.90*

Throttle Lever: Full Forward **Flaps:** Take-Off							
Weight	**Pressure Altitude**	**Climb Speed V_y**	**Rate of Climb [ft/min]**				
			Temperature [°C]				
[kg] ([lb])	**[ft]**	**[KIAS]**	**-25**	**0**	**25**	**50**	**ISA**
1160 (2557)	**S.L.**	72	1008	816	644	490	**711**
	2000	72	862	673	504	352	**596**
	4000	72	716	531	365	216	**482**
	6000	72	571	389	226	79	**368**
	8000	72	427	247	87	-57	**253**
	10000	72	283	107	-51	-192	**139**
	12000	72	139	-34	-188	-327	**25**
	14000	72	-4	-174	-325	-462	**-90**
1060 (2337)	**S.L.**	72	1162	956	772	606	**843**
	2000	72	1005	803	622	459	**721**
	4000	72	849	650	472	312	**598**
	6000	72	694	498	323	166	**476**
	8000	72	539	346	175	20	**353**
	10000	72	384	195	27	-125	**230**
	12000	72	230	45	-121	-270	**108**
	14000	72	77	-105	-268	-414	**-15**
960 (2116)	**S.L.**	71	1343	1120	920	741	**997**
	2000	71	1173	954	758	581	**865**
	4000	71	1004	788	596	422	**732**
	6000	71	835	623	434	263	**599**
	8000	71	667	459	273	105	**466**
	10000	71	500	295	113	-52	**333**
	12000	72	333	132	-47	-209	**200**
	14000	72	166	-31	-207	-365	**67**

9. EN-ROUTE RATE OF CLIMB

NOTE *To account for likely in service performance variations apply a factored to rate of climb of 0.90*

Throttle Lever: Full Forward **Flaps:** UP							
Weight	**Pressure Altitude**	**Climb Speed V_Y**	**Rate of Climb [ft/min]**				
			Temperature [°C]				
[kg] ([lb])	**[ft]**	**[KIAS]**	**-25**	**0**	**25**	**50**	**ISA**
1160 (2557)	**S.L.**	82	1070	885	720	571	**784**
	2000	82	929	747	585	439	**674**
	4000	82	789	610	451	307	**564**
	6000	82	649	474	317	176	**454**
	8000	82	510	338	184	45	**344**
	10000	82	372	202	51	-85	**234**
	12000	82	233	67	-82	-215	**123**
	14000	82	95	-68	-213	-345	**13**
1060 (2337)	**S.L.**	81	1222	1023	846	686	**914**
	2000	81	1071	875	701	544	**796**
	4000	81	920	728	557	402	**678**
	6000	81	770	581	413	261	**560**
	8000	81	620	435	270	120	**441**
	10000	81	471	289	127	-20	**323**
	12000	81	323	144	-16	-159	**205**
	14000	81	175	-1	-157	-299	**86**
960 (2116)	**S.L.**	81	1400	1184	992	818	**1066**
	2000	81	1236	1024	835	664	**938**
	4000	81	1073	864	678	510	**810**
	6000	81	910	705	522	357	**681**
	8000	81	747	546	366	204	**553**
	10000	80	585	388	211	52	**424**
	12000	80	424	230	57	-99	**296**
	14000	80	263	73	-97	-250	**168**

10. CRUISE PERFORMANCE

Weight: 1160 kg (2557 lb) **Mixture:** FULL RICH	**Corrections** **Best Power:** -10% to Full Rich F.C. **Best Economy:** -20% to Full Rich F.C.

CORRECTIONS

	KTAS	Fuel Consumption	Endurance	Range	Specific Range
For each +15 °C of OAT	-2%	-2.5%	+2%	+1%	+1%
For each -15 °C of OAT	+1%	+3%	-4%	-2%	-1%
For -100 kg (-220 lb) of weight	+3.3%	-	-	+3%	+4%

CRUISE PERFORMANCE

Pressure Altitude ft	**OAT ISA** deg C	**RPM**	**KTAS**	**Fuel Consumption** gal/hr (l/hr)	**Endurance** hr:mm	**Range** nm	**Specific Range** nm/gal (nm/l)
0	**15**	2700	137	16.6 (62.7)	3:40	502	8.3 (2.2)
		2600	131	15.3 (57.8)	3:59	521	8.6 (2.3)
		2500	125	14.1 (53.4)	4:18	538	8.8 (2.3)
		2400	119	13.1 (49.4)	4:39	553	9.1 (2.4)
		2200	107	11.3 (42.8)	5:22	573	9.4 (2.5)
2000	**11**	2700	136	15.9 (60.1)	3:50	521	8.6 (2.3)
		2600	130	14.7 (55.6)	4:08	538	8.9 (2.3)
		2500	124	13.6 (51.5)	4:28	554	9.1 (2.4)
		2400	118	12.6 (47.9)	4:48	567	9.3 (2.5)
		2200	106	11.0 (41.8)	5:30	583	9.6 (2.5)
4000	**7**	2700	135	15.2 (57.7)	3:59	540	8.9 (2.3)
		2600	129	14.1 (53.5)	4:18	556	9.1 (2.4)
		2500	123	13.1 (49.8)	4:37	570	9.4 (2.5)
		2400	117	12.3 (46.4)	4:57	581	9.6 (2.5)
		2200	105	10.8 (40.9)	5:37	592	9.7 (2.6)

Weight: 1160 kg (2557 lb) **Mixture:** FULL RICH	**Corrections** **Best Power:** -10% to Full Rich F.C. **Best Economy:** -20% to Full Rich F.C.

CORRECTIONS

	KTAS	Fuel Consumption	Endurance	Range	Specific Range
For each +15 °C of OAT	-2%	-2.5%	+2%	+1%	+1%
For each -15 °C of OAT	+1%	+3%	-4%	-2%	-1%
For -100 kg (-220 lb) of weight	+3.3%	-	-	+3%	+4%

CRUISE PERFORMANCE

Pressure Altitude ft	**OAT ISA** deg C	**RPM**	**KTAS**	**Fuel Consumption** gal/hr (l/hr)	**Endurance** hr:mm	**Range** nm	**Specific Range** nm/gal (nm/l)
6000	**3**	2600	128	13.6 (51.6)	4:27	573	9.4 (2.5)
		2500	122	12.7 (48.2)	4:47	585	9.6 (2.5)
		2400	116	11.9 (45.1)	5:06	594	9.8 (2.6)
		2200	104	10.6 (40.1)	5:44	598	9.8 (2.6)
8000	**-1**	2600	128	13.2 (49.9)	4:37	588	9.7 (2.6)
		2500	122	12.3 (46.7)	4:55	598	9.8 (2.6)
		2400	116	11.6 (44.0)	5:14	605	9.9 (2.6)
		2200	104	10.4 (39.5)	5:49	603	9.9 (2.6)
10000	**-5**	2600	127	12.8 (48.3)	4:46	603	9.9 (2.6)
		2500	121	12.0 (45.5)	5:04	610	10.0 (2.7)
		2400	115	11.4 (43.0)	5:21	614	10.1 (2.7)
		2200	103	10.3 (39.0)	5:54	606	10.0 (2.6)
12000	**-9**	2500	120	11.7 (44.4)	5:11	621	10.2 (2.7)
		2400	114	11.1 (42.1)	5:28	621	10.2 (2.7)
		2200	102	10.2 (38.5)	5:59	608	10.0 (2.6)

11. LANDING PERFORMANCES

NOTE *To account for likely in service performance variations apply a factored to distances of 1.67*

Weight = 1160 kg (2557 lb)

Flaps: LAND
Short Final Approach Speed = 66 KIAS
Throttle Lever: Idle
Runway: Paved

Corrections

Headwind: - 4 m (-13 ft) for each kn
Tailwind: + 13 m(+43 ft) for each kn
Grass Runway: +10% to Ground Roll
Runway slope: - 3% to Ground Roll for each +1%

Pressure Altitude [ft]		Distance [m] (Distance [ft]) Temperature [°C] -25	0	25	50	ISA
S.L.	Ground Roll	204 (669)	225 (738)	245 (804)	266 (873)	**237 (778)**
	At 50 ft AGL	488 (1601)	509 (1670)	529 (1736)	550 (1804)	**521 (1709)**
1000	Ground Roll	212 (696)	233 (764)	254 (833)	276 (906)	**244 (801)**
	At 50 ft AGL	496 (1627)	517 (1696)	538 (1765)	560 (1837)	**528 (1732)**
2000	Ground Roll	220 (722)	242 (794)	264 (866)	286 (938)	**251 (823)**
	At 50 ft AGL	504 (1654)	526 (1726)	548 (1798)	570 (1870)	**535 (1755)**
3000	Ground Roll	228 (748)	251 (823)	274 (899)	297 (974)	**259 (850)**
	At 50 ft AGL	512 (1680)	535 (1755)	558 (1831)	581 (1906)	**543 (1781)**
4000	Ground Roll	236 (774)	260 (853)	284 (932)	308 (1010)	**267 (876)**
	At 50 ft AGL	520 (1706)	544 (1785)	568 (1864)	592 (1942)	**551 (1808)**
5000	Ground Roll	245 (804)	270 (886)	295 (968)	320 (1050)	**275 (902)**
	At 50 ft AGL	529 (1736)	554 (1818)	579 (1900)	604 (1982)	**559 (1834)**
6000	Ground Roll	255 (837)	280 (919)	306 (1004)	332 (1089)	**284 (932)**
	At 50 ft AGL	539 (1768)	564 (1850)	590 (1936)	616 (2021)	**568 (1864)**

12. BALKED LANDING PERFORMANCE

NOTE *To account for likely in service performance variations apply a factored to rate of climb and to angle of climb of 0.90*

Throttle Lever: Full Forward
Flaps: LAND
Speed: 67 KIAS

Weight [kg] ([lb])	Pressure Altitude [ft]	Steady Gradient of Climb [%]				
		Temperature [°C]				
		-25	0	25	50	ISA
1160 (2557)	S.L.	11.5	8.6	6	3.6	7
	1000	10.4	7.5	4.9	2.6	6.1
	2000	9.3	6.4	3.9	1.6	5.3
	3000	8.2	5.3	2.8	0.5	4.4
	4000	7.1	4.3	1.8	-0.5	3.5
	5000	6	3.2	0.7	-1.5	2.7
	6000	4.9	2.1	-0.3	-2.6	1.8
	7000	3.8	1.1	-1.4	-3.6	0.9
1060 (2337)	S.L.	13.6	10.4	7.6	5	8.7
	1000	12.4	9.2	6.4	3.9	7.7
	2000	11.2	8	5.3	2.7	6.8
	3000	10	6.9	4.1	1.6	5.8
	4000	8.8	5.7	2.9	0.5	4.9
	5000	7.6	4.5	1.8	-0.7	3.9
	6000	6.4	3.3	0.6	-1.8	3
	7000	5.2	2.2	-0.5	-2.9	2
960 (2116)	S.L.	16	12.5	9.4	6.6	10.6
	1000	14.7	11.2	8.1	5.3	9.6
	2000	13.4	9.9	6.8	4	8.5
	3000	12	8.6	5.6	2.8	7.5
	4000	10.7	7.3	4.3	1.5	6.4
	5000	9.4	6	3	0.3	5.4
	6000	8.1	4.7	1.7	-1	4.3
	7000	6.7	3.4	0.5	-2.2	3.3

13. NOISE DATA

Noise level, determined in accordance with ICAO/Annex 16 6th Ed., July 2011, Vol. I°, Chapter 10 and 14 CFR Part 36, is **77.576** dB(A).

NOTE: No determination has been made by the Federal Aviation Administration that the noise levels of this aircraft are or should be acceptable or unacceptable for operation at, into, or out of, any airport.

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SECTION 6 – WEIGHT AND BALANCE

INDEX

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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 takeoff 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 PROCEDURES

2.1. PREPARATION

- Carry out weighing procedure inside closed hangar
- Remove from cabin any object unintentionally left
- Make sure Flight Manual and mandatory documents are on board
- Align nose wheel
- Drain fuel via the specific drain valve
- Oil and hydraulic fluid at the operating levels
- Move sliding seats to most forward position
- Raise flaps to fully retracted position
- Place control surfaces in neutral position
- Place scales (min. capacity 300 kg (661.4 lb)) under each wheel

2.2. LEVELLING

- Level the aircraft (the reference for longitudinal levelling is made putting a spirit-level on the cabin floor as shown in the Aircraft Maintenance Manual).
- Adjust longitudinal attitude deflating nose tire

2.3. WEIGHING

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

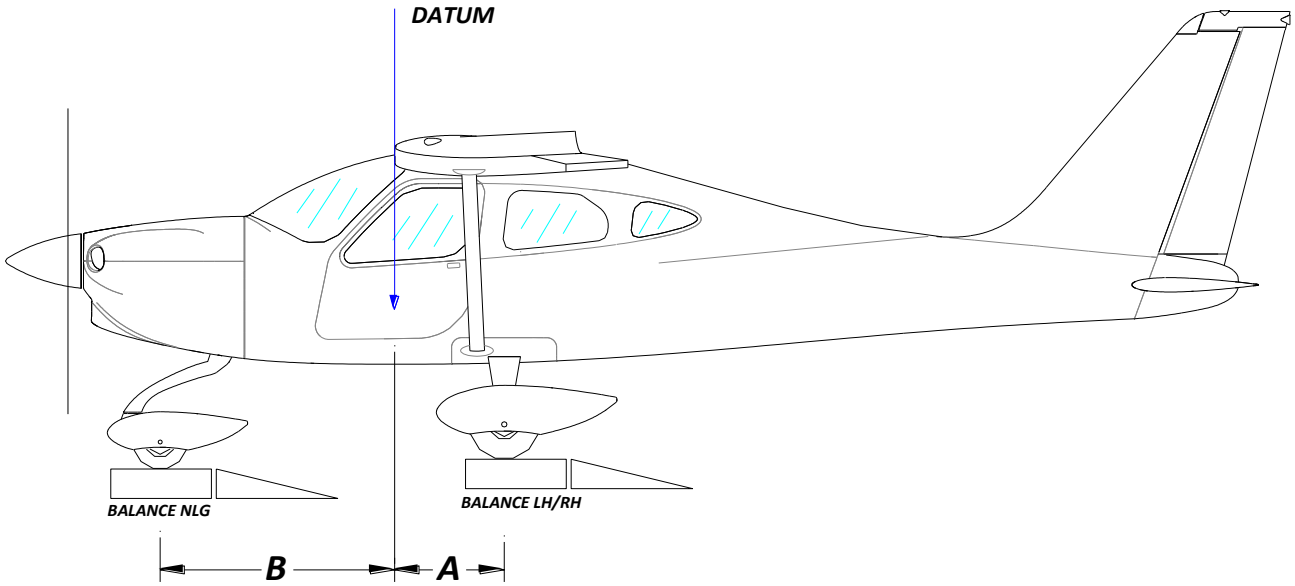
2.4. DETERMINATION OF C.G. LOCATION

- Drop a plumb bob tangent to the wing leading edge and trace a reference mark on the floor (see Figure on Para. 2.5 or 2.6)
- Repeat the operation for other wing
- Stretch a taught line between the two marks
- Measure the distance between the reference line and both main and nose wheel axis (A and B distances respectively)
- Using recorded data it is possible to determine the aircraft C.G. location and the aircraft moment (see following table)

2.5. WEIGHING RECORD

Model **P2010** *S/N*:_____ *Weighing no.* ____ *Date*:_____

Datum: leading edge vertical



	kg or lbs
Nose wheel weight	W_1 =
LH wheel weight	W_L =
RH wheel weight	W_R =
$W_2 = W_L + W_R$ =	

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

Empty weight We = $W_1 + W_2$ = [kg] or [lbs]

$$D = \frac{W_2 \cdot (A - 13) - W_1 \cdot (B + 13)}{We} =$$ [m] or [ft]

$$D\% = \frac{D}{1.378} \cdot 100 =$$

Empty weight moment: M = (D · We) = [m · kg] or [ft · lbs]

Maximum takeoff weight	W_T =	[kg] or [lbs]
Empty weight	We =	[kg] or [lbs]
Max. useful load W_T - We	Wu =	[kg] or [lbs]

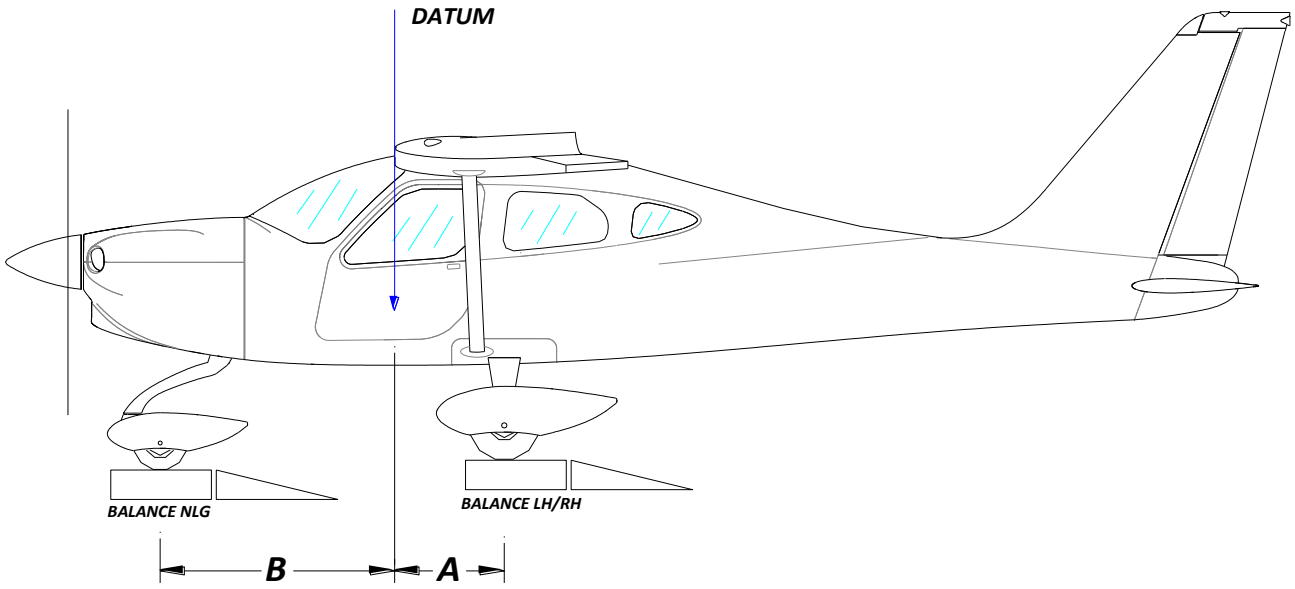
Signature

_____

2.6. WEIGHING RECORD (II)

Model ***P2010*** *S/N*:_____ *Weighing no.* ____ *Date*:_____

Datum: leading edge vertical



	kg or lbs
Nose wheel weight	W_1 =
LH wheel weight	W_L =
RH wheel weight	W_R =
$W_2 = W_L + W_R$ =	

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

Empty weight We = $W_1 + W_2$ = [kg] or [lbs]

$$D = \frac{W_2 \cdot (A-13) - W_1 \cdot (B+13)}{We} =$$ [m] or [ft]

$$D\% = \frac{D}{1.378} \cdot 100 =$$

Empty weight moment: M = (D · We) = [m · kg] or [ft · lbs]

Maximum takeoff weight	W_T =	[kg] or [lbs]
Empty weight	We =	[kg] or [lbs]
Max. useful load W_T - We	Wu =	[kg] or [lbs]

Signature

_____

3. WEIGHTS AND C.G.

C.G. position can be defined by means of the chart below.

The pilot is responsible for ensuring the correct useful load loading.

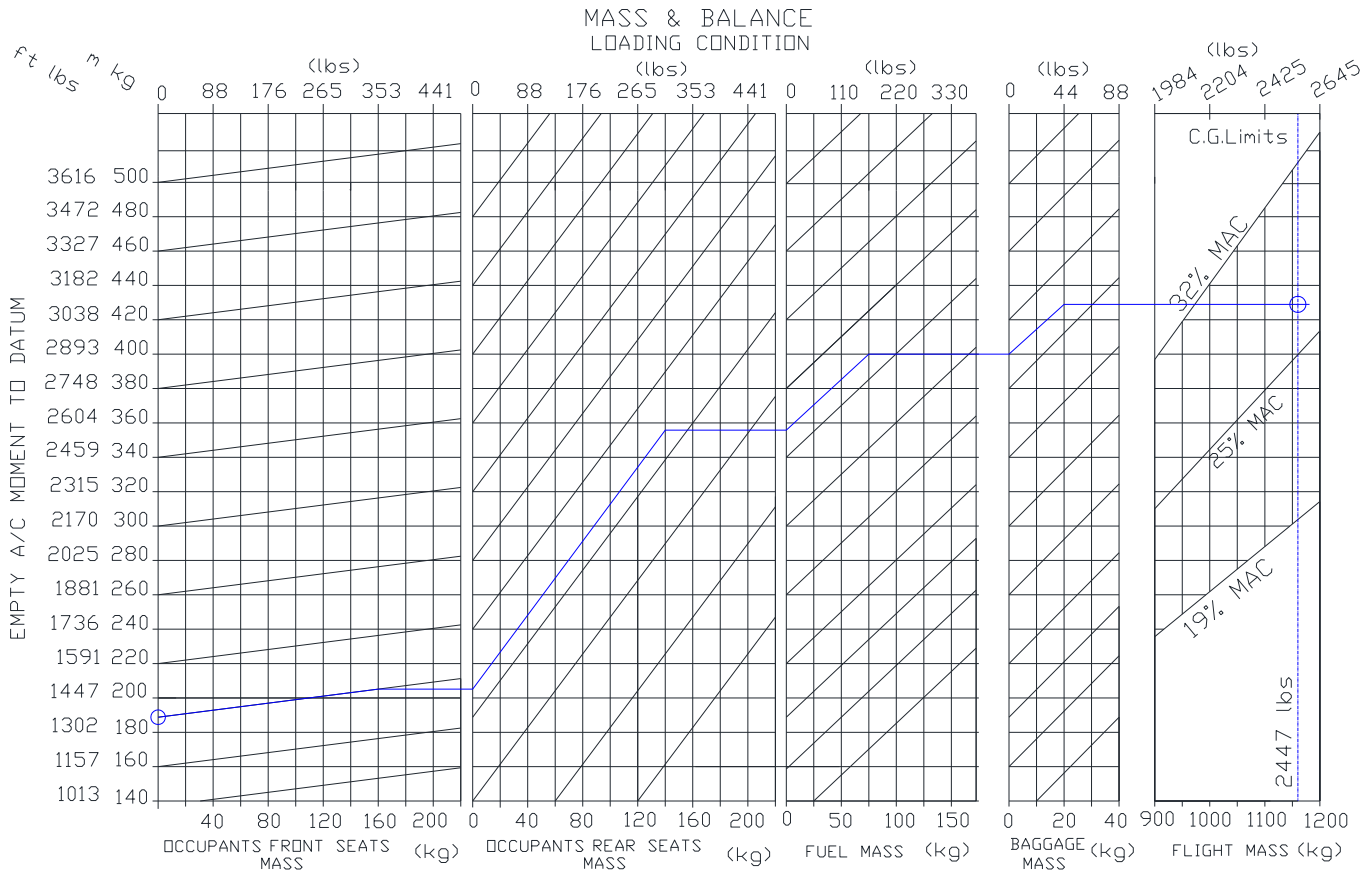


Figure 1

Example

A/C empty mass moment	188	kg*m (1360 lb*ft)
A/C empty mass	765	kg (1687 lb)
Occ. front seats	160	kg (353 lb)
Occ. rear seats	140	kg (309 lb)
Fuel	75	kg (165 lb)
Baggage	20	kg (44 lb)
A/C T.O. weight	1160	kg (2557 lb)

3.1. C.G. CALCULATION SAMPLES

3.1.1. FULL FUEL

	[kg]	Arm [mm]	Moment [kg*mm]
Empty weight	**775 (1708 lb)**	**309 (1,01 ft)**	**239475 (1726 lb*ft)**
CoG pos.	**23,4%**		
USEFUL LOAD			
Pilot	**80 (176 lb)**	133 (0,44 ft)	10640 (77 lb*ft)
Pilot	**0**	133 (0,44 ft)	0
PAX	**0**	1057 (3,47 ft)	0
PAX	**0**	1057 (3,47 ft)	0
Baggages	**0**	1599 (5,25 ft)	0
Fuel (liters)*ρ_{fuel}	**240*0,72=172,8 (381 lb)**	612 (2 ft)	105754 (762 lb*ft)
Useful load	**253 (558 lb)**	**460** (1,5 ft)	**116394 (837 lb*ft)**
W_{TO}	**1028 (2266 lb)**	**347** (1,14 ft)	**356219 (2583 lb*ft)**
CoG pos.	**26,1%**		

3.1.2. FULL PAYLOAD

	[kg]	Arm [mm]	Moment [kg*mm]
Empty weight	**775 (1708 lb)**	**309(1,01 ft)**	**239475 (1726 lb*ft)**
CoG pos.	**23,4%**		
USEFUL LOAD			
Pilot	**80 (176 lb)**	133 (0,44 ft)	10640 (77 lb*ft)
Pilot	**80 (176 lb)**	133 (0,44 ft)	10640 (77 lb*ft)
PAX	**80 (176 lb)**	1057 (3,47 ft)	84560 (278 lb*ft)
PAX	**80 (176 lb)**	1057 (3,47 ft)	84560 (278 lb*ft)
Baggages	**0**	1599 (5,25 ft)	0
Fuel (liters)*ρ_{fuel}	**90*0,72=64,8 (198 lb)**	612 (2 ft)	39658 (396 lb*ft)
Useful load	**385 (849 lb)**	**598 (1,96 ft)**	**230058** (1664 lb*ft)
W_{TO}	**1160 (2557 lb)**	**405 (1,33 ft)**	**469883** (3401 lb*ft)
CoG pos.	**30,3%**		

ρ_{fuel} = density of fuel

4. BAGGAGE LOADING

The baggage loading in the dedicated compartment must be carried out in accordance with diagram addressed on PAR. 03 and with C.G. excursion and weight limitations reported in Section 2.

Pilot is provided with a red tie-down net and snap fasteners allowing for securing the loads on the compartment floor.

CAUTION

Loading the baggage, make sure that you correctly stretched the net which must be secured to the four vertices of the floor.

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5. EQUIPMENT LIST

The following is a list of equipment which may be installed in the ***P2010***.
The items marked with an "X" were installed on the airplane described at the beginning of the list and they are included in the Basic Empty Weight.

It is the owner's responsibility to retain this equipment list and amend it to reflect changes in equipment installed in this airplane.

EQUIPMENT LIST		AIRCRAFT S/N_____	DATE:		
REF.	DESCRIPTION	P/N	INST	WEIGHT [kg] ([lb])	ARM [m] ([ft])
INSTRUMENTATION					
A1	**GARMIN G1000 IFDS**				
A2	**MD 302 MID Continent**	6420302-1		0.73 (1.61)	-0.69 (-2.26)
A3	Compass	C2400L4P		0.4 (0.88)	-0.69 (-2.26)
A4	Pitch trim indicator – UMA instruments	N0911S0U2DR00W		0.1 (0.22)	-0.69 (-2.26)
A5	Digital Clock - Davtron	M800-28V-BAT		0.1 (0.22)	-0.69 (-2.26)
A6	**GARMIN G500**				
A7	GTN 650 (Com/Nav/Gps)	011-02256-00		2.48	-0.69
A8	GNC 255A (Com/Nav)	011-02719-00		1.37	-0.69
A9	GMA 340 (Audio Panel)	011-00401-10		0.60	-0.69
A10	DME Indicator - KDI 572	066-01069-0000		0.36	-0.69
A11	ADF system - KR 87	006-00184-XXX		1.47	-0.69
A12	JP Instruments EDM 930	790000-c-[XXX]		1.36	-0.69
A13	Remote Alarm Display (RAD)	790749		0.1	0.69
A14	Rudder trim indicator	N0911R0L2R000W		0.1	-0.69
AVIONICS & MISCELLANEOUS					
B1	ELT-ACK	E-04		0.73 (1.61)	1.61 (5.28)
	ELT Kannad	406 AF		1.10 (2.42)	1.61 (5.28)
B2	Front seats TECNAM	210-10-5100-801 (LH) 210-10-5101-801 (RH)		10x2 = 20 (22x2 = 44)	0.50 (1.64)
	Front seats GEVEN	E5-01-009-T03 (LH) E5-01-010-T03 (RH)		10x2 = 20 (22x2 = 44)	0.50 (1.64)
B3	Rear seats TECNAM	210-10-5300-801 (LH) 210-10-5400-801 (RH)		9x2 = 18 (20x2 = 40)	1.26 (4.13)
	Rear seats GEVEN	E5-01-009-T03 (LH) E5-01-010-T03 (RH)		10x2 = 20 (22x2 = 44)	1.26 (4.13)
B4	Fire extinguisher	13-07655		0.8 (1.76)	-0.18 (-0.59)
	Fire extinguisher	A344T		1.0 (2.3)	-0.18 (-0.59)
B5	First aid kit	FIA270160		0.2 (0.44)	0.5 (1.64)
B6	Torch	---------		1 (2.2)	-0.18 (-0.59)
B7	Battery GILL247- 24V -19Ah	G247		19.3 (42.5)	3.05 (10.01)
B8	Fuel qty sender – Electronics international	P-300C		0.15 (0.33)	0.5 (1.64)

EQUIPMENT LIST		AIRCRAFT S/N_____	DATE:		
REF.	DESCRIPTION	P/N	INST	WEIGHT [kg] ([lb])	ARM [m] ([ft])
	Fuel qty sender	210-7-1160-801		0.31 (0.68)	0.5 (1.64)
B9	ADF Receiver – RA 3502	0505.757-912		1.5 (3.3)	3.05 (10.01)
B10	DME Transceiver - King KN 63	066-01070-0001		2 (4.4)	3.05 (10.01)
LIGHTS:					
B11	Nav/POS/Strobe Light SH wing - Ultragalactica Aveo	AVE-WPST R/G-54G		1 (2.2)	0.23 (0.75)
B12	Rudder Nav Light – PosiStrobe CT	AVE-POSW-62G		1 (2.2)	5.5 (18.04)
B13	Landing/Taxy Light - WHELEN Mod 7167400	01-0771674-00		2 (4.4)	-1.52 (-4.99)
PITOT STATIC:					
B14	Pitot (Heated) - Falcon Gauge	24-AN5812-1		3 (6.6)	0.5 (1.64)
	Garmin Gap26 Pitot Tubes	26-9-8032-000		3 (6.6)	0.5 (1.64)
GARMIN GFC700 Autopilot:					
B15	Servo pitch GSA 80	011-00877-20		1.44	5.3
B16	Servo roll GSA 80	011-00877-20		1.44	2.05
B17	Servo pitch trim GSA 81	011-00878-20		1.03	5.3
LANDING GEAR ACCESSORIES					
C1	Nose Landing Gear Wheel Fairing	210-4-3001-401		1.2 (2.6)	-1.48 (-4.86)
C2	Main Landing Gear Wheel Fairings	210-4-1020-001-L/R		1.5x2 = 3 (3.3x2 = 6.6)	0.66 (2.17)

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SECTION 7 – AIRFRAME AND SYSTEMS DESCRIPTION

INDEX

1. INTRODUCTION

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

2. AIRFRAME

P2010's airframe can be divided in the following main groups, as highlighted below on figure 7-1:

1) Wing
2) Fuselage
3) Empennage
4) Landing gear

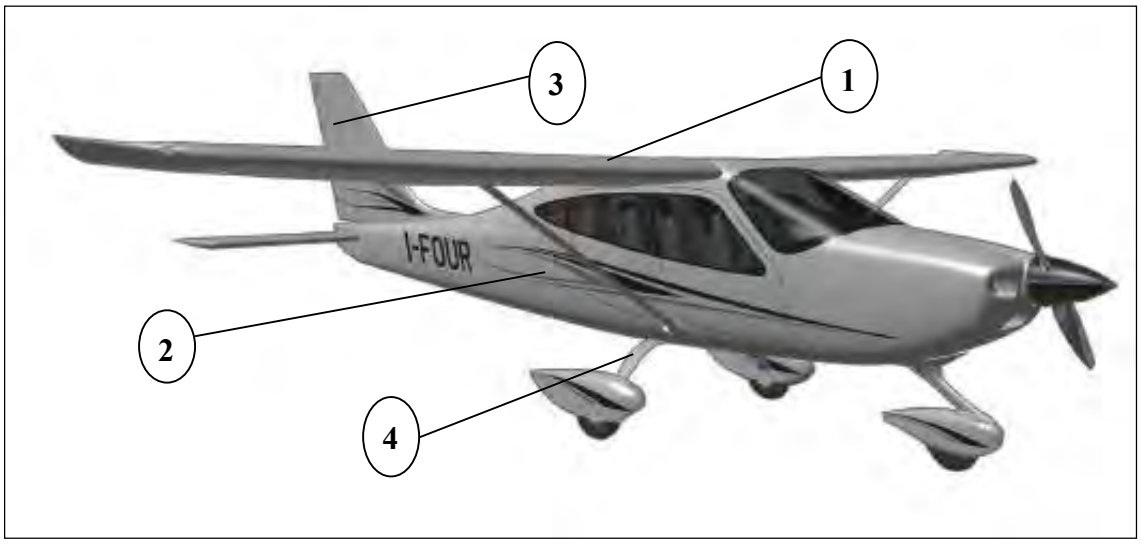

Fig. 7-1. P2010 AIRFRAME

2.1. WING

Each wing is connected to the fuselage by means of two bolt attachments and a single strut brace per side. The wings are made up of a central light alloy torsion box; a light alloy leading edge is attached to the front spar whereas the flap ("slotted") and the aileron ("frise") are attached to a rear spar through two hinges each.

The torsion box consists of a front and rear spar that represent its front and rear vertical walls; a series of ribs and wrap-around panels complete the structure. Front and rear spars are integrated with wing-fuselage attachment fittings.

Integral fuel tanks are located in the wing box, behind the main spar, with a capacity of 120 litres each (31,7 gallons).

The ailerons and flaps are made by an aluminium spar attached to a formed sheet metal leading edge and metal ribs; an aluminium skin surrounds the aileron structure.

2.2. FUSELAGE

The P2010 fuselage is mainly made by carbon fibres composite materials.

The fuselage is made by two main shells that are later assembled bonding the two main bodies and the floor (composite) and adding aluminium parts that allow the connection of the main landing gear, seats, wing and instrument panel.

Fuselage and vertical fin are thus a unique body.

2.3. EMPENNAGES

2.3.1. HORIZONTAL TAIL

The horizontal tail is an all-moving type; the stabilizer and elevator form a single uniform plane called stabilator that rotates to the desired pitch setting.

The stabilator structure (see Figure 7-2) is made-up by two aluminium spar and ribs.

Aluminium skin panels are riveted to the above elements.

A trim tab provides stick force adjustment and longitudinal compensation through a control wheel located between pilot and co-pilot seats.

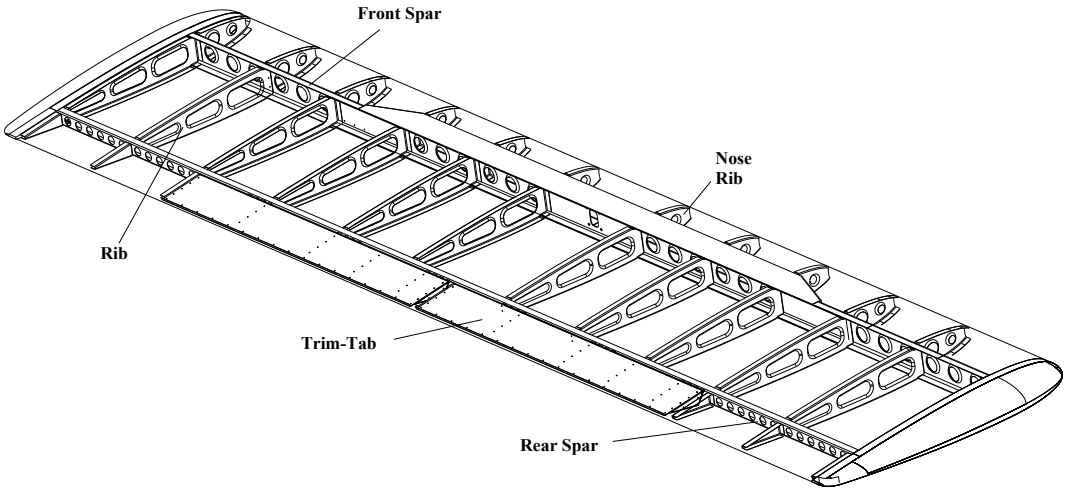

Fig. 7-2.STABILATOR STRUCTURE

2.3.1. RUDDER SURFACE

The rudder structure is made-up by a single aluminium spar (1) and ribs (2). Aluminium skin panels (3) are riveted to the above elements. It is connected to the fin through two hinges; at the lower hinge a bellcrank (4) is connected for the movement transmission.

A trim tab (5) provides stick force adjustment and lateral compensation through a rocker switch located between pilot and co-pilot seats.

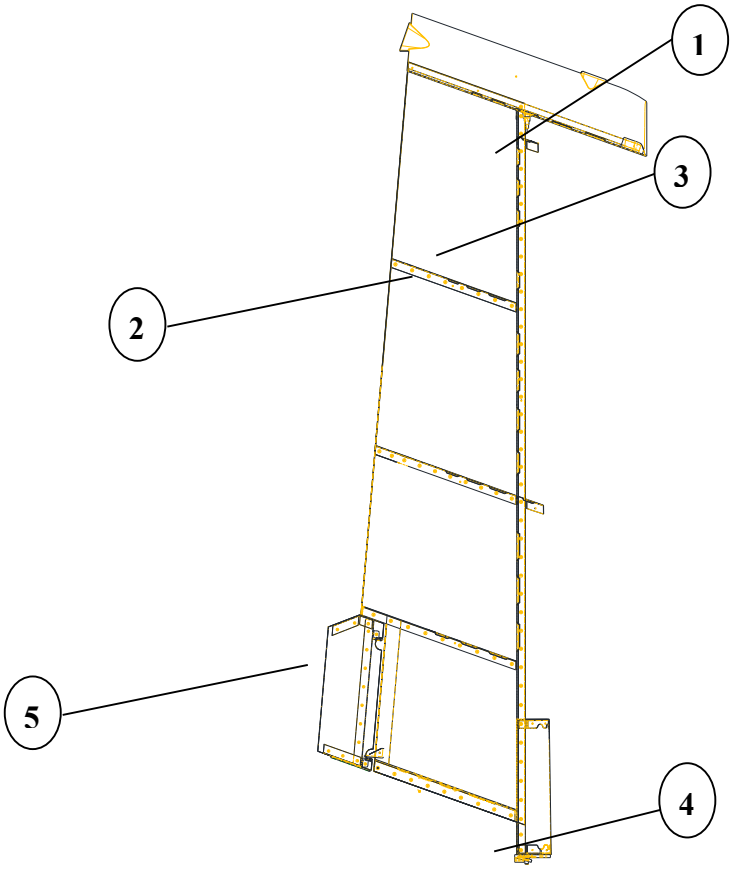

Fig. 7-3. RUDDER STRUCTURE

2.4. MAIN LANDING GEAR

The main landing gear consists of two steel leaf-springs positioned crossways to the fuselage.

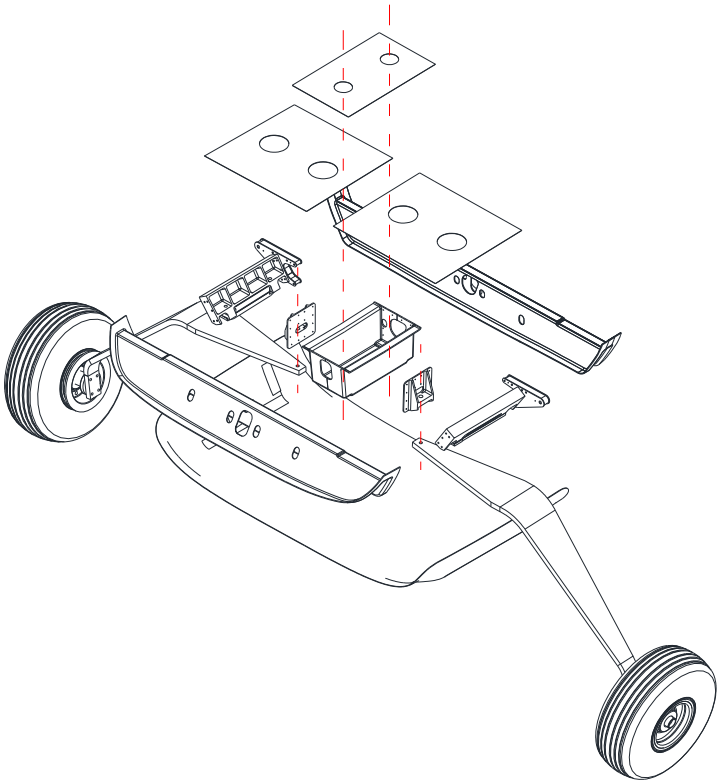

Fig. 7-4. MAIN LANDING GEAR STRUCTURE

The steel leaf-springs are attached to the fuselage structure on composite beams.

Wheels are cantilevered on gear struts and feature hydraulically actuated disc brakes controlled by toe. Main gear wheels install type 6.00-6 tires inflated at 36 psi (2.5 bar).

P2010 is provided with an independent hydraulically actuated brake system for each main wheel. A master cylinder is attached to each pilot's rudder pedal. Hydraulic pressure, applied via the master cylinders, enters the brake via lines connected to an inlet fitting on the caliper.

A parking brake valve, mounted in correspondence of the cabin floor and operated by a knob on the cockpit central pedestal, intercepts the hydraulic lines, once pressurized by toe brakes, to hold the brake assemblies linings tightened round the main wheels brake discs. Brakes can be operated from either pilot's and co-pilot's pedals: a single vented oil reservoir feeds the pilot side master cylinders which are connected, via hoses, with the co-pilot's side ones.

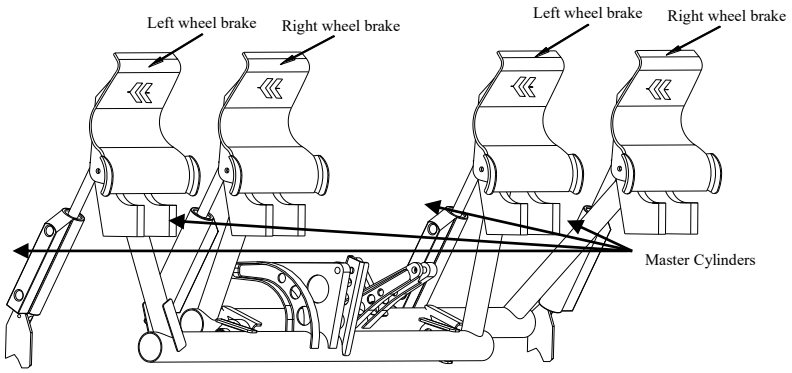

Fig. 7-5. RUDDER PEDALS AND BRAKE MASTER CYLINDERS (PILOT AND CO-PILOT SIDE)

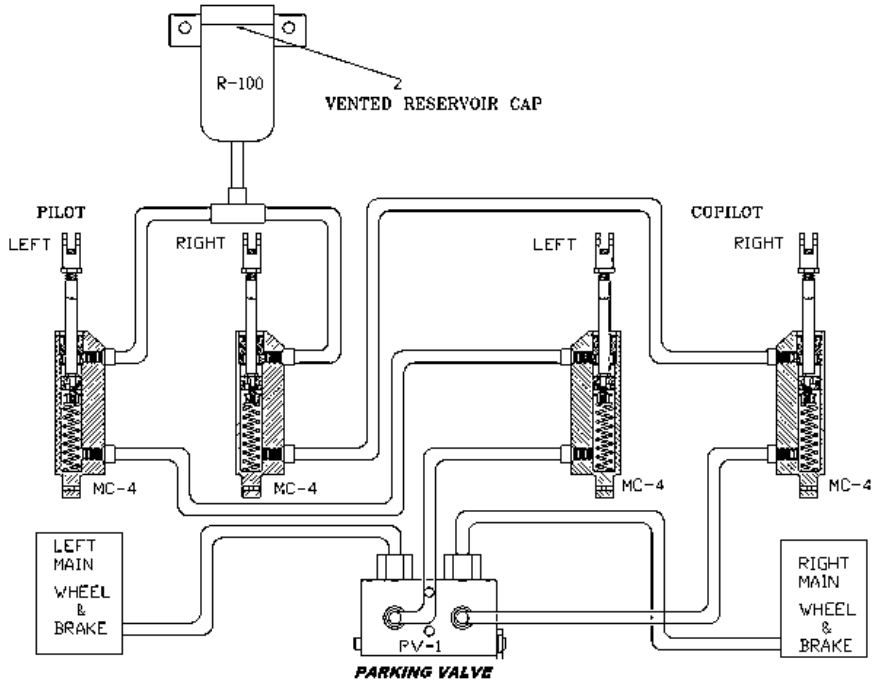

Fig. 7-6. BRAKE SYSTEM SCHEMATIC

2.5. NOSE LANDING GEAR

A Pivoting nose gear is attached to the firewall reinforcement plate. The shock absorber is fitted on the upper machined component and directly on the nose landing gear structure.

In Figure 10 is shown:

1) *Hydraulic shock absorber*
2) *Firewall*
3) *Nose wheel (5.00-5 tire, inflated at 32 PSI (2.2 BAR))*

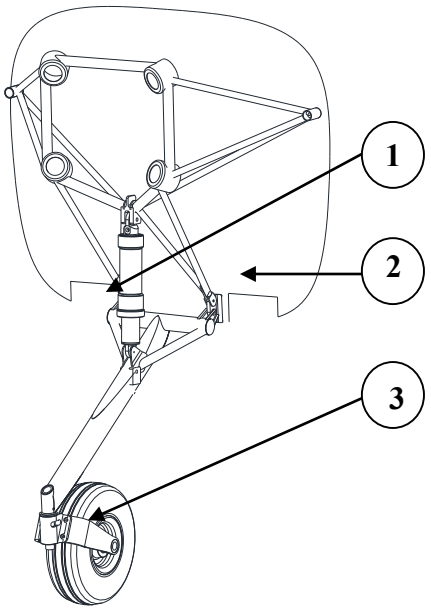

Fig. 7-7. NOSE LANDING GEAR

3. FLIGHT CONTROLS

Aircraft flight controls are operated through conventional stick and rudder pedals. Longitudinal control acts through a system of push-rods and is equipped with a trim tab. a cable control circuit is confined within the cabin and it is connected to a pair of push-pull rod systems positioned in each main wing which control ailerons differentially. Aileron trimming is carried out on ground through a small tab positioned on left aileron.

Flaps are extended via an electric servo actuator controlled by a switch on the instrument panel. Flaps act in continuous mode; the indicator displays three markings related to 0°, takeoff (T/O) and landing (FULL) positions. A breaker positioned on the right side of the instrument panel protects the electric circuit.

The control of the stabilator trim is operated by means of a control wheel, located between the two front seats that acts directly on the control cables.

Stabilator trim position is displayed on a dedicated analogue indicator located on the LH area of the instrument panel.

Rudder Trimming device for lateral control is provided by means of an electrical actuator controlled by a rocker switch located near the pitch trim wheel; the surface is connected to a potentiometer linked to a rudder trim indicator included in the Garmin G1000 EIS (Engine Indication System).

4. INSTRUMENT PANEL

The instrument panel is divided in three areas:

- The left area holds Garmin G1000 PFD, a chronometer and the pitch trim indicator;
- The Central area holds the standby unit for PFI parameters, MD 302 suite, and the ELT button.
- The right area holds Garmin G1000 MFD and breaker panel;
- The lower-LH portion of the instrument panel holds:
  - Ignition key;
  - Master and Generator switches;
  - Emergency fuel pump;
  - Avionic Master switch;
- The lower-Central portion of the instrument panel holds:
  - Fuel selector valve.
  - Flap Control
- The lower-RH portion of the instrument panel holds:
  - Pocket

Fig. 7-8. INSTRUMENT PANEL

4.1. ENGINE CONTROL LEVER

Engine handling is via three levers: Throttle, RPM lever, Mixture control lever.

They're situated on the center control; the use of "front/forward" and "rear/backward" is defined in relation to the direction of flight (longitudinal).

Mixture control lever

This lever (right hand lever with red handle) controls the fuel-air mixture, which is supplied to the engine.

With the lever full forward, extra fuel is being supplied to the engine which at higher performance setting contributes to engine cooling.

In cruise, the mixture should be made leaner in order to reach the appropriate fuel-air mixture. The leaning procedure is given in Chapter 4.

Lever forward (RICH) >> Mixture rich (in fuel)

Lever to rear (LEAN) >>Mixture lean (in fuel)

To shut off the engine the mixture control lever is pulled to the rear stop: air without fuel is drawn into the cylinders that shuts down.

Throttle

This lever (left hand with large knob) is used to control manifold pressure (MAP).

High manifold pressure means a large quantity of fuel-air mixture is being supplied to engine, while low manifold pressure means a lesser quantity of fuel-air mixture is being supplied.

4.2. ALTERNATE AIR

Alternate Air knob is located on the central pedestal; when the knob is fully pulled outward from the instrument panel, injectors receive maximum hot air. During normal operation, the knob is set in OFF position.

4.3. DEFROST AND CABIN HEAT

Two knobs, located on the lower side of the central pedestal, allow Defrost and Cabin Heat function. The one marked as “Defrost and Cabin Heat” allows hot air to perform windshield defrost and partially cabin heat.

The cabin heat control knob, when fully outward, allows cabin to receive maximum hot air. When both cabin heat and defrost and cabin heat are pulled, air is partitioned.

Fig. 7-9. CENTRAL PEDESTAL

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5. SEATS AND SAFETY HARNESS

In correspondence of the seats, three fitting points safety belts are provided; belt adjustment is via the sliding buckle located on the belt metal hook.

Seats are built with light allow tube structure and synthetic material cushioning. It is possible to perform following seat adjustments:

Horizontal – pulling the lower front lever and sliding the seat

Vertical – operating the lever located on the outward seat side

Seat back inclination – unlocking it via the lateral knob

These adjustments ensure the crew and passengers comfort.

6. DOORS

P2010 features three doors:

The main door is placed on the left side of the cabin, while on the right side there are two secondary doors, one on the front side and the other on the rear, used as an emergency exit.

On the right side of the cabin is located an additional door which gives access to the baggage compartment.

Baggage door can be opened from the inside of the cabin, where near the rear RH seat a dedicated knob is located.

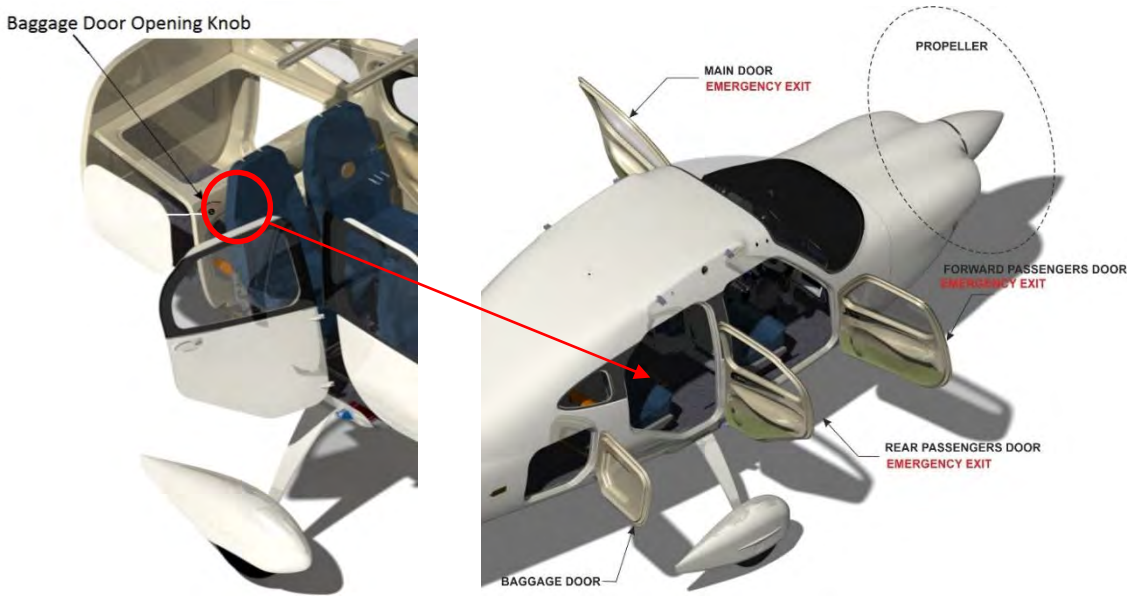

Fig. 7-11. DOORS AND BAGGAGE DOOR OPENING

"NOTE: opening of baggage compartment is only provided inside the cockpit. Occupants of rear seat shall be briefed in order to avoid unnecessary use of command by people seated in the rear seats"

The internal handle can be locked, to avoid any chance of inadvertent opening, by means of a hook located nearby the handle itself and upper safety block, following pictures show the functioning.

Fig. 7-12. HANDLE LOCKING

In case of rapid escapes or door handles malfunction, an emergency opening is provided on the rear side of the door.

The opening is operated by means of a hook, moved forward, that bypasses the normal door opening.

Fig. 7-13. EMERGENCY OPENING

7. POWERPLANT

7.1. ENGINE

Manufacturer …… Lycoming Textron

Model ……... IO-360-M1A

Type Certificate ……... EASA TCDS no. IM.E.032

Engine type …….. Fuel injected (IO), direct drive, four cylinder horizontally opposed, air cooled with down exhaust outlets.

Maximum power ……. 134.0 kW (180hp) @ 2700 rpm

Maximum continuous power ……... 134.0 kW (180hp) @ 2700 rpm

Oil Consumption				
Operation	RPM	HP	Max. Oil Cons. Qts./Hr.	*Max. Cyl. Head Temp.
Normal Rated	2700	180	.80	500°F (260°C)
Performance Cruise (75%)	2450	135	.45	500°F (260°C)
Economy Cruise (60R Rated)	2350	117	.39	500°F (260°C)

7.2. PROPELLER

Manufacturer …….. MT Propeller

Model ……. MT 188 R 145 – 4G

Type Certificate …….. EASA TCDS no. P.006

Blades/hub …….. 2 wood/composite blades – aluminium hub

Diameter ……. 1880 mm (6,17 ft) no reduction allowed

Type …… Fixed pitch

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8. FUEL SYSTEM

The fuel system is designed to supply the reciprocating engine (Lycoming IO-360-M1A) with the suitable flow rate and pressure according to engine limitations required by Lycoming operator manual.

Following figure shows a schematic of the fuel system assy for P2010 airplane.

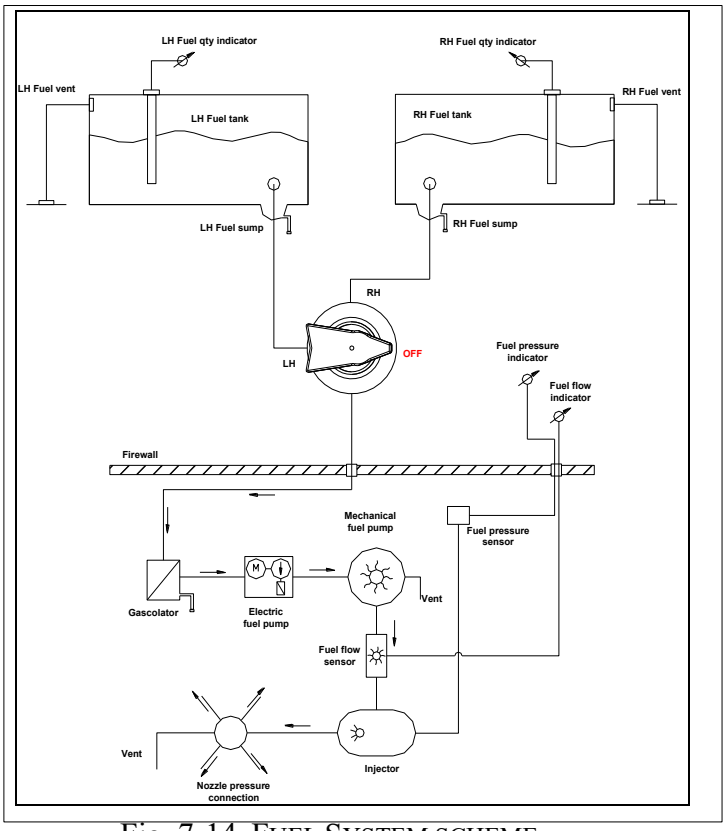

Fig. 7-14. FUEL SYSTEM SCHEME

Each fuel tank is integrated within the wing box. The capacity of each tank is 120 liters (31,7 gal.), total capacity is thus 240 liters (63.4 gal.).

The internal side of fuel tank is accessible for inspection through 4 upper dedicated caps.

Two bottom inspection panels allow the inspection of vent line and tank structure.

An anti-sloshing movable wall is located within each fuel tank, this prevents fuel centrifugation which is a possible cause of undesired engine shut down.

The fuel tank filler cap is located on the top of the wing, in the area outside of the tank and it is easily accessible from the leading edge of the aircraft. At the lowest point of the tank it is positioned a drain sump.

The engine is equipped with an engine gear pumps, mechanical (primary). An additional auxiliary electrical fuel pump is provided (auxiliary).

The fuel selector is operated by a fuel selector control knob located in the cabin on the central panel. The fuel selector control and the fuel valve are connected via a rigid control rod.

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9. ELECTRICAL SYSTEM

Primary DC power is provided by an external alternator with a 28 VDC output, rated of 70 Amps @ 2700 rpm. During normal operations, it recharges the battery.

Secondary DC power is provided by a lead type battery (GILL G-247) which provides the energy necessary for feeding the essential electrical loads in the event of an alternator failure.

The switch between the energy sources is automatic and no action is required in order to activate the alternate energy source.

For ground maintenance and/or starting, an external power socket is provided.

The alternator and battery are connected to the battery bus in order to provide energy for the electric equipment.

Each electrically fed instrument is connected to a dedicated circuit breaker which protects the cable from the battery bus to the associated electric equipment.

WARNING

If the Ignition is in the position L, R, or BOTH, an accidental movement of the propeller may start the engine with possible danger for bystanders.

In the following figure is presented the electrical system architecture.

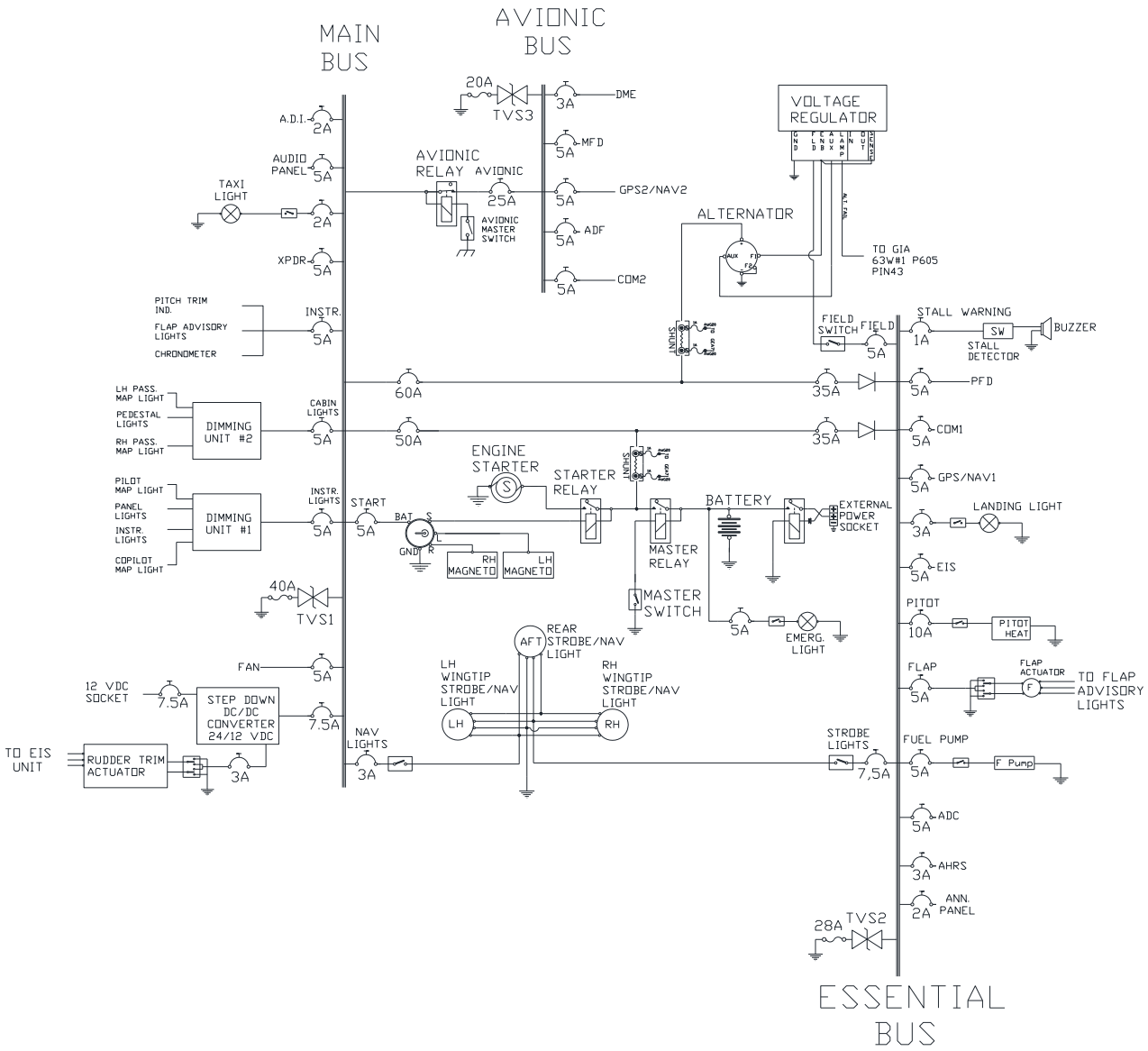

FIG.7-15. ELECTRICAL SYSTEM ARCHITECTURE

9.1. STALL WARNING SYSTEM

The aircraft is equipped with a stall warning system consisting of a sensor located on the right wing leading edge connected to a warning horn located near the instrument panel.

9.2. AVIONICS

The avionic system installed on P2010 is mainly based on the integrated avionic suite Garmin G1000. The installed configuration is based on a two-screen layout.

Primary flight information are displayed on the LH screen, namely PFD (Primary Flight Display).

Primary Engine and moving map information are displayed on the RH display, namely MFD (Multi-Function Display).

Both communication and navigation means, including the ones provided by third party units (i.e. ADF and DME), are integrated within the suite and their related information are displayed on both PFD and MFD.

In the event of a PFD or MFD failure the "reversionary mode" is automatically enabled.

In the event of a failure of the automatic reversion logic, the pilot can force reversionary mode by pressing "reversionary mode" button marked in red and located on the audio-panel.

When reversionary mode is activated primary flight and engine information are presented together on the remaining display.

In order to provide the pilot with main flight information in the event of a dual display failure of both PFD and MFD, or in the event of an AHRS and ADC units combined failure, an integrated digital stand-by instrument, Mid-Continent MD-302, featuring airspeed, altitude, attitude and slip information is installed.

A dedicated analogue indicator is provided for pitch trim position.

The installed equipment is such that the aircraft is able to fly under day/night VFR and day/night IFR rules and to perform ILS CAT I approaches with ILS.

9.3. EXTERNAL POWER SUPPLY

On the right side of the tail cone, an external power is present. Using this device it is possible to feed the electric system directly on the main bus bar, by an external power source. It should be used at the engine start-up in cold weather condition.

A white advisory "EXT. POWER" label will appear on Garmin PFD display upon connection of external power in order to advise pilot; the label will disappear upon disconnection of ground external power.

CAUTION

Exercise caution while applying external power.
Exercise extreme caution while disconnecting external power with engine running due to airflow coming from the propeller.
Approach the power supply receptacle from rear of the wing.
Make a positive check, upon disconnection, that:
- *the power chord is free from any aircraft structure*
- *the receptacle is firmly closed.*

Follow this procedure to start the engine using the external power source.

1. Ignition key, Master switch, Generator switch: OFF
2. Open the receptacle door and insert the external power source's plug into the socket
3. Engine start-up procedure (see Sect. 4 in this manual)
4. Disconnect the external power source's plug and close firmly the receptacle door.

10. PITOT-STATIC PRESSURE SYSTEMS

The P2010 air speed/altitude indicating systems are connected with a Pitot-Static system based on a total pressure/Pitot probe (simple Pitot tube, heated for icing protection) mounted on left wing strut and two static pressure ports connected in parallel and located in correspondence of engine firewall on left and right side of fuselage. Flexible hoses connects total pressure and static ports to primary analogue instruments, anemometer and altimeter.

Garmin G1000 suite and standby MD 302 unit are connected to both static and total pressure lines providing both air speed and altitude information.

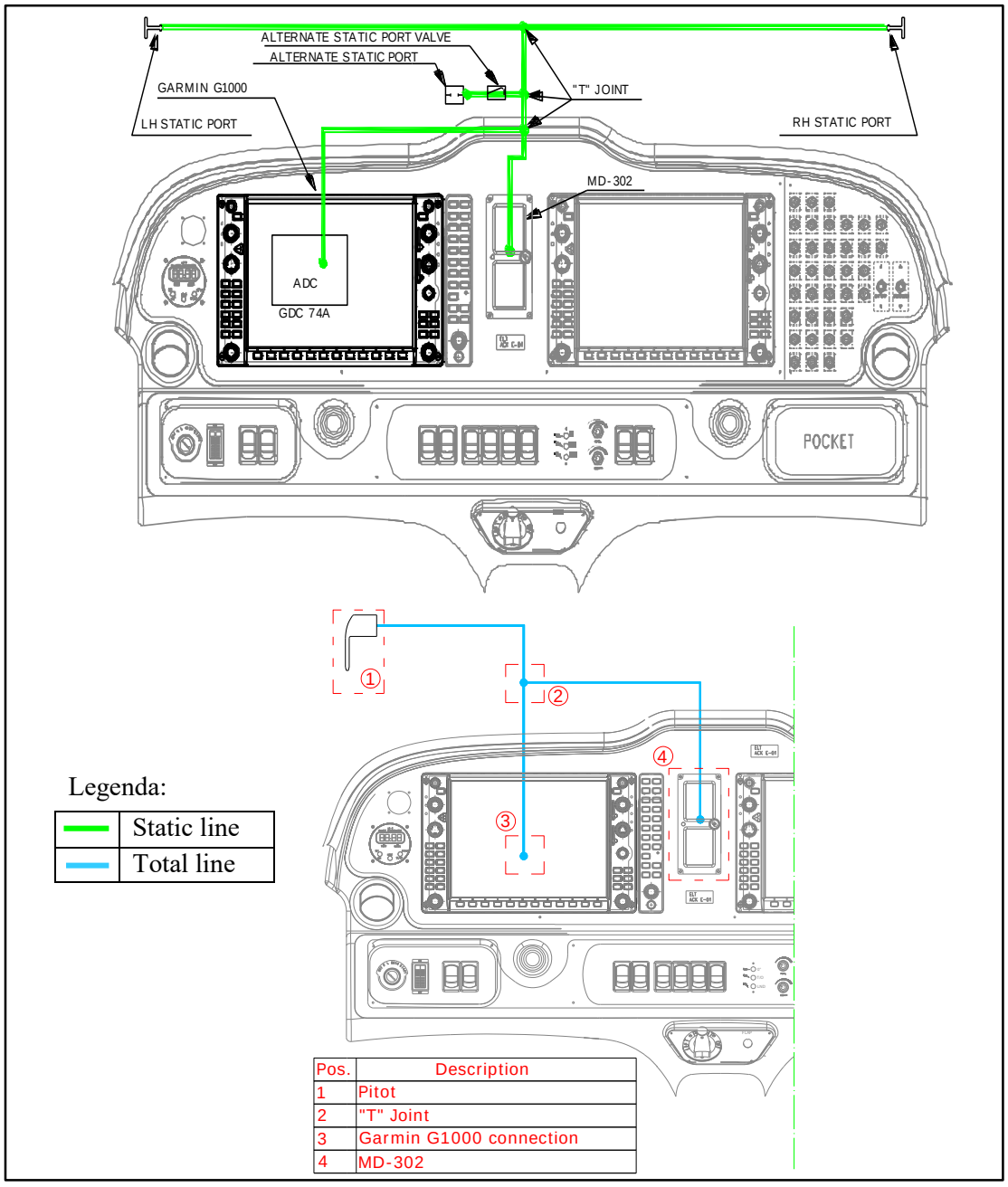

FIG.7-16. PITOT-STATIC SYSTEM

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11. LIGHTS

11.1. EXTERNAL LIGHTS

P2010 is equipped with the following external lights:

- 2 combined LED NAV/POS/Strobe integrated lights located on RH and LH wing;
- 1 POS/strobe combined light located on the rear (fixed on the rudder);
- 1 combined LED landing and taxi light located on the lower engine cowling.

The following schematic shows the configuration layout for external lights:

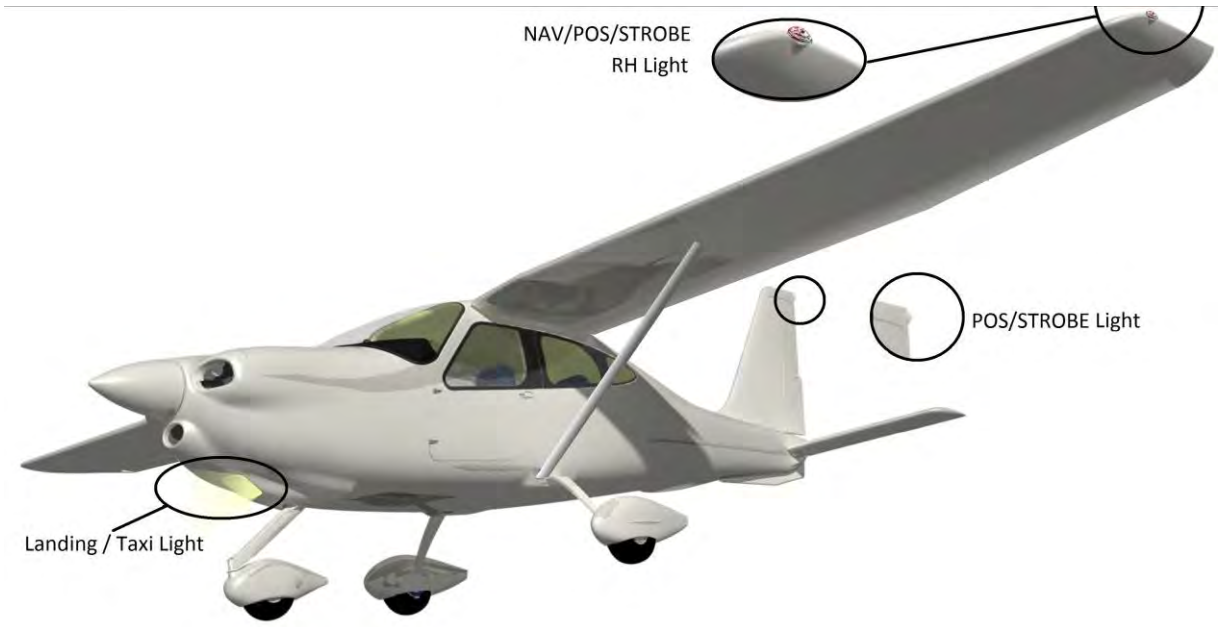


FIG.7-17. EXTERNAL LIGHTS

11.2. INTERNAL LIGHTS

On the cabin ceiling are located four map lights, two in the front area (pilot) and two in the rear area (passengers).

In the central area of the cabin ceiling is located a spot light used to illuminate the pedestal during night flight operations. All ceiling lights are dimmable by a dedicated dimmer.

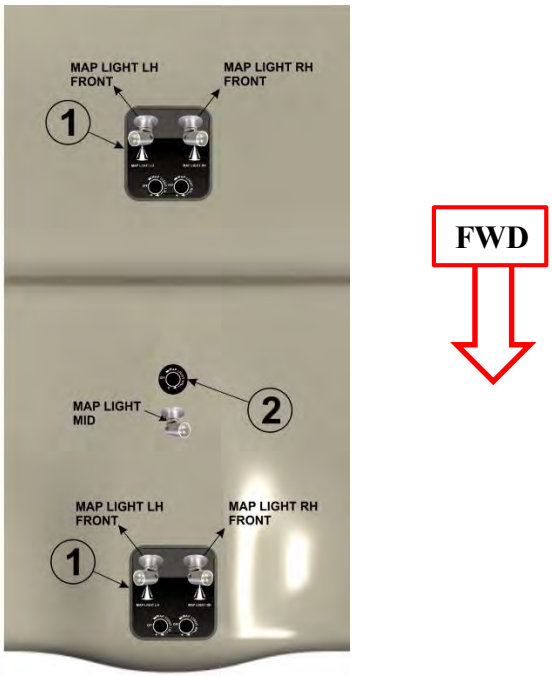


FIG.7-18. CABIN CEILING LIGHTS LAYOUT

The instrument panel can be illuminated by 8 incandescence light strips, all dimmable.

FIG.7-19. INSTRUMENT PANEL LIGHTS LAYOUT

12. PLACARDS

In addition to the limitation placards reported on Section 2, following placards are installed on the aircraft.

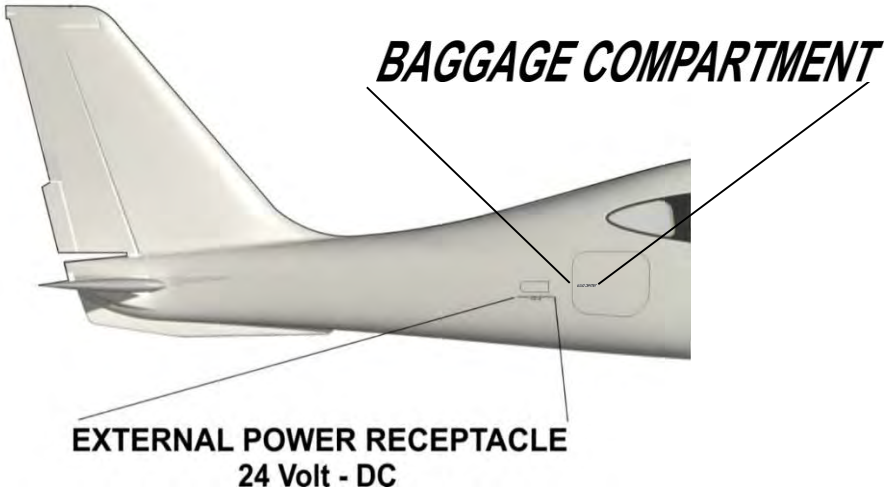
NOTE

Additionally, nearby the placards listed below (English language), directly translated placards in the language of the country in which the airplane is registered can be installed, when required by the specific NAA.

12.1. EXTERNAL PLACARDS

Aircraft Registration Placard:

External Power Socket and baggage compartment placards:

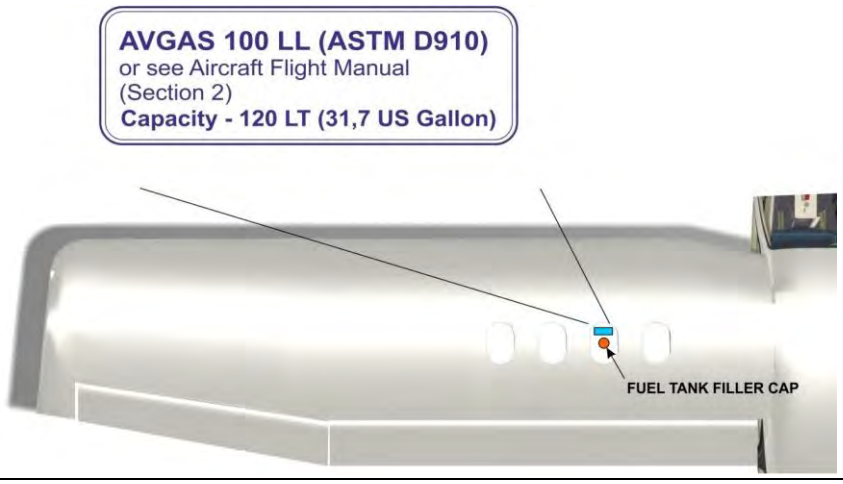


Static Ports:

Lift Point:

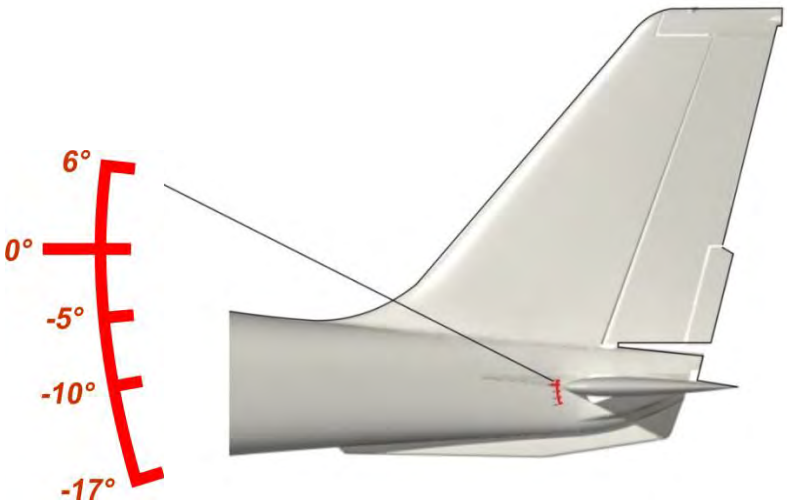
Wheel Fairing "No Step":

Allowed Fuel Placard:



Tire Pressure placard:

Stabilator degrees placard:



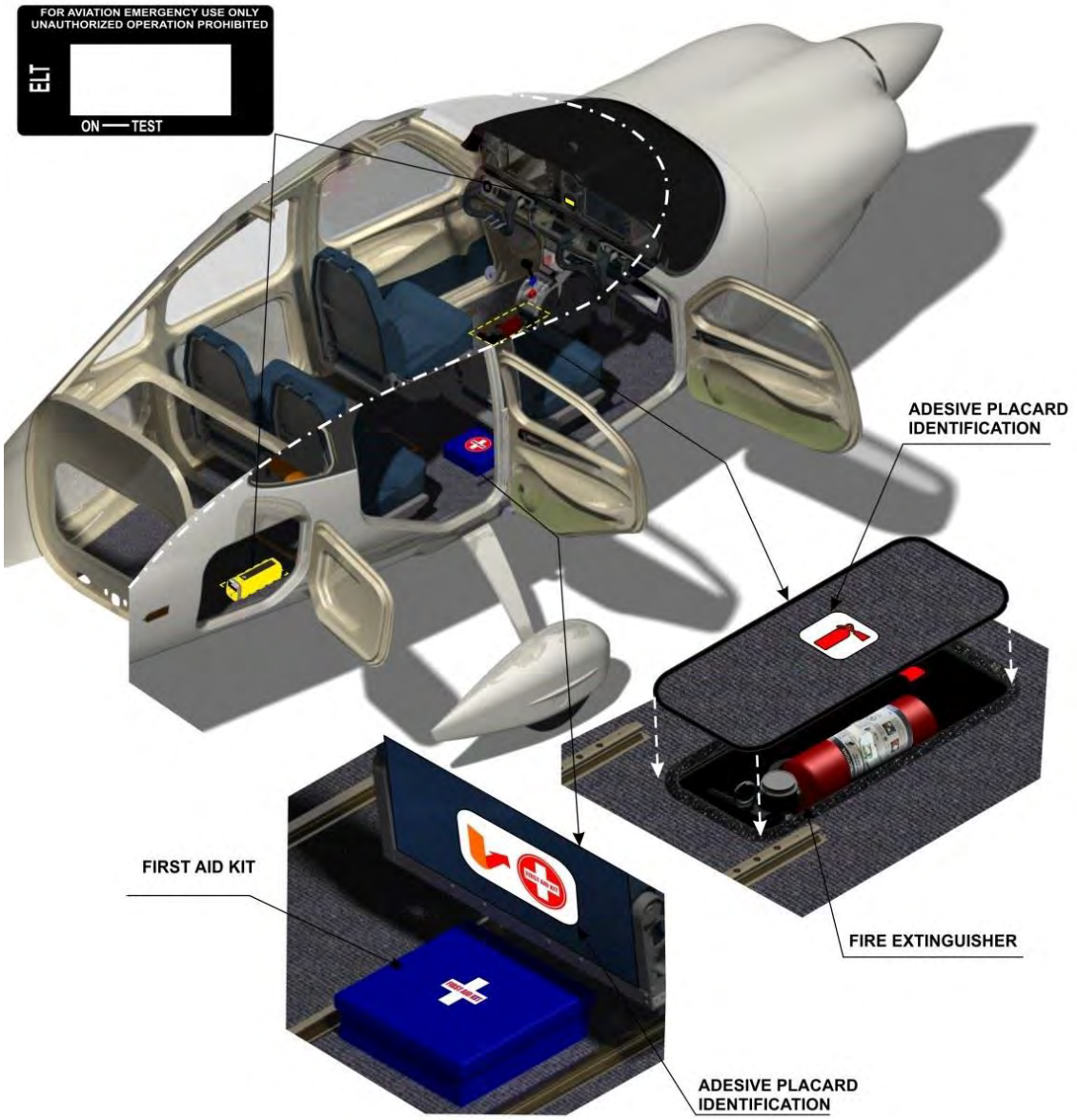
Emergency exit placards:

1 **EMERGENCY EXIT**

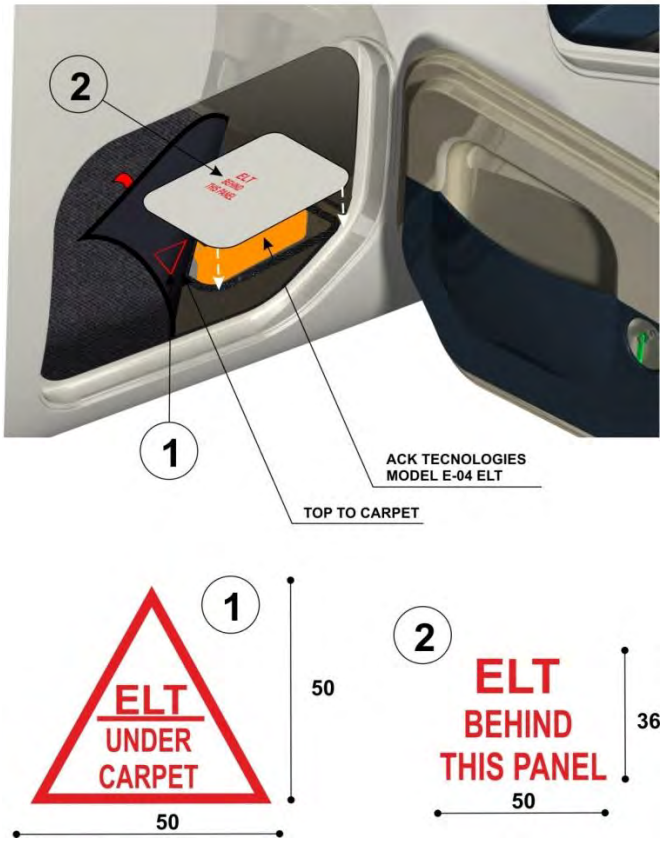
2 FOR EMERGENCY ACCESS
OPEN DOOR WITH HANDLE

12.2. INTERNAL PLACARDS

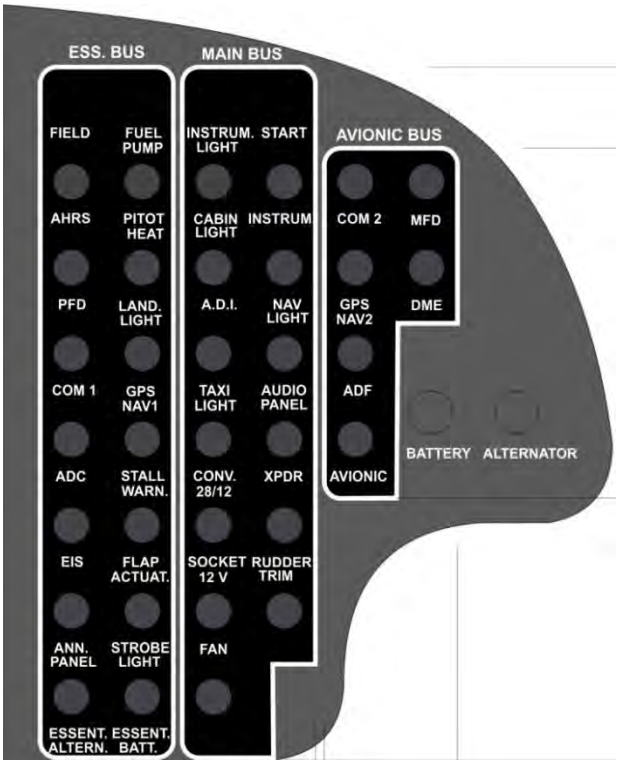
Safety equipment placards:



ELT unit position placard:



Breaker Panel placards:

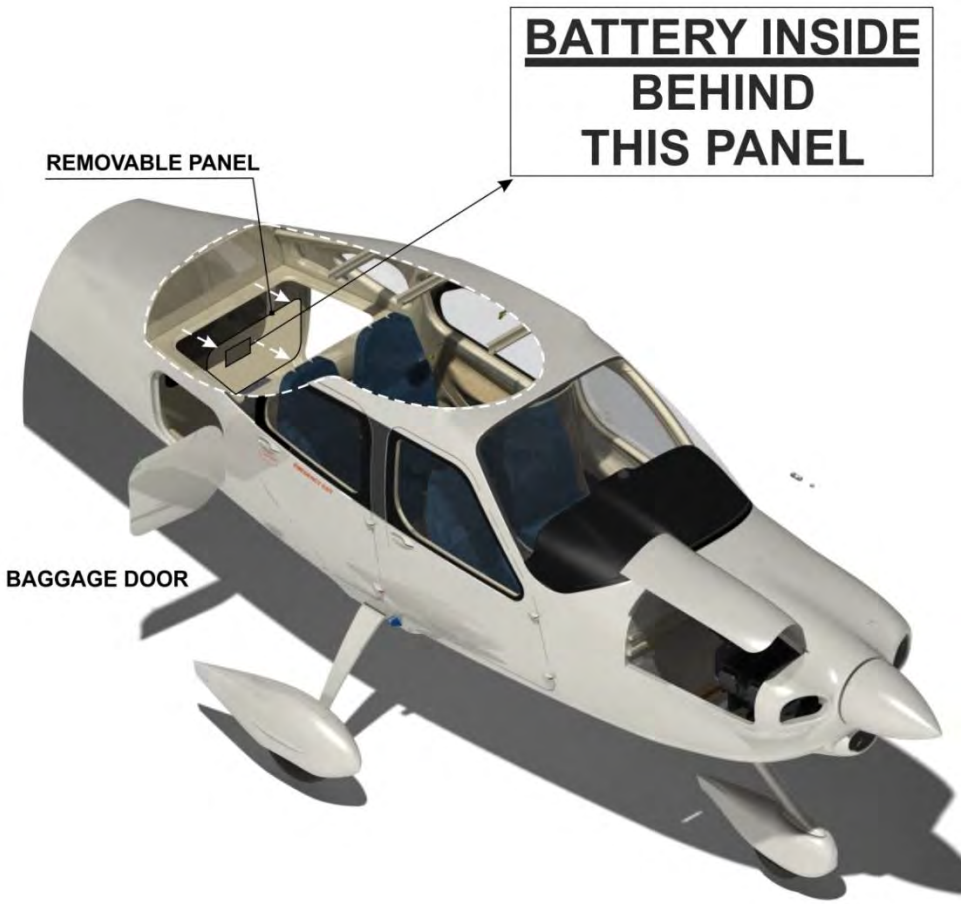


Magnetic Compass placard:

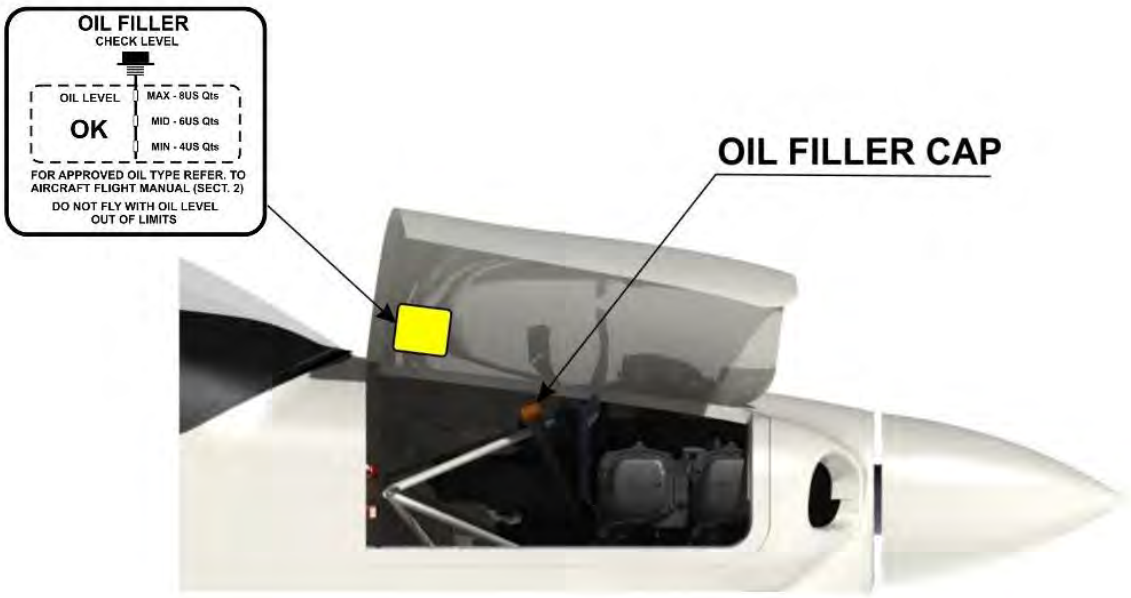
For	N	30	60	E	120	150
Steer						
For	S	210	240	W	300	330
Steer						

DATE RADIO ON AIRPATH

Battery Placard:

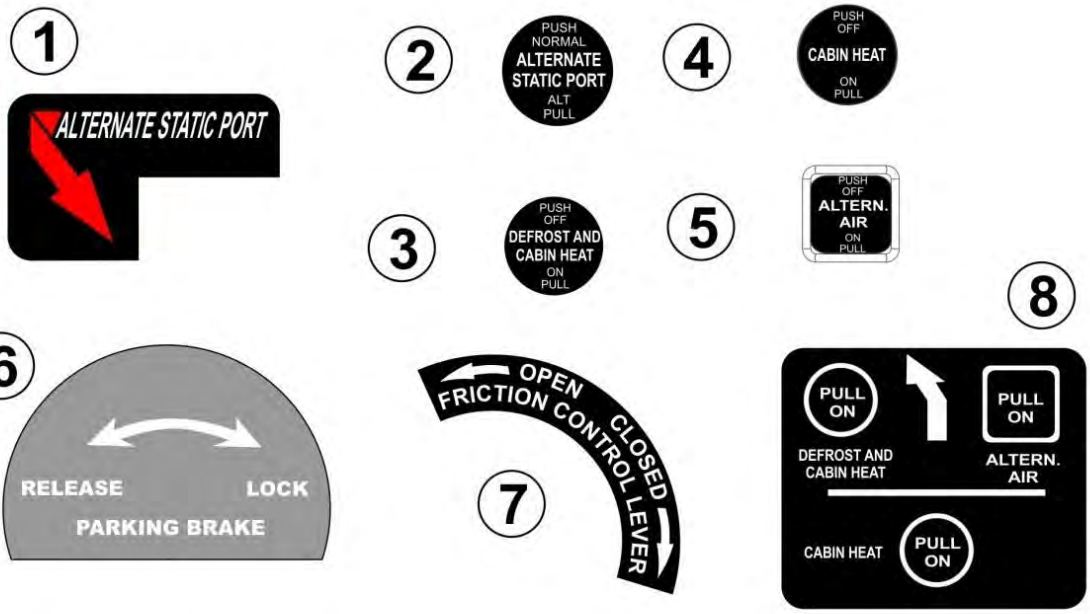


Oil Filler placard:



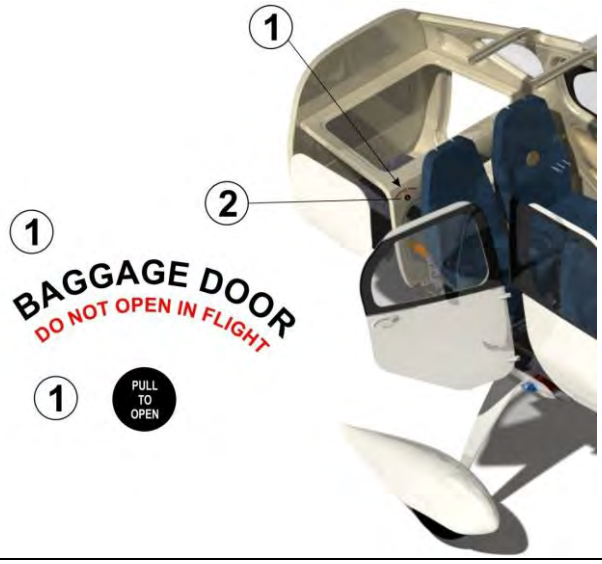
Emergency exit placards

Pedestal placards:



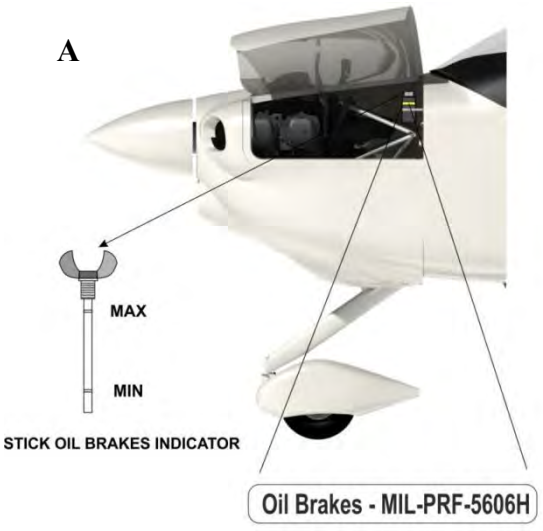
Fuel selector valve and Flap control knob:

Baggage Door opening knob:

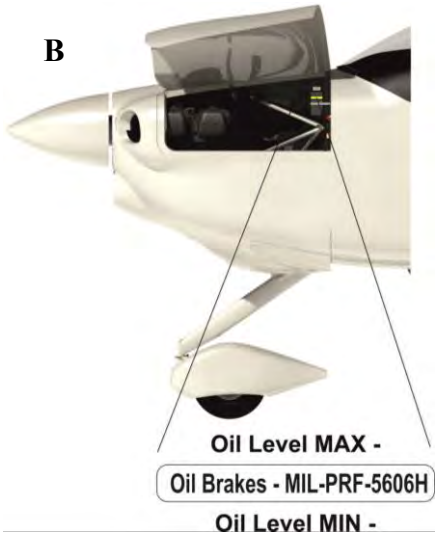


Oil brake reservoir placard:

A



B



A – Oil brake reservoir placard

B – Oil brake reservoir placard if MOD2010/020 is installed

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SECTION 8 – GROUND HANDLING & SERVICE

INDEX

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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.

It is recommended to follow a planned schedule of lubrication and preventive maintenance based on climatic and flying conditions encountered locally.

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2. AIRCRAFT INSPECTION INTERVALS

Scheduled inspections must be performed in accordance with the instructions addressed on the Aircraft Maintenance Manual. Independently from the aircraft flight hours, an annual inspection has to be performed.

All required inspections are reported in the Aircraft Maintenance Manual.

As far as the scheduled/unscheduled engine maintenance is concerned, refer to the engine manufacturer Maintenance Manual.

CAUTION

Unscheduled inspections/maintenance tasks are necessary when one or more of following conditions occur:

1. *Emergency landing*
2. *Breaking / damage of propeller (or in case of simple impact)*
3. *Engine fire*
4. *Lighting damage*
5. *Any type of damage or failure*

3. AIRCRAFT CHANGES OR REPAIRS

Aircraft changes or repairs must be performed in accordance with Aircraft Maintenance Manual and Job cards provided by TECNAM.

4. MAINTENANCE

4.1 REFUELLING

- *Do not perform aircraft refuelling near flames, sparks or similar.*
- *Avoid fuel contact with the skin: a skin corrosion could occur.*
- *Make sure that a fire extinguisher is available nearby during refuelling operations.*

WARNING

- *Make sure that overall aircraft instrumentation is turned OFF before performing the refuelling.*
- *Do not operate switches and/or pushbuttons inside the aircraft during refuelling operation; make sure that crew left the aircraft before performing refuelling.*
- *Make sure that the aircraft is electrically connected to the ground.*

4.2 ENGINE AND BRAKES OIL LEVEL CONTROL

1. Open the engine cowling (RH)
2. Clean the dipstick and soak it in the reservoir
3. Remove dipstick and read oil level
4. If required, replenish oil: oil level should be between max. and min. Marks shown on the dipstick
5. Close the engine cowling
6. Repeat for LH engine cowling side for Oil brakes level control.

RH Engine Cowling

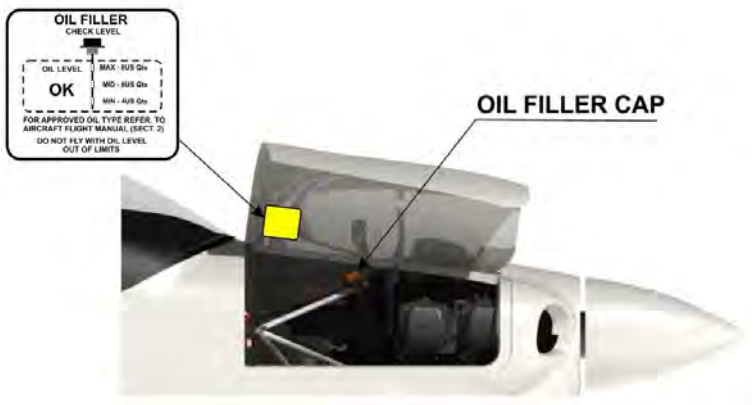

FIG. 8-1. OIL CHECK

LH Engine Cowling

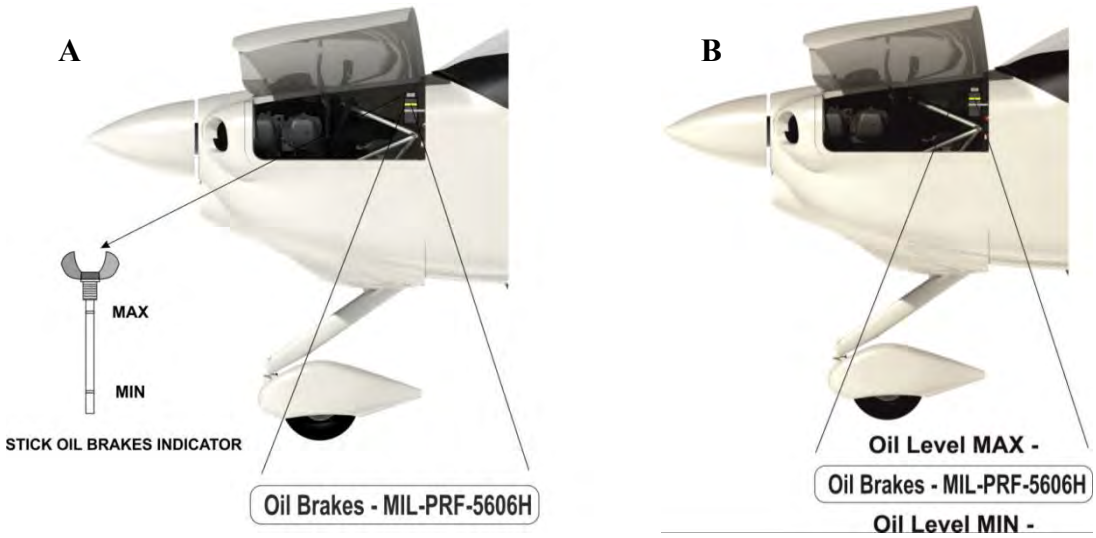

FIG. 8-1 BIS OIL CHECK

A – Oil brake reservoir placard

B – Oil brake reservoir placard if MOD2010/020 is installed

4.3 LANDING GEAR TIRES PRESSURE CONTROL

For each wheel proceed as follows:

1. Remove wheel fairing
2. Unscrew the tire cap
3. Connect a gauge
4. Read the pressure value
5. If required, rectify the pressure (nose tire 2.2 Bar / 32 psi, main landing gear tires 2.5 Bar / 36 psi)
6. Fit the tire cap
7. Install wheel fairing

FIG. 8-2. TIRE PRESSURE PLACARDS

5. ENGINE COWLING CHECK

5.1 UPPER COWLING

1. Parking brake: *ON*
2. Fuel selector valve: *OFF*
3. Ignition key: *OFF*
4. Generator & Master switches: *OFF*
5. Unlatch all four butterfly Cam-locks mounted on the cowling by rotating them 90° counter clockwise while slightly pushing inwards.
6. Remove engine cowling paying attention to propeller shaft passing through nose.
7. To assemble: rest cowling horizontal insuring proper fitting of nose base reference pins.
8. Secure latches by applying light pressure, check for proper assembly and fasten Cam-locks.

WARNING

Butterfly Cam-locks are locked when tabs are horizontal and open when tabs are vertical. Verify tab is below latch upon closing.

5.2 LOWER COWLING

1. After disassembling upper cowling, move the propeller to a horizontal position.
2. Using a standard screwdriver, press and rotate 90° the two Cam-locks positioned on lower cowling by the firewall.
3. Disconnect the ram-air duct from the NACA intake. Pull out the first hinge pin positioned on the side of the firewall, then, while holding cowling, pull out second hinge pin; remove cowling with downward motion.
4. For installation follow reverse procedure.

6. GROUND HANDLING

6.1 TOWING

The aircraft is most easily and safely maneuvered by hand by pushing on wing struts near attachments or by pulling it by its propeller near the axle. A tow bar can be fixed onto nose gear fork. Aircraft may be steered by turning rudder or, for steep turns, by pushing lightly on tail cone to lift nose wheel.

6.2 PARKING AND TIE-DOWN

General

Under normal weather conditions, the airplane may be parked and headed in a direction that will facilitate servicing without regard to prevailing winds. Ensure that it is sufficiently protected against adverse weather conditions and present no danger to other aircraft.

Procedure

1. Position airplane on levelled surface, headed into the prevailing wind, if practical.
2. Engage parking brake
3. Secure pilot control wheel by wrapping the seat belt around it

NOTE: *Do not engage the parking brakes at low ambient temperature, when an accumulation of moisture may cause the brakes to freeze, or when they become hot from severe use. In this case use wheel chocks.*

In case of long time parking or overnight parking, it is recommended to moor the a/c as shown on Para.6.3.

CAUTION *Mooring is strongly recommended when the wind is more than 15 knots and the a/c is completely refuelled.*

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6.3 MOORING

The aircraft is moored to insure its immovability, protection, and security under various weather conditions.

CAUTION

Mooring is strongly recommended when the wind is more than 15 knots and the a/c is completely refuelled.

Procedure

1. Position airplane on levelled surface and headed into the prevailing wind, if practical
2. Centre nose wheel and engage parking brake and/or use the wheel chocks

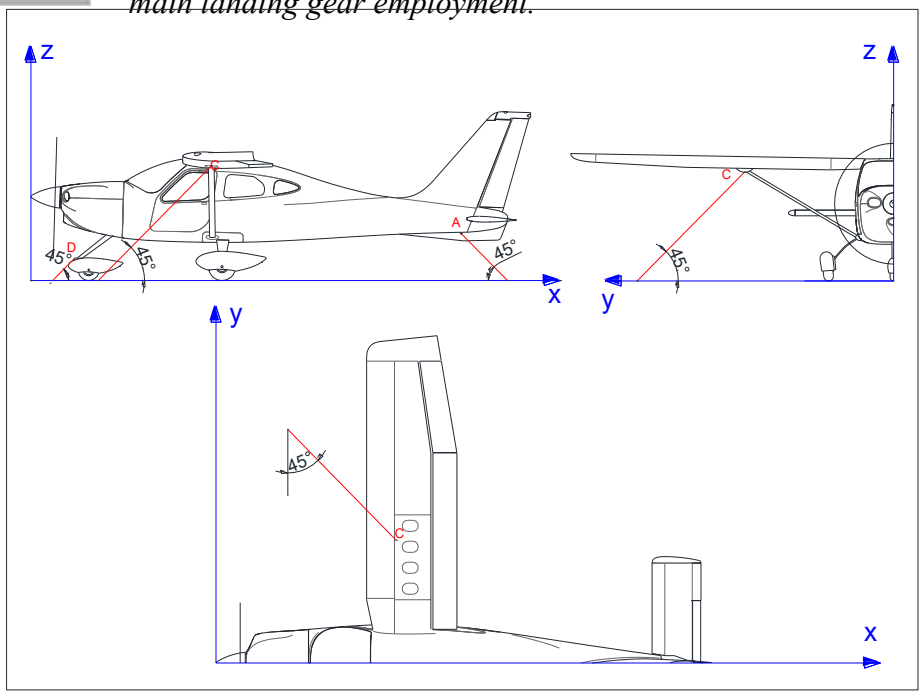
NOTE:

Do not engage the parking brakes at low ambient temperature, when an accumulation of moisture may cause the brakes to freeze, or when they become hot from severe use. In these cases use wheel chocks.

3. Secure pilot control stick by wrapping the seat belt around it
4. Assure that flaps are retracted
5. Electrically ground airplane, by connecting ground cable to the engine muffle
6. Install control locks
7. Install protective plugs
8. Close and lock cabin doors.
9. Secure tie-down cables to the nose gear leg (and to the wings (in correspondence of wing struts) and tail cone tie-down rings at approximately 45 degree with respect to the ground.

NOTE:

Additional preparation for high winds includes tie-down ropes from the main landing gear employment.



6.4 JACKING

The aircraft can be lifted up by hydraulic jacks in correspondence of the points shown by external placards.

For the correct procedure please refer to the Maintenance Manual.

6.5 ROAD TRANSPORT

It is recommended to secure tightly all aircraft components onto the cart to avoid damage during transport. Minimum cart size is 9x4 meters. 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.

7. CLEANING AND CARE

CAUTION

Aircraft surface must be kept clean to ensure expected flight performance. Excessively dirty surfaces can affect normal flight conditions.

7.1 WINDOWS

For windows cleaning, it is allowed the use of acrylic products employed for glass and Plexiglas surfaces cleaning.

7.2 EXTERNAL SURFACES

Aircraft surface is cleaned with soapy water; they are not allowed solvents or alcohol based products. Died insects must be removed using hot water.
It is advisable to avoid outside aircraft parking for long periods; it is always convenient to keep the aircraft in the hangar.

7.3 PROPELLER

To preserve its functionality avoiding wear and corrosion, the propeller manufacturer uses, for external surface painting, an acrylic paint which is resistant to all solvents. In any case it is advisable to clean the propeller using exclusively soapy water.

7.4 ENGINE

Engine cleaning is part of the scheduled maintenance. Refer to the engine manufacturer Maintenance Manual for operating and for planning its cleaning.

7.5 INTERNAL SURFACES

Interiors must be cleaned with a rate of 3 to 6 months. Any object present in the cabin (like pens, lost property, maps etc) must be removed.
The instrumentation as a whole must be cleaned with a humid cloth; plastic surfaces can be cleaned with suitable products.
For parts not easily accessible, perform cleaning with a small brush; seats must be cleaned with a humid cloth.

8. ICE REMOVAL

Anti icing products are not allowed. To remove ice, tow the aircraft in the hangar and operate with a soft brush or a humid cloth.

SECTION 9 – AFM SUPPLEMENTS

INDEX

1. INTRODUCTION

This Section concerns the supplemental manuals of additional (or optional) instrumentation equipping the ***P2010*** 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

Sup. N	Title	Rev. N	Date	APPLICABLE	
				YES	NO
D01	GARMIN GFC700 Autopilot	2		☐	☐
D02	Variable Pitch Propeller	3		☐	☐
D03	Alternative avionic configuration	2		☐	☐
D04	Automotive Fuel	1		☐	☐
D05	Argentine AFMS	0		☐	☐
D06	Reserved	/		/	/
D07	GFC700 Autopilot for Variable Pitch Propeller equipped aeroplanes	0		☐	☐
D08	Alternative avionics configuration for variable pitch propeller equipped airplanes	0		☐	☐
D09	Reserved	/		/	/
D10	Lycoming IO-390 Engine and GARMIN G1000 NXi Avionic Suite	1		☐	☐
D11	Brazil AFMS	0		☐	☐
D12	Reserved	/		/	/

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SUPPLEMENT NO. D01

AFMS FOR GARMIN GFC700 AUTOPILOT INSTALLATION AND RNAV/RNP NAVIGATION ELIGIBILITY

Record of Revisions

Rev	Revised page	Description of Revision	Tecnam Approval			EASA Approval or Under DOA Privileges
			DO	OoA	HDO	
0	-	First Issue	D. Ronca	C. Caruso	M. Oliva	
1	2A-15, 17 thru 20	Amended to add the wording "Approved" in order to better identify the pages approved according to EASA regulation	D. Ronca	C. Caruso	M. Oliva	Approved under the authority of DOA ref. EASA.21J.335 (Approval No. MOD2010/070.160118)
2	6A-11 thru 12	Pages removed	D. Ronca	C. Caruso	M. Oliva	Approved under the authority of DOA ref. EASA.21J.335 (Approval No. MOD2010/103.161026)

List of Effective Pages

	Page	Revision
Cover Pages	D01-1 thru 23	*Rev. 0*
Section 1	1A-13, 1A-16 thru 31	*Rev. 0*
Section 2	2A-15, 2A-17 thru 20	*Rev. 1*
Section 3	3A-31 thru 35	*Rev. 0*
Section 4	4A-27 thru 38	*Rev. 0*
Section 7	7A-8 thru 9, 7A-20 thru 21, 7A-27, 7A-33	*Rev. 0*

INDEX

INTRODUCTION

This section contains supplemental information to operate, in a safe and efficient manner, the aircraft when equipped with Garmin GFC 700 autopilot device interfacing Garmin G1000.

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 D01: pages replacement instructions

SECTION 1 – GENERAL

Make sure you first applied instructions reported on the basic AFM, Section 1 General

According to A/C configuration apply following pages replacement:

Supplement D01 GENERAL page		AFM Section 1 page
1A-13	**REPLACES**	1-13 of basic AFM, Section 1
1A-16 thru 31	**REPLACES**	1-16 of basic AFM, Section 1

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Autopilot acronyms

AC	Advisory Circular	*GNSS*	Global Navigation Satellite System
A/C	Aircraft	*GP*	Glide Path
ADC	Air Data Computer	*GPS*	Global Position System
ADF	Automatic Direction Finder	*GS*	Glide Slope
ADI	Attitude Directional Indicator	*GSA*	Garmin Servo Actuator
AFCS	Automatic Flight Control Systyem	*GSM*	Garmin Servo Mount
AHRS	Attitude Heading Reference System	*HDG*	Heading
ALT	Altitude	*HSDB*	High Speed Data Bus
ALTS	Altitude Selector	*IAU*	Integrated Avionic Unit
AMPS	Ampere	*LOC*	Localizer
A/P	Autopilot	*LRU*	Line Repleaceable Unit
APR	Approach	*LVL*	Level
ARP	Aerospace Recommended Practice	*MAG*	Magnetometer
ASI	Air Speed Indicator	*MET*	Manual Electric Trim
BC	Back Course	*MFD*	Multi-Function Display
CAS	Caution Advisory System	*NAV*	Navigation
CDI	Course Deviation Indicator	*OAT*	Outside Air Temperature
CS	Certification Specifications	*PFD*	Primary Flight Display
CWS	Control Wheel steering	*PFI*	Primary Flight Information
DC	Direct Current	*PFT*	Pre Flight Test
DME	Distance Measuring Equipment	*PWM*	Pulse Width Modulation
EIS	Engine Indication System	*SAE*	SAE International
ESP	Electronic Stability and Protection	*TDM*	Time Division Multiplexing
FD	Flight Director	*USP*	Under Speed Protection
FLC	Flight Level Change	*VHF*	Very-High Frequency
GA	Go Around	*VNV*	Vertical Navigation
GDU	Garmin Display Unit	*VS*	Vertical Speed
GIA	Garmin Integrated Avionics	*XPDR*	Transponder

12 AUTOPILOT DESCRIPTION

P2010 aircraft is equipped, as an optional equipment, with an integrated 2-axis autopilot suite manufactured by Garmin and identified as GFC 700. This autopilot suite was designed as an option for the G1000 integrated flight deck. The autopilot is controlled via dedicated keys grouped in a control panel located on the MFD. The installed MFD display is different with respect to standard P2010 configuration since it is GDU 1044.

The autopilot suite installed on P2010 is based on the following configuration:

- 1 Roll servo
- 1 Pitch servo
- 1 Pitch Trim servo

Neither yaw axis nor rudder trim tab control is provided.

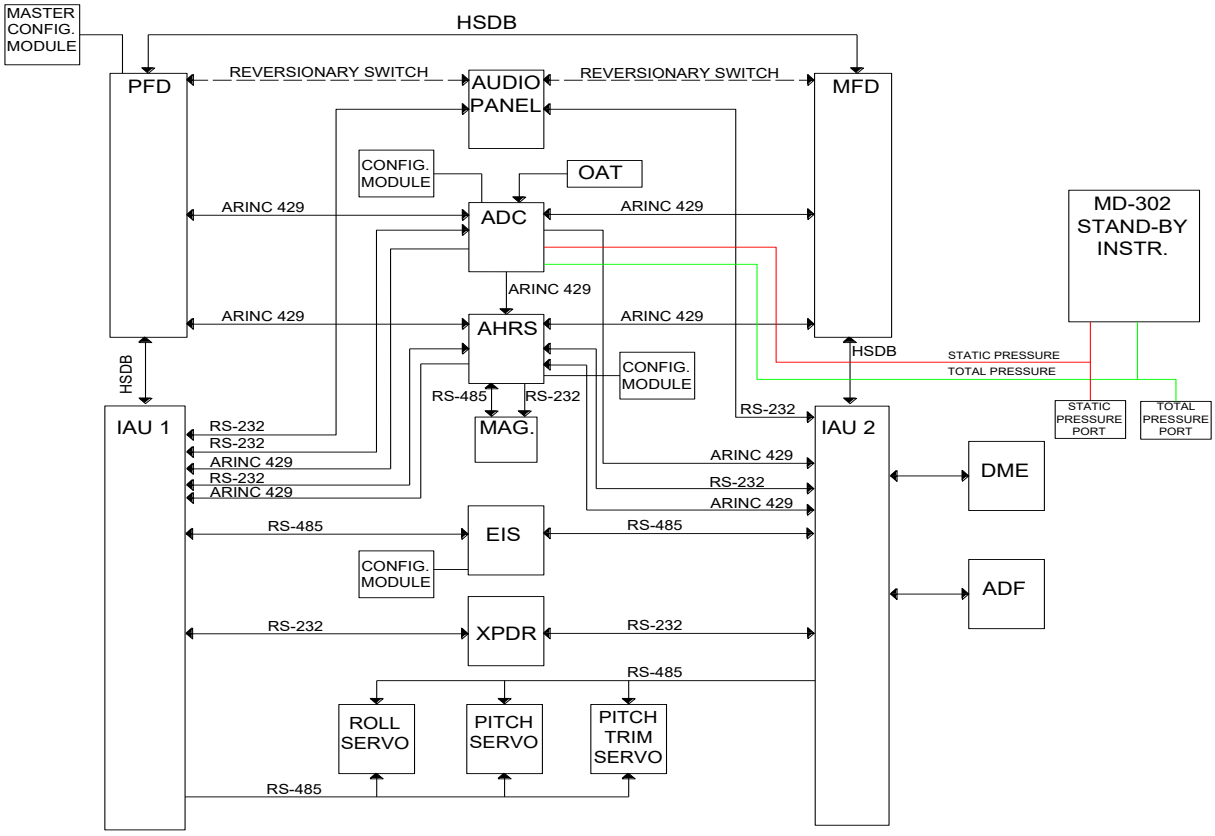
The autopilot is connected to electric system through the below listed circuit breakers connected to the avionics bus:

1) A/P (5A)
2) PITCH TRIM (3A)

The installed servos are capstan type and are composed of two main components:

- A servo motor
- A servo capstan including the servo clutch

The following block diagram describes the avionic system installed on P2010 and its interconnections with the autopilot servos:



The multifunction display (MFD) provides the pilot with a dedicated set of keys for autopilot control (see red frame in the below picture).

The roll servo is located under the pilot seat and is fixed to a/c structure using a dedicated mount. Pitch and pitch trim servos are located in the tail cone and are installed on a dedicated mount which hosts both the servos.

GFC 700 is an integrated autopilot since it uses several information provided by other units embodied in the G1000 avionics suite in order to compute the maneuvers to be performed by the aeroplane and actuate them. The below table lists the functions which are required in order to have the GFC 700 operational and the G1000 LRUs responsible for providing it:

LRU / Function	PFD/MFD (GDU 104X)	ADC (GDC 74X)	AHRS (GRS 77)	MAG. (GMU 44)	IAU1/2 (GIA 63W)	ACTUATOR (GSA 8X)	CAPSTAN (GSM 8X)
AFCS mode select buttons	✓						
Display of the AFCS mode annunciations and flight director command bars.	✓ (PFD NORMAL) (MFD REVERSIONARY)						
Attitude/Heading information			✓	✓			
Air data information		✓					
Navigational database Parameters	✓						
GPS/WAAS, VOR, and ILS navigational data					✓		
Mode logic, flight director computations, and servo management					✓		
Autopilot computations and monitoring						✓	
Aircraft control surface Actuation							✓
Trim functionality						✓	

In control of the roll axis, the autopilot senses turn rate, as well as closure rate to the selected course, along with the non-rate quantities of heading error, course error and course deviation indication.

In control of the pitch axis, the autopilot senses vertical speed, acceleration, and closure rate to the selected glideslope, along with the non-rate quantities of altitude and glideslope deviation indication.

The ~~"a~~utotrim" function senses when the aircraft needs to be trimmed about the pitch axis, and responds by driving the trim servo in the proper direction to provide trim.

12.1 GDU 1044 (MFD)

GDU 1044 MFD unit can display as default engine parameters and moving map information, along with other information that can be selected by the pilot (see the first figure below); when reversionary mode is active it will display flight parameters (in the form of PFD with the left strip engine information, as can be seen in the second figure below). It is the user interface for P2010 avionics suite. GDU 1044 unit replaces the GDU 1040 unit on instrument panel RH side (MFD).

GDU 1044 (MFD)

Reversionary mode:

- In the event of a single display failure the system is able to automatically switch the critical information including flight and engine parameters on the remaining display presenting them in a compact view. In the event of a failure of the automatic switch logic, the pilot can easily force the reversionary mode by pressing the red button on the bottom of the audio panel thus getting both flight and engine parameters information, necessary for continued safe flight, on the remaining display.

GDU 1044 (MFD) in reversionary mode