

Aircraft Flight Manual

Doc. No. 2010/552

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TECNAM P2010tdi

MANUFACTURER: COSTRUZIONI AERONAUTICHE **TECNAM** S.p.A.

AIRCRAFT MODEL: **P2010tdi**

SERIAL NUMBER:

BUILD YEAR:

REGISTRATION MARKINGS:

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.

This manual also constitutes the FAA Approved Airplane Flight Manual for U.S. operations in accordance with FAR 21.29.

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1. FOREWORD

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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When technical changes cause expansion or deletion of text which results in unchanged text appearing on a different 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.

2. SECTIONS LIST

General (*)	Section 1
Limitations (**)	Section 2
Emergency Procedures (*)	Section 3
Normal Procedures (*)	Section 4
Performances (*)	Section 5
Weight and Balance (*)	Section 6
Airframe and Systems description (*)	Section 7
Airplane Care and Maintenance (*)	Section 8
Supplements (***)	Section 9

(*) non-approved Section

(**) approved Section

(***) partially approved Section. Approved parts, if any, are reported in the Supplements.

3. 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 outer 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, these pages will be updated to the current regular revision date.

For Supplements Record of Revision, make reference to the RoR Page of each Supplement

NOTE

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

Ed / Rev	Revised pages	Description of Revision	Approval
Ed. 2 Rev. 0	-	First issue	EASA approval No. 10076578
Ed.2 Rev.1	RoR-2 LoEP-1, 2 2 - 9, 13, 14, 21 thru 23, 30 3 - 9, 22, 33 4 - 10 thru 11, 13, 17, 22 5 - 5, 9, 10, 16, 17 6 - 5, 6, 8 thru 11, 14 thru 16 7 - 7, 9, 11, 27, 30, 56, 71 9 - 5	Updates for: - MOD2010/221 - MOD2010/227; - MOD2010/228; - MOD2010/231; - MOD2010/234; - MOD2010/236; - Typos; - Limitations, Emergency and Normal Procedures, Weight and Balance, System description optimization; - Additional performance information.	Approved under the authority of DOA ref. EASA.21J.335 (MOD2010/241.220119)
Ed.2 Rev.2	RoR-2 LoEP-1, 2 7 - 42	Updates for: - MOD2010/244	Approved under the authority of DOA ref. EASA.21J.335 (MOD2010/245.220222)
Ed.2 Rev.3	RoR-2 LoEP-1 thru 4 4 – 11, 12 6-14, 15, 16 7 – 12, 31, 33, 62, 66, 68, 73, 74 9 - 5	Updates for: - MOD2010/251 - MOD2010/252 - MOD2010/253 - MOD 2010/257 - Normal procedures optimization - Typos	Approved under the authority of DOA ref. EASA.21J.335 (MOD2010/256.220601)
Ed.2 Rev.4	RoR-2 LoEP-1 thru 3 1-6 2 – 7, 9, 30 3 - 6, 7, 27, 30 4 - 13, 14 9 - 5 Suppl.S08: refer to suppl. RoR	Updates for: - MOD 2010/240 (EASA Approval 10079623) - Typos - A/P limitations optimization Refer to RoR of Supplement S08	Approved under the authority of DOA ref. EASA.21J.335 (MOD2010/264.221121)

4. 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.

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

Edition 2, Rev 0	31 May , 2021
Edition 2, Rev 1	19 Jan , 2022
Edition 2, Rev 2	22 Feb , 2022
Edition 2, Rev 3	01 June 2022
Edition 2, Rev 4	21 November 2022

Section	Pages	Revision
Section 0	i, ii, iii, iv; RoR-1	Rev. 0
	LoEP-4	Rev. 3
	RoR-2, LoEP-1 thru 3	Rev. 4
Section 1	1 thru 5, 7 thru 14	Rev. 0
	6	Rev. 4
Section 2	1 thru 6, 8, 10 thru 12, 15 thru 20, 24 thru 29	Rev. 0
	13, 14, 21 thru 23, 30	Rev. 1
	7, 9, 30	Rev. 4
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	9, 22, 33	Rev. 1
	6, 7, 27, 30	Rev. 4
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	10, 17, 22	Rev. 1
	11, 12	Rev. 3
	13, 14	Rev. 4
Section 5	1 thru 4, 6 thru 8, 11 thru 15, 18 thru 22	Rev. 0
	5, 9, 10, 16, 17	Rev. 1

Section 6	1 thru 4, 7, 12, 13	Rev. 0
	5, 6, 8 thru 11	Rev. 1
	14, 15, 16	Rev. 3
Section 7	1 thru 6, 8, 10, 13 thru 21, 23 thru 26, 28, 29, 32, 34 thru 41, 43 thru 55, 57 thru 61, 63, 64, 65, 67, 69, 70, 72	Rev. 0
	7, 9, 11, 22, 27, 30, 56, 71	Rev. 1
	42	Rev. 2
	12, 31, 33, 62, 66, 68, 73, 74	Rev. 3
Section 8	All	Rev. 0
Section 9	1 thru 4, 6	Rev. 0
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Supplements LoEP: make reference to the Supplements LoEP Pages.		



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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. Warning – Caution – Note

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



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



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



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

3. Three view and Dimensions

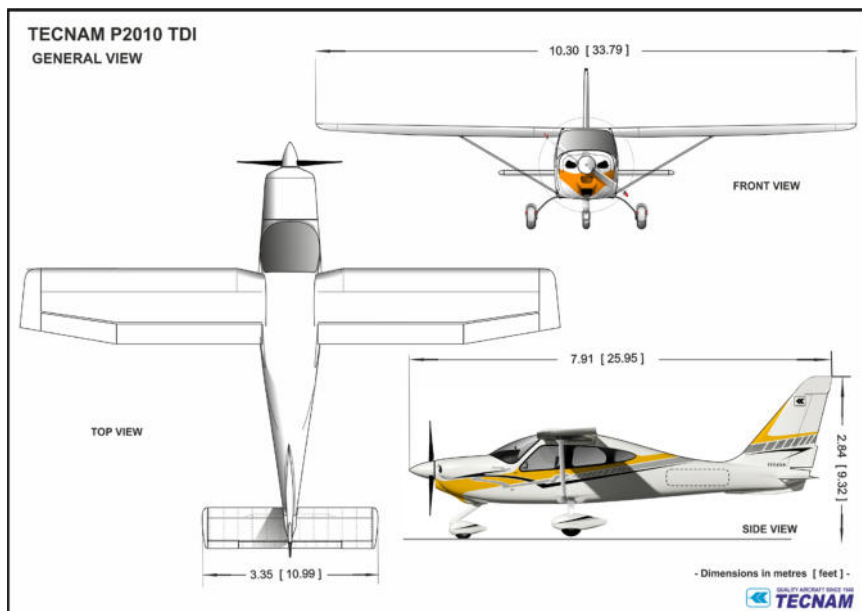


Figure 1-1 - General View

3.1. Dimensions

Overall dimensions

Wing Span.....	10.30m / 33.79ft
Overall Length.....	7.91m / 25.95ft
Overall Height.....	2.84m / 9.32ft
Stabilator span.....	3.35m / 10.99ft

Wing

Wing surface.....	13.9 m ² / 149.6 ft ²
Mean Geometric Chord.....	1.349m / 4.426ft
Dihedral.....	1°
Aspect ratio.....	7.63

Fuselage

Cabin width.....	1.14m / 3.74ft
Cabin length.....	2.3m / 7.55 ft

Landing Gear

Wheels Track.....	2.1m / 6.89ft
Wheels base.....	2.15m / 7.05
Main Gear Tire.....	6.00-6
Nose Gear Tire.....	5.00-5

4. Engine

Manufacturer.....	Continental Aerospace Technologies GmbH
Model.....	TAE 125-02-125
Type Certificate.....	EASA.E.055
Engine type.....	Liquid cooled 4 cylinder in-line four-stroke diesel engine with DOHC (double overhead camshaft), turbo charged, engine equipped with an electric starter and one alternator and optional auxiliary drive.
Max. take-off power (max. 5 min)	125 kW / 168 hp (100%) @2300 rpm
Max. continuous power	114 kW / 153 hp (91%) @2250 rpm

5. Propeller

Manufacturer.....	MT Propeller
Model.....	MTV-6-R/190-69
Type Certificate.....	EASA.P.094
Blades.....	3 laminated wood composite
Diameter.....	1900mm / 6 ft 2.8 in
Type.....	Variable pitch propeller at constant speed

6. Maximum Weights and Specific Loadings

6.1. Maximum Weights

Maximum Take-Off Weight.....	1160 kg (2557 lb)
Maximum Landing Weight.....	1160 kg (2557 lb)

For Aircraft embodying MOD2010/207:

Maximum Take-Off Weight.....	1200 kg (2645 lb)
Maximum Landing Weight.....	1200 kg (2645 lb)

6.2. Specific Loadings

Wing Loading..... 83.45 kg/m² (17.09 lb/ft²)

Power Loading..... 6.90 kg/hp (15.22 lb/hp)

For Aircraft embodying MOD2010/207:

Wing Loading..... 86.33 kg/m² (17.68 lb/ft²)

Power Loading..... 7.14 kg/hp (15.74 lb/hp)

7. Fuel, Lubricant and Coolant

7.1. Fuel

Fuel Specification..... JET A-1 (ASTM D 1655)
Diesel (EN 590)

7.2. Lubricant

Engine Oil Specification..... Aero Shell Oil Diesel Ultra
Shell Helix Ultra 5W-30

Gearbox Oil Specification..... Centurion Gearbox Oil N1

7.3. Coolant

Coolant Specification..... Water / radiator protection in a
ratio of 50:50

Radiator Protection..... BASF Glysantin Protect Plus / G48

8. Acronyms and Terminology

8.1. Velocity terminology

KCAS	<u>Calibrated Airspeed</u> is the indicated airspeed expressed in knots, corrected taking into account the errors related to the instrument itself and its installation.
CIAS	<u>Indicated Airspeed</u> is the speed shown on the airspeed indicator and it is expressed in knots.
KTAS	<u>True Airspeed</u> is the KCAS airspeed corrected taking into account altitude and temperature.
V _A	<u>Design Manoeuvring speed</u> is the speed above the which it is not allowed to make full or abrupt control movement.
V _{FE}	<u>Maximum Flap Extended speed</u> is the highest speed permissible with flaps extended.
V _{NO}	<u>Maximum Structural Cruising Speed</u> is the speed that should not be exceeded, except in smooth air and only with caution.
V _{NE}	<u>Never Exceed Speed</u> is the speed limit that may not be exceeded at any time.
V _O	<u>Operating Manoeuvring speed</u> is the speed above the which it is not allowed to make full or abrupt control movement. Operating at or below manoeuvring speed does not provide structural protection against multiple full control inputs in one axis or full control inputs in more than one axis at the same time.
V _S	<u>Stall Speed</u> is the minimum steady flight speed for a specific flaps configuration and power setting.
V _{SO}	<u>Stall Speed in landing configuration</u> (flaps fully extended).
V _X	<u>Best Angle-of-Climb Speed</u> is the speed which results in the greatest gain of altitude with respect to a given horizontal distance.
V _Y	<u>Best Rate-of-Climb Speed</u> is the speed which results in the greatest gain in altitude in a given time.
V _R	<u>Rotation speed</u> : is the speed at which the aircraft rotates about the pitch axis during take-off.
V _{REF}	<u>Reference Speed</u> is the reference speed for the approach during landing phase.
V _{50ft}	<u>Obstacle speed (screen speed, V_{50ft})</u> : is the speed at which the aircraft flies over a 15m (50 ft) obstacle during take-off or landing.
V _{GLIDE}	<u>Glide speed</u> : is the speed of maximum efficiency (to fly the longest distance per unit of altitude lost)

8.2. Meteorological terminology

ISA	<u>International Standard Atmosphere</u> : is the air atmospheric standard condition at sea level, at 15°C (59°F) and at 1013.25hPa (29.92 inHg).
QFE	<u>Official atmospheric pressure at airport level</u> : it indicates the aircraft absolute altitude with respect to the official airport level.
QNH	<u>Theoretical atmospheric pressure at sea level</u> : is the atmospheric pressure reported at the medium sea level, through the standard air pressure-altitude relationship, starting from the airport QFE.
OAT	<u>Outside Air Temperature</u> is the air static temperature expressed in degrees Celsius (°C) / Fahrenheit (°F).
T _s	<u>Standard Temperature</u> is 15°C (59°F) at sea level pressure altitude and decreased by about 2°C (3.5°F) for each 1000 ft of altitude.
H _p	<u>Pressure Altitude</u> is the altitude read from an altimeter when the barometric subscale has been set to 1013 mb (29.92 inHg).

8.3. Avionics System Acronyms

XPDR	<u>Transponder</u>
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8.4. Aircraft performance and flight planning terminology

<i>Crosswind Velocity</i>	is the velocity of the crosswind component for the which adequate control of the airplane during take-off and landing is assured.
<i>Usable fuel</i>	is the total fuel minus unusable fuel.
<i>Unusable fuel</i>	is the quantity of fuel that cannot be safely used in flight.
<i>G</i>	is the acceleration of gravity.
<i>TOR</i> <i>(Take-off Ground Roll)</i>	is the take-off distance measured from actual start to MLG (main landing gear) wheel lift-off point.
<i>TOD</i> <i>(Take-off Distance)</i>	is total take-off distance measured from start to 15m (50 ft) obstacle clearing.
<i>LR</i>	is the distance measured during landing from actual touchdown to stop point.
<i>LD</i>	is the distance measured during landing, from 15m (50 ft) obstacle clearing to actual stop.

8.5. Weight and balance terminology

<i>Datum</i>	"Reference datum" is an imaginary vertical plane from which all horizontal distances are measured for balance purposes.
<i>Arm</i>	is the horizontal distance of an item measured from the reference datum.
<i>Moment</i>	is the product of the weight of an item multiplied by its arm.
<i>C.G.</i>	<u>Center of Gravity</u> 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.
<i>Standard Empty Weight</i>	is the weight of the aircraft with engine fluids and oil at operating levels.
<i>Basic Empty Weight (BEW)</i>	is the standard empty weight to which it is added the optional equipment weight.
<i>Useful Load</i>	is the difference between maximum take-off weight and the basic empty weight.
<i>Maximum Take-off Weight (MTOW)</i>	is the maximum weight approved to perform the take-off.
<i>Maximum Landing Weight (MLW)</i>	is the maximum weight approved for the landing touchdown.

9. Unit Conversion Chart

Table 1-1 - Unit Conversion Chart

MULTIPLYING		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	[m/s]
Knots	[kts]	1.852	Kilometers/hour	[km/h]
Kilometers/hour	[km/h]	0.5399	Knots	[kts]
PRESSURE				
Atmosphere	[atm]	14.7	Pounds / sq. in	[psi]
Pounds / sq. in	[psi]	0.068	Atmosphere	[atm]
LENGTH				
Kilometers	[km]	0.5399	Nautical miles	[nm]
Nautical miles	[nm]	1.852	Kilometers	[km]
Meters	[m]	3.281	Feet	[ft]
Feet	[ft]	0.3048	Meters	[m]
Centimeters	[cm]	0.3937	Inches	[in]
Inches	[in]	2.540	Centimeters	[cm]
VOLUME				
Litres	[l]	0.2642	U.S. Gallons	[US
U.S. Gallons	[US Gal]	3.785	Litres	[l]
AREA				
Square meters	[m²]	10.76	Square feet	[sq ft]
Square feet	[sq ft]	0.0929	Square meters	[m²]

10. Litres / US Gallons Conversion Chart

Table 1-2 - 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

SECTION 2 LIMITATIONS

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1. Introduction

Section 2 includes operating limitations instrument markings and basic placards necessary for safe operation of P2010tdi aircraft, its engines, standard systems and equipment.

2. Speed

2.1. Speed limitations

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

Table 2-1 - Speeds Limitations

SPEED		KCAS	KIAS	REMARKS
V_{NE}	Never exceed Speed	164	163	Do not exceed this speed in any operation.
V_{NO}	Maximum Structural Cruising Speed	130	130	Do not exceed this speed except in smooth air and only with caution.
V_A	Design Manoeuvring Speed	119	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	119	119	
V_{FE}	Maximum Speed flap extended (flap TO)	101	100	Do not exceed this speed for indicated flaps setting.
	Maximum Speed flap extended (flap LAND)	92	90	

For Aircraft embodying MOD2010/207:

Table 2-2a - Speeds Limitations (MOD 2010/207)

SPEED		KCAS	KIAS	REMARKS
V_{NE}	Never exceed Speed	164	163	Do not exceed this speed in any operation.
V_{NO}	Maximum Structural Cruising Speed	130	130	Do not exceed this speed except in smooth air and only with caution.
V_A	Design Manoeuvring Speed	121	121	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	121	121	
V_{FE}	Maximum Speed flap extended (flap TO)	103	102	Do not exceed this speed for indicated flaps setting.
	Maximum Speed flap extended (flap LAND)	93	92	

2.2. Airspeed Indicator Markings

Table 2-3 - Airspeed Indicator Markings

MARKING	KIAS	EXPLANATION
White arc	48-90	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	61-130	Normal Operating Range (lower limit is V_{S1} at specified maximum weight and most forward e.g. with flaps retracted and upper limit is maximum structural speed V_{NO}).
Yellow arc	130-163	Manoeuvres must be conducted with caution and only in smooth air.
Red line	163	Maximum speed for all operations.

For Aircraft embodying MOD2010/207:

Table 2-4 - Airspeed Indicator Markings(MOD 2010/207)

MARKING	KIAS	EXPLANATION
White arc	49-92	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	62-130	Normal Operating Range (lower limit is V_{S1} at specified maximum weight and most forward e.g. with flaps retracted and upper limit is maximum structural speed V_{NO}).
Yellow arc	130-163	Manoeuvres must be conducted with caution and only in smooth air.
Red line	163	Maximum speed for all operations.

3. Powerplant

3.1. Engine

MANUFACTURER.....	Continental Aerospace Technologies GmbH
MODEL.....	TAE 125-02-125
TYPE.....	Liquid cooled 4 cylinder in-line four-stroke diesel engine with DOHC (double overhead camshaft), turbo charged, engine equipped with an electric starter and one alternator and optional auxiliary drive.

3.2. Propeller

MANUFACTURER.....	MT Propeller
MODEL.....	MTV-6-R/190-69
TYPE.....	Laminated wood composite, variable pitch propeller at constant speed, 3 blades
DIAMETER.....	1900 mm (75 in)

3.3. Powerplant Limitations

Following list reports the operating limitations for installed engines:

Power

- Max. take-off power (max. 5 min) 125 kW / 168 hp (100%) @2300 rpm
- Max. continuous power 114 kW / 153 hp (91%) @2250 rpm

Oil pressure

- Normal operating pressure 2.3 – 6 bar
min. 1.0 bar
max. 6.5 bar

Oil temperature

- Operating temperature..... min. 50°C (122°F)
max. 120°C (248°F)

Coolant temperature

- Operating temperature..... min. 60°C (140°F)
max. 105°C (221°F)

Gearbox temperature

- Operating temperature..... min. 0°C (32°F)
max. 120°C (248°F)

Fuel temperature*

- Operating temperature max. 75°C (167 °F)
- Engine start up temperature (JET A-1)..... min. -25°C (-13 °F)
- Opening-up* temperature (JET A-1)..... min. -30°C (-22 °F)

*) Opening-up is the minimum temperature to increase power setting of the engine.



Additional temperature limitations must be observed if the airplane is operated with Diesel Fuel or blends of Diesel Fuel with Jet Fuel.

Diesel Fuel, Blends of Diesel Fuel with Jet Fuel, or unknown fuel grade:

- Engine starting fuel temperature min. -5 °C (+23 °F)
- Opening-up fuel temperature min. -5 °C (+23 °F) **

*) Temperature refers to temperature of the fuel in the tank.

**) The take-off with Diesel fuel is not permitted, if the temperature of the fuel in the tank is below -5°C (-10°C if Liqui Moly "Diesel Fließ-Fit" is added at appropriate ratio). Refer to additive specification for proper usage.



If you do not know what fuel grade is in the tank, always assume it is additive-free Diesel.

Engine operation

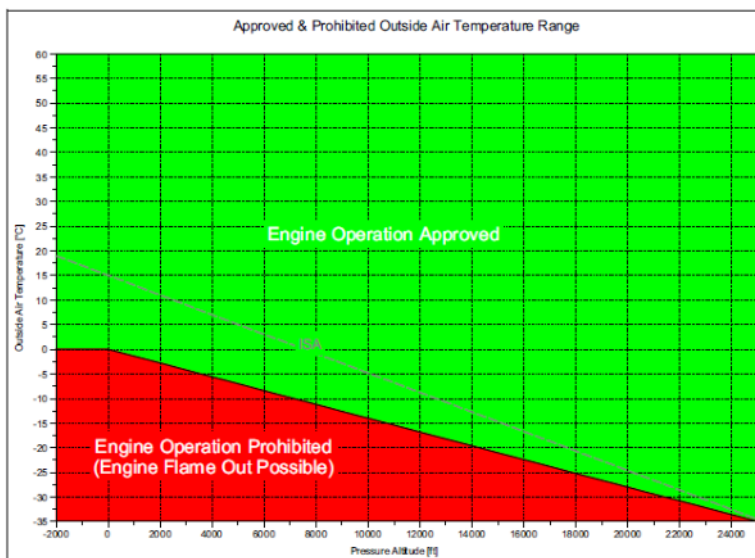
Time limit for engine operation with negative g-force values.....	-0.2 g for 5 seconds
	-0.3 g for 4 seconds
	-0.4 g for 3 seconds
	-0.5 g for 2 seconds

Cold Weather Operation*

P2010tdi is equipped with a sensor monitoring intercooler temperature. In case of both intercooler temperature equal or lower than 15°C (59°F) and altitude/Outside Air Temperature envelope within red area, a CAS message ("INTRCLR TEMP LO") alerts the pilot. In this case, leave immediately this condition and manage the engine to restore allowed conditions (Refer to Par. 7.8.1 in Section 3).engine to restore allowed conditions (Refer to Par. 7.8.1 in Section 3).



If continuous monitoring of intercooler temperature in-flight is not possible, engine operation in the red area should be avoided, due to the risk of an engine flame out.



**) applicable for aircraft NOT embodying MOD 2010/240 - CD-170 upgrade for MAT limitation removal (Engine P/N 05-7200-K040301).*

4. Instrumentation Markings

Table 2-5 – Avionics System Instrument Markings

INSTRUMENT		RED ARC/LINE Minimum limit	WHITE ARC Advisory	GREEN ARC Safe operation	YELLOW ARC Caution	RED ARC Maximum limit
PROPELLER	RPM	/	/	0 -> 2250	2251 -> 2300	2301 -> 2500
POWER	% Power	/	/	0 -> 91	92 -> 100	/
OIL PRESS	bar	0 -> 0.9	1.0 -> 2.2	2.3 -> 6.0	6.1 -> 6.5	6.6 -> 7
OIL TEMP.	°C	/	0 -> 49	50 -> 120	/	121 -> 125
Coolant Temperature	°C	/	0 -> 59	60 -> 105	/	106 -> 110
Gearbox Temperature	°C	/	/	0 -> 120	/	121 -> 125
Fuel Temperature	°C	-35 -> -31	/	-5 -> 65	66 -> 75 -30 -> -6	76 -> 80
Fuel Flow	l/hr	/	0 -> 50	/	/	/
	gal/hr	/	0 -> 13.2	/	/	/
FUEL QTY	litres	0	/	0 -> 115	/	/
	gal			0 -> 30.4		
Alternator Ammeter	A	/	/	1 -> 70	0 -> 1	/
Main Battery Ammeter	A	/	/	0 -> 100	/	/
Main Bus /Essential Bus Voltage	V	20	/	24 -> 29	21 -> 23	30 -> 31
Backup Battery Voltage	V	20 – 21	/	24 – 30	21 – 23	30 - 31

5. Fuel

2 TANKS	120 litres each one (32 gallons)
MAXIMUM CAPACITY	240 litres (63 gallons)
MAXIMUM USABLE FUEL	231 litres (61 gallons)
APPROVED FUEL	JET A-1 (ASTM D 1655) Diesel (EN 590)
MAXIMUM FUEL UNBALANCE	50 litres (13 gallons)

6. Oil

Maximum Oil Level (liters / USq).....	6* / 6.34*
*plus the volume in the pipes and oil cooler	
Minimum Oil Level (liters / USq).....	4.5* / 4.75*
*plus the volume in the pipes and oil cooler	
Engine Oil Specification.....	Aero Shell Oil Diesel Ultra Shell Helix Ultra 5W-30
Gearbox Oil Specification.....	Centurion Gearbox Oil N1

For additional info, refer to "CD 170 Installation Manual".

7. Coolant

Coolant Specification.....	Water / radiator protection in a ratio of 50:50
Radiator Protection.....	BASF Glysantin Protect Plus / G48

For additional info, refer to "CD 170 Installation Manual".

8. Operative and additional limitations

8.1. Maximum Operating Altitude

Maximum operating altitude is 18000 ft (5846 m) MSL



Flight crew and passengers are required to use supplemental oxygen according to applicable Air Operation Rules.

8.2. Flight Crew

The minimum crew is one pilot seated in the left hand seat.

8.3. Smoking

Smoking is not allowed.

8.4. Types of surface

The take-off and landing can be conducted on hard paved or grass surfaces.

8.5. Paint

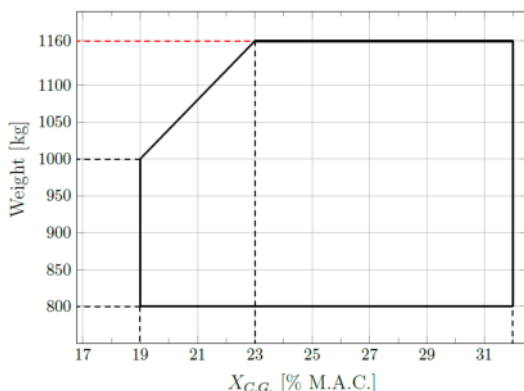
To ensure that the temperature of the composite structure does not exceed limits, the outer surface of the aeroplane must be painted with white paint, except for areas of registration marks, placards, and ornament.

Refer to Aircraft Maintenance Manual (AMM) for specific paint requirements.

9. Weights and center of gravity limits

Table 2-6 – Weight Limits

Condition	Weight	
Maximum Take-off Weight	1160 kg	2557 lb
Maximum Landing Weight	1160 kg	2557 lb



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	0.275 m (0.90 ft) (19% MAC) aft of datum for all weights up to 1000 kg / 2205 lb 0.330 m (1.08 ft) (23% MAC) aft of datum for MTOW Straight line variations between indicated points.
Aft limit	0.454 m (1.49 ft) (32% MAC) aft of datum for all weights

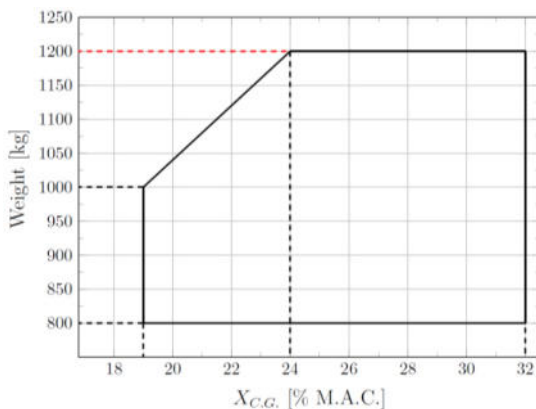


The pilot is responsible for ensuring that the airplane is properly loaded. Refer to Section 6 for appropriate instructions.

For aircraft embodying MOD2010/207:

Table 2-7 – Weight Limits(MOD2010/207)

Condition	Weight	
Maximum Take-off Weight	1200 kg	2645 lb
Maximum Landing Weight	1200 kg	2645 lb



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	0.275 m (0.90 ft) (19% MAC) aft of datum for all weights up to 1000 kg / 2205 lb 0.344 m (1.13 ft) (24% MAC) aft of datum for MTOW Straight line variations between indicated points.
Aft limit	0.454 m (1.49 ft) (32% MAC) aft of datum for all weights



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

10. Maneuvers and Load Factor Limits

10.1. 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

10.2. Approved Maneuvers

This is a normal category aircraft.

The normal category is limited to non-aerobatic operations.

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



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



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

11. Seats and Baggage

11.1. Maximum Passenger Seating Configuration

Maximum passenger seating configuration is 3.

11.2. Baggage Loading Limit

Table 2-8 – Baggage Weight Limits

Max Loading	Max Loading Intensity
40 kg / 88 lb	0.72 kg/dm ² / 14.9 lb/ft ²

12. Limitation Placards

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

12.1. Speed limitations

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

Operating Manoeuvring speed
 $V_o = 119$ KIAS

For aircraft embodying MOD2010/207:

Operating Manoeuvring speed
 $V_o = 121$ KIAS

12.2. Operating and autopilot limitations

On the central side of the instrument panel, the following placards are placed reminding the observance of aircraft operating limitations according to installed equipment configuration, see KOEL and autopilot limitations:

**THIS A/C CAN BE OPERATED ONLY IN NORMAL CATEGORY
DAY-NIGHT-VFR-IFR (WITH REQUIRED EQUIPMENT) IN NON-ICING CONDITIONS.
NO AEROBATICS MANOEUVRES, INCLUDING SPINNING, APPROVED.
FOR OPERATIONAL LIMITATIONS REFER TO FLIGHT MANUAL**

OPERATING LIMITATIONS FOR P2010 GARMIN GFC700 AUTOPILOT

- | | |
|---|---|
| • Pilot with seat belt fastened must be seated at the left pilot position during A/P Ops | • Min. alt. AGL for A/P Operations are: |
| • Do not use A/P during take-off and landing | • Cruise and descent: 800 ft AGL |
| • For RNAV/RNP departures, navigation and approaches pilot must confirm GPS, RAIM and SBAS system availability, in order to comply with appropriate minimum requirements. | • Climb after T/O and during non-precision approaches: 400 ft AGL |
| | • Cat.I ILS Approaches only (200ft AGL) |

12.3. No smoking placard

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

NO SMOKING

12.4. Baggage compartment placard

Behind the baggage compartment door, the following placard is placed:



13. Kinds of operation

The airplane is approved for single pilot, VFR and IFR (day/night) operations, provided the appropriate equipment is installed and operable. Flights in icing conditions are prohibited.

The following list identifies the systems and equipment upon which type certification for each kind of operation was predicated. Deviations from this KOEL may be approved for the operation of a specific aircraft if a proper MEL (*Minimum Equipment List*) has been authorized by the appropriate regulatory agency.

NOTE

The following systems and equipment list does not include all equipment required by the National Operating Regulations. It also does not include components obviously required for the airplane to be airworthy (wing, empennages, engines, etc...).

Table 2-9 – Kinds of Operation Equipment List

Id.	System, Instrument, and/or Equipment	Number of items installed					Remarks and/or Exceptions
		VFR Day					
		VFR Night					
		IFR Day					
		IFR Night					
							Remarks and/or Exceptions
1	Autoflight (ATA-22) A/P system	1	0	0	0	0	Left hand pilot's headset must be installed and operative. In case headphones jacks are not available or operative, speakers and a handheld microphone should be available and operative.
1	Communications (ATA-23) VHF COM	2	1	1	2	2	
2	Headset	2	1	1	1	1	
1	Electrical (ATA-24) Battery	3	3	3	3	3	
2	Alternator	1	1	1	1	1	
3	AMP indicator	2	2	2	2	2	
4	Voltage indicator	3	3	3	3	3	

Id.	System, Instrument, and/or Equipment	Number of items installed					Remarks and/or Exceptions
		VFR Day					
		VFR Night					
		IFR Day					
		IFR Night					
Equipment/ Furnishings (ATA-25)							
1	Safety belt	4	One safety belt and one seat for each occupant must be operative.				
2	First aid kit	1	1	1	1	1	
3	Torch	1	0	1	0	1	
Fire Protection System (ATA-26)							
1	Fire extinguisher	1	1	1	1	1	
Flight Controls (ATA-27)							
1	Flap system	1	1	1	1	1	
2	Flap position indicator	1	1	1	1	1	
3	Rudder trim system	1	1	1	1	1	
4	Rudder trim position indicator	1	1	1	1	1	
5	Pitch trim system	1	1	1	1	1	Either electric or mechanic pitch trim must be operative.
6	Pitch trim position indicator	1	1	1	1	1	
7	Stall warning system	1	1	1	1	1	

Id.	System, Instrument, and/or Equipment	Number of items installed					Remarks and/or Exceptions
		VFR Day					
		VFR Night				IFR Day	
		IFR Night					
Fuel System (ATA-28)							
1	Electrical fuel pump	1	1	1	1	1	
2	Fuel temperature indicator	2	2	2	2	2	
3	Fuel quantity indicator	2	2	2	2	2	
Ice And Rain Protection (ATA-30)							
1	Pitot heat system	1	0	0	1	1	
2	Pitot heater caution light	1	0	0	1	1	
3	Alternate static air source	1	0	0	1	1	
Instruments (ATA-31)							
1	Clock	1	1	1	1	1	
Lights (ATA-33)							
1	Instruments light system	1	0	1	0	1	
2	Emergency light	1	0	1	0	1	
3	Taxi light	1	0	0	0	0	
4	Landing light	1	0	1	0	1	
5	Navigation lights	3	0	3	0	3	

Id.	System, Instrument, and/or Equipment	Number of items installed					Remarks and/or Exceptions	
		VFR Day						
		VFR Night						
		IFR Day						
		IFR Night						
6	Strobe lights	3	3	3	3	3		
7	Map light	2	0	1	0	1		
Navigation Instruments (ATA-34)								
1	Primary flight display (PFD)	1	1	1	1	1		
2	Multifunction display (MFD)	1	1	1	1	1		
3	Air data computer (ADC)	1	1	1	1	1		
4	Attitude heading reference system (AHRS)	1	1	1	1	1		
5	Stand-by instrument	1	1	1	1	1		
6	Magnetic compass	1	1	1	1	1		
7	Transponder	1	1	1	1	1		
8	NAV Unit	2	1	1	1	1		
9	DME	1	0	0	1	1		
10	Marker beacon	1	0	0	1	1		
11	GPS Unit	2	0	0	0	0		Required for VNAV.

Id.	System, Instrument, and/or Equipment	Number of items installed					Remarks and/or Exceptions
		VFR Day					
		VFR Night					
		IFR Day					
		IFR Night					
	Engine Indicating System (ATA-77)						
1	PWR indicator	1	1	1	1	1	
2	RPM indicator	1	1	1	1	1	
3	CT indicator	1	1	1	1	1	
4	Fuel flow indicator	1	0	0	0	0	
5	Gearbox temperature indicator	1	1	1	1	1	
	Engine Oil Indications (ATA-79)						
1	Oil pressure indicator	1	1	1	1	1	
2	Oil temperature indicator	1	1	1	1	1	
3	Oil quantity measuring device (dipstick)	1	1	1	1	1	

14. PBN (RNAV & RNP) Operational Capability

14.1. General GNSS Navigation Equipment Approvals

The Garmin GNSS navigation system as installed in this airplane complies with the requirements of AC 20-138D, JAA TGL-10 and AMCs 20-4A, 20-27A and 20-28.

It's approved for navigation using GPS and SBAS for IFR en-route, terminal area, precision and non-precision approach operations.

In accordance to ICAO doc 9613 (Fourth Edition - 2013), the G1000Nxi system has been shown to be eligible for:

- B-RNAV (RNAV-5) per AMC 20-4A.
- RNAV1 / P-RNAV (RNP-1) en-route and terminal navigation per JAA TGL-10 Rev.1.
- RNP APCH LNAV/VNAV per EASA AMC 20-27A. This does not include APV BARO-VNAV operation which is not cleared.
- LPV with SBAS per EASA AMC 20-28. provided that the G1000Nxi is receiving usable navigation information from at least one GPS receiver.

This does not constitute an operational approval.

15. Avionic System Limitations

15.1. General

1. The following document, at the latest revision, must be carried on board the airplane at all times:
 - The “Garmin G1000Nxi Pilot’s Guide for the Tecnam P2010tdi” (last issue) must be carried in the aircraft and made available to the pilot at all time.

NOTE

The Garmin Pilot’s Guide has been published by Garmin and has not been approved by EASA or FAA; it has been written, specifically, for the P2010tdi but a specific airplane could not install all the features there described.

2. The MFD must be operational prior to engine start.
3. Take-off not authorized if reversionary function fails operating.
4. Operating in the reversionary mode is limited to training and display failure conditions.
5. The Air Data Computer (ADC) must be operative for take-off.
6. The Attitude Heading Reference System (AHRS) must be operative for take-off.
7. The Stand-by Instrument must be operative for take-off.



Sunglasses with polarized lenses or lenses that are designed to filter specific colors/frequencies of light may adversely affect a pilot’s ability to see some colours shown on PFD/MFD displays. Some elements on the display can be completely invisible while wearing these types of sunglasses. Also, the colour of some elements may be changed. For example, some blue light filtering lenses can change magenta to red.

RNAV OPERATIONS

In general terms, RNAV equipment operates by automatically determining aircraft position from one, or a combination, of the following together with the means to establish and follow a desired path:

- VOR/DME
- GPS

Therefore, in addition to the information provided in the KOEL for “IFR Night”, the airplane may enter and operate in R-NAV airspace when one of the above equipment is installed and operable.

U.S. RNAV OPERATIONS

In addition to the information provided in the KOEL for “IFR Night”, the airplane may enter and operate in U.S. Terminal and En-Route Area Navigation - RNAV airspace when at least one GPS is installed and operable.

15.2. G1000Nxi GNSS (GPS/SBAS) Navigation System Limitations

The pilot must confirm at system initialization that the Navigation database is current. Navigation database is expected to be current for the duration of the flight.

If the AIRAC cycle will change during flight, the pilot must ensure the accuracy of navigation data, including suitability of navigation facilities used to define the routes and procedures for flight. If an amended chart affecting navigation data is published for the procedure, the database must not be used to conduct the procedure.

GPS/SBAS based IFR en-route, oceanic, and terminal navigation is prohibited unless the pilot verifies and uses a valid, compatible, and current Navigation database or verifies each waypoint for accuracy by reference to current approved data.

Discrepancies that invalidate a procedure must be reported to Garmin International. The affected procedure is prohibited from being flown using data from the Navigation database until a new Navigation database is installed in the airplane and verified that the discrepancy has been corrected.

Contact information to report Navigation database discrepancies can be found at www.Garmin.com > Support > Contact" class = "redactor-linkify-object"> www.Garmin.com > Support > Contact Garmin Support > Aviation. Pilots and operators can view navigation data base alerts at www.Garmin.com In the Air NavData Alerts.

For flight planning purposes, in areas where SBAS coverage is not available, the pilot must check RAIM availability.

Within Europe, RAIM availability can be determined using the G1000 WFDE Prediction program or Europe's AUGER GPS RAIM Prediction Tool at <http://augur.ecacnav.com>.

This requirement is not necessary if SBAS coverage is confirmed to be available along the entire route of flight.

The route planning and WFDE prediction program may be downloaded from the GARMIN G1000Nxi website on the internet. For information on using the WFDE Prediction Program, refer to GARMIN WAAS FDE Prediction Program, part number 190-00643-01, "WFDE Prediction Program instructions".

For flight planning purposes for operations within European B-RNAV and P-RNAV airspace, if more than one satellite is scheduled to be out of service, then the availability of GPS integrity RAIM shall be confirmed for the intended flight (route and time).

In the event of a predicted continuous loss of RAIM of more than five minutes for any part of the intended flight, the flight should be delayed, cancelled, or re- routed on a track where RAIM requirements can be met.

Both GPS navigation receivers must be operating and providing GPS navigation guidance to the PFD for operations requiring RNP-4 (long range navigation) performance.

Whenever possible, RNP and RNAV routes including Standard Instrument Departures (SIDs) and Obstacle Departure Procedures (ODPs), Standard Terminal Arrival (STAR), and en-route RNAV “Q” and RNAV “T” routes should be loaded into the flight plan from the database in their entirety, rather than loading route waypoints from the database into the flight plan individually.

Selecting and inserting individual named fixes from the database is permitted, provided all fixes along the published route to be flown are inserted. “GPS”, “or GPS” and “RNAV (GPS)” instrument approaches using the G1000Nxi System are prohibited unless the pilot verifies and uses the current Navigation database. GPS based instrument approaches must be flown in accordance with an approved instrument approach procedure that is loaded from the Navigation database.

Not all published Instrument Approach Procedures (IAP) are in the Navigation database.

Pilots planning on flying an RNAV instrument approach must ensure that the Navigation database contains the planned RNAV Instrument Approach Procedure and that approach procedure must be loaded from the Navigation database into the FMS flight plan by its name.

The navigation equipment required to join and fly an instrument approach procedure is indicated by the title of the procedure and notes on the IAP chart.

Use of the GARMIN G1000Nxi GPS/SBAS receivers to provide navigation guidance during the final approach segment of an ILS, LOC, LOC-BC, LDA, SDF, MLS or any other type of approach not approved for “or GPS” navigation is prohibited. When using the G1000Nxi VOR/LOC/GS receivers to fly the final approach segment, VOR/LOC/GS navigation data must be selected and presented on the CDI.

SID/STAR

The use of SIDs and STARs stored in GPS data base is only authorized, if the pilot has checked that GPS procedure corresponds to the one given in the official documentation (coordinates of various points and paths between points).

DEAD RECKONING MODE**NOTE**

Dead Reckoning Mode only functions in En-route (ENR) or Oceanic (OCN) phase of flight. In all other phases, an invalid GPS solution produces a “NO GPS POSITION” annunciation on the map and the G1000Nxi stops using GPS.

It is important to note that estimated navigation data supplied by the G1000Nxi in DR Mode may become increasingly unreliable and must not be used as a sole means of navigation. If while in DR Mode airspeed and/or heading data is also lost or not available, the DR function may not be capable of accurately tracking estimated position and, consequently, the system may display a path that is different than the actual movement of the aircraft. Estimated position information displayed by the G1000Nxi through DR while there is no heading and/or airspeed data available shall not be used for navigation.

DR Mode is inherently less accurate than the standard GPS/SBAS Mode due to the lack of satellite measurements needed to determine a position.



Changes in wind speed and/or wind direction compound the relative inaccuracy of DR Mode. Because of this degraded accuracy, other navigation equipment must be relied upon for position awareness until GPS-derived position data is restored.

DR Mode is indicated on the G1000Nxi by the appearance of the letters ‘DR’ superimposed in yellow over the ‘own aircraft’ symbol.

In addition, ‘DR’ is prominently displayed in yellow on the HSI slightly above and to the right of the aircraft symbol on the CDI. Also, the CDI deviation bar is removed from the display. Lastly, but at the same time, a ‘GPS NAV LOST’ alert message appears on the PFD.

Normal navigation using GPS/SBAS source data resumes automatically once a valid GPS solution is restored. As a result of operating in DR Mode, all GPS-derived data is computed based upon an estimated position and is displayed as yellow text on the display to denote degraded navigation source information.

While the G1000Nxi is in DR Mode, some terrain functions are not available. Additionally, the accuracy of all nearest information (airports, airspace, and waypoints) is questionable. Finally, airspace alerts continue to function, but with degraded accuracy.

RAIM AVAILABILITY

Because of tighter protection limit on approaches, there may be times when RAIM is not available. The G1000Nxi automatically monitors RAIM and warns with an alert message when it is not available. If RAIM is not predicted to be available for the final approach course, the approach does not become active, as indicated by the message “Approach is not active”.

During GNSS approaches, if RAIM is not available when crossing the FAF, the missed approach procedure must be flown.

16. Autopilot System Limitations

NOTE

The “Garmin G1000Nxi Pilot’s Guide for the Tecnam P2010tdi” (last issue) must be carried in the aircraft and made available to the pilot at all time.

Following operating limitations shall apply when the aircraft is equipped with Garmin GFC700 Autopilot:

- The Autopilot is certified for Category I – ILS Approaches [with a decision height not lower than 200 ft AGL (61 m)]
- During Autopilot operation, a pilot with seat belt fastened must be seated at the left pilot position
- Maximum speed for Autopilot operation is 150 KIAS
- Do not use autopilot for airspeed below 70 KIAS. Operation below 70 KIAS with autopilot engaged are not authorized.
- Minimum approach speed is 75 KIAS
- The autopilot must be OFF during take-off and landing
- Minimum altitude AGL for Autopilot operation is:
 - a. Climb after Take-off: 400 ft (122 m) AGL
 - b. CAT I precision approach: 200 ft (61 m) AGL
 - c. Cruise, Descent and all other approaches: 800 ft (244 m) AGL
- Use of the autopilot or manual electric trim system is prohibited before the satisfactory completion of the Pre-flight procedure.

SECTION 3

EMERGENCY PROCEDURES

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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 procedure are hereby given:

- a. "Bold faces" which must be committed to memory 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:

<u>BEFORE ROTATION: ABORT TAKE OFF</u>	
1. Thrust Lever.....	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

The following definitions apply:

NOTE

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

MTOW	1160 Kg	1200 Kg (MOD2010/207)
Best glide speed (V_{GLIDE})	79 KIAS	79 KIAS
No-flaps Approach Speed	79 KIAS	80 KIAS

1.2. Annunciator and Alerts

The G1000Nxi Alerting System conveys alerts using the following items:

Annunciation Window: The Annunciation Window displays abbreviated annunciation text. Text color is based on alert levels described in the following section. The Annunciation Window is located to the right of the Altimeter and Vertical Speed Indicator. All *P2010tdi* annunciations can be displayed simultaneously in the Annunciation Window. A white horizontal line separates annunciations that are acknowledged from annunciations that are not yet acknowledged. Higher priority annunciations are displayed toward the top of the window. Lower priority annunciations are displayed toward the bottom of the window.

Alerts Window: The Alerts Window displays text messages for up to 64 prioritized alert messages. Pressing the **Alerts** Softkey displays the Alerts Window. Pressing the **Alerts** Softkey a second time removes the Alerts Window from the display.

Softkey Annunciation: During certain alerts, a **Warning** or **Caution** Softkey may appear as a flashing annunciation to accompany an alert. The **Alerts** Softkey assumes a new label consistent with the alert level (Warning, Caution). By pressing the softkey when flashing an annunciation, the alert is acknowledged. The softkey label then returns to **Alerts**. If alerts are still present, the **Alerts** label is displayed in white with black text. Pressing the **Alerts** Softkey a second time views the alert text messages.

System Annunciations: Typically, a large red 'X' appears over instruments whose information is supplied by a failed Line Replaceable Unit (LRU).

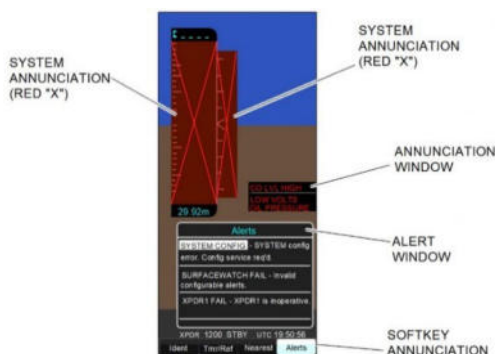


Figure 3-1 - Alerting System

1.3. Alert Level Definition

Warning: This level of alert requires immediate attention. A warning alert appears in the Annunciation Window. Text appearing in the Annunciation Window is red. A warning alert is also accompanied by a flashing **Warning** Softkey annunciation. Pressing the Warning Softkey acknowledges the warning alert and stops the aural tone, if applicable. When a parameter exceeds its maximum value or a red caption is generated, an aural is provided to the pilot.

Caution: This level of alert indicates the existence of abnormal conditions on the aircraft that may require pilot intervention. When a new caution alert appears in the Annunciation Window, it is shown in black on amber inverse video in conjunction with the **Caution** Softkey. Pressing the **Caution** Softkey acknowledges all amber messages and extinguishes the softkey. Once acknowledged, caution messages are displayed until the issue is corrected.

Safe Operating Advisory: This level of alert indicates crew awareness is required. It is shown in green text in the Annunciation Window.

System Message Advisory: This level of alert provides general information to the pilot. Message Advisories appear in the Alerts Window and are not shown in the Annunciation Window. When a Message Advisory occurs, the system provides a white flashing **Messages** Softkey annunciation. Pressing the softkey acknowledges the message advisory alert, and displays the associated text in the Alerts Window.

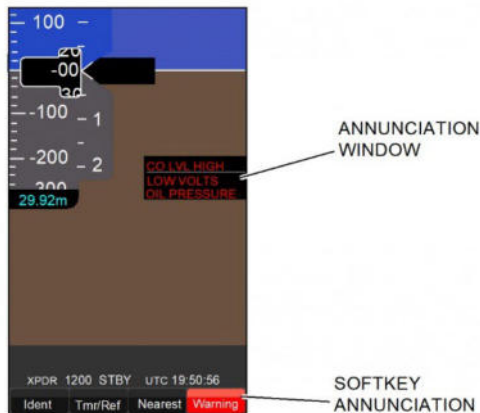


Figure 3-2 - Annunciation Windows



Figure 3-3 - Warning and Caution Softkey Annunciations

1.4. CAS Messages Summary

The following table shows a summary of all Crew Alerting Message (CAS), divided for System or Function.

For CAS message related to avionics system refer to Garmin P2010tdi Pilot's Guide.

Table 3-1 -CAS Messages Summary

ID#	System or Function	CAS (Flag)	G1000Nxi Alert	Conditions (to activate flag)
1	Electrical	EXT PWR ON	EXT POWER ON	External Power connected to the aircraft
2	Electrical	ALT FAIL	ALT FAIL	ALTERNATOR FAILURE
3	Engine	COOLANT LVL LOW	COOLANT LEVEL LOW	Low coolant quantity detected
4	Engine	CT HIGH	COOLANT TEMP HIGH	COOLANT TEMP $\geq 106^{\circ}\text{C}$
5 ¹	Engine	GLOWPLUG ON	GLOW PLUG ON	Glow plug preheating system active
5 ²	Engine	GLOWSYS ACTV	GLOWPLUG ACTV	Glow plug preheating system active
6 ²	Engine	GLOWSYS FAIL	GLOWSYS FAIL	Glow plug system failure
7	Engine	GEARBOX TEMP HI	GEARBOX TEMP HIGH	GEARBOX TEMP $\geq 121^{\circ}\text{C}$
8 ¹	Engine	INTRCLR TEMP LO	INTERCOOLER TEMP LOW	Intercooler Temp $\leq 15^{\circ}$ and cold weather condition detected
9	Engine	INTRCLR TEMP HI	INTERCOOLER TEMP HIGH	INTERCOOLER TEMP $\geq 81^{\circ}\text{C}$
10	Fadec	FADEC TEST	FADEC TEST	Fadec test ongoing
11	Fadec	FADEC B ACTIVE	FADEC B ACTIVE	FABEC B operative
12	Fadec	FADEC A	FADEC A WARNING	FADEC A Health level < 9
13	Fadec	FADEC B	FADEC B WARNING	FADEC B Health level < 9
14	Fadec	FADEC B FORCED	FADEC B FORCED	FADEC B operative forced
15	Flight Control	STALL	IMPENDING STALL	Stall condition detected by stall sensor

- 1) Applicable for aircraft NOT embodying MOD 2010/240
- 2) Applicable for aircraft embodying MOD 2010/240

16	Fuel	LH FUEL QTY LOW	LH FUEL LOW	Low fuel quantity detected
17	Fuel	RH FUEL QTY LOW	LH FUEL LOW	Low fuel quantity detected
18	Fuel	LH-RH FUEL QTY LO	RH-LH FUEL QTY LOW	LH and RH FUEL QTY LOW both ON
19	Fuel	FUEL PUMP ON	FUEL PUMP ON	Fuel pump operative
20	Fuel	LH FUEL TMP LOW	LH FUEL TEMP LOW	LH FUEL TEMP ≤ 31
21	Fuel	RH FUEL TMP LOW	RH FUEL TEMP LOW	RH FUEL TEMP ≤ 31
22	Fuel	FUEL FLTR CLGD	FUEL FILTER CLOGGED	Filter pressure drop out of operative limit
23	Oil	OIL PRESS LOW	OIL PRESS LOW	OIL PRESS ≤ 0.9 bar
24	Oil	OIL TEMP HI	OIL TEMP HIGH	OIL TEMP ≥ 121 °C
25	Pitot	PITOT HEAT	PITOT HEAT	Pitot Heat OFF or FAIL
26	Pitot	PITOT HEAT ON	PITOT HEAT ON	Pitot heater operative

2. ELECTRICAL SYSTEM

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**



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



The TAE 125-02-125 requires an electrical power source for its operation. If the alternator fails, continued engine operation time is dependent upon the remaining capacity of the main battery, the FADEC backup battery and equipment powered.

2.2. Loss of Essential Bus

1. Land as soon as practical

In case of loss of essential bus, the following equipment will be lost:

Table 3-2 – Loss of Essential Bus

-	FIELD	FUEL PUMP	FADEC B
AHRS	PITOT HEAT	STROBE LIGHT	PFD
LANDING LIGHT	COM#1	GPS/NAV#1	STALL WARNING
ADC	EIS (Garmin Engine Interface Unit)	FLAP ACTUATOR	-



*The FADEC A, powered by Essential Bus in normal condition, continues to be powered by means of back-up battery in case of loss of Essential Bus. When operating on FADEC backup battery only, the FADEC FORCE B mode **MUST** not be activated. This will shut down the engine.*



Change or maintain flight conditions according to available equipment.



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 and fuel parameters and related warnings/cautions are lost.



Flaps selection will be not available to the pilot. Perform visual check to determine actual position and refer to Flap Operating System Failure procedure.



Strobe and landing lights will be lost, NAV and taxi lights are still available.

2.3. Loss of Main Bus

1. Land as soon as practical

The following will be lost:

Table 3-3 – Loss of Main Bus

INSTRUMENT LIGHT	STARTER	CABIN LIGHT	CONVERTER 28/12V
-	NAV LIGHT	TAXI LIGHT	AUDIO PANEL
PILOT SEAT	XPDR	COPILOT SEAT	RUDDER TRIM
AVIONIC FAN	-	-	-



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.

2.4. Loss of Avionic Bus

1. Land as soon as practical

The following will be lost:

Table 3-4 – Loss of Avionic Bus

COM#2	MFD	GPS/NAV#2	DME
ADF	AUTOPILOT	ELECTRIC TRIM	-



Pitch trim will be available by means of control wheel..



Autopilot will be not available.

2.5. 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



If generator and main battery are turned OFF, continued engine operation is dependent on the remaining capacity of the FADEC backup battery. In this case, all electrical equipment will not operate, do not switch the FORCE-B switch, this will shut down the engine.

3. PITOT-STATIC SYSTEM

3.1. Pitot heating system failure

Annunciation window	Alert window
PITOT HEAT ON	Pitot heat on
PITOT HEAT	Pitot heat off or fail



When the Pitot Heating system is active, 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**

3.2. Static source malfunction

NOTE

The alternate source valve is located on the left side of the central pedestal.

If static source malfunction is suspected and/or abnormal fluctuations of indicated airspeed and/or altitude are detected in relationship with yawing:

1. Alternate static source.....**OPEN**
2. Cabin air system **OFF**

NOTE

Operation of the alternate static air requires that the cabin air system be switched off in order not to affect the air pressure measurement.

4. AVIONIC SYSTEM

4.1. 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.



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.

4.2. 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

4.3. 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

4.4. 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

4.5. 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

4.6. 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

4.7. Display failure

In the event of a display failure, the G1000 Nxi phase III 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



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



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.



5. Engine Securing

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

- | | |
|------------------------------|-------------|
| 1. Thrust Lever..... | <i>IDLE</i> |
| 2. Engine Master..... | <i>OFF</i> |
| 3. Fuel Selector valve..... | <i>OFF</i> |
| 4. Electrical fuel pump..... | <i>OFF</i> |
| 5. Generator switch..... | <i>OFF</i> |

6. Aircraft Evacuation

With the engine secured and propeller stopped:

- | | |
|--|----------------|
| 1. Parking brakes..... | <i>ENGAGED</i> |
| 2. Seat Belts..... | <i>UNSTRAP</i> |
| 3. Headphones..... | <i>REMOVE</i> |
| 4. Doors..... | <i>OPEN</i> |
| 5. Master switch..... | <i>OFF</i> |
| 6. Escape away from flames/hot engine compartment/spilling fuel tanks/hot brakes | |

7. POWERPLANT

7.1. Engine Failure during Take-off run

If engine fails before rotation: ABORT TAKE OFF

- | | |
|----------------------|--------------------|
| 1. Thrust Lever..... | <i>IDLE</i> |
| 2. Brakes..... | <i>AS REQUIRED</i> |

With aircraft stopped

- | | |
|-------------------------------------|-----------------------------|
| 3. Engine Master..... | <i>OFF</i> |
| 4. Fuel Selector valve..... | <i>OFF</i> |
| 5. Electrical fuel pump..... | <i>OFF</i> |
| 6. Generator & Master Switches..... | <i>OFF</i> |
| 7. Parking Brake..... | <i>ENGAGED</i> |
| 8. Aircraft Evacuation..... | <i>PERFORM if necessary</i> |

7.2. 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 ($V_{GLIDE}=79$ kts)
- 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. Thrust Lever..... | <i>IDLE</i> |
| 3. Brakes..... | <i>As required</i> |

With aircraft stopped

- | | |
|-------------------------------------|-----------------------------|
| 4. Fuel Selector valve..... | <i>OFF</i> |
| 5. Electrical fuel pump..... | <i>OFF</i> |
| 6. Engine Master..... | <i>OFF</i> |
| 7. Generator & Master Switches..... | <i>OFF</i> |
| 8. Parking Brake..... | <i>ENGAGED</i> |
| 9. Aircraft Evacuation..... | <i>PERFORM if necessary</i> |

7.3. Abnormal engine or propeller behaviour during the flight



In normal conditions, FADEC switch must be in "AUTO" position, as this will allow the FADEC system to choose automatically the healthiest channel. If the engine acts abnormal during flight and the system does not automatically switch to the FADEC B, it is possible switch to the FADEC B manually.



It is only possible to switch from the automatic position to FORCE B (FADEC A is active in normal operation FADEC B is active in case of malfunction). This only becomes necessary when no automatic switching occurred in case of abnormal engine behaviour.

In case of irregular RPM, un-commanded power or RPM variations:

1. Airspeed..... *SELECT appropriate airspeed to avoid engine overspeed*



When the FADEC is powered by backup battery only (in case of loss of Essential Bus), the FADEC switch must NOT be set in FORCE B position. This will shut down the engine.

2. FADEC Switch..... *FORCE B, FADEC B ACTIVE and FADEC B FORCED messages comes ON*
3. Flight may be continued, but the pilot should:
 - i. Select an airspeed to avoid engine overspeed
 - ii. **Land as soon as possible**
 - iii. Be prepared for an emergency landing

7.4. Propeller Overspeed

In case of propeller overspeeding, apply following procedure:

1. Thrust Lever..... *REDUCE power*
2. Airspeed..... *REDUCE to prevent propeller overspeed*
3. RPM indicator..... *CHECK*

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



Maximum propeller RPM exceedance may cause engine components damage.

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



For propeller overspeeding up to 2500 RPM for maximum 20 sec., no maintenance action is required. Refer to engine/propeller manufacturer manuals.

7.5. Coolant Temperature (CT) Limit Exceedance

7.5.1. HIGH COOLANT TEMPERATURE

Annunciation window	Alert window
CT HIGH	Coolant Temp High

If CT exceeds maximum limit:

1. Thrust lever..... *REDUCE power as practical*
2. Airspeed..... *INCREASE*
3. CT..... *Verify decreasing*

If CT stabilizes in the green arc:

4. Continue flight

If CT continue to rise and engine shows roughness:

4. **Land as soon as possible** applying forced landing procedures (§15)
5. Expect an engine failure

7.6. Coolant Level Limit Exceedance

Annunciation window	Alert window
COOLANT LVL LOW	Coolant Level Low

1. Coolant Temperature..... *Monitor*

If CT rises:

2. Refer to CT Limits Exceedance procedure (§7.6).

7.7. Gearbox Temperature Limit Exceedance

7.7.1. HIGH GEARBOX TEMPERATURE

Annunciation window	Alert window
GEARBOX TEMP HI	Gearbox Temp High

1. POWER..... *REDUCE*
2. AIRSPEED..... *INCREASE as required to extinguish CAS message.*

If CAS message doesn't extinguish:

3. **Land as soon as possible**

7.8. Intercooler Temperature Limit Exceedance

7.8.1. LOW INTERCOOLER TEMPERATURE*

Annunciation window	Alert window
INTRCLR TEMP LO	Intercooler Temp Low

1. POWER..... *INCREASE as required to extinguish CAS message*

If CAS message doesn't extinguish:

2. Fly immediately away from engine red zone (see Sect.2) (changing altitude and direction of flight, out and below of clouds, visible moisture, precipitation) to allow to increase outside air temperature.

If CAS message doesn't extinguish:

3. **Land as soon as possible**

*) applicable for aircraft NOT embodying MOD 2010/240

7.8.2. HIGH INTERCOOLER TEMPERATURE

Annunciation window	Alert window
INTRCLR TEMP HI	Intercooler Temp High

1. POWER..... *REDUCE as required to extinguish CAS message*

If CAS message doesn't extinguish:

2. **Land as soon as possible**

7.9. Oil Temperature Limits Exceedance

7.9.1. HIGH OIL TEMPERATURE

Annunciation window	Alert window
OIL TEMP HI	Oil Temp High

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. Thrust Lever..... *REDUCE*
2. OIL TEMP..... *CHECK*

If oil temperature does not decrease

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

If oil temperature comes back within limits

3. **Land as soon as practical**

If oil temperature does not come back within limits

3. **Land as soon as practical** with engine set to the minimum necessary power
4. Be prepared for an emergency landing and expected an engine failure

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

3. ENGINE..... *SECURE*
4. **Land as soon as possible** applying Forced landing procedure

7.10. Oil Pressure Limits Exceedance

7.10.1. LOW OIL PRESSURE

Annunciation window	Alert window
OIL PRESS LO	Oil Press Low

If the oil pressure is under the lower limit

1. Thrust Lever..... *REDUCE to minimum practical*
2. OIL TEMP..... *CHECK within limits*
3. OIL PRESS..... *CHECK*

If oil pressure does not increase and temperature remains within limits

4. OIL and CT..... *CHECK*
5. **Land as soon as practical**

If oil pressure does not increase and temperature exceeds limits

4. ENGINE..... *SECURE*
5. **Land as soon as possible** applying Forced landing procedure

7.10.2. HIGH OIL PRESSURE

If the oil pressure exceeds upper limit

1. Thrust Lever..... *REDUCE*
2. OIL PRESS..... *CHECK*

If oil pressure does not decrease

3. ENGINE..... *SECURE*
4. **Land as soon as possible** applying Forced landing procedure

7.11. Alternate Air Caution Light ON

1. Land as soon as practical.
2. Check the air filter before next flight.

7.12. Glow Plug System Failure*

Annunciation window	Alert window
GLOWSYS FAIL	GLOWSYS Fail
1. Land as soon as practical	

*) applicable for aircraft embodying MOD 2010/240

8. FUEL SYSTEM

8.1. Fuel Temperature Limits Exceedance

8.1.1. LOW FUEL TEMPERATURE



CAS message will be provided only when fuel temperature is below or equal to -31°C . For Diesel, operation with fuel temperature equal or below -5°C are not allowed.

Apply the following procedure when fuel temperatures are in red arc for JET A-1 fuel or in yellow arc for Diesel fuel:

Annunciation window	Alert window
LH FUEL TMP LOW RH FUEL TMP LOW	LH Fuel Temp Low
	RH Fuel Temp Low

- Fuel Tank..... *SWITCH to fuel tank with higher fuel temperature, if this contains sufficient fuel*
- Altitude..... *CHANGE to altitude with higher OAT*

If the temperature does not increase, **land as soon as possible**.

**8.2. Fuel Filter Clogged**

Annunciation window	Alert window
FUEL FLTR CLGD	Fuel Filter Clogged

1. **Land as soon as practical.**
2. Replace the fuel filter before next flight.

9. Inflight Engine Restart



Engine inflight restart must be performed without using the starter as long as propeller is windmilling in order to avoid possible engine damages.

NOTE

The propeller will normally continue to turn as long as the airspeed is above 65 KIAS. Should the propeller stop at an airspeed of 65 KCAS or more, the reason for this should be investigated before attempting a restart. If the engine or propeller jamming is suspected, do not use the Starter.

NOTE

The engine re-start can be performed in the whole aircraft envelope. However, it is suggested to perform inflight engine re-start at 13000 ft or below.

- | | |
|---------------------------------|---|
| 1. Glide..... | <i>Below 13000 ft</i> |
| 2. Master switch..... | <i>CHECK ON</i> |
| 3. Fuel quantity indicator..... | <i>CHECK</i> |
| 4. Fuel Selector valve..... | <i>SWITCH TANK (if not empty)</i> |
| 5. Electric Fuel pump..... | <i>ON</i> |
| 6. Thrust Lever..... | <i>IDLE</i> |
| 7. Engine Master..... | <i>OFF and then ON (if the propeller does not turn, then additionally Starter ON)</i> |

NOTE

If the Engine Master is in position OFF, a X will be displayed on each engine parameter.

In case of unsuccessful engine restart:

8. **Land as soon as possible** applying Forced landing procedure. (§15.1)

In case of successful engine restart:

9. Engine power:
 - i. Thrust Lever..... *Set as required*
 - ii. Engine parameters..... *CHECK*

10. FADEC Warning

Annunciation window	Alert window
FADEC A FADEC B	Fadec A Fail
	Fadec B Fail



In case of both FADEC warnings come ON, consider that a monitoring of intercooler temperature is not available. Avoid operating aircraft in the engine red zone (see Sect.2).



In normal conditions, operate with the FADEC switch in the "AUTO" position, as this will allow the FADEC system to choose automatically the healthiest channel.



The FADEC consists of two components that are independent of each other: FADEC A and FADEC B. In case of malfunctions in the active FADEC, it automatically switches to the other one. If the engine acts abnormal during flight and the system does not automatically switch to the FADEC B, it is possible switch to the FADEC B manually.



It is only possible to switch from the automatic position to FADEC B (FADEC A is active in normal operation FADEC B is active in case of malfunction). This only becomes necessary when no automatic switching occurred in case of abnormal engine behaviour.



*When operating on FADEC backup battery only, the "FADEC Force B" switch **MUST** not be activated. This will shut down the engine.*

11. Smoke and Fire

11.1. Engine fire on the ground

1. Fuel Selector valve.....	OFF
2. Engine Master.....	OFF
3. Electric Fuel pump.....	OFF
4. Cabin heat and defrost.....	OFF
5. Master and Generator Switches.....	OFF
6. Parking Brake.....	ENGAGED
7. Aircraft Evacuation.....	PERFORM

11.2. Engine fire during take-off

<i>If engine fails before rotation: <u>ABORT TAKE-OFF</u></i>	
1. Engine Master	OFF
2. Thrust Lever	IDLE
3. Brakes.....	As required
<u>With the aircraft under control</u>	
4. Fuel Selector valve.....	OFF
5. Electric Fuel pump.....	OFF
6. Cabin heat.....	OFF
7. Master and generator Switches.....	OFF
8. Parking Brake.....	ENGAGED
9. Aircraft Evacuation.....	PERFORM

11.3. Engine fire in flight

1. Fuel Selector valve.....	OFF
2. Engine Master.....	OFF
3. Electric Fuel pump.....	OFF
4. Cabin heat and defrost.....	OFF
5. Thrust Lever.....	FULL FORWARD
6. Master and Generator Switches.....	OFF
7. Cabin ventilation.....	OPEN
8. Land as soon as possible applying <i>Forced landing procedure</i>	

11.4. Electrical smoke or fire in cabin on the ground

1. Master Switch.....	OFF
2. Generator Switch.....	OFF
3. Cabin heat and defrost.....	OFF
4. Thrust Lever.....	IDLE
5. Engine Master.....	OFF
6. Fuel Selector valve.....	OFF
<u>With propeller stopped, evacuate the aircraft</u>	

11.5. Electrical smoke or fire 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

Initiate an emergency descent:

4. Flaps UP
5. Thrust lever IDLE
6. Airspeed *as required*

When passing 10,000 ft or at an altitude where oxygen is no longer required, whichever comes first:

7. OXYGEN OFF

If smoke persists:

8. Generator Switch..... OFF

If smoke persists:

9. Generator switch..... ON
10. Keep RPM above 1000..... OFF
11. Master switch..... OFF

If smoke persists:

12. Generator switch..... OFF



If both generator and main battery are turned OFF, continued engine operation is dependent on the remaining capacity of the FADEC backup battery.



*Turn on electrical equipment required to continue flight depending on the situation and **land as soon as possible**.*



If the Generator SWITCH is set to OFF, consider that flaps are supplied by battery. If the Master switch is set to OFF, flap will remain in the last position.

12. FLIGHT CONTROLS

12.1. Electrical pitch trim control failure

Trim Runaway

In event of trim runaway:

1. AP DISC switch..... *PRESS and HOLD*
2. TRIM DISC switch..... *OFF*
3. AP DISC switch..... *RELEASE*
4. Pitch trim..... *Set as required using control wheel*

Trim Jamming

Should trim control be jammed/inoperative:

1. Breaker..... *CHECK IN*
2. Airspeed and flaps..... *ADJUST to control aircraft without excessive force*
3. **Land aircraft as soon as practical**

12.2. Electrical rudder trim control failure

Trim Runaway

In event of trim runaway:

1. Airspeed and flaps..... *ADJUST to control aircraft without excessive 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. Airspeed and flaps..... *ADJUST to control aircraft without excessive force*
3. Rudder..... *As required*
4. **Land aircraft as soon as practical**

12.3. Flaps control failure

1. Flaps position *Visually check position*
2. Airspeed *Maintain according to observed flap position*
3. Flaps position *Visually check movement while operating the flaps switch in all positions*

If flaps are stuck:

4. Consider possible degraded performance



If flaps are stuck at T/O or LDG consider higher aerodynamic drag, decreased specific range and 98 or 90 KIAS V_{MAX} according to actual flap setting. If exactly flaps position can be determined, observe the lower V_{FE} value.

5. Plan landing considering the actual flap setting (refer to the Table below)

Table 3-5 – Reference Approach Speed

CONFIGURAT.	V_{REF} (@MLW=1160 kg / 2557 lbs)
Flaps UP	79 KIAS
Flaps T/O	70 KIAS
Flaps LDG	65 KIAS

Table 3-5a – Reference Approach Speed(MOD2010/207)

CONFIGURAT.	V_{REF} (@MLW=1200 kg / 2645 lbs)
Flaps UP	80 KIAS
Flaps T/O	72 KIAS
Flaps LDG	66 KIAS

NOTE

If flaps are stuck UP, plan landing using a flat approach and use power levers to control airplane speed and rate of descent.

If flaps are NOT stuck:

NOTE

Consider flaps indicator inoperative.

4. Flaps switch *as required*
5. Flaps position..... *CHECK visually*

13. RECOVERY FROM UNINTENTIONAL SPIN

If unintentional spin occurs:

1. Flap..... *UP*
2. Thrust Lever..... *IDLE*
3. Ailerons..... *Neutral*
4. Rudder..... *Fully opposite to the direction of spin*
5. Control Wheel..... *Forward*

When rotation stops:

6. Rudder..... *NEUTRAL*
7. Attitude..... *RECOVERY promptly but smoothly, averting speed close to/in excess of V_{NE}*
8. Thrust Lever..... *As required*



*Keep full rudder against rotation until spin has stopped.
One complete turn and recovery will take about 800 to 1000 feet altitude loss*

14. UNINTENTIONAL FLIGHT INTO ICING CONDITIONS

3. Pitot heat..... *CHECK ON*
4. *Fly immediately away from icing conditions (changing altitude and direction of flight, out and below of clouds, visible moisture, precipitation)*
5. Control surfaces..... *MOVE continuously to avoid locking*
6. Thrust Lever..... *INCREASE to prevent ice build-up on propeller blades*



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 lose its efficiency, leading to lack of aircraft pitch control and loss of control.

15. Emergency Landing

15.1. Forced Landing without Engine Power

Preparation:

1. Flaps..... UP
2. Airspeed..... ESTABLISH V_{GLIDE}
(79 KIAS)

NOTE

Glide ratio is about 11.5, therefore in zero wind conditions for every 1000 ft it is possible to cover about 2 NM. With propeller in windmilling glide ratio is about 9.3, therefore for every 1000 ft it is possible to cover about 1.5 NM.

3. Radio..... Transmit MAYDAY giving location and intentions
4. Transponder..... Set EMERGENCY CODE
5. If off airport, ELT..... ON
6. Find a suitable place to land safely
7. Thrust Lever..... IDLE
8. Fuel Selector valve..... OFF
9. Engine Master..... OFF
10. Fuel Pump..... OFF
11. Seat Belts..... Tightly FASTENED

When landing is assured:

12. Flaps..... As required
13. Generator and Master switches..... OFF

NOTE

Be prepared for aircraft evacuation.

15.2. Power on forced landing

1. Flaps..... UP
2. Airspeed..... *ESTABLISH V_{GLIDE}*
(79 KIAS)

NOTE

Glide ratio is about 11.5, therefore in zero wind conditions for every 1000 ft it is possible to cover about 2 NM. With propeller in windmilling glide ratio is about 9.3, therefore for every 1000 ft it is possible to cover about 1.5 NM.

3. Find a suitable place to land safely
4. Safety Belts..... *Tightly FASTENED*

When landing is assured:

5. Flaps..... *As necessary*
6. Fuel selector valve..... OFF
7. Electric Fuel pump..... OFF
8. Engine Master..... OFF
9. Generator and Master switches..... OFF

NOTE

Be prepared for aircraft evacuation.

16. Oxygen System

16.1. Oxygen pressure loss

1. Cabin Ventilation.....OPEN

Initiate an emergency descent:

2. Flaps UP
3. Thrust lever IDLE
4. Airspeed *as required*

When passing 10,000 ft or at an altitude where oxygen is no longer required, whichever comes first:

5. Oxygen.....OFF
6. Oxygen pressure check

If oxygen pressure is constant, continue flight:

7. Airspeed *check*
8. Thrust lever *as required*
9. Airspeed *as required*

If oxygen pressure drops, abort flight:

10. Land at the nearest suitable airfield.



A leak in the oxygen system may excessively increase the risk of fire.

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SECTION 4

NORMAL PROCEDURES

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1. Introduction

Section 4 describes checklists and recommended procedures for the conduct of normal operations for *P2010tdi* aircraft.

2. Airspeeds for normal operations.

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

SPEEDS	FLAPS	MTOW	MTOW (MOD 2010/207)
		1160 kg (2557 lb)	1200 kg (2645 lb)
Rotation Speed (V_R)	T/O	60 KIAS	61 KIAS
Best Angle-of-Climb Speed (V_X)	UP	74 KIAS	74 KIAS
Best Rate-of-Climb Speed (V_Y)	UP	79 KIAS	79 KIAS
No flaps approach speed (V_{REF})	UP	79 KIAS	80 KIAS
Approach speed (V_{REF})	T/O	70 KIAS*	72 KIAS*
Final Approach Speed (V_{REF})	LN	65 KIAS*	66 KIAS*
Optimal Touch Down Speed	LN	56 KIAS	58 KIAS
Glide Speed (V_{GLIDE})	UP	79 KIAS	79 KIAS
Manoeuvring Speed (V_A)	UP	119 KIAS	121 KIAS
Never Exceed Speed (V_{NE})	UP	163 KIAS	163 KIAS

*) Minimum approach speed with autopilot engaged is equal to 75 kts.

3. 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.

3.1. Cabin Inspection

- | | |
|---------------------------------|---|
| 1. Aircraft documents | <i>CHECK valid and on board</i> |
| 2. Weight and balance..... | <i>CALCULATE (ref. to Section 6) and CHECK within limits</i> |
| 3. Breakers..... | <i>all IN</i> |
| 4. Safety belts..... | <i>CONNECTED to hard points, and CHECK condition</i> |
| 5. Engine Master..... | <i>OFF</i> |
| 6. Master switch..... | <i>ON</i> |
| 7. Voltmeters..... | <i>CHECK within limits</i> |
| 8. Lights..... | <i>All ON, CHECK for operation</i> |
| 9. Pitot..... | <i>REMOVE cover</i> |
| 10. Acoustic stall warning..... | <i>CHECK for operation</i> |
| 11. Pitot heaters..... | <i>CHECK and OFF</i> |
| 12. Master switch..... | <i>OFF</i> |
| 13. Baggage..... | <i>CHECK: ELT fire extinguisher, luggage secured with restraint net</i> |

If oxygen system is planned or anticipated to be used for flight:

1. Cannulas visual inspection
2. Masks visual inspection

NOTE

There must be at least one cannula or mask for each occupant on board. Further connection hoses for each occupant are required. The cannulas and masks must be accessible during flight.

3. Oxygen pressure check
4. Oxygen flow duration chart observe/ calculate duration
(refer to Section 5)

3.2. Aircraft Walk-Around

To perform the aircraft walk around, carry out the checklists according to the pattern shown in



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



Fuel level indicated by the fuel quantity indicators must be verified by visual check of actual fuel quantity in the tanks: graduated dipstick must be used.



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

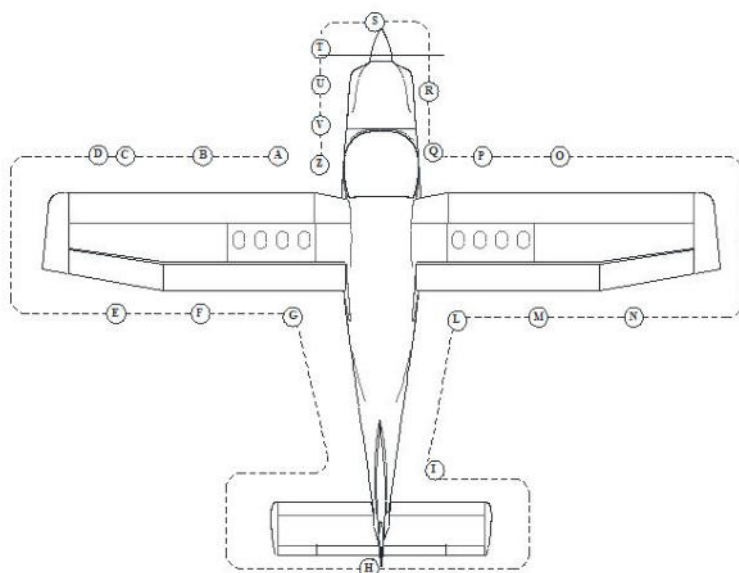


Figure 4-1 - Aircraft Walk-around

- | | | |
|----------|--|---|
| A | Left fuel filler cap | <i>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.</i> |
| B | Pitot tube | <i>REMOVE pitot plug and check the pitot for obstructions. Do not blow inside pitot tube.</i> |
| C | Left side leading edge and wing skin | <i>Visual inspection, check stall strips (if present)</i> |
| D | Left strobe light | <i>Visual inspection, CHECK for integrity and fixing</i> |
| E | Left aileron, hinges and LH tank vent line | <i>CHECK aileron and hinges for damage, and freedom from plays;
Copper bonding strips: CHECK for proper connection;
Left tank vent: CHECK for obstructions.</i> |
| F | Left flap and hinges | <i>Visual inspection;
Copper bonding strips: CHECK for proper connection.</i> |

G	Left main landing gear	<i>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.</i>
H	Stabilator, tab and rear light	<i>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>
I	Vertical tail and rudder	<i>Visual inspection, check free of play, friction.</i>
L	Right main landing gear	<i>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.</i>
M	Right flap and hinges	<i>Visual inspection; Copper bonding strips: CHECK for proper connection;</i>
N	Right aileron, hinges and RH tank vent line	<i>Visual inspection, check free of play, friction; Copper bonding strips: CHECK for proper connection; Right side tank vent: check for obstructions.</i>
O	Right strobe light, leading edge and wing skin	<i>Visual inspection, CHECK stall strips (if present), CHECK strobe light for integrity and fixing</i>
P	Stall indicator switch	<i>CHECK for integrity and free of play</i>
Q	Right fuel filler cap	<i>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.</i>
R	Nose wheel strut and tire/RH static port	<i>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.</i>
S	Propeller and spinner condition	<i>CHECK for nicks, cracks, dents and other defects, propeller should rotate freely. Check fixing and lack of play between blades and hub.</i>

- 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*

Verify all parts are fixed or locked: inspect fuel circuit for leakages.

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

NOTE

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

4. Checklist

4.1. Before Starting Engine

1. Pre-flight inspection..... *Complete*
2. Seat position and safety belts..... *Adjust*
3. Flight controls..... *Operate full stroke checking for movement smoothness, free of play and friction*
4. Parking brake..... *Engage*
5. Thrust Lever..... *Check for freedom of movement*
6. Thrust Lever..... *IDLE*
7. Engine Master..... *OFF*
8. Circuit Breakers..... *Check all IN*
9. Master switch..... *ON and wait PFD turn on*
10. 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
11. Avionic Master switch..... *ON, wait MFD turn on, check instruments, check Voltage on Essential Buses and Back-up Battery.*
12. A/P Master Switch..... *ON*
13. Trim DISC Switch..... *ON*

NOTE

If A/P Master switch and/or Trim disconnect switch are inadvertently switched OFF, it will be necessary to reset both switches to allow A/P and pitch trim functionality. In this case pilot will make sure A/P is disengaged before reset. The single reset of only one of the switches will not permit to reset the single functionality.

- | | |
|-------------------------------|--|
| 14. Fuel quantity..... | <i>compare the fuel quantity indicators with fuel quantity visually checked into the tanks</i> |
| 15. Fuel temperature..... | <i>Check within limits. Refer to Instrumentation Markings (Par. 4) in Section 2.</i> |
| 16. Electric fuel pump..... | <i>ON (check for audible pump noise)</i> |
| 17. Electric fuel pump..... | <i>OFF</i> |
| 18. Flap control..... | <i>Cycle fully extended and then set to T/O</i> |
| 19. Pitch Trim..... | <i>Cycle fully up and down, then set to NEUTRAL</i> |
| 20. Rudder trim..... | <i>Cycle full right and left, then set to NEUTRAL</i> |
| 21. Nav & Strobe lights..... | <i>ON</i> |
| 22. Doors..... | <i>Closed and locked</i> |
| 23. PFD/MFD Reversionary mode | <i>CHECK</i> |

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.

4.2. Engine Starting

1. Thrust Lever..... *IDLE*
2. Fuel selector valve..... *Select the tank with less fuel*
3. Electric fuel pump..... *ON*
4. Propeller area..... *Check that area is clear of persons / objects*



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



For operation with diesel, the aircraft must not be started if the temperature of the fuel in the tank is below -5°C (-10°C if use additive allowed by manufacturer's specifications).

If the grade of the fuel in the tank is unknown, always assume it is additive-free Diesel.



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

5. Engine Master Switch..... *ON*
6. *Check the following messages are ON:*
 - a. *ALT FAIL warning*
 - b. *OIL PRESS LOW warning*

If aircraft NOT embodying MOD 2010/240:

7. Wait until CAS message "GLOWPLUG ON" extinguishes

If aircraft embodying MOD 2010/240:

7. Wait until CAS message "GLOWSYS ACTV" extinguishes
8. Check whether the thrust lever moves freely, check power indicator: at 0 speed, load must be shown as 0%.
9. Generator switch..... *ON*
10. Engine Starter..... *START and note time*

11. Check oil pressure rises and OIL PRESS LOW warning extinguish.



If after 3 seconds the minimum oil pressure of 1 bar is not indicated: shut down the engine immediately.

12. Electric fuel pump..... *OFF*
13. Voltmeters..... *Check within green arc*
14. ALT FAIL warning..... *Extinguished*
15. Nav. light..... *Check ON*
16. Taxi light..... *ON*
17. Engine instruments..... *Check within limits*
18. Check G1000 Nxi for warning / caution messages

4.3. Warm Up

1. Allow the engine to warm up for approximately 2 minutes at idle speed.
2. Increase RPM to 1400 until the Oil Temperature 50°C (122°F), Coolant Temperature 60°C (140°F)

4.4. Before taxing

1. Flight instruments and avionics..... *Set, TEST functions*
2. Altimeters..... *Set*
3. Pitot Heat..... *ON, CHECK CAS message "Pitot heat ON", then OFF, CHECK CAS message "Pitot heat"*

4.5. Taxiing

1. Parking brake..... *Release*
2. Brakes..... *Check*
3. Flight Instruments..... *Check altimeters*

4.6. Before Take-off

1. Parking brake..... *Brake pedal press, ON*
2. Engine parameters..... *Check within limits*
3. ALT FAIL warning..... *OFF (check)*
4. Electric Fuel pump..... *ON*
5. Fuel selector valve..... *Select the fullest tank*
6. Fuel Temperature..... *Check*
7. Thrust Lever..... *FULL FORWARD*
 - a. Propeller RPM..... *CHECK*

The propeller must accelerate smoothly and steadily to the propeller speed limits (rpm): 2240 to 2300 RPM.
 - b. Engine parameters..... *CHECK, power indicator must show more than 95%.*
 - c. Ammeters and Voltmeters..... *CHECK*
 - d. CAS messages..... *CHECK*
8. Thrust Lever..... *IDLE*
9. Flaps..... *Check T/O*
10. Pitch and Rudder trim..... *Check neutral*
11. Flight controls..... *Check free*
12. FADEC and propeller adjustment function check
 - a. Thrust Lever..... *IDLE (no FADEC warning)*
 - b. FADEC Test Button..... *PRESS and HOLD button for entire test*

During the test, verify the following:

1. FADEC TEST CAS message comes ON and propeller speed increases. Propeller speed target 1100-1300 RPM.



If the CAS messages do not appear at this time, a take-off must not be attempted with the aircraft.

2. The system then automatically switches to the FADEC B (FADEC-B ACTIVE comes ON).
3. The propeller governor is activated; the propeller speed decreases. Propeller speed target 800-900 RPM.
4. The system automatically switches to the FADEC A (FADEC-B ACTIVE CAS message disappears), the propeller speed increases. Propeller speed target 1100-1300 RPM.
5. The propeller governor is activated; the propeller speed decreases. Propeller speed target 800-900 RPM.
6. FADEC TEST CAS message extinguishes, idle speed is reached; the test is completed.
7. Release test button.



If there are prolonged engine misfires or the engine shuts down during the test, take off may not be attempted.



The whole FADEC-Test procedure has to be performed without any failure. In case the engine shuts down or a FADEC warning is indicated, take-off is prohibited. This applies even if the engine seems to run without failure after the test.



If the test button is released before the self-test is over, the FADEC immediately switches over to normal operation.



While switching from one FADEC to another, it is normal to hear and feel a momentary surge in the engine.

13. FADEC Switch..... *Switch to FADEC B (FADEC B FORCED and FADEC B ACTIVE messages come ON)
Engine check (running without a change)*
14. Thrust Lever..... **FULL FORWARD**
- a. Propeller RPM..... **CHECK**
- The propeller must accelerate smoothly and steadily to the propeller speed limits (rpm): 2240 to 2300 RPM.*
- b. Engine parameters..... *CHECK, power indicator must show more than 95%.*
- c. Ammeters and Voltmeters..... **CHECK**
- d. CAS messages..... **CHECK**
15. Thrust Lever..... **IDLE**
16. FADEC Switch..... *Switch back to Auto*



In normal conditions, FADEC switch must be in AUTO position. Not returning the FADEC switch to the AUTO position will prevent automatic selection of the healthier FADEC.

17. Seat Belts..... *Check Fastened*
18. Doors..... *Check closed and locked.*
19. External lights..... *As required*
20. Transponder..... **ON**
21. Pitot HEAT..... **ON**
22. Fuel pump..... **CHECK ON**

4.7. Take-off

1. Parking brake..... *Release*
2. Brakes..... *Apply*
3. Thrust Lever..... *FULL and check 2240 to 2300 RPM, power indicator must show more than 95%.*



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.

4. Engine parameters..... *Check within the limits*
5. Brakes..... *Release*
6. At rotation speed..... *Rotate*

At safe altitude

7. Flaps..... *UP*

NOTE

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

8. Attitude..... *As required for en-route climb*
9. Electrical fuel pump..... *OFF*

4.8. Climb

1. Thrust Lever..... *As required*
2. Engine parameters..... *In the allowed range*

NOTE

Normal climbs are performed flaps UP and maximum continuous power at speeds 5 to 10 knots higher than best rate of climb speeds. These higher speeds give the best combination of performance, visibility and engine cooling.

4.9. 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. Engine parameters..... *Monitor*

4.9.1. Flight using oxygen system

Before climbing above 10,000 ft or at an altitude where oxygen is required, whichever comes first:

4. Oxygen pressure check
5. Cannula, mask and hose adjust to face (refer to Section 7)
6. Delivery hose plug each occupant hose into the regulator
7. Oxygen valve OPEN

NOTE

When the oxygen system is turned on, oxygen will flow continuously at the appropriate rate of flow selected for the altitude with only minor adjustments to the needle valve thumb wheel required.

8. Cannula hose flowmeter adjust to altitude

NOTE

Check each occupant's oxygen cannula adjustment and flowmeter setting. Recheck oxygen pressure indication from time to time.

NOTE

Always place the flowmeter in a position where it is in the normal scan area of the user.



WARNING

Smoking is in no case permitted in the P2010. It is especially dangerous while the oxygen system is in use.



WARNING

If the oxygen pressure gauge indicates a cylinder pressure of 500 psi, initiate descent to reach an altitude below 10,000 ft.

After descending below 10,000 ft or at an altitude where oxygen is no longer required, whichever comes first:

1. OXYGEN VALVE.....OFF

4.10. Descent

1. Thrust Lever..... *As required*

4.11. Before Landing

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

On downwind, leg abeam touch down point

4. Flaps..... *Set T/O (below 100 KIAS,
102 KIAS for MOD2010/207)*

NOTE

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

5. Approach speed..... *Set*
6. Flaps..... *LAND (below 90 KIAS,
92 KIAS for MOD2010/207)*
7. Final Approach Speed..... *Set*



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

4.12. Balked landing/Missed Approach/Go-Around

1. Thrust Lever..... *FULL FORWARD*
2. Attitude..... *Attain climb speed*
3. Flaps..... *TO*

Above a safe altitude

4. Flaps..... *UP*

4.13. Landing

1. Thrust Lever..... *IDLE at touchdown*
2. Brakes..... *Apply*
3. Flaps..... *UP*
4. Electric Fuel Pump..... *OFF*
5. Pitot Heat..... *OFF (if ON)*
6. External lights..... *As required*
7. Transponder..... *As required*

4.14. Engine Shutdown

1. Parking brake..... *Set*
2. Thrust Lever..... *IDLE*
3. Flaps..... *CHECK UP*
4. External lights..... *As required*
5. Engine Master switch..... *OFF*
6. All electric/avionic/lights switches..... *OFF*
7. Master & Generator switches..... *OFF*



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

**4.15. Post-flight checks**

1. Wheel chocks and wing mooring lines..... *Set*
2. Parking brake..... *Release*
3. Doors..... *Close and Lock*
4. Protection covers..... *Install*

SECTION 5 PERFORMANCE

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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. Demonstrated Operating Temperature

Satisfactory engine cooling has been demonstrated for this airplane with an outside air temperature 23°C above standard. The value given is not considered an operating limitation. Reference should be made to Section 2 for operating limitations.

4. Gradient / Rate (ft/min) of climb / descent

GRADIENT				GROUND SPEED (kts)															
%	DEG	ft/NM		80	90	100	110	120	130	140	150	160	170	180	190				
0.5	0.3	30	41	46	51	56	61	66	71	76	81	86	91	96					
1.0	0.6	61	81	91	101	111	122	132	142	152	162	172	182	192					
1.5	0.9	91	122	137	152	167	182	197	213	228	243	258	273	289					
2.0	1.1	122	162	182	202	223	243	263	283	304	324	344	364	385					
2.5	1.4	152	202	228	253	278	304	329	354	380	405	430	456	481					
3.0	1.7	182	243	273	304	334	364	395	425	456	486	516	547	577					
3.5	2.0	213	283	319	354	390	425	460	496	531	567	602	638	673					
4.0	2.3	243	324	364	405	445	486	526	567	607	648	688	729	769					
4.5	2.6	273	364	410	455	501	546	592	637	683	728	774	819	865					
5.0	2.9	304	405	455	506	556	607	657	708	759	809	860	910	961					
5.5	3.1	334	445	501	556	612	667	723	779	834	890	945	1001	1057					
6.0	3.4	365	485	546	607	667	728	788	849	910	970	1031	1092	1152					
6.5	3.7	395	525	591	657	723	788	854	920	985	1051	1117	1182	1248					
7.0	4.0	425	566	636	707	778	849	919	990	1061	1131	1202	1273	1344					
7.5	4.3	456	606	682	757	833	909	985	1060	1136	1212	1288	1363	1439					
8.0	4.6	486	646	727	808	888	969	1050	1131	1211	1292	1373	1454	1534					
8.5	4.9	516	686	772	858	943	1029	1115	1201	1287	1372	1458	1544	1630					
9.0	5.1	547	726	817	908	999	1089	1180	1271	1362	1452	1543	1634	1725					
9.5	5.4	577	766	862	958	1054	1149	1245	1341	1437	1532	1628	1724	1820					
10.0	5.7	608	806	907	1008	1108	1209	1310	1411	1511	1612	1713	1814	1915					
10.5	6.0	638	846	952	1058	1163	1269	1375	1481	1586	1692	1798	1904	2009					
11.0	6.3	668	886	997	1107	1218	1329	1439	1550	1661	1772	1882	1993	2104					
11.5	6.6	699	926	1041	1157	1273	1388	1504	1620	1735	1851	1967	2083	2198					
12.0	6.8	729	965	1086	1207	1327	1448	1569	1689	1810	1931	2051	2172	2292					
12.5	7.1	760	1005	1130	1256	1382	1507	1633	1759	1884	2010	2135	2261	2387					
13.0	7.4	790	1044	1175	1306	1436	1567	1697	1828	1958	2089	2219	2350	2480					
13.5	7.7	820	1084	1219	1355	1490	1626	1761	1897	2032	2168	2303	2439	2574					
14.0	8.0	851	1123	1264	1404	1544	1685	1825	1966	2106	2247	2387	2527	2668					
14.5	8.3	881	1163	1308	1453	1599	1744	1889	2034	2180	2325	2470	2616	2761					
15.0	8.5	911	1202	1352	1502	1652	1803	1953	2103	2253	2404	2554	2704	2854					
15.5	8.8	942	1241	1396	1551	1706	1861	2016	2172	2327	2482	2637	2792	2947					
16.0	9.1	972	1280	1440	1600	1760	1920	2080	2240	2400	2560	2720	2880	3040					
16.5	9.4	1003	1319	1484	1649	1814	1978	2143	2308	2473	2638	2803	2968	3132					
17.0	9.7	1033	1358	1527	1697	1867	2037	2206	2376	2546	2716	2885	3055	3225					
17.5	9.9	1063	1397	1571	1746	1920	2095	2269	2444	2619	2793	2968	3142	3317					
18.0	10.2	1094	1435	1615	1794	1973	2153	2332	2512	2691	2870	3050	3229	3409					
18.5	10.5	1124	1474	1658	1842	2026	2211	2395	2579	2763	2948	3132	3316	3500					
19.0	10.8	1154	1512	1701	1890	2079	2268	2457	2646	2835	3024	3213	3403	3592					
19.5	11.0	1185	1551	1744	1938	2132	2326	2520	2714	2907	3101	3295	3489	3683					
20.0	11.3	1215	1589	1787	1986	2185	2383	2582	2780	2979	3178	3376	3575	3773					
20.5	11.6	1246	1627	1830	2034	2237	2440	2644	2847	3051	3254	3457	3661	3864					
21.0	11.9	1276	1665	1873	2081	2289	2497	2706	2914	3122	3330	3538	3746	3954					
21.5	12.1	1306	1703	1916	2129	2341	2554	2767	2980	3193	3406	3619	3832	4044					
22.0	12.4	1337	1741	1958	2176	2393	2611	2829	3046	3264	3481	3699	3917	4134					

A rule of thumb to find the rate of climb/descent in (ft/min) is multiply Ground Speed (Kts) by gradient of climb/descent (in percent).

Example:

Given

Find

a. Ground Speed = 100 Kts

→c. Corresponding Rate of
Climb = 1200 ft/min

b. Gradient = 12%

Section 5 – PERFORMANCE

GRADIENT / RATE (ft/min) OF CLIMB/DESCENT

5. Airspeed Indicator System Calibration

Indicated airspeeds provided in this flight manual assume zero instrument error for all flap configurations.

Normal Static Source

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

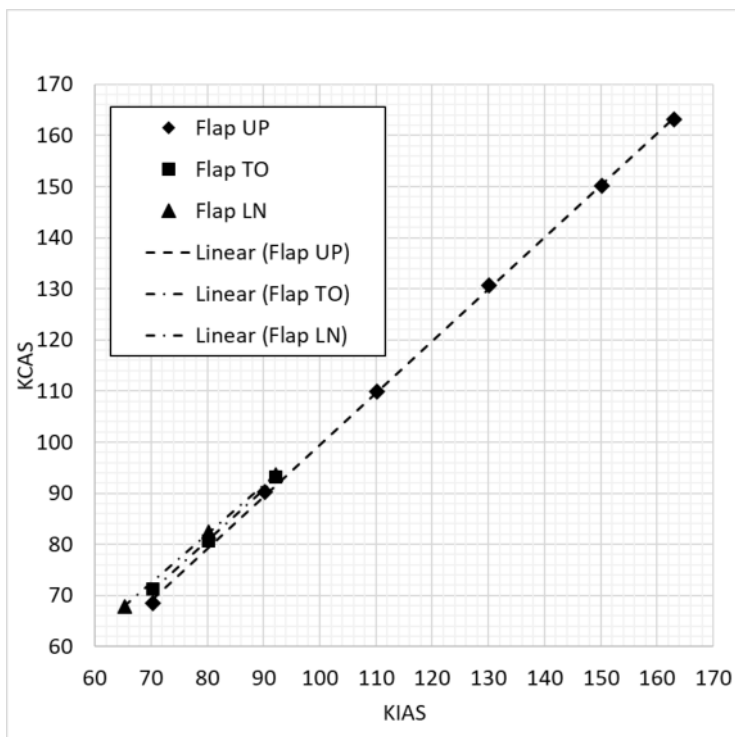


FIG. 5-1. CALIBRATED VS INDICATED AIRSPEED

Given

KIAS 79

Flap: UP

Find

KCAS 78

NOTE

Indicated airspeed assumes 0 as an instrument error

6. ICAO Standard Atmosphere

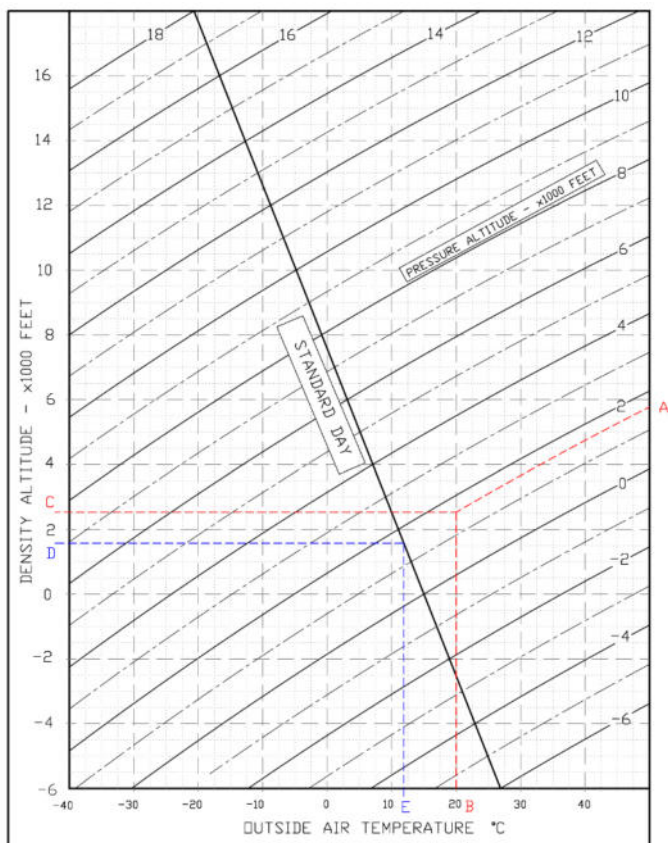


Figure 5-1 - ICAO Chart

Examples:

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



7. Stall Speed

Weight: 1160 kg (2557 lb) Thrust Lever: IDLE CG: Most Forward (23%)							
WEIGHT [kg] ([lb])	BANK ANGLE [deg]	STALL SPEED					
		FLAPS 0°		FLAPS T/O		FLAPS FULL	
		CIAS	KCAS	CIAS	KCAS	CIAS	KCAS
1160 (2557) (FWD C.G.)	0	61	60	54	55	48	52
	15	62	61	55	56	49	53
	30	66	64	58	59	52	56
	45	72	71	64	65	58	62
	60	86	85	77	78	71	74

Weight: 1200 kg (2645 lb) (*) Thrust Lever: IDLE CG: Most Forward (24%)							
WEIGHT [kg] ([lb])	BANK ANGLE [deg]	STALL SPEED					
		FLAPS 0°		FLAPS T/O		FLAPS FULL	
		CIAS	KCAS	CIAS	KCAS	CIAS	KCAS
1200 (2645) (FWD C.G.)	0	62	61	55	56	49	53
	15	63	62	56	57	50	54
	30	67	66	59	60	53	57
	45	74	73	65	67	60	63
	60	87	86	78	79	72	75

NOTE

Altitude loss during conventional stall recover is estimated to be about 350 ft.

(*) Applicable for Aircraft embodying MOD2010/207

8. Crosswind

Maximum demonstrated crosswind is 17 kts.

⇒ Example:

Given

Wind direction (with respect to aircraft longitudinal axis) = 30°

Wind speed = 20 kts

Find

Headwind = 17.5 kts

Crosswind = 10 kts

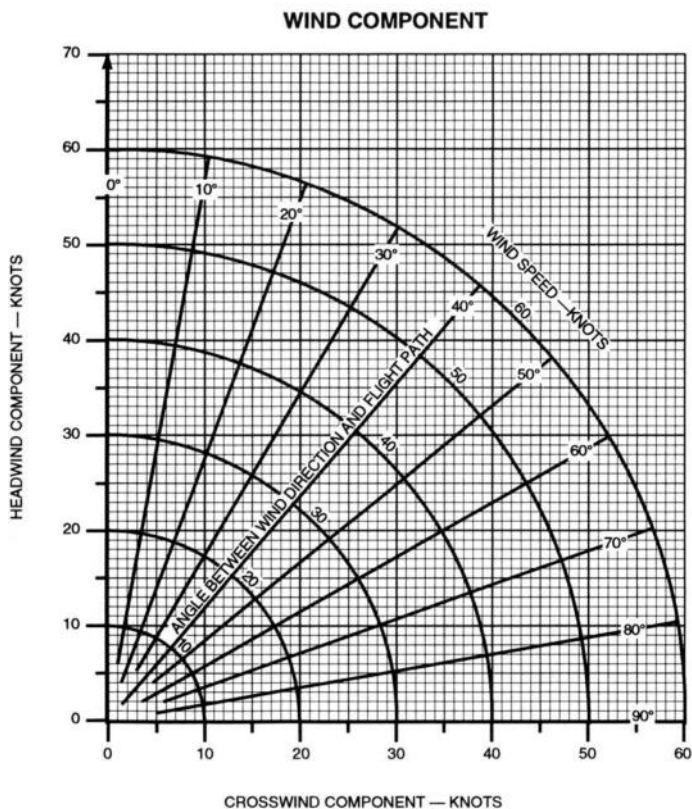


Figure 5-2 - Crosswind Chart

9. Take-Off Performance

Weight = 1160 kg (2557 lbs)										Corrections					
Flaps: Take-off										Headwind: - 10 m (33 ft) for each kts					
Thrust lever: MTO/2300 RPM										Tailwind: +20 m (66 ft) for each kts					
V _R = 60 kts (IAS)										Grass Runway: + 10% to Ground Roll					
V _{50ft} = 65 kts (IAS)										Runway slope: +10% to Ground Roll for each +1%					
										Consider about 110 m (361 ft) of take-off distance					
Dry paved runway										reduction for each 100 kg (220 lb) of weight reduction.					
Press Alt [ft]		Distance [m / ft]													
		Temperature [°C / °F]													
		-25/-13		-15/5		0/32		15/59		30/86		50/122		ISA	
		[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]
0	GR	293	961	315	1033	351	1152	389	1276	428	1404	483	1585	389	1276
	50ft	465	1526	501	1644	557	1827	617	2024	680	2231	767	2516	617	2024
1000	GR	313	1027	338	1109	376	1234	416	1365	459	1506	518	1699	411	1348
	50ft	498	1634	536	1759	597	1959	661	2169	728	2388	822	2697	652	2139
2000	GR	336	1102	362	1188	403	1322	446	1463	491	1611	558	1831	435	1427
	50ft	533	1749	575	1886	640	2100	709	2326	780	2559	886	2907	690	2264
3000	GR	360	1181	388	1273	432	1417	479	1572	527	1729	613	2011	460	1509
	50ft	572	1877	617	2024	686	2251	760	2493	837	2746	972	3189	730	2395
4000	GR	387	1270	417	1368	464	1522	513	1683	572	1877	672	2205	487	1598
	50ft	614	2014	662	2172	736	2415	815	2674	908	2979	1068	3504	773	2536
5000	GR	415	1362	447	1467	498	1634	553	1814	629	2064	738	2421	516	1693
	50ft	659	2162	710	2329	791	2595	878	2881	998	3274	1172	3845	819	2687
6000	GR	446	1463	480	1575	535	1755	608	1995	691	2267	810	2657	546	1791
	50ft	707	2320	763	2503	849	2785	966	3169	1097	3599	1286	4219	868	2848
7000	GR	479	1572	516	1693	585	1919	669	2195	760	2493	890	2920	591	1939
	50ft	760	2493	819	2687	928	3045	1062	3484	1206	3957	1412	4633	938	3077
8000	GR	515	1690	558	1831	644	2113	736	2415	835	2740	977	3205	639	2096
	50ft	817	2680	886	2907	1022	3353	1169	3835	1325	4347	1550	5085	1014	3327
9000	GR	556	1824	615	2018	709	2326	810	2657	917	3009	1072	3517	691	2267
	50ft	883	2897	976	3202	1125	3691	1285	4216	1457	4780	1702	5584	1096	3596
10000	GR	614	2014	678	2224	781	2562	891	2923	1008	3307	1177	3862	747	2451
	50ft	974	3196	1076	3530	1239	4065	1414	4639	1601	5253	1869	6132	1186	3891

Weight = 1200 kg (2645 lbs) (*) Flaps: Take-off Thrust lever: MTOP/2300 RPM V_R = 61 kts (IAS) V_{50ft} = 66 kts (IAS)															
Corrections Headwind: - 10 m (33 ft) for each kts Tailwind: +20 m (66 ft) for each kts Grass Runway: + 10% to Ground Roll Runway slope: +10% to Ground Roll for each +1% <i>Consider about 110 m (361 ft) of take-off distance reduction for each 100 kg (220 lb) of weight reduction.</i>															
Dry paved runway															
Press Alt [ft]		Distance [m / ft]													
		Temperature [°C / °F]													
		-25/-13		-15/5		0/32		15/59		30/86		50/122		ISA	
		[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]
0	GR	320	1050	344	1129	384	1260	425	1394	467	1532	528	1732	425	1394
	50ft	507	1663	547	1795	609	1998	674	2211	742	2434	838	2749	674	2211
1000	GR	342	1122	369	1211	411	1348	455	1493	501	1644	565	1854	449	1473
	50ft	544	1785	586	1923	652	2139	722	2369	795	2608	898	2946	713	2339
2000	GR	367	1204	396	1299	440	1444	487	1598	537	1762	609	1998	475	1558
	50ft	583	1913	628	2060	699	2293	774	2539	852	2795	967	3173	754	2474
3000	GR	394	1293	424	1391	472	1549	523	1716	576	1890	669	2195	502	1647
	50ft	625	2051	673	2208	750	2461	830	2723	914	2999	1062	3484	798	2618
4000	GR	422	1384	455	1493	507	1663	561	1841	625	2051	734	2408	532	1745
	50ft	670	2198	722	2369	804	2638	890	2920	992	3255	1166	3825	844	2769
5000	GR	453	1486	489	1604	544	1785	604	1982	687	2254	806	2644	563	1847
	50ft	719	2359	776	2546	863	2831	959	3146	1090	3576	1280	4199	894	2933
6000	GR	487	1598	525	1722	584	1916	664	2178	755	2477	885	2904	597	1959
	50ft	773	2536	833	2733	927	3041	1055	3461	1198	3930	1405	4610	947	3107
7000	GR	523	1716	564	1850	639	2096	731	2398	830	2723	972	3189	645	2116
	50ft	830	2723	895	2936	1014	3327	1160	3806	1317	4321	1542	5059	1024	3360
8000	GR	562	1844	609	1998	703	2306	804	2638	912	2992	1067	3501	698	2290
	50ft	893	2930	967	3173	1116	3661	1276	4186	1447	4747	1693	5554	1108	3635
9000	GR	608	1995	672	2205	774	2539	884	2900	1002	3287	1171	3842	754	2474
	50ft	965	3166	1066	3497	1229	4032	1404	4606	1591	5220	1859	6099	1197	3927
10000	GR	670	2198	740	2428	852	2795	973	3192	1101	3612	1286	4219	816	2677
	50ft	1064	3491	1175	3855	1353	4439	1544	5066	1748	5735	2041	6696	1295	4249

(*) Applicable for Aircraft embodying MOD2010/207

10. Take-Off Rate of Climb

Thrust lever: MCP/2250 RPM								
Flaps: Take-off								
Vy=67 kts (IAS)								
Weight [kg/lbs]	Pressure Altitude [ft]	Rate of Climb [ft/min]						
		Temperature [°C/°F]						
		-25/-13	-15/5	0/32	15/59	30/86	50/122	ISA
1160 / 2557	0	702	688	667	648	630	607	648
	2000	676	661	641	622	604	581	627
	4000	649	635	615	596	578	553	606
	6000	622	608	589	569	548	509	584
	8000	596	581	560	534	499	416	562
	10000	568	551	520	466	399	317	531
	12000	531	504	433	364	298	217	476
	14000	455	403	330	262	198	118	392
	16000	350	299	228	161	98	20	308
	18000	246	196	125	60	-2	-78	224
1110 / 2447	0	767	752	731	711	692	669	711
	2000	739	725	704	685	666	643	690
	4000	712	698	677	658	640	615	668
	6000	685	671	650	631	610	572	646
	8000	658	643	622	597	562	477	624
	10000	630	614	582	528	460	375	594
	12000	594	567	495	423	357	274	539
	14000	517	464	389	319	254	173	453
	16000	410	358	284	216	152	72	367
	18000	303	252	180	113	50	-29	281
1060 / 2337	0	836	820	799	779	760	736	779
	2000	808	793	771	751	733	709	757
	4000	780	765	744	724	706	682	735
	6000	752	737	716	697	677	639	712
	8000	724	709	689	664	629	542	690
	10000	696	680	649	594	524	438	661
	12000	661	633	560	487	419	334	605
	14000	583	528	452	380	313	230	517
	16000	473	419	344	274	208	126	429
	18000	363	311	237	168	104	23	341

Thrust lever: MCP/2250 RPM								
Flaps: Take-off								
Vy=67 kts (IAS)								
Weight [kg/lbs]	Pressure Altitude [ft]	Rate of Climb [ft/min]						
		Temperature [°C/°F]						
		-25/-13	-15/5	0/32	15/59	30/86	50/122	ISA
1200 / 2645 (*)	0	654	640	619	600	582	560	600
	2000	628	613	593	575	557	535	580
	4000	601	587	568	549	531	506	559
	6000	575	561	542	522	500	461	538
	8000	549	535	513	487	452	370	515
	10000	521	504	472	418	353	272	484
	12000	484	456	387	318	254	174	429
	14000	408	357	285	218	155	77	346
	16000	305	255	184	118	57	-20	264
	18000	202	153	84	19	-41	-117	181
1110 / 2447	0	767	752	731	711	692	669	711
	2000	739	725	704	685	666	643	690
	4000	712	698	677	658	640	615	668
	6000	685	671	650	631	610	572	646
	8000	658	643	622	597	562	477	624
	10000	630	614	582	528	460	375	594
	12000	594	567	495	423	357	274	539
	14000	517	464	389	319	254	173	453
	16000	410	358	284	216	152	72	367
	18000	303	252	180	113	50	-29	281
1060 / 2337	0	836	820	799	779	760	736	779
	2000	808	793	771	751	733	709	757
	4000	780	765	744	724	706	682	735
	6000	752	737	716	697	677	639	712
	8000	724	709	689	664	629	542	690
	10000	696	680	649	594	524	438	661
	12000	661	633	560	487	419	334	605
	14000	583	528	452	380	313	230	517
	16000	473	419	344	274	208	126	429
	18000	363	311	237	168	104	23	341

(*) Applicable for Aircraft embodying MOD2010/207

11. En-Route Rate of Climb

Thrust Lever: MCP/2250 RPM								
Flaps: UP								
Vy=79 kts (IAS)								
Weight [kg/lbs]	Pressure Altitude [ft]	Rate of Climb [ft/min]						
		Temperature [°C/°F]						
		-25/-13	-15/5	0/32	15/59	30/86	50/122	ISA
1160 / 2557	0	793	775	751	728	706	679	728
	2000	761	744	719	697	675	648	702
	4000	729	712	688	666	644	613	677
	6000	697	680	657	633	606	562	652
	8000	665	648	622	591	552	473	623
	10000	631	611	574	519	457	379	587
	12000	587	557	489	423	362	285	529
	14000	509	461	392	327	267	192	450
	16000	410	362	295	232	172	99	371
	18000	312	265	198	136	78	6	291
1110 / 2447	0	856	838	813	790	768	741	790
	2000	824	806	782	759	738	710	765
	4000	791	774	751	728	706	674	740
	6000	759	743	719	695	668	623	714
	8000	728	710	683	652	612	531	685
	10000	693	672	635	579	514	434	648
	12000	648	617	547	480	417	338	589
	14000	569	518	448	381	319	242	508
	16000	467	418	348	283	222	147	426
	18000	365	317	249	185	126	51	345
1060 / 2337	0	923	906	881	857	836	808	857
	2000	891	874	849	826	805	777	832
	4000	859	842	818	795	772	740	807
	6000	826	810	786	761	734	688	781
	8000	794	777	750	718	677	593	751
	10000	759	738	700	642	576	494	714
	12000	714	682	610	541	475	395	653
	14000	632	580	507	439	375	296	569
	16000	527	476	405	338	275	197	485
	18000	423	373	303	237	176	99	401

Thrust Lever: MCP/2250 RPM								
Flaps: UP								
Vy=79 kts (IAS)								
Weight [kg/lbs]	Pressure Altitude [ft]	Rate of Climb [ft/min]						
		Temperature [°C/°F]						
		-25/-13	-15/5	0/32	15/59	30/86	50/122	ISA
1200 / 2645 (*)	0	745	728	703	680	659	632	680
	2000	713	696	672	650	628	601	655
	4000	682	665	641	619	597	566	630
	6000	650	633	610	586	560	516	605
	8000	618	601	575	545	506	429	577
	10000	584	564	528	474	413	337	541
	12000	541	511	444	380	320	245	484
	14000	464	417	349	286	227	153	406
	16000	367	321	254	192	134	62	329
	18000	271	225	160	99	42	-29	251
1110 / 2447	0	856	838	813	790	768	741	790
	2000	824	806	782	759	738	710	765
	4000	791	774	751	728	706	674	740
	6000	759	743	719	695	668	623	714
	8000	728	710	683	652	612	531	685
	10000	693	672	635	579	514	434	648
	12000	648	617	547	480	417	338	589
	14000	569	518	448	381	319	242	508
	16000	467	418	348	283	222	147	426
	18000	365	317	249	185	126	51	345
1060 / 2337	0	923	906	881	857	836	808	857
	2000	891	874	849	826	805	777	832
	4000	859	842	818	795	772	740	807
	6000	826	810	786	761	734	688	781
	8000	794	777	750	718	677	593	751
	10000	759	738	700	642	576	494	714
	12000	714	682	610	541	475	395	653
	14000	632	580	507	439	375	296	569
	16000	527	476	405	338	275	197	485
	18000	423	373	303	237	176	99	401

(*) Applicable for Aircraft embodying MOD2010/207

12. Cruise Performance

MTOW Pressure altitude: 0 feet		ISA-30°C	ISA	ISA+30°C
PWR [%]	F.C. [l/h]/ [USg/h]	TAS [ktas]	TAS [ktas]	TAS [ktas]
91	33 / 8.7	123	127	131
75	26 / 6.8	113	116	120
65	22 / 5.8	103	106	109
55	18 / 4.7	91	92	93

MTOW Pressure altitude: 5000 feet		ISA-30°C	ISA	ISA+30°C
PWR [%]	F.C. [l/h]/ [USg/h]	TAS [ktas]	TAS [ktas]	TAS [ktas]
91	33 / 8.7	130	134	138
75	26 / 6.8	116	119	123
65	22 / 5.8	109	112	116
55	18 / 4.7	96	99	102

MTOW Pressure altitude: 10000 feet		ISA-30°C	ISA	ISA+30°C
PWR [%]	F.C. [l/h]/ [USg/h]	TAS [ktas]	TAS [ktas]	TAS [ktas]
91	33 / 8.7	136	140	144
75	26 / 6.8	120	123	127
65	22 / 5.8	114	117	121

13. Landing Performance

Weight = 1160 kg (2557 lbs) Flaps: Landing Thrust lever: Idle V _{REF} = 65 kts (IAS) V _{TD} = 56 kts (IAS)								Corrections Headwind: - 4 m (-13 ft) for each kts Tailwind: +13 m (+43 ft) for each kts Grass Runway: + 10% to Ground Roll Runway slope: -3% to Ground Roll for each +1% Consider about 20 m (66 ft) of landing distance reduction for each 100 kg (220 lb) of weight reduction.							
Dry paved runway															
Press Alt [ft]		Distance [m / ft]													
		Temperature [°C / °F]													
		-25/-13		-15/5		0/32		15/59		30/86		50/122		ISA	
		[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]
0	GR	225	738	234	768	247	810	261	856	275	902	293	961	261	856
	50ft	501	1644	510	1673	524	1719	537	1762	551	1808	569	1867	537	1762
1000	GR	233	764	242	794	257	843	271	889	285	935	304	997	269	883
	50ft	509	1670	519	1703	533	1749	547	1795	561	1841	580	1903	545	1788
2000	GR	242	794	251	823	266	873	281	922	295	968	317	1040	277	909
	50ft	518	1699	528	1732	542	1778	557	1827	572	1877	594	1949	553	1814
3000	GR	251	823	261	856	276	906	291	955	306	1004	336	1102	285	935
	50ft	527	1729	537	1762	552	1811	568	1864	583	1913	621	2037	562	1844
4000	GR	260	853	271	889	286	938	302	991	322	1056	357	1171	294	965
	50ft	537	1762	547	1795	563	1847	579	1900	601	1972	648	2126	570	1870
5000	GR	270	886	281	922	297	974	315	1033	342	1122	379	1243	303	994
	50ft	546	1791	557	1827	574	1883	592	1942	628	2060	677	2221	579	1900
6000	GR	280	919	292	958	309	1014	335	1099	363	1191	402	1319	312	1024
	50ft	557	1827	568	1864	585	1919	619	2031	656	2152	706	2316	589	1932
7000	GR	291	955	303	994	326	1070	356	1168	386	1266	427	1401	328	1076
	50ft	568	1864	579	1900	607	1991	647	2123	686	2251	737	2418	610	2001
8000	GR	303	994	317	1040	347	1138	378	1240	410	1345	453	1486	345	1132
	50ft	579	1900	594	1949	635	2083	676	2218	716	2349	770	2526	633	2077
9000	GR	316	1037	337	1106	369	1211	402	1319	435	1427	480	1575	363	1191
	50ft	593	1946	622	2041	664	2178	706	2316	748	2454	804	2638	656	2152
10000	GR	337	1106	359	1178	393	1289	427	1401	462	1516	509	1670	382	1253
	50ft	621	2037	650	2133	694	2277	738	2421	781	2562	839	2753	680	2231

Weight = 1200 kg (2645 lbs) (*) Flaps: Landing Thrust lever: Idle V_{REF} = 66 kts (IAS) V_{TD} = 58 kts (IAS)															
Corrections Headwind: - 4 m (-13 ft) for each kts Tailwind: +13 m (+43 ft) for each kts Grass Runway: + 10% to Ground Roll Runway slope: -3% to Ground Roll for each +1% <i>Consider about 20 m (66 ft) of landing distance reduction for each 100 kg (220 lb) of weight reduction.</i>															
Dry paved runway															
Press Alt [ft]		Distance [m / ft]													
		Temperature [°C / °F]													
		-25/-13		-15/5		0/32		15/59		30/86		50/122		ISA	
		[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]	[m]	[ft]
0	GR	233	764	242	794	256	840	270	886	284	932	303	994	270	886
	50ft	509	1670	518	1699	532	1745	546	1791	560	1837	579	1900	546	1791
1000	GR	241	791	251	823	265	869	280	919	295	968	314	1030	278	912
	50ft	517	1696	527	1729	542	1778	556	1824	571	1873	590	1936	554	1818
2000	GR	250	820	260	853	275	902	290	951	306	1004	327	1073	286	938
	50ft	526	1726	536	1759	552	1811	567	1860	582	1909	605	1985	563	1847
3000	GR	259	850	270	886	286	938	301	988	317	1040	348	1142	295	968
	50ft	536	1759	546	1791	562	1844	578	1896	593	1946	632	2073	571	1873
4000	GR	269	883	280	919	296	971	313	1027	333	1093	369	1211	304	997
	50ft	546	1791	556	1824	573	1880	589	1932	612	2008	660	2165	580	1903
5000	GR	279	915	291	955	308	1010	326	1070	354	1161	392	1286	313	1027
	50ft	556	1824	567	1860	584	1916	603	1978	640	2100	690	2264	590	1936
6000	GR	290	951	302	991	319	1047	346	1135	376	1234	416	1365	323	1060
	50ft	566	1857	578	1896	596	1955	630	2067	669	2195	720	2362	599	1965
7000	GR	301	988	313	1027	337	1106	368	1207	399	1309	441	1447	340	1115
	50ft	578	1896	590	1936	619	2031	659	2162	699	2293	752	2467	622	2041
8000	GR	313	1027	327	1073	359	1178	391	1283	424	1391	468	1535	357	1171
	50ft	589	1932	605	1985	647	2123	689	2260	730	2395	786	2579	645	2116
9000	GR	327	1073	349	1145	382	1253	416	1365	450	1476	497	1631	376	1234
	50ft	604	1982	633	2077	677	2221	720	2362	763	2503	820	2690	669	2195
10000	GR	348	1142	371	1217	406	1332	442	1450	478	1568	527	1729	395	1296
	50ft	633	2077	663	2175	708	2323	753	2470	797	2615	857	2812	693	2274

(*) Applicable for Aircraft embodying MOD2010/207

14. Balked Landing Performance

Thrust Lever: Full Forward								
Flaps: LAND								
V _{REF} =65 kts (IAS)								
Weight [kg/lbs]	Pressure Altitude [ft]	Steady Gradient of Climb [%]						
		Temperature [°C/°F]						
		-25/-13	-15/5	0/32	15/59	30/86	50/122	ISA
1160 / 2557	0	9.0	8.6	8.0	7.5	7.0	6.3	7.5
	2000	8.6	8.2	7.6	7.1	6.6	6.0	7.2
	4000	8.2	7.8	7.3	6.7	6.2	5.4	6.9
	6000	7.9	7.5	6.9	6.4	5.9	4.6	6.6
	8000	7.5	7.1	6.5	6.0	5.2	3.8	6.3
	10000	7.1	6.7	6.2	5.5	4.4	3.1	6.0
1110 / 2447	0	9.9	9.5	8.9	8.3	7.8	7.1	8.3
	2000	9.5	9.1	8.5	7.9	7.4	6.8	8.0
	4000	9.1	8.7	8.1	7.6	7.0	6.2	7.7
	6000	8.7	8.3	7.7	7.2	6.7	5.3	7.4
	8000	8.3	7.9	7.3	6.8	5.9	4.5	7.1
	10000	8.0	7.5	7.0	6.2	5.1	3.7	6.8
1060 / 2337	0	10.9	10.5	9.8	9.2	8.7	8.0	9.2
	2000	10.5	10.1	9.4	8.8	8.3	7.6	8.9
	4000	10.1	9.6	9.0	8.4	7.9	7.0	8.6
	6000	9.7	9.2	8.6	8.0	7.5	6.1	8.3
	8000	9.3	8.8	8.2	7.6	6.7	5.3	7.9
	10000	8.9	8.4	7.8	7.1	5.9	4.4	7.6

Thrust Lever: Full Forward								
Flaps: LAND								
V _{REF} =66 kts (IAS)								
Weight [kg/lbs]	Pressure Altitude [ft]	Steady Gradient of Climb [%]						
		Temperature [°C/°F]						
		-25/-13	-15/5	0/32	15/59	30/86	50/122	ISA
1200 / 2645 (*)	0	8.3	7.9	7.4	6.8	6.4	5.8	6.8
	2000	7.6	7.2	6.7	6.2	5.7	4.9	6.3
	4000	6.9	6.5	6	5.5	4.7	3.4	5.7
	6000	6.2	5.8	5.3	4.2	3.2	1.9	5
	8000	5.4	4.9	3.7	2.7	1.7	0.4	3.8
	10000	4.1	3.3	2.2	1.1	0.2	-1.1	2.5
1110 / 2447	0	9.9	9.5	8.9	8.3	7.8	7.1	8.3
	2000	9.5	9.1	8.5	7.9	7.4	6.8	8.0
	4000	9.1	8.7	8.1	7.6	7.0	6.2	7.7
	6000	8.7	8.3	7.7	7.2	6.7	5.3	7.4
	8000	8.3	7.9	7.3	6.8	5.9	4.5	7.1
	10000	8.0	7.5	7.0	6.2	5.1	3.7	6.8
1060 / 2337	0	10.9	10.5	9.8	9.2	8.7	8.0	9.2
	2000	10.5	10.1	9.4	8.8	8.3	7.6	8.9
	4000	10.1	9.6	9.0	8.4	7.9	7.0	8.6
	6000	9.7	9.2	8.6	8.0	7.5	6.1	8.3
	8000	9.3	8.8	8.2	7.6	6.7	5.3	7.9
	10000	8.9	8.4	7.8	7.1	5.9	4.4	7.6

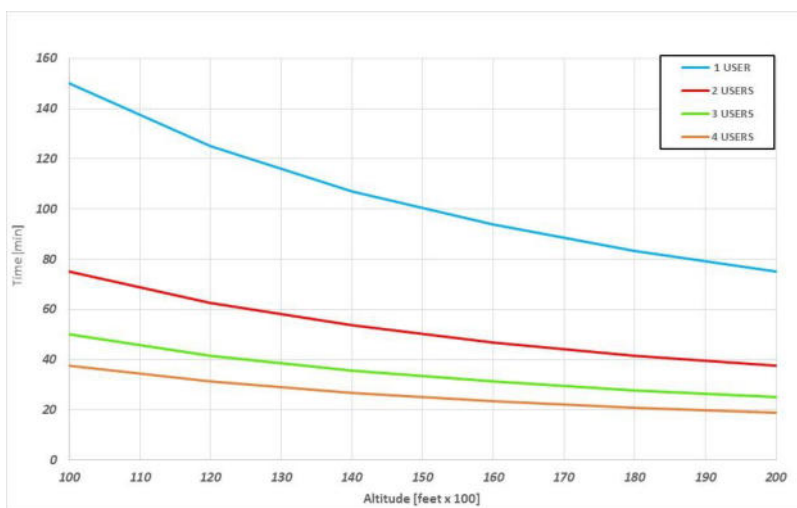
(*) Applicable for Aircraft embodying MOD2010/207

15. Oxygen System

OXYGEN FLOW DURATION PER ALTITUDE AND PER USERS WITH MAXIMUM CYLINDER CAPACITY (165 LITERS)

Altitude	1 user time	2 user time	3 user time	4 user time
[ft]	[min]	[min]	[min]	[min]
1000	150,0	75,0	50,0	37,5
12000	125,0	62,5	41,7	31,3
14000	107,1	53,6	35,7	26,8
16000	93,8	46,9	31,3	23,4
18000	83,3	41,7	27,8	20,8

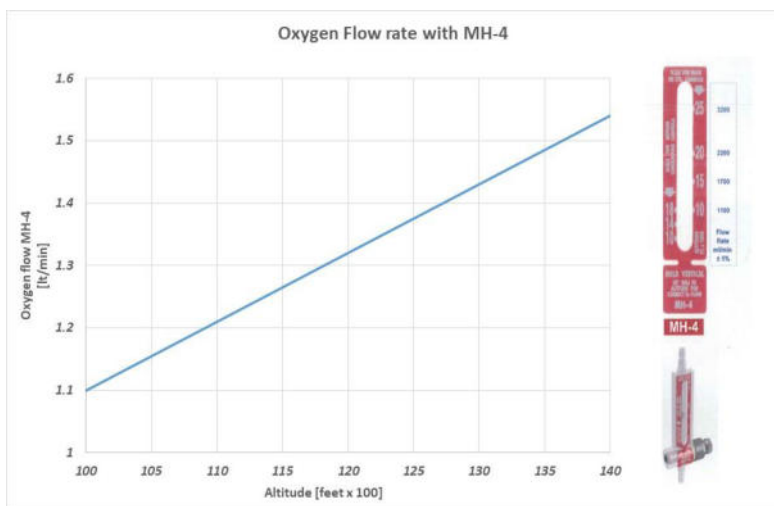
OXYGEN FLOW DURATION PER ALTITUDE AND PER USERS WITH MAXIMUM CYLINDER CAPACITY (165 LITERS)



- (1) Consider 10 min of time reduction for each 10 lt (130 psi) below full tank capacity.
- (2) Consider 5 min of time reduction for each 10 lt (130 psi) below full tank capacity.
- (3) Consider 3 min of time reduction for each 10 lt (130 psi) below full tank capacity.
- (4) Consider 2 min of time reduction for each 10 lt (130 psi) below full tank capacity.

Capacity		
psi	lts	
2218	165	Full tank
1680	125	
1140	85	Middle tank
870	65	
600	45	Empty
335	25	

OXYGEN FLOW RATE WITH MH-4 FLUXOMETER



16. 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 **74.85 dB(A)**.

For A/C embodying MOD2010/207, Noise level, determined in accordance with ICAO/Annex 16 6th Ed., July 2011, Vol. I°, Chapter 10 and 14 CFR Part 36, is **75.6 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.

SECTION 6

WEIGHT AND BALANCE

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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 take-off weight and CG excursion as re-ported in Flight Manual Section 2.

Pilot is responsible for checking the weight and CG excursion are compliant with the related limits. C.G. 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 in middle position
- Refuel/Defuel the aircraft with the unusable fuel
- Raise flaps to fully retracted position
- Place control surfaces in neutral position
- Place scales 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

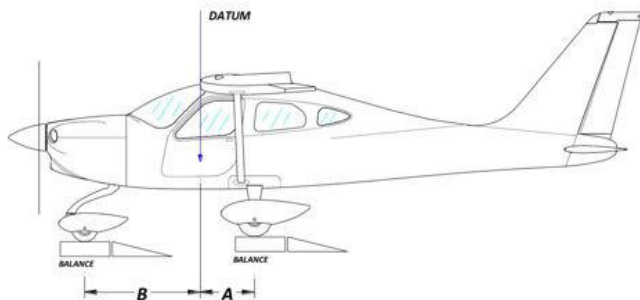
- Record weight shown on each scale
- Repeat weighing procedure three times
- Calculate empty weight

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
- 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 | **P2010TDI** 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 $\frac{(A_L + A_R)}{2}$	$A =$
Plumb bob distance from nose wheel	$B =$

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

$$D = \frac{W_2 \cdot A - W_1 \cdot B}{W_e} = \text{___} \quad [\text{m}] \longrightarrow D(\%MAC) = \frac{D - 0.013}{1.378} \cdot 100 = \text{___}$$

$$D = \frac{W_2 \cdot A - W_1 \cdot B}{W_e} = \text{___} \quad [\text{ft}] \longrightarrow D(\%MAC) = \frac{D - 0.043}{4.520} \cdot 100 = \text{___}$$

Empty weight moment $M = D \cdot W_e =$

[m · kg] or [ft · lbs]

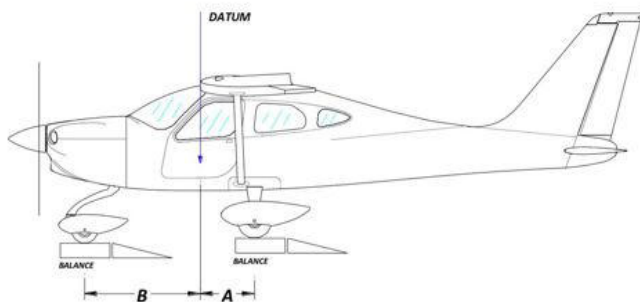
Maximum take-off weight	$W_{tr} =$	[kg] or [lbs]	Signature _____
Empty weight	$W_e =$	[kg] or [lbs]	
Max. useful load $W_{tr} - W_e$	$W_u =$	[kg] or [lbs]	

Figure 6-1 - Aircraft Weighing Record

2.6. Weighing Record (II)

Model **P2010TDI** 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 $\frac{(A_L + A_R)}{2}$	$A =$ _____
Plumb bob distance from nose wheel	$B =$ _____

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

$$D = \frac{W_2 \cdot A - W_1 \cdot B}{W_e} = \text{_____} \text{ [m]} \longrightarrow D(\%MAC) = \frac{D - 0.013}{1.378} \cdot 100 = \text{_____}$$

$$D = \frac{W_2 \cdot A - W_1 \cdot B}{W_e} = \text{_____} \text{ [ft]} \longrightarrow D(\%MAC) = \frac{D - 0.043}{4.520} \cdot 100 = \text{_____}$$

Empty weight moment $M = D \cdot W_e =$ _____ [m · kg] or [ft · lbs]

Maximum take-off weight	$W_T =$ _____	[kg] or [lbs]	Signature _____
Empty weight	$W_e =$ _____	[kg] or [lbs]	
Max. useful load $W_T - W_e$	$W_u =$ _____	[kg] or [lbs]	

Figure 6-2 - Aircraft Weighing Record

3. Weight and Balance determination for flight

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

In this subsection, the procedure to be used for the determination of aircraft weight and balance in flight is described. The weight and moment obtained must fall within the approved Weight-Moment Envelope (Figure 6-4). The procedure explained requires the use of:

- Aircraft Weighing Record (Figure 6-1/2)
- Weight and C.G. – Form (Table 6-1)
- Loading Diagram (Figure 6-3)
- Weight-Moment Envelope (Figure 6-4)

An example calculation is provided to help understand the method.

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

1. Read the most recent values of the Empty A/C weight and corresponding moment from the Aircraft Weighing Record (Figure 6-1/2) and write them in the Weight and C.G. – Form (Table 6-1)
2. Write the weight and moment of the pilot/co-pilot and occupant(s) in the Weight and C.G. – Form (Table 6-1). Calculate the moment as:
Moment = weight X arm where the arm is read in Table 6-1
Alternatively, the moment can be read from the Loading Diagram (Figure 6-3)
3. Sum the weights to obtain the zero fuel weight condition and write it in the Weight and C.G. – Form (Table 6-1). The zero fuel weight must not exceed its limit value provided in Section 2 and reported in Table 6-1.
4. Write weight and moment of the usable fuel in the Weight and C.G. – Form (Table 6-1). Determine the fuel moment using the procedure of step 2.
5. The total weight can be obtained summing zero fuel condition and usable fuel weights; the resulting moment is, instead, obtained summing all moments; report take-off condition (weight and moment) in the Weight and Balance C.G. – Form (Table 6-1)
6. To obtain the landing weight and moment, subtract from take-off condition values the weight and moment of the total fuel required. These values are reported in the Weight and Balance C.G. – Form (Table 6-1). Write the landing values Weight and Balance C.G. – Form (Table 6-1).
7. Locate on Weight-Moment Envelope (Figure 6-4) the points (weights and moment) corresponding to the take-off and landing conditions. If the points fall within the envelope, the loading condition meets the weight and balance requirements.

Table 6-1 - Weight and C.G. – Form

	W [kg] or (lb)	Arm [m] or (ft)	Moment (M) = W * Arm [kg*m] or (lb*ft)
Empty weight			
USEFUL LOAD			
Pilot		0.293 (0,96 ft)	
Co-Pilot		0.293 (0,96 ft)	
1 st Passenger		1.070 (3,51 ft)	
2 nd Passenger		1.070 (3,51 ft)	
Baggage		1.612 (5,29 ft)	
Usable fuel Fuel (liters) * ρ_{fuel} (0.8) [kg] Fuel (USg) * ρ_{fuel} (6.7) [lb]		0.625 (2,05 ft)	
Take-off condition $W_{TO} = \sum W$		$M_{TO} = \sum M$	
Fuel required Fuel (liters) * ρ_{fuel} (0.8) [kg] Fuel (USg) * ρ_{fuel} (6.7) [lb]		0.625 (2,05 ft)	
Landing condition $W_L = W_{TO} - W_{fuel_req}$		$M_L =$ $M_{TO} - M_{fuel_req}$	

Table 6-2 - Weight and C.G. – Example

	W [kg] or (lb)	Arm [m] or (ft)	Moment (M) = W * Arm [kg*m] or (lb*ft)
Empty weight	765 (1687 lb)	0.245 (0,80 ft)	187.4 (1350 lb*ft)
USEFUL LOAD			
Pilot	80 (176 lb)	0.293 (0,96 ft)	23.4 (169 lb*ft)
Co-Pilot	80 (176 lb)	0.293 (0,96 ft)	23.4 (169 lb*ft)
1 st Passenger	70 (154 lb)	1.070 (3,51 ft)	74.9 (541 lb*ft)
2 nd Passenger	70 (154 lb)	1.070 (3,51 ft)	74.9 (541 lb*ft)
Baggage	20 (44 lb)	1.612 (5,29 ft)	32.2 (233 lb*ft)
Usable fuel Fuel (liters) * ρ_{fuel} (0.8) [kg] Fuel (USg) * ρ_{fuel} (6.7) [lb]	94 lt*0,8 = 75 kg 24,7 USg*6,7 = 165 lb	0.625 (2,05 ft)	46.9 (338 lb*ft)
Take-off condition $W_{TO} = \sum W$	1160 (2557 lb)	$M_{TO} = \sum M$	463.1 (3341 lb*ft)
Fuel required Fuel (liters) * ρ_{fuel} (0.8) [kg] Fuel (USg) * ρ_{fuel} (6.7) [lb]	40 lt*0,8 = 32 kg 10,5 USg*6,7 = 71 lb	0.625 (2,05 ft)	20.0 (146 lb*ft)
Landing condition $W_L = W_{TO} - W_{fuel_req}$	1128 (2486 lb)	$M_L =$ $M_{TO} - M_{fuel_req}$	443.1 (3195 lb*ft)

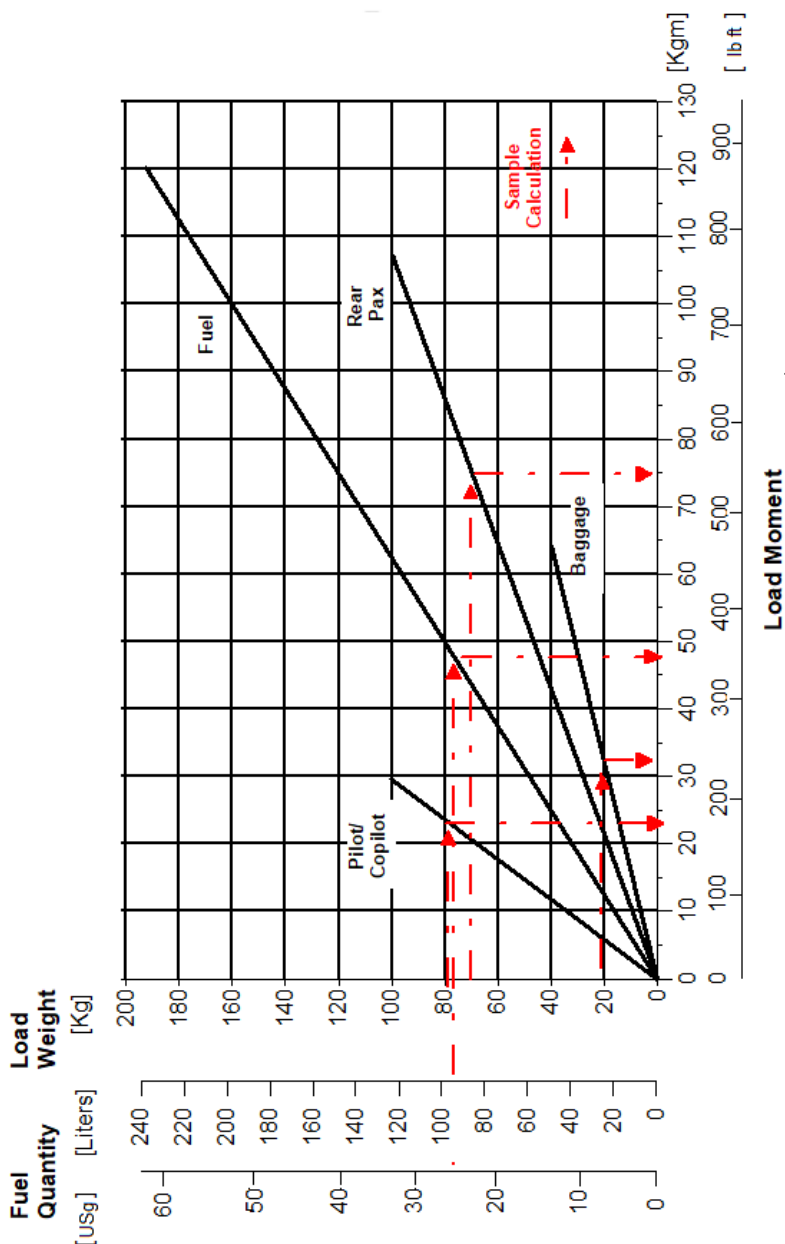


Figure 6-3 - Loading Diagram

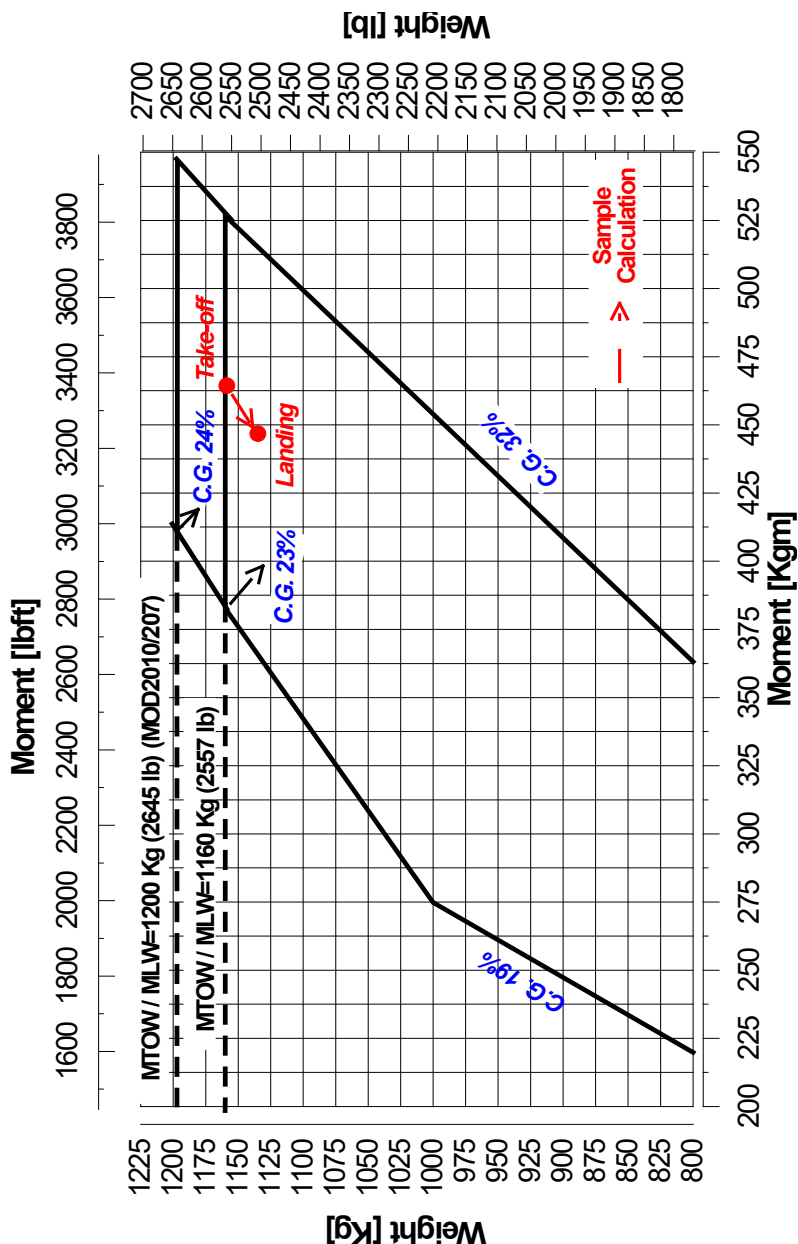


Figure 6-4 – Weight Moment Envelope

4. Baggage Loading

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

Pilot is provided with tie-down nets and snap fasteners allowing for securing the loads.



CAUTION

Loading the baggage, make sure that you correctly stretched the net which must be secured to the hooking points.

5. Equipment List

This paragraph contains a list of equipment which may be installed on TECNAM P2010tdi. The items that have been installed on the aircraft at the time of its registration are marked with an "X" in the column "As deliv.". It is an operator's responsibility made on the airplane. New installations shall be marked in the column "Inst./Rem." With a "I" before the date, while removals shall be marked with a "R".

Id	Description	Model/PN	Weight (each)		Arm		As deliv.	Inst. / Rem. (I/R) & Date
			[kg]	[lbs]	[m]	[ft]		
ATA 22 – Auto Flight								
22-10-1	Servo Pitch GSA 80	011-00877-20	1.44	3.17	5.3	17.4		
22-10-2	Servo Roll GSA 80	011-00877-20	1.44	3.17	2.05	6.73		
22-10-3	A/P Control Panel	GMC 707	0.28	0.62	-0.69	-2.26		
ATA 23 – Communications								
23-10-1	COM 1 Antenna	Comant CI-121	0.23	0.5	1.88	6.16		
23-10-2	COM 2 Antenna	Comant CI-292-2	0.23	0.5	2.85	9.35		
23-10-3	Marker Beacon Antenna	010-10175-00	0.23	0.5	1.88	6.16		
23-50-1	Audio Panel	Garmin GMA 1360	0.60	1.32	-0.69	-2.26		
ATA 24 – Electrical Power								
24-30-1	Main Battery	Gil G247 @24V	19	41.88	4.8	15.78		
24-30-2	FADEC backup battery	FIAMM FG20721 @12V	2.4	5.3	0.5	1.64		
24-30-3	FADEC backup battery	FIAMM FG20721 @12V	2.4	5.3	0.5	1.64		
24-30-4	Excitation battery	FIAMM FG20121 @12V	0.57	1.26	1.61	5.28		
24-30-5	Excitation battery	FIAMM FG20121 @12V	0.57	1.26	1.61	5.28		
ATA 25 - Equipment / Furnishing								
25-10-1	Pilot seat LH	210-10-5100-801	10	22	0.29	0.96		
25-10-2	Pilot seat RH	210-10-5200-801	10	22	0.29	0.96		
25-20-1	Passenger seat 1 st LH	210-10-5300-801	9	20	1.070	3.51		
25-20-2	Passenger seat 1 st RH	210-10-5400-801	9	20	1.070	3.51		
25-60-1	ELT System (Unit)	Kannad 406 AF	1.10	2.42	1.61	5.28		
		Kannad 406 Integra						
25-60-2	Fire extinguisher	A344T	1	2.2	-0.18	-0.59		
		A620T						
25-60-3	First aid kit	FIA270160	0.2	0.44	0.5	1.64		
ATA 27 – Flight Controls								
27-30-1	Servo pitch trim GSA 81	011-00878-20	1.03	2.27	5.3	17.4		
27-30-3	Flaps actuator	Sir AO-01/M 6110020	0.84	1.85	0.7	2.30		
27-30-4	Stall Warning	210-9-420-000	0.23	0.5	0	0		
ATA 28 – Fuel system								
28-40-1	Low Fuel q.ty sender – LH	Honeywell LLN8651721	0.020	0.044	0.5	1.64		
28-40-2	Low Fuel q.ty sender - RH	Honeywell LLN8651721	0.020	0.044	0.5	1.64		
28-40-3	Fuel q.ty sender – CIES – LH	CC284022-(1304)-(101)	0.29	0.64	0.5	1.64		
28-40-4	Fuel q.ty sender – CIES - RH	CC284022-(1304)-(101)	0.29	0.64	0.5	1.64		
28-40-5	Fuel tank temp.probe LH	TSP-1MAN40305MZ	0.030	0.066	0.5	1.64		
28-40-6	Fuel tank temp.probe RH	TSP-1MAN40305MZ	0.030	0.066	0.5	1.64		

Id	Description	Model/PN	Weight (each)		Arm		As deliv.	Inst. / Rem. (I/R) & Date
			[kg]	[lbs]	[m]	[ft]		
ATA 31 – Indicating / Reporting Systems								
31-20-1	Compass	C2400L4P or C2400L4P-SF	0.4	0.88	-0.69	-2.26		
31-40-1	COM/NAV/GPS Interface unit	Garmin GIA 64W	3.26	7.19	-0.69	-2.26		
31-60-1	MFD	GDU 1054	2.94	6.5	-0.69	-2.26		
		GDU 1050	2.94	6.5	-0.69	-2.26		
31-60-2	PFD	GDU 1050	2.94	6.5	-0.69	-2.26		
31-60-3	Standby Attitude and Air Data Computer	Mid-Continent MD302	0.73	1.61	-0.69	-2.26		
ATA 32 – Landing gear								
32-10-1	MLG Wheel Fairing	210-4-1020-001-L	1.5	3.3	Ref. to A distance in Weighing Record			
32-10-2	MLG Wheel Fairing	210-4-1020-001-R	1.5	3.3				
32-10-3	MLG Wheel	Goodyear 606C61B1	4.0	9				
32-10-4	MLG Wheel	Goodyear 606C61B1	4.0	9				
32-20-1	NLG Wheel Fairing	210-4-3001-401	1.2	2.6	Ref. to B distance in Weighing Record			
32-20-2	NLG Wheel	Goodyear 505C61-8	2.7	5				
ATA 33 – Lights								
33-40-1	Nav/Pos/Strobe Light– Ultragalactica Aveo	AVE-WPST (R/G)-54G	1	2.2	0.23	0.75		
	Nav/Pos/Strobe Light– Ultragalactica Aveo	Whelen OR6502RE Whelen OR6502GE	1	2.2	0.23	0.75		
33-40-2	Rudder Nav Light	AVE-POSW-(62 or 54)G or AVE-PSPSYW-T01	0.05	0.11	5.5	18.04		
33-40-3	Landing/Taxi Light – WHELEN Mod 7167400	01-0771674-00	2	4.4	-1.52	-4.99		
ATA 34 – Navigation Instruments								
34-10-2	ADC	Garmin GDC 72	0.73	1.6	-1.06	-3.47		
34-10-2	OAT Probe	Garmin GTP 59	0.6	0.8	0.94	3.08		
34-10-3	Pitot Probe	TECNAM 210-7-4550-401	0.35	0.77	0.5	1.64		
34-20-1	AHRS	Garmin GRS 79 unit	1.27	2.8	3.28	10.76		
34-20-2	Magnetometers	Garmin GMU 44B unit	0.16	0.35	3.28	10.76		
34-40-1	GPS 1 Antenna	Garmin GA 35 013-00235-00	0.21	0.47	0.65	2.13		
34-40-2	GPS 2 Antenna	Garmin GA 35 013-00235-00	0.21	0.47	0.65	2.13		
34-40-3	Stormscope Processor	L-3 Avionics 805-11500-001	1.13	2.50	1.61	5.28		
34-40-4	Stormscope Antenna	L-3 Avionics NY-163 800-10930-001	0.38	0.84	5.5	18.04		

Id	Description	Model/PN	Weight (each)		Arm		As deliv.	Inst. / Rem. (I/R) & Date
			[kg]	[lbs]	[m]	[ft]		
34-50-1	ADF System (Receiver Controller)	Becker Avionics RA 3502 0505.757-912	1	2.2	-0.69	-2.26		
		Becker Avionics RA 3502 (02) 0506.133-912						
34-50-2	ADF System (RMI Converter)	Becker Avionics AC 3504-01	0.5	1.10	-0.69	-2.26		
34-50-3	DME System (Antenna)	Bendix King KA61	0.41	0.9	-0.75	-2.46		
		Comant Industries C 105-16	0.41	0.9	-0.75	-2.46		
34-50-4	DME System (Unit)	Bendix King KN63 066-01070-0001	2	4.4	-0.69	-2.26		
34-50-5	Transponder	Garmin GTX 345 R	1.5	3.3	3.05	10.01		
34-50-6	Transponder (Antenna)	010-10160-00	0.41	0.9	-0.18	-0.59		
34-50-7	VOR/LOC/GS Antenna	Comant CI-158C	0.16	0.35	5.5	18.04		
34-50-8	ADF Antenna	AN 3500	1.7	3.75	1.45	4.75		
34-60-1	FMS	GCU 477	0.36	0.79	-0.69	-2.26		
ATA 35 – Oxygen System								
35-10-1	Mountain High	AL-180	1.42	3.13	0.450	1.47		
ATA 61 – Propellers								
77-00-01	Propellers	MTV-6-R/190-69	14	30.86	-2.12	-6.9		
ATA 77 – Engine indicating								
77-00-01	EIS	Garmin GEA 71B	2.3	5.1	-0.80	-2.62		



QUALITY AIRCRAFT SINCE 1948

TECNAM

SECTION 7

AIRFRAME AND SYSTEM DESCRIPTION

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1. INTRODUCTION

This section provides description and operation of the its system

2. AIRFRAME

P2010tdi's airframe can be divided in the following main groups:

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

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 P2010tdi 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.

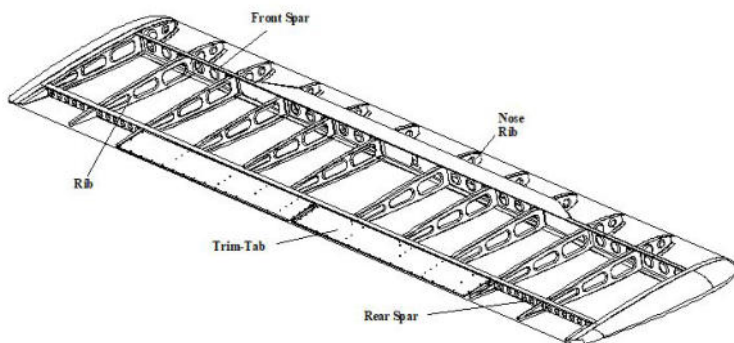


Figure 7-1 - Stabilator Structure

2.3.2. 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.

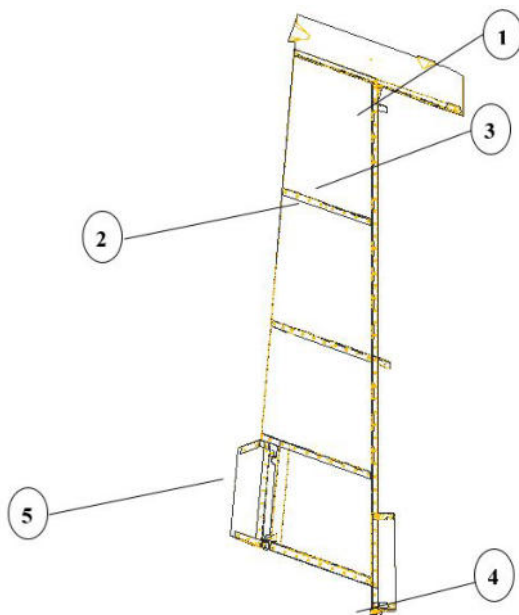


Figure 7-2 - Rudder Structure

2.4. MAIN LANDING GEAR

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

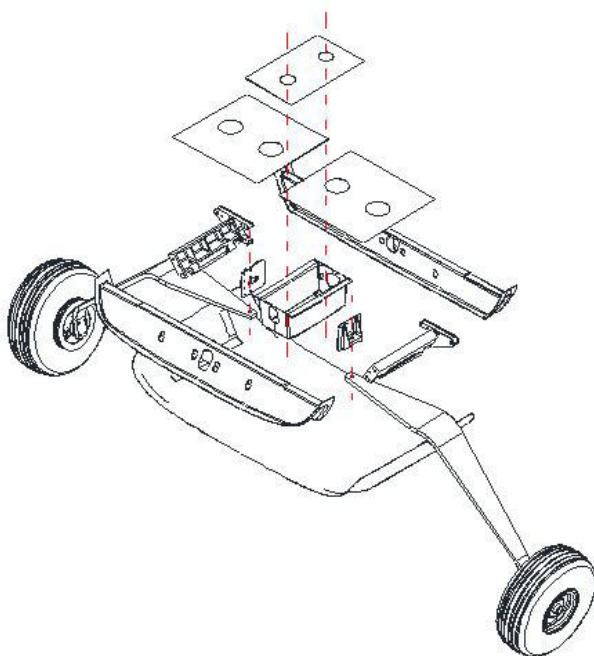


Figure 7-3 - Main Landing Gear Structure

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 brakes. Main gear wheels install type 6.00-6 tyres.

P2010tdi 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.

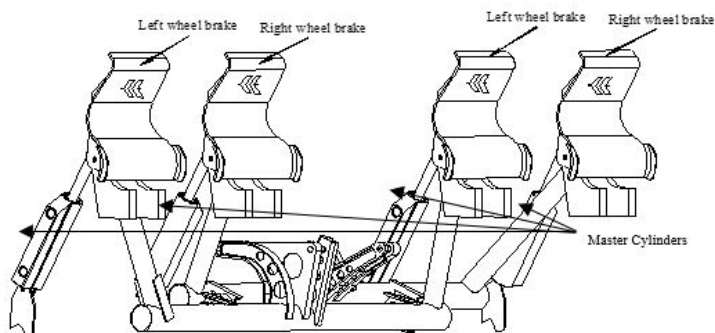


Figure 7-4 - Rudder Pedals and Brake Master Cylinders (Pilot and Co-pilot Side)

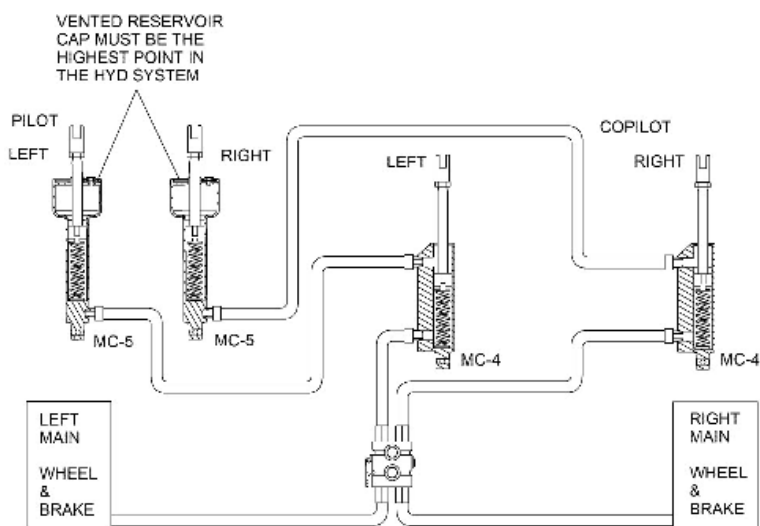


Figure 7-5 - Brake System Schematic

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.

The nose landing gear is composed by:

1. Hydraulic shock absorber
2. Firewall
3. Nose wheel

3. FLIGHT CONTROLS

Aircraft flight controls are operated through control wheel 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 aileron trailing edge.

Flaps are extended via an electric servo actuator controlled by a switch on the instrument panel. Flaps act in discrete 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 indicator included in the Garmin G1000 Nxi.

Rudder Trimming device for directional 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 Nxi phase III, Figure 7-6.



Figure 7-6 - Flight Control Windows

4. INSTRUMENT PANEL

The instrument panel is divided in three areas:

- The left area holds Garmin G1000 Nxi phase III PFD, FADEC test button, Engine Starter and FADEC switches;
- The Central area holds the standby unit MD 302 suite, audio panel and the ELT button;
- The right area holds Garmin G1000 Nxi phase III MFD and breaker panel;
- The lower-LH portion of the instrument panel holds:
 - Starter;
 - Master and Generator switches;
 - Electric fuel pump;
 - Avionic Master switch;
- The lower-central portion of the instrument panel holds:
 - Autopilot Master;
 - Trim disconnect;
 - Pitot Heat;
 - Strobe Light;
 - Navigation Light;
 - Taxi Light;
 - Landing Light;
 - Defrost and Cabin Heat Control;
 - Instrument and Panel Dimmer;
 - Day/Night switch;
 - Emergency Light;
 - Flap Control
 - Fuel selector valve;
 - Thrust Lever;
- The lower-RH portion of the instrument panel holds:
 - Pocket;
- The higher-central portion of the instrument panel holds:
 - Magnetic compass;



Figure 7-7 - Instrument Panel

4.1. ENGINE CONTROL LEVER

Engine handling is via one lever: Thrust Lever.

It is situated on the centre control and it is used to control power and RPM.

The lever is linked to FADEC unit; depending on the backward or advanced position, the FADEC unit sends input to the motor for automatic adjustment.

4.2. ALTERNATE AIR

The engine air intake system consists of an air filter housing, air filter and alternate valve. The alternate air valve has an opening door oriented in the into engine compartment.

The alternate air door is usually magnetically closed and sealed and is opened automatically by means the differential pressure (depression) depression that is created when the filter is blocked by ice. When the alternate door is open, a yellow light comes on to provide a feedback to the pilot.

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.

Starting from this condition, if the cabin heat control knob is fully outward, it allows cabin to receive maximum hot air*

For aircraft embodying MOD2010/257 the two knobs are replaced by a single rotating knob with which is possible to regulate the intensity of hot air, indeed is not provided a mechanism for the partition of air between defrost and cabin heat.

This knob is installed on instrument panel.

4.4. FADEC

The Full Authority Digital Engine Control (herein after FADEC) is a system consisting of two redundant ECU's (FADEC A and FADEC B), and its related accessories that control all aspects of aircraft engine performance. FADEC works by receiving multiple input variables of the current flight condition including air density, throttle lever position, engine temperatures, engine pressures, and many other parameters. The inputs are received by the ECU and analysed several times per second. Engine operating parameters such as fuel flow, fuel pressure, and others are computed from this data and applied as appropriate. FADEC also controls engine starting and restarting. The FADEC's basic purpose is to provide optimum engine efficiency for a given flight condition.

FADEC not only provides for efficient engine operation, it also allows the manufacturer to program engine limitations and receive engine health and maintenance reports. For example, to avoid exceeding a certain engine temperature, the FADEC can be programmed to automatically take the necessary measures without pilot intervention. Nevertheless, the FADEC cannot compensate engine temperature exceedances due to engine failures or not of respecting operating limitations.

The FADEC is activated by Engine Master switch and it is powered by means of main battery. A dedicated back-up battery is installed to provide power to FADEC A in case of main battery failure.

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 alloy 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

P2010tdi 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.

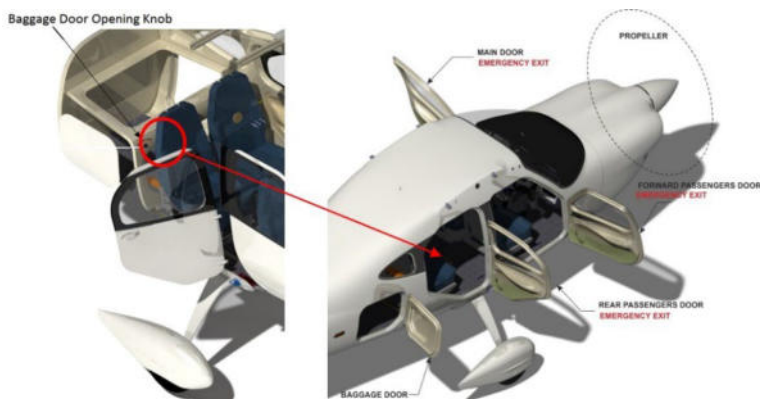


Figure 7-8 - Doors and Baggage Door Opening

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.



Figure 7-9 - 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.



Figure 7-10 - Emergency Opening

7. POWERPLANT

7.1. ENGINE

The CD-170 is an engine build by:

Continental Aerospace
Technologies GMBH
Platanenstr. 14
09356 St. Egidien
Germany

The CD-170 (TAE 125 series) is a liquid-cooled 4-cylinder in-line four-stroke diesel engine with DOHC (double overhead camshaft).

The valves are actuated by a cam follower. The operation of the direct diesel injection engine is based on the common-rail technique and is turbo charged. The engine is controlled by a FADEC system and is equipped with an electric starter and one alternator and optional auxiliary drive.

The propeller is driven via an integrated gearbox with a clutch/dual mass flywheel.

The engine is capable to operating with JET A1 (ASTM 1655) or Diesel (EN590).

The engine installation includes a heat exchanger, which is part of liquid coolant system and is located at the lower front section of the engine compartment.

The engine installation has an additional oil/water heat exchanger for cooling the gear box oil. The heat exchanger for cabin heat is installed in line with the unregulated exit of the cooling system thermostat.

7.2. PROPELLER

The engine is equipped with a MT propeller MTV-6-R/190-69 manufactured. It is a three blade constant speed variable pitch propeller. Blades are made of laminated wood composite structure. Epoxy fiberglass covers the entire blade surface and it is painted with acryl lacquer. The outer portion is protected against erosion by a bounded on stainless steel erosion sheath.

The inner portion of the blade is protected by a self-adhesive PU strip. Propeller hub is made in aluminium alloy.

The propeller spinner installed is build and furnished by MT-Propeller.

The spinner dome is a one-piece part made from fiber reinforced composite or spin-formed aluminium alloy. The bulkhead is spin-formed or truncated aluminium alloy.

The front support is part of the hub. Filler plates increase the stiffness of the dome on the cut-outs for the blades. The dome is mounted on the supports by means of screws.

Once an engine rotational speed is selected it will be held constant at variations of airspeed and power. Mechanical stops for low pitch and high pitch limit the pitch change travel. In case of the oil pressure of the governor is lost, the blades return automatically to low pitch enabling the pilot to continue the flight.

The propeller control system uses a gearbox oil to function.

The prop-pitch control system is integrated into FADEC. The propeller has a CSU (a constant speed unit), it is a FADEC-controlled single acting propeller governor produced by Continental Motors, for hydraulically variable pitch propellers with and without feathering. The CSU is installed on the front side of gearbox.

The constant speed unit regulates oil pressure to the propeller to regulate pitch and thereby control the prop speed. Gearbox oil is supplied from the gearbox oil pump (combi pump/single stage pump) to a micro filter. After the micro filter, oil pressure is regulated to 20 bar by a pressure relief valve. From here, oil pressure is supplied to the electronic prop control valve (PRV). Based on various target values and input conditions, the FADEC provides a control signal to the pulse width controlled prop valve to regulate oil pressure and respectively prop speed. The valve increases oil pressure to increase propeller pitch angle, while the blade pitching moment and a servo spring inside the propeller hub reduce blade pitch. In case of a CSU failure the propeller blades will return to fine pitch.

7.3. GEARBOX OIL SYSTEM

The gearbox oil system is a wet oil sump system. Gearbox oil is used for lubrication and cooling of the gearbox and for operation of the propeller regulation by the Constant Speed Unit. The bearings of the gearbox are lubricated without pressure, the gear wheels convey the oil and leak oil from the propeller regulation is used. The oil pump sucks oil from the sump and leads it to the micro filter within the single stage pump, then to the pressure relief valve and thereafter to the regulation valve. The oil is then reaching the piston of the propeller which is changing the blade pitch according to the value given by the FADEC. The oil temperature is measured at the propeller-shaft, leak oil of the propeller-regulation lubricates the bearings and returns to the sump.

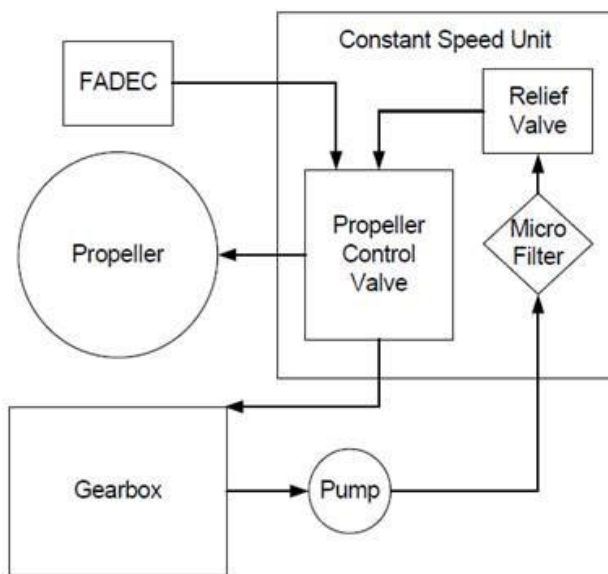


Figure 7-11 - Gearbox scheme

8. FUEL SYSTEM

The P2010tdi fuel system provides to the following function: fuel storage, fuel distribution and fuel indicating, Figure 7-12.

Fuel system and relative components are designed in accordance to Continental motors specification and requirements.

It is designed to ensure a fuel flow at a rate and pressure established for proper engine functioning under any normal operating condition required by Continental Operation and Installation Manual.

The fuel system consists of two fuel tanks integrated in the wing box and having a capacity of 120 lt (31.7 USG) for a total capacity of 240 lt (63.4 USG).

Internal side of fuel tank is accessible for inspection through dedicated fuel tank inspection doors.

The mainly component of the fuel system are:

- Suction pipe: it is the first fuel filter (in the fuel tank sump);
- Gascolator filter: it is installed between the fuel tank outlet and the emergency electric pump. It is positioned in the lowest point of the engine and the fuel system, this allows to obtain a complete drainage of any water debris and of the fuel, if needed.
- Fuel pumps: Main pump (high and low pressure) and Electric fuel pump to feed the engine and designed to ensure a flow of fuel at a rate and pressure established for proper engine functioning under any normal operating condition.

Main pump (high + low pressure pumps) is independent from engine power supply because is a mechanical item driven by the engine crankshaft and allow to feed the engine in all operating conditions.

The electrical fuel pump supports the fuel flow to the filter module, if needed. Is used only when it is necessary to refill the fuel line in case of maintenance but don't have any impact on the operations on ground and in flight.

Gascolator and electric fuel pump are duly protected by stainless steel shields.

So starting from the tank the fuel passes first through the suction pipe, gascolator and electric pump, before to enter in the engine.

The CD-170 engine is fed by means of an engine-electrical driven mechanical pump (fuel feed pump more high pressure pump) provided by Continental and integrated in the housing of the engine.

A multi position fuel selector is located on the top side of the central console, Figure 7-13, just below the instrument panel and it is easily accessible from pilot and co-pilot. Two capacitive type fuel quantity senders are installed in each tank and provide the fuel indication on the A/C cockpit.

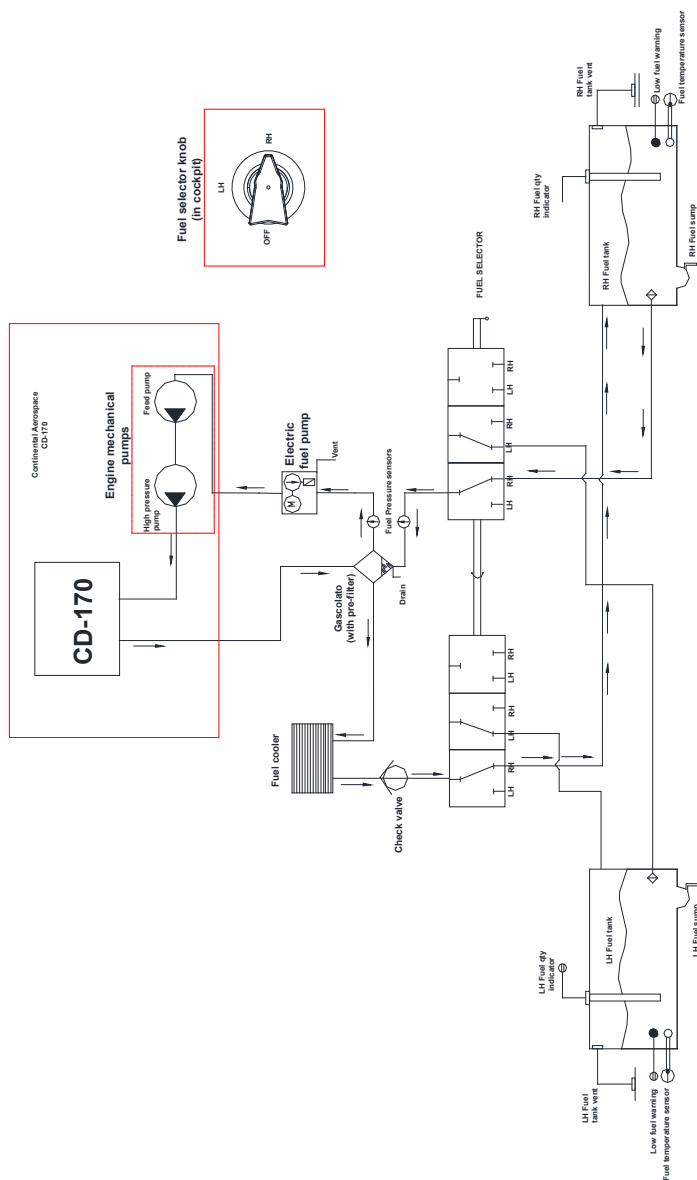


Figure 7-12 - Fuel System

A thermostat switch in the filter module controls the heat exchange between the fuel feed and return. In the CD-170 engine surplus fuel flows to the fuel cooler, flows to the filter module and then through the fuel selector valve back into the selected tank.



Figure 7-13 - Fuel selector valve control location

The fuel approved and tested by Tecnam for feeding the CD-170 engine are Jet A-1 or Diesel EN590.

9. ELECTRICAL SYSTEM

The electric system installed on P2010tdi A/C is based on 28VDC voltage. The primary electrical power source is provided by engine driven alternator rated of 70 Amps, the secondary is the MAIN battery. To improve the safety of aircraft systems are used two battery systems (2x Fadedc backup and 2x excitation voltage), as shown in Figure 7-14.

In the Table 7-1 is shown the battery specification.

Table 7-1 - Battery Specification

Item	Description	Output Voltage	Output Current	Q.ty
Main Battery	Gil G247	24V	19Ah	1
FADEC Backup Battery	FIAMM FG20721	12V	7.2Ah	2
Excitation battery system	FIAMM FG20121	12V	1,2Ah	2

The FADEC A Backup Batteries connected in series to obtain 24V.

The Main battery installed is a lead type 12 cells battery.

The MAIN battery is used to start the engine and to power the units when the P2010TDI A/C is on the ground while the engine and therefore the alternator are switched off.

The Fadedc A Backup battery has the role to prevent engine shut down in case of sudden failure of the alternator, so the FADEC power supply is still provided by the Backup battery and the Main battery. In normal condition, the Backup battery is recharged by the Alternator. In case of failure of Main battery, the pilot is able to continue to fly safely, switching off the "MASTER" switch, Figure 7-15.

The main battery supply power to the aircraft for at least 30 minutes in case of alternator failure. The backup of FADEC A is provided by means of two batteries connected in series that provide power to FADEC A for about additionally 60 minutes in case of alternator failure and main battery discharge.

When engine is running above 1000 rpm the alternator supply the power required in order to recharge the batteries and the electrical loads.

The alternator is Continental Aerospace Technologies GmbH belt-driven alternator (05-7150-E001901) rated of 24VDC/70 Amps output. Since the installed alternator model is not internally regulated, the output of alternator is connected to an external voltage regulator which provides a 28Volt DC output. The voltage regulator is also capable of detecting overvoltage, reverse current, low voltage, field short conditions automatically disconnecting the alternator should such an event occur.

The electric system is composed of three distribution busses:

- Essential bus;
- Main bus;
- Avionic bus.

A dedicated switch, named Avionic Master Switch, allow the selection of active/inactive Avionic bus, Figure 7-15.

The electrical loads are connected to the buses through dedicated circuit breakers. Switches are installed in order to allow the pilot the control of loads, where required. Essential bus is fed from 2 points and includes electrical loads required for continued safe flight and landing.

A/C power is based upon 2 independent energy sources, one alternator and one battery (Main Battery). Each source has a dedicated switch.

The power sources are able to run independently or together without any pilot action required.

The switches to enable and disable alternator and Main battery are grouped in the master switches group and are located lower in the left side of cockpit, Figure 7-15.

The failure of one of the energy sources will not affect the operation of alternate energy sources.

The switch between the energy sources is automatic and no action is required in order to activate the alternate energy source. Since each instrument using a power source is connected to a dedicated circuit breaker, the failure of an instrument will not interfere with the proper supply of energy to the other instruments.

One 70 Amps breaker for the battery, one 80 Amps breaker for the alternator and two 35 Amps breaker, one for essential battery and one for essential alternator, are installed.

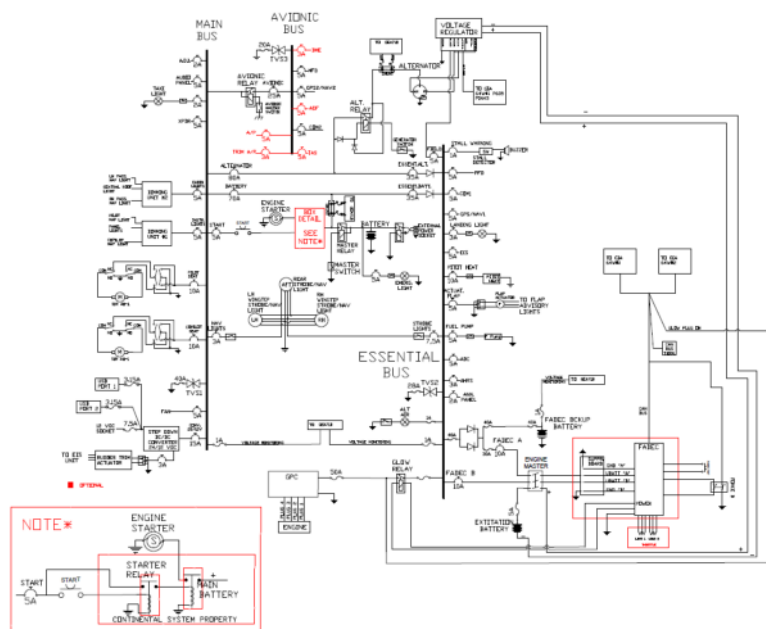


Figure 7-14 - Electric System

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. MASTER SWITCH ARRANGEMENT

The master switches group is located in the lower left area.

The “Master” switch is put in the ON position it enables the master relay and connects the battery to the bus Bar.

The switch named “Generator”, located near “Fuel Pump” switch, Figure 7-15, enables the Alternator relay and control the alternator field signal which enables the alternator by providing it the field current.

The switch named “Avionic Master”, located near master switch, enables the Avionic relay and when put in ON position, enable the dedicated circuit breakers and connect the main bus bar to the Avionic Bar.



Figure 7-15 - Electrical Main Switches

9.3. EXTERNAL POWER SUPPLY

An external power socket, Military Standard P/N MS3506-1 provided by Adams Aviation, is installed in order to allow engine starting and the possibility of feeding electric system during ground operations without depleting the batteries. The external power plug is made in such a way that the polarity cannot be inadvertently reversed and is located near Main Battery. The External socket is connected to Electrical system by mean a dedicated relay controlled by External Voltage



Figure 7-16 - External power Receptacle



*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. Master, Generator and Engine master 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.

9.4. IGNITION CONTROL PANEL

In the P2010tdi A/C there is a Fadec Unit (Full Authority Digital Engine) located in the central pedestal under Thrust Lever compartment; this Fadec unit is enabled by means of "Engine Master" switch located in the upper left side of cockpit panel.

The "Engine Master" switch connects the Fadec to the dedicated battery (Fadec Backup Battery) and to General Electric System of P2010tdi A/C.

The Fadec Unit is connected to a GPC unit (GLOW Plug Control); the GPC unit is linked to electrical system of A/C by mean of dedicated relay controlled by Fadec.

The GPC unit is located near engine and the related relay of control is located near firewall in the engine compartment lower left side pilot view.

This GPC, controlled by Fadec unit, allows heating the glow plugs inside every cylinder of the engine to extremely high temperatures. The high temperature ensures that the fuel burns efficiently, with the lowest possible amount of emissions.

The lower and upper left side of the cockpit panel, see Figure 18, the following switches are installed:

1. "Start" push-button
2. "FADEC" switch,
3. "Engine Master" switch,
4. Electric "FUEL PUMP" switch,
5. FADEC Test push button.

As shown in the below image the "Engine Master" and "Fadec" switches are guarded ones and are located in such a way that they cannot be inadvertently operated by the pilot. Particularly the switches are un-guarded when the Glow Plug, Fadec unit and Voltage regulator are disabled (engine stopped) and are guarded when engine is running.



Figure 17 - Engine start and Fadec Control Switches

10. AVIONIC SYSTEM

P2010tdi avionic suite is based on G1000 Nxi. Garmin G1000 Nxi suite is an integrated flight deck whose modular layout allows to extend it in order to add new features. It provides the pilot with primary flight information, presenting navigation moving map and engine parameters.

A block diagram of the suite is given in Figure 7-18, this diagram provides a description of the system architecture and information about the data-buses used.

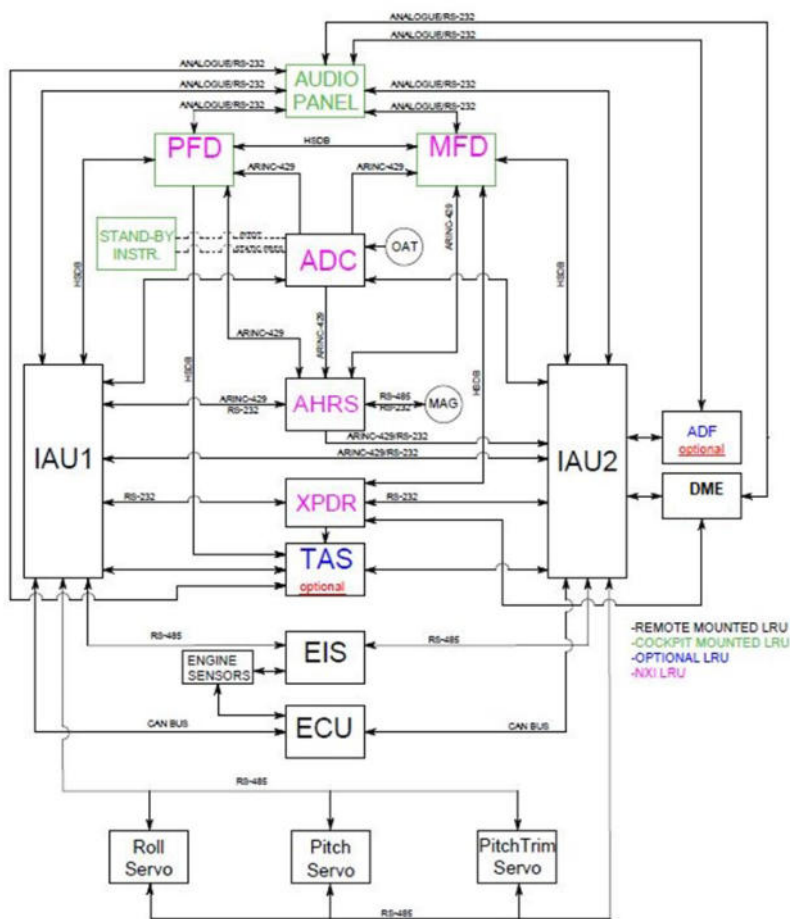


Figure 7-18 – P2010tdi, Avionic Block diagram

The installed configuration is based on a two-screens 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).

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.

The avionic system installed is based on the following configuration:

Table 7-2 – Garmin LRUs

LRU Model	Description	Type	Qty.
GDU 1050	Display unit (PFD)	Panel Mount	1
GDU 1054	Display unit (MFD)	Panel Mount	1
GIA 64W	COM/NAV/GPS Interface unit	Remote	2
GRS 79	AHRS	Remote	1
GDC 72	ADC	Remote	1
GEA 71B	EIS unit	Remote	1
GMU 44B	Magnetometer	Remote	1
GTP 59	OAT Probe	Remote	1
GMA 1360	Full digital audio panel	Panel Mount	1
GTX 345R	MODE-S/ADSB-OUT/ADSB-IN-FIS-B XPDR	Remote	1

Table 7-3 – Other LRUs

LRU Model	Description	Type	Qty.
MD-302	Stand-by instrument	Panel Mount	1
ELT	Emergency Locator transmitter	Remote	1

Additional items that may be installed as optional equipment at customer request are listed in table below.

Table 7-4 – Optional equipment

LRU Model	Description	Type	Qty.
KN 63	DME	Remote	1
RA-3502/AC-3504	ADF System	Remote	1
GTS 800	TAS unit	Remote	1
Flight Stream 510 Wireless Avionics Interface	Wireless Database Transfer	-	1

Cockpit layout is shown in Figure 7-19. Garmin LRUs other than the screens and audio panel are housed in dedicated racks, provided by the avionics manufacturer and installed behind the PFD and MFD screens. GMU 44B and GRS 79, instead, are located in the fuselage tail cone.



Figure 7-19 – Cockpit layout

CD-170 is controlled by a Full Authority Digital Engine Control system (FADEC). System redundancy and integrity were considered in order to provide connection layout between FADEC unit and the G1000 NXi, as shown in Figure 7-18. The ECU is in fact tied, via CAN bus, to Garmin IAU #1 and #2.

10.1. GARMIN G1000NXi AVIONICS SUITE

Below in this paragraph, all of the Garmin avionics equipment installed on the *P2010tdi* will be individually described.

10.1.1. GDU 1050/GDU 1054 (PFD/MFD)

GDU 1050/1054 units display flight and engine parameters and moving map information and act as the user interface for *P2010tdi* avionics suite. GDU 1050 units placed on instrument panel LH side are identified as Primary Flight Display (PFD), while GDU 1054 placed on instrument panel RH side are identified as Multifunction Display (MFD).

For MOD2010/252, the MFD unit GDU1054 is replaced by GDU1050.

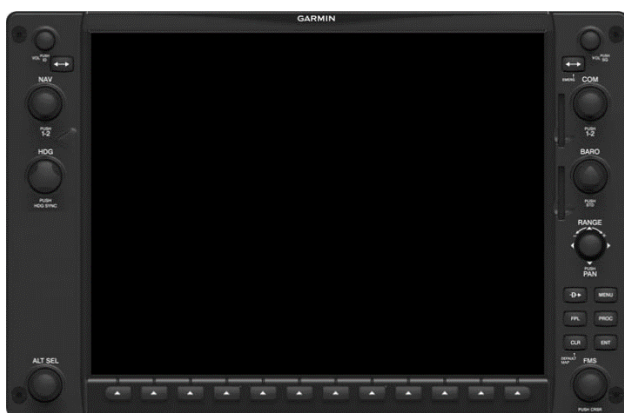


Figure 7-20 – GDU 1050 (PFD/MFD(MOD2010/252))



Figure 7-21 – GDU 1054 (MFD)

This feature provides the pilot with an automatic dimming of both display and keys in accordance with the lighting conditions sensed by the two external light sensors positioned in the upper right and lower left corners of each display. Furthermore, the pilot can easily access a manual dimming mode for both displays and keys.

In the event of a single display failure, the system will 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 force the reversionary mode by pressing the dedicated reversionary mode button close to PFD thus getting both flight and engine parameters information, necessary for continued safe flight, on the remaining display.

GDU 1050 provides the interface for NAV and COM information, displaying the functions listed further:

1. Flight instruments functions

- (a) Display of attitude (pitch and roll) rate of turn, slip/skid, directional, airspeed, altitude and vertical speed (PFD function); display of Outside Air Temperature, annunciator panel, navigation functions transponder management;
- (b) Display of engine and airframe instrumentation (MFD or reversionary modes only).

2. Navigation instruments functions

- (a) Display of position and ground speed;
- (b) HSI, Selected Heading and Selected Course (PFD);
- (c) Area Navigation functions;
- (d) Baro-altitude Vertical Navigation.

3. Interface functions

- (a) Interface with GIA 64W Integrated Avionics Unit (IAU);
- (b) Control and operations of two independent communication systems that operate on frequencies from 118,00MHz to 136,975MHz through increments of 8,33kHz or 25kHz;
- (c) Control and operations of two independent navigation systems VOR/ILS that operate on frequencies from 108,00MHz to 117,95MHz through increments of 50kHz or 25kHz;
- (d) Control and display of GTX 345R transponder;

GDU 1054 provides the following functions:

- 1. Flight instruments functions (Reversionary mode only)**
 - (a) Display of attitude (pitch and roll) rate of turn, slip/skid, directional, airspeed, altitude and vertical speed; display of Outside Air Temperature, annunciator panel, navigation functions transponder management
 - (b) Display of engine and airframe instrumentation (normal and reversionary modes only)
- 2. Navigation instruments functions (Reversionary mode only)**
 - (a) Display of position and ground speed
 - (b) HSI, Selected Heading and Selected Course
 - (c) Display of ADF and DME information
 - (d) Area Navigation functions
 - (e) Baro-altitude Vertical Navigation
- 3. Interface functions**
 - (a) Interface with GIA Integrated Avionics Unit (IAU) and with second GDU unit
 - (b) Control and operations of double communication that operate on frequencies from 118,00MHz to 136,975MHz through increments of 8,33kHz or 25kHz
 - (c) Control and operations of double navigation VOR/ILS that operate on frequencies from 108,00MHz to 117,95MHz through increments of 50kHz or 25kHz
 - (d) Control and display of GTX transponder
 - (e) Control of remote DME
 - (f) Control of remote ADF
- 4. Autopilot Control Panel**

The GDU 1054 (GMC707 for MOD2010/252) includes a set of additional soft-keys dedicated to the control of Autopilot system. For details and additional information on Autopilot Control System refer to §11 and Supplement S08 (if applicable).

10.1.2. GMA 1360 (AUDIO PANEL)

The Garmin GMA1360 is a vertically oriented panel mounted audio control and marker beacon system. The system delivers reliability and versatility for all audio controlling functions. LED-illuminated push-buttons and logical panel layout allow audio selection of NAV, COM, DME, ADF, MKR, TEL, AUX and automatic warning audio in voice or tone annunciation. LED brightness is adjusted to a level appropriate for ambient cockpit light conditions automatically by the GDU or manually with radio lighting controls, depending upon installation connections. A failsafe circuit connects the pilot's headset and microphone directly to COM 1 in case power is interrupted or the unit is turned off.

The GMA1360 includes a six-position intercom system (ICS) with electronic cabin noise de-emphasis, two stereo music inputs, and combined pilot, co-pilot, and passenger volume controls. The intercom provides four selectable modes of isolation (All, Crew, Pilot, Co-pilot). A pilot-selectable cabin speaker output can be used to listen to the selected aircraft radios or to broadcast PA announcements. The PA function is pilot selectable. The GMA 1360 includes Bluetooth® technology, used to wirelessly connect smartphones and tablets to stream audio and make phone calls.



Figure 22 - GMA 1360

10.1.3. GIA 64W (IAU INTEGRATED AVIONICS UNIT)

GIA 64W unit is a microprocessor-based unit linked to GDU 1050 via Ethernet High speed Data Bus (HSDB).

P2010tdi is equipped with two GIA 64W units, each one connected to a GDU 1050 unit through a HSDB link.

Each GIA 64W is interfaced with the following antennas:

- GPS antenna;
- COM antenna;
- NAV (VOR/ILS) antenna.

10.1.4. GDC 72 (AIR DATA COMPUTER)

GDC 72 unit is an Air Data Computer; it receives and processes air data and allows to display it on instrument panel displays, whom are connected with through ARINC 429 data bus.

GDC 72 unit is able to sense the following flight information:

- Aircraft Altitude and Airspeed
- Aircraft Vertical Speed, Mach, and Air Temperature
- Density Altitude
- Pressure Altitude
- Indicated Airspeed
- True Airspeed

The air data computer static port is connected to the primary and alternate static ports. The GDC 72 also provides the operating current to the GTP 59 OAT Probe.

10.1.5. GTP 59 (TEMPERATURE PROBE)

The Garmin GTP 59 is an outside mounted temperature probe that provides raw air temperature data.

One GTP are installed, interfaced with the GDC 72, and provide them with temperature data in order to allow the evaluation of temperature influenced air data parameters.

10.1.6. GRS 79/GMU 44B (AHRS/MAGNETOMETER)

GRS79 AHRS (Attitude and Heading Reference System) and GMU 44B units are remote devices that provide the aircraft with attitude and heading reference system.

GRS 79 provides the following information using ARINC 429 data-bus:

- Aircraft heading, pitch and roll
- Aircraft yaw, pitch and roll rates
- Aircraft body-axis accelerations
- Rates of change of heading, pitch and roll
- Aircraft accelerations expressed in a local level frame of reference

GMU 44B provides magnetic information to support GRS 79 functions. The following list shows the GRS 79 Interfaces used to connect the GMU 44:

- Magnetometer Power
- RS-232 (OUT)
- RS-422 (IN)

10.1.7. GTX 345R (TRANSPONDER)

GTX 345R is rack mounted MODE C and S transponder that operates on radar frequencies receiving ground radar or TCAS interrogations at 1030 MHz and transmitting a coded response of pulses to ground-based radar on a frequency of 1090 MHz.

The GTX 345R replies to Mode A, Mode C and Mode S interrogation. Mode A replies consist of framing pulses and any one of 4096 codes, which differ in the position and number of pulses transmitted. Mode C replies include framing pulses and encoded altitude.

GTX 345R is equipped with IDENT capability.

GTX 345R includes the ADS-B IN/OUT enhanced capabilities.

10.1.8. GEA 71B (ENGINE/AIRFRAME INTERFACE)

The GEA 71B is a microprocessor based input/output Line Replaceable Unit (LRU) used to monitor sensor inputs and drive annunciator outputs for aircraft engine systems. It interfaces with all engine sensors on the aircraft and communicates engine information via RS-485 digital interface to both GIA 64W Integrated Avionics Units. The GIAs then interface with the GDU Primary Flight Display (PFD) and Multi-Function Display (MFD). The MFD shows engine instrumentation while the PFD shows airframe alerts provided by the GEA 71B.

Engine instrumentation is also displayed on the PFD and/or MFD while the system is in reversionary mode.

10.1.9. MD 302 STAND-BY INSTRUMENT

MD302 is a Stand-by Attitude Module installed in order to provide the pilot with flight information in case of failure of the PFD and MFD. It is a digital instrument featuring airspeed, altitude, attitude and slip information.

The display has automatic dimming adjustment in order to have proper visibility in all operative conditions.



Figure 7-23 - MD-302 (Stand-by Instrument)

The design is built around a solid-state electronic sensor array for high reliability and contains an integral and rechargeable Nanophosphate® lithium-ion battery that can power the unit for up to one hour in the event of complete loss of main 14 VDC battery bus power. The dual, high-resolution LCD display uses a configurable lighting response curve to ensure visibility in all conditions. The user interface of the MD302 allows operation using a single push-and-turn control knob that easily navigates through the user options and menu screens.

**10.1.10. FLIGHT STREAM 510 WIRELESS AVIONICS INTERFACE
(MOD2010/206)**

The Flight Stream 510 Wireless Avionics Interface allows the connection of a compatible mobile electronic device to the avionics. The Flight Stream 510 utilizes a Bluetooth connection for pairing up to 4 devices as well as a WI-FI connection for wireless database transfer. The Flight Stream 510 is mounted in the bottom MFD card slot.

NOTE

AHRS information transmitted by Flight Stream 510 is not to be used as a primary source of aircraft attitude information.

Data output from the Flight Stream 510 can be used to provide additional situational awareness for the pilot and passengers. Flight plans can be transferred between compatible mobile devices.

Power for Flight Stream 510 operation is supplied through the MFD which is powered by the MFD circuit breaker on the Avionic Bus.

For a complete description of the Flight Stream 510 system, its operating modes, and additional detailed operating procedures, refer to the Garmin Pilot's Guide.

11. AUTOPILOT SYSTEM

P2010tdi 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 G1000Nxi 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 1054.

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 P2010tdi and its interconnections with the autopilot servos:

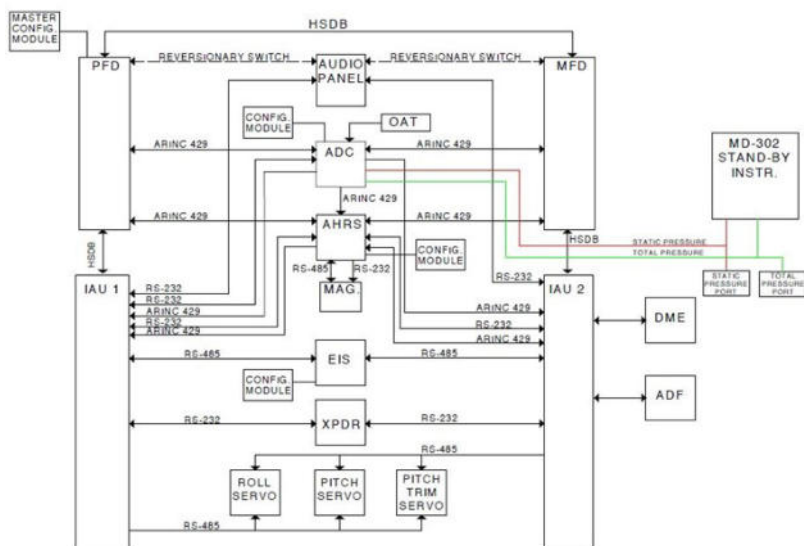


Figure 7-24 – Avionic Scheme with Auto-pilot

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 G1000Nx avionics suite in order to compute the manoeuvres to be performed by the aeroplane and actuate them.

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 “auto-trim” 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.

11.1. AUTOPILOT CONTROL PANEL

The GDU1054 includes a set of additional soft-keys dedicated to the control of Autopilot system.

The following dedicated AFCS keys are located on the bezel of the MFD (refer picture below):

- 1) **AP Key:** Engages/ disengages the autopilot
- 2) **FD Key:** Activates/deactivates the flight director only
- 3) **NAV Key:** Selects/deselects Navigation Mode
- 4) **ALT Key:** Selects/deselects Altitude Hold Mode
- 5) **VS Key:** Selects/deselects Vertical Speed Mode
- 6) **FLC Key:** Selects/deselects Flight Level Change Mode
- 7) **HDG Key:** Selects/deselects Heading Select Mode
- 8) **APR Key:** Selects/deselects Approach Mode
- 9) **VNV Key:** Selects/deselects Vertical Path Tracking Mode for Vertical Navigation flight control
- 10) **NOSE UP/ NOSE DN Keys:** Control the mode reference in Pitch Hold, Vertical Speed and Flight Level Change modes

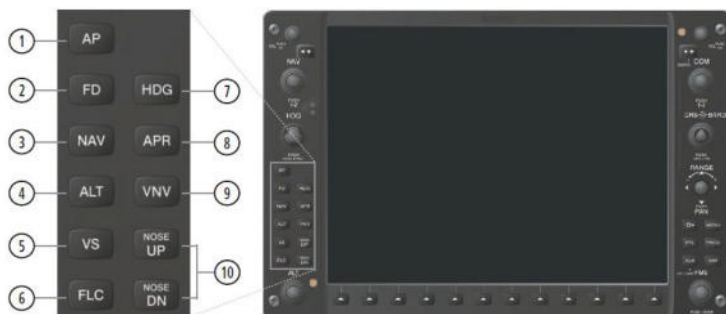


Figure 7-25 – Autopilot Control Panel

11.2. PILOT CONTROL WHEEL AND THROTTLE BUTTONS

On the left side of pilot's and copilot's control wheels there are two PTT switches (the one on pilot control wheel is shown below as **(1)**) that, when pushed, allow radio transmission. These switches are momentary ones thus acting in such a way that when they are released the active COM device returns to the non-transmitting state. These switches are already installed in the basic aircraft which is not equipped with the autopilot.

The following additional dedicated AFCS controls are located on the pilot control wheel, separately from the MFD, and on the throttle handle:

AP DISC Switch: Disengages the autopilot and interrupts pitch trim operation. This switch may be used to mute the aural autopilot disconnect alert.

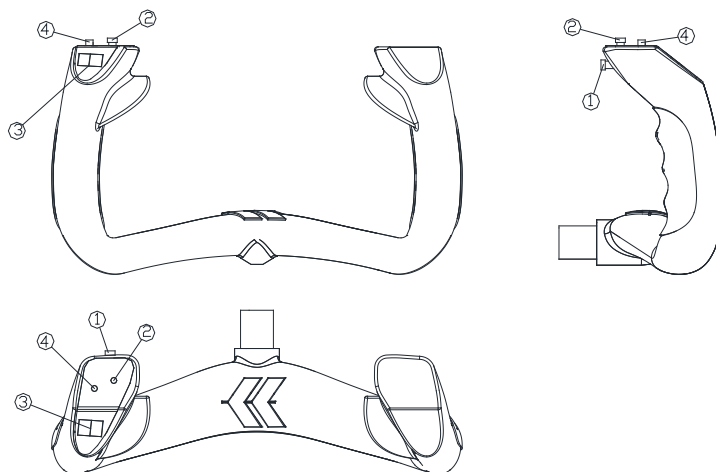
AP Trim Switch: Used to command manual electric trim. This composite switch is split into left and right sides. The left switch is the ARM contact and the right switch controls the DN (forward) and UP (rearward) contacts. The AP TRIM ARM switch can be used to disengage the autopilot and to acknowledge an autopilot disconnect alert and mute the associated aural tone. Manual trim commands are generated only when both sides of the switch are operated simultaneously. If either side of the switch is active separately for more than three seconds, MET function is disabled and 'PTRM' is displayed as the AFCS Status Annunciation on the PFD. The function remains disabled until both sides of the switch are inactivated.

For aircraft embodying MOD2010/244, pitch trim switch is also installed on copilot side.

CWS Button: While pressed, the Control Wheel Steering allows manual control of the aircraft while the autopilot is engaged and synchronizes the flight director's Command Bars with the current aircraft pitch (if not in Glideslope Mode) and roll (if in Roll Hold Mode). Upon release of the CWS Button, the flight director may establish new reference points, depending on the current pitch and roll modes. CWS operation details are discussed in the flight director modes section.

TO/GA Switch: The GA Switch is located on the throttle handle. Go Around and Take-off modes are coupled pitch and roll modes and are annunciated as both the vertical and lateral modes when active. In these modes, the flight director commands a constant set pitch attitude and keeps the wings level. The GA Switch is used to select both modes. The mode entered by the flight director depends on whether the aircraft is on the ground.

The above mentioned AFCS controls are depicted in the below figures.



where:

- 1) PTT switch
- 2) AP DISC Switch
- 3) AP Trim Switch
- 4) CWS Button

Figure 7-26 – Autopilot Control Wheel Switches/Buttons

11.3. AUTOPILOT FUNCTIONS AND FEATURES

GFC 700 autopilot suite is deeply integrated with Garmin G1000Nxi avionics suite which integrates both the a/p controls and the sensors providing the required data to the servos.

The GFC 700 AFCS is equipped with the following main operating functions:

- **Flight Director (FD)** — Flight director commands are displayed on the PFD. The flight director provides:
 - ✓ Command Bars showing pitch/roll guidance
 - ✓ Pitch/roll mode selection and processing
 - ✓ Autopilot communication
- **Autopilot (AP)** — Autopilot operation occurs within the pitch, roll, and pitch trim servo and provides servo monitoring and automatic flight control in response to flight director steering commands, AHRS attitude and rate information, and airspeed.
- **Manual Electric Trim (MET)** — The pitch trim servo provides manual electric trim capability when the autopilot is not engaged.
- **ESP** (Electronic Stability & Protection) keeps the aircraft within well-defined operational limits thus preventing the pilot to operate the aircraft outside a specific envelope when it is being hand flown. This feature only operates when autopilot is not engaged and its operation is mutually exclusive with autopilot operation.
- **USP** (Underspeed Protection) is a flight director function that reacts to underspeed conditions in a way that allows the autopilot to remain engaged but prevents the airplane from stalling.

11.3.1 ESP

Garmin GFC 700 is equipped with an envelope protection feature referred as ESP (Electronic Stability & Protection). Electronic Stability and Protection continuously monitors the aircraft. The system works by applying a correcting force to the controls in order to nudge pilot to avoid extreme attitudes that may bring the aircraft, if not corrected, to exceed normal flying envelope.

This software feature aims to provide protection against aircraft operation outside a desired flight envelope. ESP will maintain the desired operating envelope, defined at autopilot development time, by automatically engaging one or more servos when the aircraft is near the operating limit and nudging pilot to come back to nominal operating envelope. While ESP utilizes the same sensors, processors, and actuators as the GFC 700 autopilot, it is basically a separate function. ESP can be overpowered by the pilot and can be temporarily disabled using the AP disconnect or CWS switches. It functions independently of the aircraft's autopilot system (although it uses the same control servos), so it basically operates "in background" whenever the pilot is hand-flying the airplane.

The ESP feature will only function with GPS available, A/P MASTER SWITCH ON (but autopilot not engaged) and aircraft above 200ft AGL.

In the event that GPS or database information is unavailable at take-off, the ESP function will store the last pressure altitude reading prior to entering airborne status and activate once the aircraft pressure altitude exceeds the minimum altitude above the stored altitude reference. USP will remain active in this scenario for the remaining flight.

ESP enabling:

As a standard, ESP will automatically set to enable at power-up.

The system is configured in order to allow the pilot to disable ESP (or re-enable it if previously disabled after power up) via the "Aux-System Setup Page" on MFD.

If ESP has been disabled via MFD, it will automatically be set to ON upon any battery/power reset.

ESP function uses the same servos that provide autopilot functionality while autopilot is not engaged, as such, if power is cut from these servos both autopilot and ESP functions will be unavailable.

Based on the above if "AUTOPILOT MASTER" is set to OFF, power to servos is cut irrespectively of their mode of operation (autopilot or ESP).

The pilot can interrupt ESP by pressing and holding either the Control Wheel Steering (CWS) or Autopilot Disconnect (AP DISC TRIM INTRPT) switch. Upon releasing the CWS or AP DISC TRIM INTRPT switch, ESP force will again be applied, provided aircraft attitude and/or airspeed are within their respective engagement limits.

To enable or disable ESP:

- 1) Turn the large FMS Knob to select the AUX Page Group.
- 2) Turn the small FMS Knob to select the System Setup Page.
- 3) If necessary, select the SETUP 2 Softkey to display the AUX-SYSTEM SETUP 2 Page. If the AUX-SYSTEM SETUP 2 is already displayed, proceed to step 4.
- 4) Press the FMS Knob to activate the cursor.
- 5) Turn the large FMS Knob to place cursor in the STABILITY & PROTECTION field.
- 6) Turn the small FMS Knob to select 'ENABLE' or 'DISABLE'.
- 7) Press the FMS Knob to remove the cursor.

ESP engagement and operation:

ESP is automatically enabled on system power up.

NOTE

ESP unavailability and/or failure is indicated to the pilot on PFD by the advisory "ESP not available" on alert window.

NOTE

ESP will turn OFF upon loss of both GPS. The ADVSY "ESP OFF" will appear on the alert window in case of loss of both GPS.

11.3.1.1 Pitch Mode

Pitch attitude boundaries are set based on P2010tdi aircraft performances. Since pitch ESP augments the natural aircraft longitudinal stability, no special symbology is required.

Value that have been set-up for the P2010 are as follows:

Nose above the horizon:

Engagement low threshold: + 15°
Engagement upper threshold: + 18°
Lower disengage threshold: + 12°

Nose below the horizon:

Engagement low threshold: -15°
Engagement upper threshold: -20°
Lower disengage threshold: -13°

ESP utilizes electronic torque and speed commands to augment the aircraft's stability: it uses an Electronic Torque Limit (ETL) and an Electronic Speed Limit (ESL) to limit the maximum authority of the ESP function. ESP is inactive when the pitch attitude is within the positive and negative engagement limits defined in the certification gain file.

When the aircraft reaches the engagement limit, ESP ramps up the servo torque command to adjust the aircraft back toward zero pitch attitude. ESP uses a rate command to drive the attitude back to the nominal range and does not try to control to a specific attitude. As the pitch attitude returns to the nominal range, the torque and pitch rate are reduced until the aircraft reaches the disengagement limit at which time ESP turns off. The disengagement threshold is sized so that the transition from ESP being active to being inactive is transparent to the pilot (no transient when ESP turns off).

If, when ESP engages, the aircraft continues to pitch away from the nominal attitude range the torque command will increase with increasing pitch deviation. Above the upper disengagement limit specified in the certification gain file ESP will be disabled

11.3.1.2 Roll Mode

Roll mode is similar to pitch mode and also utilizes configurable gain file parameters to define engagement and disengagement limits as well as the speed and torque curves.

The engagement and disengagement attitude limits are displayed with double hash marks on the roll indicator when ESP is available and /or active. The lack of double hash marks above 200 ft AGL (when autopilot is not connected) is a clear indication that ESP is not available.

Values for the symmetric roll attitude limits are as follows:

Engagement low threshold: $\pm 45^\circ$

Engagement upper threshold: $\pm 75^\circ$

Lower disengage threshold: $\pm 30^\circ$

Electronic stability and protection action starts at the predetermined roll angle. Since crossing this roll angle results in a change in aircraft stability (and therefore handling characteristics) indications of this boundary are provided to the pilot.

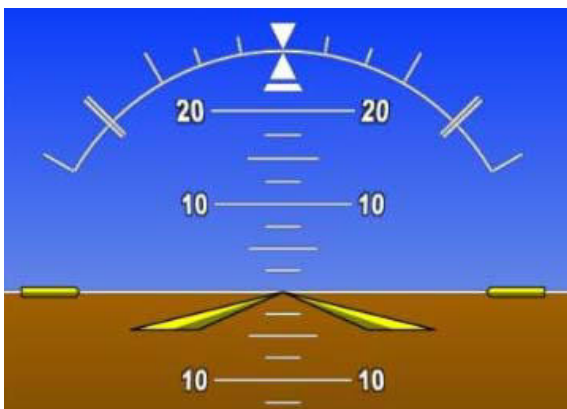


Figure 7-27 – ESP Roll angle limits

See the below figure for an example of the ESP engagement limits.

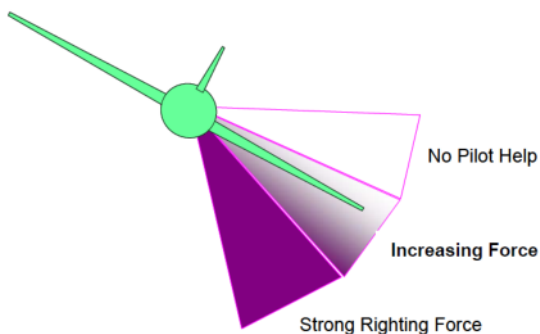


Figure 7-28 – ESP engagement limits

In proximity of V_{NE} , ESP will apply force to raise the nose; when the high speed condition is remedied, ESP force is no longer applied.

11.3.2 USP

Underspeed Protection (USP) is a flight director function that reacts to underspeed conditions, designed to discourage aircraft operation below minimum established airspeeds.



WARNING

USP has to be intended as a feature that will work to recover the minimum established airspeed but it does not authorize using of autopilot below the minimum speed authorized for autopilot operation.

Pilot will be warned of impending low speed conditions, and if no action will be taken FD will directly react in a way that allows the A/P to remain engaged but prevents the airplane from stalling.



WARNING

USP function has been developed in order to warn pilot of impending low speed conditions, and if no action will be taken FD will directly react in a way that allows the Autopilot to remain engaged but prevents the airplane from stalling.

Pilot action is still expected at first warning of low airspeed conditions in order to prevent a low speed conditions, so to maintain normal flight.



CAUTION

When autopilot is engaged USP will provide the pilot with aural/visual cues to make him aware of an impending stall and will drive the servos in order to prevent stall.

When autopilot is not engaged and only Flight director is active, USP will provide the pilot with aural/visual cues to make him aware of an impending stall but servos will not be driven.

Flap position and stall warning inputs to the G1000Nxi are required for USP.

In the event that flap position indication is unavailable, the USP will assume the flap in UP position and will work on the minimum airspeeds allowed for this configuration.

How Underspeed Protection functions depends on which vertical flight director mode is selected.

For the purpose of this discussion, the vertical flight director modes can be divided into two categories:

- It is important to maintain altitude for as long as possible (altitude-critical modes).
- Maintaining altitude is less crucial (non-altitude critical modes).

NOTE

If USP engages and power is abruptly set to full throttle, pilot must be aware to expect pitch attitude changes that could not be quickly counteracted by autopilot. Avoid wide power changes that could result in hazardous attitudes and that could work against the recovery of airspeed.

**CAUTION**

USP engagement is a consequence of autopilot failing to properly monitoring A/P and aircraft behaviour. This is mainly caused by a pilot request that cannot be fulfilled due to lack of power coupled with unattainable pitch input.

Pilot need to continuously monitor autopilot performance, while checking that mode selections are compatible with aircraft performance.

**CAUTION**

If Autopilot is engaged in FLC mode, FLC mode will downgrade to PIT mode when in USP for more than 10 seconds.

**CAUTION**

If USP engages while in ALT mode, upon USP disengagement FD will command bars to regain pre-selected altitude (altitude selected before USP engagement). Pilot must monitor A/P to check if previous pre-selected altitude is still attainable with energy available. It is recommended in this case to pre-select a new altitude in order to speed-up energy management and recover from slow speed conditions.

NOTE

When USP becomes active, expect a small FD adjustment due to reaction to very low speed condition.

11.3.2.1 Altitude critical modes (ALT, GS, GP, TO, GA)

This mode allows the airplane to slow as much as possible but still protect against a stall as USP is triggered by stall warning. In these modes when stall protection is triggered, the airplane responds more abruptly and aggressively attempts to minimize flight path deviation while preventing a stall. The same sensor used for stall warning is used to trigger the altitude critical underspeed function. The autopilot will remain engaged and protect from an impending stall by lowering the nose as required.

When the airspeed trend vector (dedicated algorithm) reaches a determined value (70 +/- 2 KIAS for flap UP and 65 +/- 2 KIAS for flap TO and LAND) a single aural "AIRSPEED" will sound, alerting the pilot to the impending underspeed condition, which requires pilot action. When the airspeed reaches a determined value (70 +/- 2 KIAS for flap UP and 65 +/- 2 KIAS for flap TO and LAND), MINSPD amber annunciation will be seen (impending stall discrete is off).

If the aircraft decelerates to stall warning, the lateral and vertical flight director modes will change from active to armed and the autopilot will provide input causing the aircraft to pitch down and the wings to level.



Figure 7-29 – USP activation (AP armed mode)

An aural "AIRSPEED" alert will sound every five seconds and a red "UNDERSPEED PROTECT ACTIVE" annunciation will appear to the right of the vertical speed indicator. The pitch down force will continue until the aircraft reaches a pitch attitude at which IAS equals the IAS at which stall warning turns off, plus two knots. The MINSPD amber annunciation will disappear at 70kts.



Figure 7-30 – USP activation (indication)

When airspeed increases (as a result of adding power/thrust) to above the IAS at which stall warning turns off, plus two knots, the autopilot will cause the aircraft to pitch up until recapturing the vertical reference and the vertical and lateral flight director modes will change from armed to active.

11.3.2.2 Non Altitude critical modes (VS, VNAV, PIT, LVL, FLC)

USP in these modes is triggered by airspeed and is just a transition from following the selected reference to following a minimum airspeed. This provides for smooth transition to USP and also can provide a larger stall protection margin. In these no altitude critical modes, the system provides a smoother transition and less aggressive flight path tracking.

When the airspeed trend vector (dedicated algorithm) reaches a determined airspeed (70 +/- 2 KIAS for flap UP and 65 +/- 2 KIAS for flap TO and LAND) a single aural "AIRSPEED" will sound, alerting the pilot to the impending underspeed condition, which requires pilot action. If the aircraft decelerates to an IAS below the minimum commandable autopilot airspeed, a red "UNDERSPEED PROTECT ACTIVE" annunciation to the right of the vertical speed indicator will appear. In addition, a yellow "MINSPD" above the airspeed ribbon will appear.

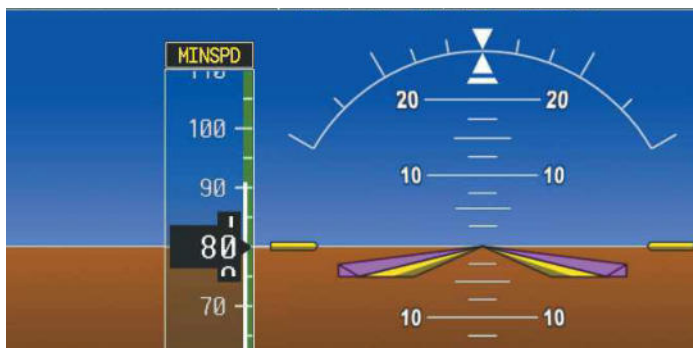


Figure 7-31 – USP activation (MINSPD indication)

Vertical flight director mode will change from active to armed, Flight Director and autopilot will command the aircraft to pitch down until reaching a pitch attitude at which IAS equals the minimum commandable autopilot airspeed, avoiding the development of a stall condition.

When airspeed increases (as a result of adding power/thrust) to an IAS above 70 KIAS, USP will then disengage and the autopilot will command the aircraft to pitch up until recapturing the vertical reference (vertical flight director mode will switch from white armed to green active).

When adding power, the AP/FD will abandon the reference mode and will maintain MINSPD. Non altitude critical mode will maintain the originally selected lateral mode (HDG, NAV...).



Another mode related to USP is the coupled go-around. This mode allows the pilot to perform coupled missed approaches by pressing a button located on the throttle lever. With this feature, the AP will remain engaged and fly the missed approach attempting to capture and track the Flight Director command bars (6° nose up).

If insufficient airplane performance is available and/or power is not added to follow the commands, the AFCS will enter Altitude-Critical Mode when the stall warning sounds. The USP system will maintain a speed just above stall warning, adjusting the airplane's pitch attitude as required.

13. LIGHTS

13.1. EXTERNAL LIGHTS

P2010tdi 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 cowl.

13.2. INTERNAL LIGHTS

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



Figure 7-33 – Cockpit internal lights

14. OXYGEN SYSTEM

The oxygen system is composed by a cylinder AL-180, a regulator for the inlet of up to 4 lines with cannulas or mask (one for each cabin occupant). Each line presents a flowmeter for the monitoring and the adjustment of oxygen flow. Figure 1 represents a scheme of oxygen equipment.

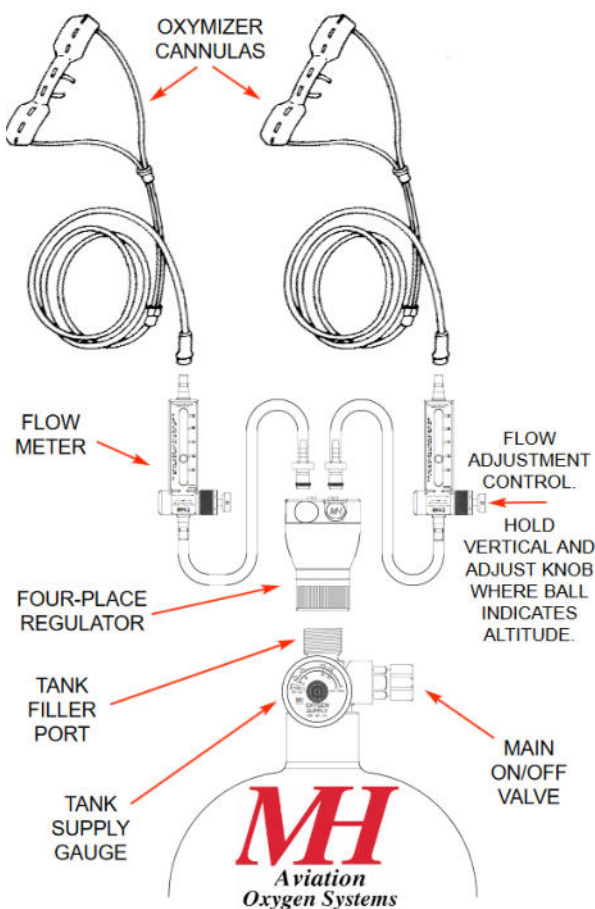


Figure 7-34 – Oxygen system (main components)

The cylinder specification are shown in the following table.

Cylinder Model Number	Maximum Cylinder Pressure [psi]	Maximum Cylinder Capacity [Cu.Ft.]/[lit]	Diameter [in]/[cm]	Length [in]/[cm]	Empty Weight [lb]/[kg]
AL-180	2216	5.8/165	3.2/8.1	11.8/30	2.7/1.2

The position of cylinder, together with lines, is in cabin, as shown in Figure 2 far from each possible ignition source, due to the position behind the firewall, thus protected by unsafe temperature and from hazard in case of crash landings. The cylinder presents a supply gauge, positioned in the upper side of cylinder installed on the right side on pilot seat, that allows to determine the quantity of oxygen available, see Figure 1. The system is equipped with a shut off valve to immediately stop the supply off oxygen at the high pressure source.

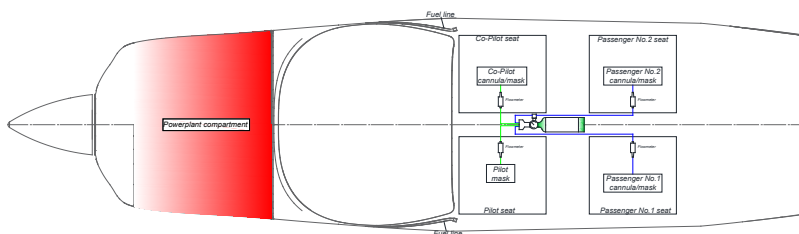


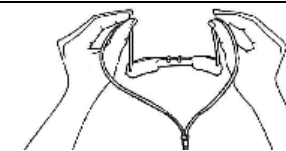
Figure 7-35 – Oxygen system (typical installation)

Oxygen flow is calibrated through flowmeters installed on each line before cannula or masks. Each occupant can regulate oxygen flow by the control installed on each flowmeter defining the altitude at which the aircraft is flying.

14.1. USE OF CANNULAS

The cannula can be readily placed into position on the face of the user through the following passages:

- 1 Slide the loop adjustment collar (bola) down to enlarge the size of the loop



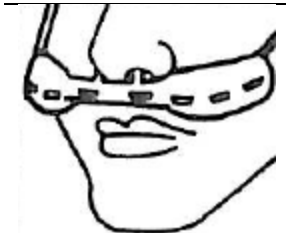
- 2 With the back of the face-piece toward you, pick up the Oxysaver with one of the small flexible plastic tubes in each hand, as if putting on eyeglasses:



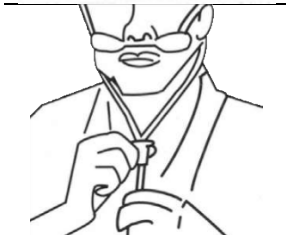
- 3 Place the flexible plastic tubing over your ears (as if putting on glasses) and under your chin or pass the tubing over your ears and around the back of your head



- 4 The face-piece should rest on your upper lip under your nose, with the oxygen delivering prongs extending well into and pointing towards the back of your nose. You may rotate these prongs for maximum comfort.



- 5 Slide the bola up toward your chin to hold the cannula snugly and comfortably against your face.



14.2. USE OF MASK

The mask allows the pilot to use both the installed dispensing unit and radio equipment. The mask presents a connector, that is fixed by lining up the two pins on the cable connector to the receptacle on the mask and pushing in. The removal happens by pushing in the red button and pulling the connector down. The other end is connected by pilot to the aircraft audio system. The mask presents then an inlet of 6mm on the right side to supply the pilot with oxygen.



Figure 7-36 – Mask use (general information)

The mask secures to the pilot head through head strap and neck strap. The pilot adjusts the straps accordingly so that he has free head movement and comfort as well as a good seal around the circumference of the mask opening. The pilot dons the mask so the head strap cradles the top/ rear of his head and then clasps the neck strap securely around the back of his neck.

14.3. CLEANLINESS OF MASK AND CANNULAS

The cannulas and masks can be cleaned with soap and water using a clean, lint-free cloth. Refer to Maintenance Manual for detailed information on servicing instructions.

15. PLACARDS

Here in the overview of the placard installed on the aircraft in addition to the limitation placards reported in Section 2.

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.

External placards

Aircraft Registration Placard:



Baggage compartment placards:



Static Port:



Lift Point:

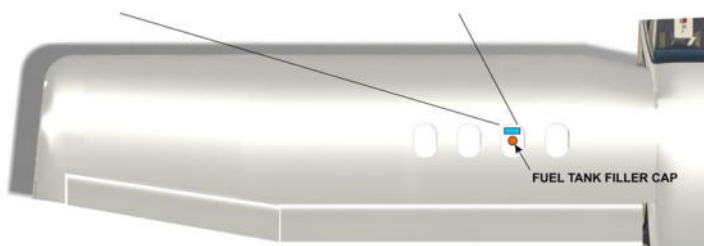


Wheel Fairing “No Step”:

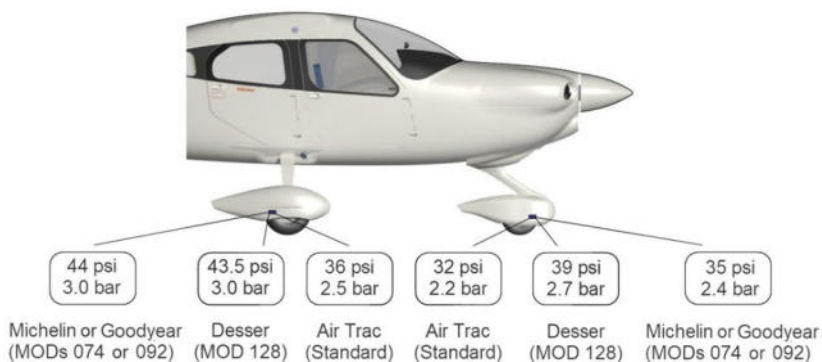


Allowed Fuel Placard:

JET A1 (ASTM D1655)/DIESEL (EN590)
or see Aircraft Flight Manual
(Section 2)
Capacity - 120 LT (31,7 US Gallon)



Tire Pressure placard:



Stabilator degrees placard:



Emergency exit placards:

SIDE VIEW LH



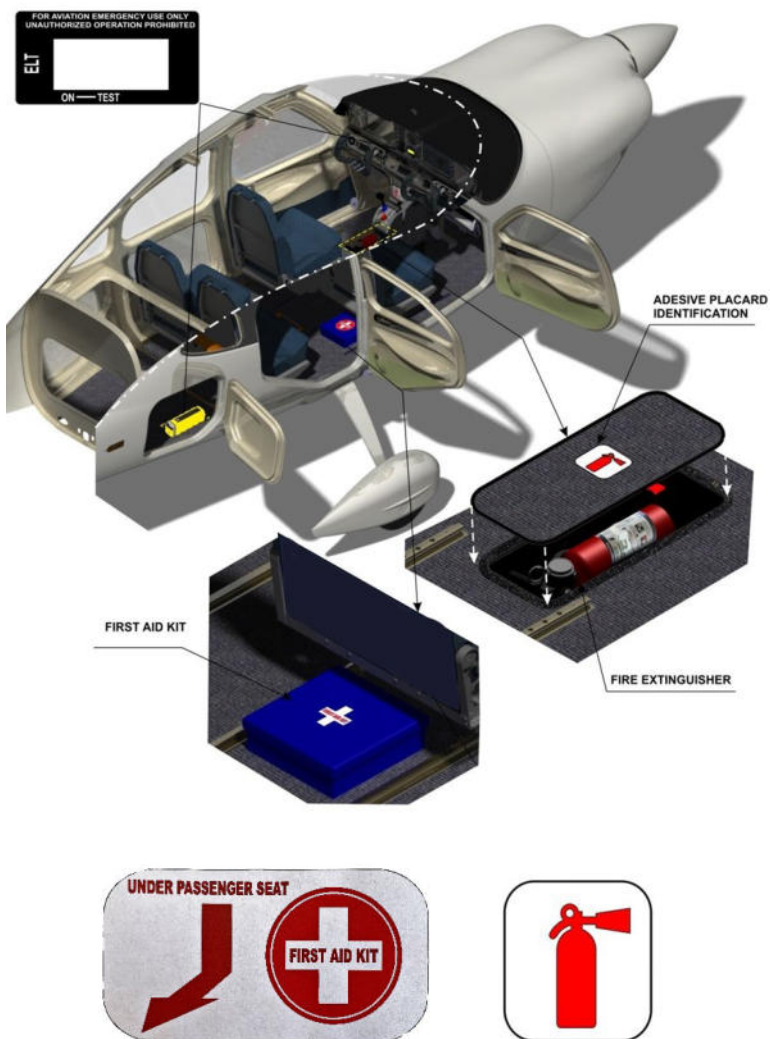
① **EMERGENCY EXIT**

② **FOR EMERGENCY ACCESS**
OPEN DOOR WITH HANDLE



15.1. INTERNAL PLACARD

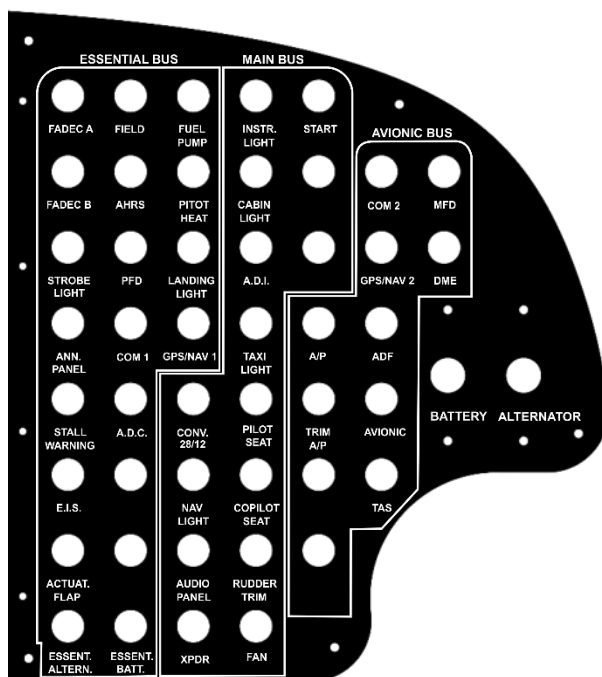
Safety equipment placards:



ELT unit position placard:



Breaker Panel placards:





Magnetic Compass placard:

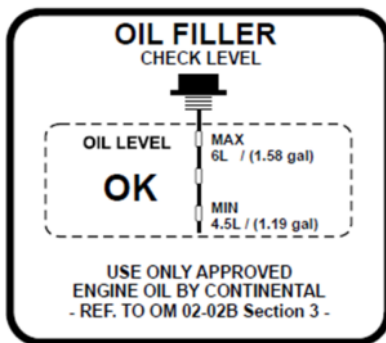


Battery Placard:

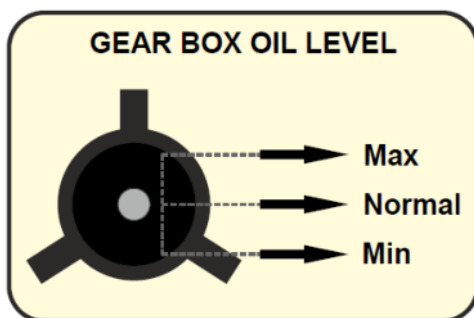


(installed on the LH side of fuselage cone)

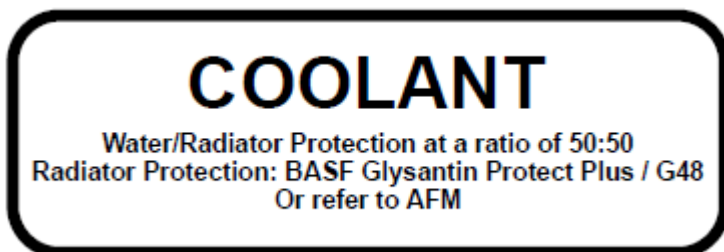
Engine Oil filler placard:



Gearbox Oil level check placard:



Coolant tank placard:





Emergency exit placards:



MAIN DOOR
EMERGENCY EXIT

FORWARD PASSENGERS DOOR
EMERGENCY EXIT

REAR PASSENGERS DOOR
EMERGENCY EXIT

①

EMERGENCY EXIT

②





Baggage Door opening knob:





Pedestal placards:





Cabin air system (instrument panel)*:



*) for aircraft NOT embodying MOD2010/257

Power lever placard:



Fuel selector control knob:

