TUCANO Replica Experimental Aircraft
FLIGHT MANUAL

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Cover page

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Address	
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AIRCRAFT KIT TYPE & MODEL	
Type :	Tucano Replica
Model :	650-6G-R
Kit S/N	**TR-.....**
Aircraft Mark :	**??????????**
Aircraft S/N :	**TR-.....**

[1] This document is a translation of the "*ManVolo170905.docx*" document therefore only the Italian version shall be considered the legal document.

TABLE OF CONTENTS

INTRODUCTION

This Flight Manual applies to the **TUCANO REPLICA 650-6G-R** aircraft built from Flying Legend Kit by **builder pilot ?????????????**

Disclaimer

This aircraft is classified as "experimental". Hence certain design features may deviate from the typical "spam can"certified production aircraft.
Also, flight characteristics such ashigh roll rate and light control forces can be more demanding to the pilots' skill.
This aircraft has been built by the builders to the best of their knowledge and quality of craftsmanship.
Nonetheless,operating this aircraft is at the sole risk of the pilot.

Copyright

The aircraft is identified by the registration marking and serial number on the Cover Page.
Therefore this document contains the airworthiness limitations and essential operating data provided by Kit manufacturer Company .
The Flight Manual shall be carried in the aircraft on all flights.

Special operations requiring additional limitations and instructions are listed in the "Supplements Section" and this section shall be consulted before undertaking any such operations. For operating information not included in this manual, reference should be made to the appropriate operations or manufacturer's manuals.
The builder pilot in command the aircraft shall comply with all requirements, procedures and limitations with respect to the operation of the aircraft set out in the Flight Manual for the aircraft.

Amendments shall be issued by builder pilot after consulting Flying Legend Comp. as necessary and will take the form of replacement pages, with the changes to the text indicated by a vertical line in the margin together with the amendment date at the bottom of the page.

Interim/Temporary amendments may be issued in the same manner and are to be inserted as directed. These amendments will be issued on colored pages and will take precedence over the stated affected page.

It is the owner's responsibility to incorporate in this manual all such amendments, and to enter the date of incorporation and his signature on the appropriate Amendment Record Sheet.

All limits, procedures, safety practices, servicing, and maintenance requirements contained in thismanual are considered mandatory for the continued airworthiness of the airplane.All values in this manual are based on ICAO Standard Atmosphere conditions and maximum take-offweight (MTOW).

No entries or endorsements may be made to this Flight Manual except by builder pilot.

REVISIONS

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

Owners should contact Flying Legend (Comp). S.r.l.s. whenever the revision status of their Manual is in question.

All revised pages will carry the revision number and the date on the applicable page.

The following List of Effective Pages provides the dates of issue for original and revised pages, and a listing of all pages in the Manual. Pages affected by the current revision are indicated by an asterisk (*) preceding the pages listed.

LIST OF EFFECTIVE PAGES

The dates of issue for original & revised pages are:

Page	Rev.	Date	Page	Rev.	Date	Page	Rev.	Date
Section 0			**Section 3**			**Section 5**		
0-1	0		3-15	0		5-6	0	
0-2	0		3-16	0		5-7	0	
0-3	0		3-17	0		5-8	0	
0-4	0		3-18	0		5-9	0	
0-5	0		3-19	0		5-10	0	
0-6	0		3-20	0		**Sectiom 6**		
0-7	0		3-21	0		6-1	0	
Section 1			3-22	0		6-2	0	
1-1	0		**Section 4**			6-3	0	
1-2	0		4-1	0		6-4	0	
1-3	0		4-2	0		6-5	0	
1-4	0		4-2	0		**Annex A**		
1-5	0		4-3	0		a-1	0	
Section 2			4-4	0		a-2	0	
2-1	0		4-5	0		a-3	0	
2-2	0		4-6	0		a-4	0	
2-3	0		4-7	0		a-5	0	
2-4	0		4-8	0		a-6	0	
2-5	0		4-9	0		a-7	0	
Section 3			4-10	0		a-8	0	
3-1	0		4-11	0		a-9	0	
3-2	0		4-12	0		a-10	0	
3-3	0		4-13	0		**Annex B**		
3-4	0		4-14	0		b-1	0	
3-5	0		4-15	0		b-2	0	
3-6	0		4-16	0		b-3	0	
3-7	0		4-17	0		b-4	0	
3-8	0		4-18	0		b-5	0	
3-9	0		**Section 5**			b-6	0	
3-10	0		5-1	0		b-7	0	
3-11	0		5-2	0		**Annex C**		
3-12	0		5-3	0		c-1	0	
3-13	0		5-4	0				
3-14	0		5-5	0				

This page will change with all revision issues

DEFINITIONS

AIRFIELD PRESSURE ALTITUDE	The Airfield Pressure Altitude is that altitude registered at the surface of the aerodrome by an altimeter with the pressure subscale set to 1013 millibars
INDICATED AIRSPEED (I.A.S.)	Indicated airspeed, which is the reading obtained from an airspeed indicator having no calibration error.
TAKEOFF SAFETY SPEED	The Takeoff Safety Speed is a speed chosen to ensure that adequate control will exist under all conditions, including turbulence and sudden and complete engine failure, during the climb after takeoff.
LANDING SAFETY SPEED	The Landing Safety Speed is the speed chosen to ensure that adequate control will exist under all conditions, including turbulence, to carry out normal flare and touchdown.
NORMAL OPERATING SPEED	This speed shall not normally be exceeded. Operations above the Normal Operating Speed shall be conducted with caution and only in smooth air.
V_A MANOEUVRING SPEED	Maximum for manoeuvres involving an approach to stall conditions or full application of the primary flight controls.
KCAS KNOTS CALIBRATED AIRSPEED	Indicated airspeed corrected for position and instrument error and expressed in knots. KCAS is equal to KTAS in standard atmosphere at sea level
KIAS KNOTS INDICATED AIRSPEED	The speed shown on the airspeed indicator and expressed in knots.
KTAS KNOTS TRUE AIRSPEED	The airspeed expressed in knots relative to undisturbed air which is KCAS corrected for altitude and temperature.
V_{FE} MAXIMUM FLAP EXTENDED SPEED	The highest speed permissible with wing flaps in the prescribed extended position.
V_{NO} MAXIMUM STRUCTURAL CRUISING SPEED	The speed that should not be exceeded except in smooth air, and then only with caution.
V_{NE} NEVER EXCEED SPEED	The speed limit that may not be exceeded at any time.
V_S STALLING SPEED	The stall speed or minimum steady flight speed at which the airplane is controllable in a specified configuration.
V_{S0} STALLING SPEED LANDING CONFIGURATION	The stall speed or minimum steady flight speed at which the airplane is controllable in the landing configuration at the most forward centre of gravity.
V_X BEST ANGLE-OF-CLIMB SPEED	The speed which results in the greatest gain of altitude in a given horizontal distance.
V_Y BEST RATE-OF-CLIMB SPEED	The speed which results in the greatest gain in altitude in a given time.

METEOROLOGICAL TERMINOLOGY

OAT OUTSIDE AIR TEMPERATURE	The free static air temperature. It is expressed in either degrees Celsius or degrees Fahrenheit.
STANDARD TEMPERATURE	Standard Temperature is 15 degrees C at sea level pressure altitude.
PRESSURE ALTITUDE	The altitude read from the an altimeter when the altimeter's barometric scale has been set to 1013 mb (29.92 inches of mercury).

ENGINE POWER TERMINOLOGY

BHP BRAKE HORSEPOWER	The power developed by the engine.
RPM REVOLUTIONS PER MINUTE	Engine speed.
STATIC RPM	The engine speed attained during a full-throttle engine runup when the airplane is on the ground and stationary.

AIRPLANE PERFORMANCE AND FLIGHT PLANNING TERMINOLOGY

MAXIMUM CROSSWIND VELOCITY	The velocity of the crosswind component for which adequate control of the airplane during takeoff and landing was actually demonstrated during the certification tests. The value shown is limiting.
USEABLE FUEL	The fuel available for flight planning
UNUSABLE FUEL	The quantity of fuel that cannot be safely used in flight
LPH LITRES PER HOUR	The amount of fuel (in litres) consumed per hour
NMPL NAUTICAL MILES PER LITRE	The distance (in nautical miles) which can be expected per litre of fuel consumed at a specific engine power setting and/or flight configuration.
G	The acceleration due to gravity.

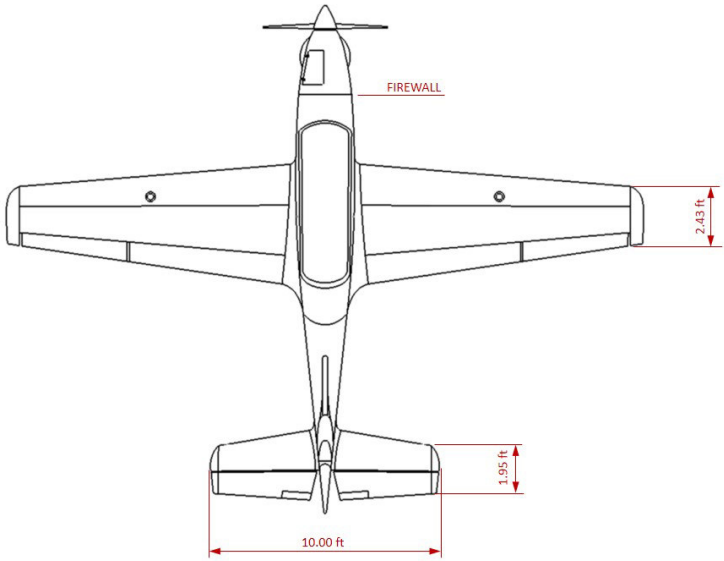
WEIGHT AND BALANCE TERMINOLOGY

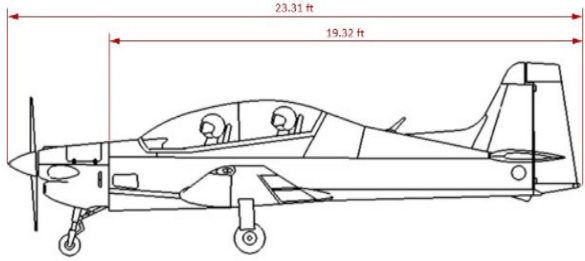
STA - STATION	Only two load stations are specified: ie Seat Station which is the centre of the fixed seats and Fuel Station which is the centre of the fixed fuel tank.
C.G. - CENTRE OF GRAVITY	The point at which an airplane, or equipment, would balance if suspended.
C.G. LIMITS	The extreme centre of gravity locations within which the airplane must be operated at a given weight.
STANDARD EMPTY WEIGHT	The weight of a standard airplane, including unusable fuel, full operating fluids and full engine oil.
BASIC EMPTY WEIGHT	The standard empty weight plus the weight of optional equipment.
USEFUL LOAD -	The difference between ramp weight and the basic empty weight.
MTOW - MAXIMUM TAKEOFF WEIGHT	The maximum weight approved for the start of the takeoff run.

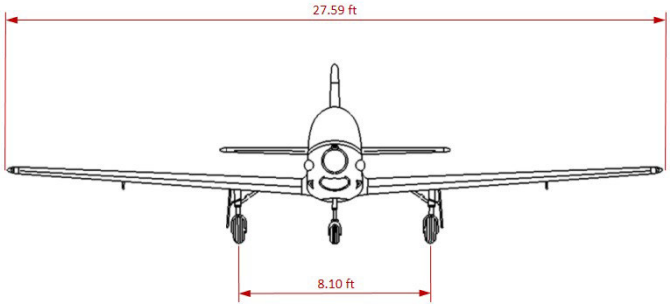
Section1 - General

Table of Contents

1.1 AIRCRAFT THREE VIEW DRAWING







Ground Turning Radius = 6 metres.(19.7 ft)

1.2 TECHNICAL DATA

Wing span:	8.45	m	27.7	(ft)
Wing area:	10	m²	111.4	(sqft)
Length:	7.18	m	23.5	(ft)
Height	2.33	m	7.6	(ft)
max. weight:	650	kg	1433	(lb)
Fuel capacity	120	lt	31.7	(gal)

Expl note:

the hereinafter technical data are the limit data in order to give to the owner the safety limit values to write proper manual.

1.2.1. ENGINE

(**Expl note: refer and verify specific engine and prop manual)**

Manufacturer:	ROTAX GmbH
Aircraft Engine Type:	915iS A Series liquid cooled

1.2.2. PROPELLER

Manufacturer:	-Hub: ELITEST -Blade: ELITEST
Type:	- Carbon Fiber - Three blades propeller
Diameter:	1.76 m (70 inch)
Pitch:	VariablePitch.

1.2.3. APPROVED FUEL TYPES AND GRADES

-UNLEADED MOGAS (98 Octane or higher - 90 RON or higher) -100 LL or 100/130 grade aviation gasoline (only for short utilization time, with carbon level inspection)

1.2.4. FUEL CAPACITY

Total:	120 Litres (31.7 gal)
Useable	118 Litres (31.2 gal)

1.2.5. APPROVED OIL GRADES

Motorcycle oil of a registered brand with gear additive	
Specification	API classification "SF" or "SG"
For temperature above and belove stated check engine manual	

1.2.6. OIL CAPACITY

Sump capacity is : 2,6 Lts min – 3,05 max Lts

1.2.7. TYRE INFLATION PRESSURES

Standard Mains:	36.7psi (2.5bar)
Nose:	32.3psi (2.2bar)

Section 2 - Limitations

Table of Contents

2.1. INTRODUCTION

Section 2 includes operating limitations, instrument markings and basic placards necessary for the safe operation of the airplane, its engine, standard systems and standard equipment. Observance of these operating limitations is required.

The aeroplaneshall be operated so that the limitations and instructions included in this section are observed.

2.2. TYPE OF OPERATION

The aircraft comply to CS VLA Amendment 1 - 5 March 2009 as VFR by Day NON Aerobatics at 1433Lbs (650 Kg) MTOW (see also para 2.4).

Permitted with caution VFR by Day Aerobatics MTOW, including Spins at1280Lbs (580 Kg) - see annex "C"

MTOW and C.G limitations (see para 2.5. and Sect 6).

2.3. AIRSPEED LIMITATIONS

Airspeed limitations and their operational significance are shown below.

SPEED (kts)	*@ MTOM (lbs)* *1430- 1280*	REMARKS
V_{NE} Never exceed speed	**160 -178 (*)**	Do not exceed this speed in any operation.
V_{NO} Maximum structural cruising speed	**130**	Do not exceed this speed except in smooth air, and then only with caution.
V_A Maneuvering speed	**125**	Do not make full or abrupt control movements above this speed.
V_{FE} Maximum flap extended speed	**82**	Do not exceed this speed with flaps down.

(*) This V_{NE} follows from the calculation documents, related static tests and flight tests where the **dive speed V_D is 178 kts and n_1 is 6 g's**. Therefor the A/C structure have been verified for this condition. The V_{NE} purpose is to prevent flutter problems. Therefore depends to the **Demonstrated Dive Speed** that must be roughly 11% higher and must demonstrate no buffeting at this speed.
Because the possible flutter depends by higher tolerances utilized and by skill of structure builder the V_{NE} can be selected higher only by flight test made by pilot builder with its own aeroplane (structures) and step by step, with caution,increasing dive speed to verify NO buffeting.

Airspeed Indicator Markings and their operational significance are:

MARKING	Range (kts)	SIGNIFICANCE
White Arc	**48 - 82**	Full-flap operating range. Lower limit is max. weight Vso in landing configuration. Upper limit is max. speed permissible with flaps extended V_{FE}.
Green Arc	**60 - 130**	Normal operating range. Lower limit is Take-off Safety speed V_{S1}. Upper limit is max. structural cruising speed V_{NO}.
Yellow Arc	**130- 160**	Operations must be conducted with caution and only in still air, V_{NO}->V_{NE}.
Red Line	**160**	V_{NE}

2.4. MANEUVERING MASS (WEIGHT)and LOADING

Operating mass CS VLA non aerobatic	**1430** lb (650 kg)	**@+6 -3**
Max operating mass	**1650** lb (750 kg)	**@+4.5 -2.2**
Operating mass basic aerobatic*	***1280** lb (580 kg)*	***@+5 -2.5***

***Note: Basic aerobatics maneuvers factor is selected at 5 g's for safety**

WARNING: all values are valid if the builder have been taken in account, during structure making,accuracy riveting and usedtight tolerances along commands line (from control bar to control surfaces).

2.5. CENTRE OF GRAVITY LIMITS
(see also Sect 6)

Forward Limit	**18% MAC**
Aft Limit NO aerobatic	**32% MAC**
Aft Limit aerobatic	**29% MAC**
DATUM	**FIREWALL**
***Leveling Means*:Longitudinal**	Spirit Level placed lateral canopy strut
***Leveling Means*Lateral**	Spirit Level crossingcanopy

Note: reduce weight and CG range when operating at max speed and high G's

2.6. OPERATING ALTITUDE

At operating mass of:

Max 1650 lb (750 kg)**< 11500 ft**

Min 1278lb (580 kg)**<9000 ft**

Note: Decreasing mass reduce altitude linearly

Note: the indicated altitudes are service altitude where the ROC is minimum 100 ft/min. The above altitudes can be reached only in smooth air and with caution (at flying speed lesser of V_C) due to gust structural factor (higher at min weight and max altitude), flight test demonstrated altitude: 14500 ft/msl (650kg - 1433lb).

2.7. POWERPLANT LIMITATIONS

(Explnote:standardconfiguration.Verify specific engine manual)

Instrument	Yellow Arc	Green Arc	Red Radial Line/Arc
Tachometer	1000 – 1400RPM	1400 - 5500 RPM	5800 RPM
Oil Temp.	120° - 190° F	190° - 250° F	266° F
Oil Pressure	12 - 29 psi	29 - 73 psi	102 psi
Coolant Temp.		104° - 248° F	248° F

Minimum Oil Temp for Takeoff	120° F	
Minimum Oil Pressure	in Level Flight or climb	29 psi
	In Descent	12 psi
Maximum Coolant Temperature		248° F
Maximum RPM for all operations		5800
Full Throttle Static RPM	Not Above	5500
	Not Under	5300

2.8. OTHER LIMITATIONS

2.8.1. AUTHORISED MANEUVERS AND ASSOCIATED LIMITATIONS

Under
CS-VLA Aeroplanecategories

"ThisCS-VLAappliestoaeroplaneintendedfornon-aerobaticoperationonly.
Non-aerobaticoperationincludes:

(a) Anymaneuverincidenttonormalflying;
(b) Stalls(exceptwhipstalls);and
(c) Lazy
eights,chandelles,andsteepturns,inwhichtheangleofbankisnotmorethan60°

***Note:BASIC Aerobatic maneuvers, including spins, are permitted under limitations at Sect.2 (2.2 - 2.4 - 2.5) and Sect 6.**

2.8.2. ENGINE START, OPERATING TEMPERATURE

(modify following proper engine manual)

MAX 120° F
MIN -13° F

2.8.3. SMOKING

Prohibited.

2.8.4. MAXIMUM AIR TEMPERATURE FOR OPERATIONS

104^{O}F for takeoff at gross weight.

2.8.5. FLIGHTS WITH CANOPYOPEN or REMOVED

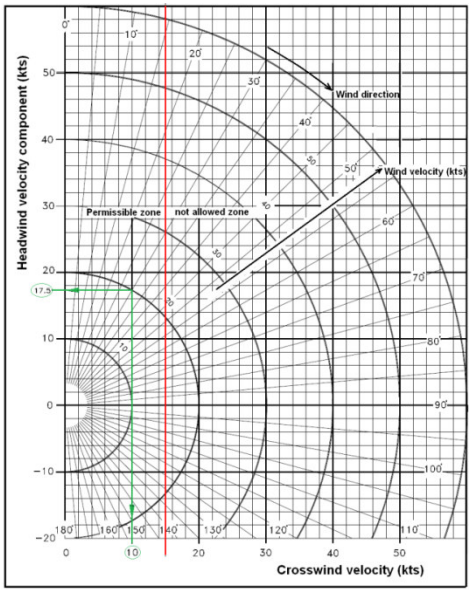
Prohibited.

2.8.6. MAXIMUM PERMISSIBLE NUMBER OF OCCUPANTS

Two (including Pilot).

2.8.7. MAXIMUM CROSSWINDCOMPONENTVELOCITY:

15 kts



Green line (example)
Wind data: 20 kts; 30° (angle from longitudinal axis of A/C)
Results: Head wind component 17.5 kts; Crosswind component 10 kts

2.9. PLACARDS

Cockpit Placards General

- **PASSENGER WARNING** - THIS AIRCRAFT IS AMATEUR BUILD AND DOES NOT COMPLY WITH FEDERAL SAFETY REGULATIONS FOR STANDARD AIRCRAFT	
	

External Fuselage

Section 3 - Emergency Procedures

Table of Contents

3.1. INTRODUCTION

Section 3 provides checklist and other procedures for coping with emergencies that may occur. Emergencies caused by airplane malfunctions are rare if proper preflight inspections and maintenance are practiced. En route weather emergencies can be minimized or eliminated by careful flight planning and good judgment when unexpected weather is encountered. However, should an emergency arise, the basic guidelines outlined in this section should be considered and applied as necessary to correct the problem.

Due to the airframe architecture and retractable gears, during forced landings in open field or in water the utilization of the landing gear is at pilot's discretion

3.2. AIRSPEEDS FOR EMERGENCY OPERATION

Expl note: Due to great importance of airspeed displayed hereafter (IAS) it is mandatory during flying test to verify, to control and calibrate pitot and air speed indicator

The following speeds (SL EAS) are based on a maximum weight of 650 Kg and may be used for any lesser weight.

Engine Failure After Takeoff	55-65 kts
Maneuvering Speed (at all weights)	125 kts
Maximum Glide Distance, Still Air (see also graph following page)	73 -> 78 kts[1]
Precautionary Landing Approach with Engine Power	65kts
Landing Approach Without Engine Power: landing Flaps Up landing Flaps Down (see also graph following page)	 65kts 55kts

Note increase values linearly as per para 2.2 and 2.3 and verify during flight test

Note[1] : A slightly higher speed may give better distance over the ground if gliding into wind; a slightly lower speed if gliding downwind.

3.3. OPERATIONAL CHECKLISTS

(see note Sect 3 page 2 of 14)

3.3.1 ENGINE FAILURES

ENGINE FAILURE DURING TAKEOFF RUN

1	Throttle	Idle
2	Brakes	Apply
3	Ignition Switches	OFF
4	Master Switch	OFF
5	Fuel Valve	OFF
6	Aircraft	**ABANDON**(according to situat.)

ENGINE FAILURE IMMEDIATELY AFTER TAKEOFF

1	Speed :	55-65 kts
2	Landing Site:	**Max ± 45° HDG change**
	When landing is assured	
1	L/G	As required
2	FLAPS	As required
3	Canopy	Open before touchdown
	After aircraft has Stopped	
2	Fuel Shutoff Valve	OFF
3	Ignition Switches	OFF
5	Master Switch	OFF

ENGINE FAILURE DURING FLIGHT

1	Best GlideAirspeed	73 -> 78 kts
2	Fuel Shutoff Valve	ON
3	Fuel Pump	ON
4	Ignition Switches	ON
5	Engine restart	Apply
	If restart is unsuccessful	
6	Forced Landing Procedure	Apply
	If restart is successful	
7	Electrical system	Set Norm. Conf.
8	Landing	ASAP

Note : A slightly higher speed may give better distance over the ground if gliding into wind; a slightly lower speed if gliding downwind

AIRSTART &LIMITATIONS(warning: modify as per engine type and its manual).

In the event that the engine is stopped during flight, it may be restarted by application of fuel & ignition, provided that the propeller is still windmilling.

Therefore, the following procedure addresses only airstarts by use of the Starter Motor

IMPORTANT
***DO NOT* depress starter button while propeller is rotating.**

1	Ignition Switches	OFF
2	Cabin	Clear
3	Increase angle of attack & reduce speed (up to & including a stall) until propeller stops rotation	
4	Establish Glide	73 -> 78 kts
5	Fuel	ON
6	Fuel Pump	ON
7	Master	ON
8	Ignition Switches	ON
9	Starter Button	Depress
10	Throttle	Open
11	Repeat as necessary: **Ensuring propeller has stopped rotation before each restart attempt.**	
	If restart is unsuccessful	
12	Forced Landing Procedure	Apply
	If restart is successful	
13	Electrical system	Set Norm. Conf.
14	Landing	ASAP

Note : The engine cools quickly with the propeller stopped. Choke may need to be used to start if time between restart is longer. After restart not RPM max power.

3.3.2. FIRE

SMOKE and FIRE DURING START ON GROUND

1	Cranking	CONTINUE to get a start that would suck the flames and accumulated fuel through the system and into the engine.	
If engine starts,			
2	Power	5000 RPM	
3	Fuel	OFF	
4	Engine	Inspect for damage	
If engine fails to start,			
5	Cranking	CONTINUE in an effort to obtain a start. If no start in 15 seconds : Shut off fuel & continue to crank for another 15 seconds.	
6	Fire Extinguisher	Obtain (have ground attendant obtains if not installed).	
7	Engine	SECURE.	
		A Master Switch	OFF
		B Ignition Switch	OFF
		C Fuel Pump Switch	OFF
		D Fuel Shutoff Valve	OFF
8	Fire	Extinguish using fire extinguisher, wool blanket, or dirt.	

ENGINE FIRE IN FLIGHT

1	Throttle	CLOSED
2	Fuel Shutoff Valve	OFF
3	Lane A/B Switches	OFF
4	Master Switch	OFF
5	Fuel Pump Switch	OFF
6	Cabin Air	OFF
7	Airspeed	75 kts (if fire is not extinguished, increase glide speed to find an airspeed which will provide an incombustible mixture).
8	Forced Landing	Execute (as described in Emergency Landing Without Engine Power).

ELECTRICAL FIRE IN FLIGHT

1	Master Switch	OFF
2	All Other Switches	OFF
3	Vents/cabin air (*)	OPEN
If fire appears out and electrical power is necessary for continuance of flight:		
4	Master Switch	ON
5	Fuses	CHECK for faulty circuit, **DO NOT** reset or replace.
6	Radio/Electrical Switches	ON one at a time, with delay after each until short circuit is localised.
7	Land as soon as possible to inspect for damage	

CABIN FIRE

1	Master Switch	OFF
2	Vents/Cabin Air (*)	OPEN
3	Land as soon as possible to inspect for damage.	

(*) Have been demonstrated possibility to open canopy in flight up to 100 mm slot, and at a speed up to 70 kts manually blocked in this position.

3.3.3. FORCED LANDINGS

AIRFIELD OR AIRSTRIP EMERGENCY LANDING WITHOUT ENGINE POWER

1	Airspeed	65kts (flaps UP) Approach 55kts (flaps DOWN)
2	Landing site	Locate (if possible)
3	Fuel Shutoff Valve	OFF
4	Fuel Pump	OFF
5	Ignition Switches	OFF
6	Wing Flaps	as required
7	Seat Harness	Tighten & locked
	When landing is assured	
8	L/G	As required
9	Canopy	Open before touchdown
	Note : IF FIRE	Release canopy and seat belts just before touchdown. Cushion face at touchdown with folded coat or cushion
10	Touchdown	Slightly Tail Low
11	Brakes	as required
12	Master Switch	OFF
13	Aircraft	Abandon

AIRFIELD OR AIRSTRIP PRECAUTIONARY LANDING WITH ENGINE POWER

1	Airspeed	65-70 kts
2	Wing Flaps	1st Stage
3	Fuel Pump	ON
4	Selected Field	FLY OVER Note terrain and obstructions
5	Radio and Electrical Switches	ON
6	Wing Flaps	FULL (on final approach)
7	Airspeed	60 kts
	Note : IF FIRE	Release canopy and seat belts just before touchdown. Cushion face at touchdown with folded coat or cushion
8	Touchdown	Slightly Tail Low
9	Ignition Switch	OFF
10	Brakes	as required

OPEN FIELD FORCED LANDING WITHOUT ENGINE POWER

1	Airspeed	65kts
2	Flaps	AS required
3	L/G	As required
3	Fuel Shutoff Valve	OFF
4	Fuel Pump	OFF
5	Ignition Switches	OFF
6	Master Switch	OFF
7	Canopy	Open before touchdown
	Note : IF FIRE	Release canopy and seat belts just before touchdown. Cushion face at touchdown with folded coat or cushion
7	Touchdown	level attitude

OPEN FIELD FORCED LANDING WITH ENGINE POWER

1	Airspeed	65-70 kts
2	Wing Flaps	1st Stage
3	Fuel Pump	ON
4	Selected Field	FLY OVER Note terrain and obstructions
5	Radio and Electrical Switches	ON
6	Flaps and gear	As required
7	Airspeed	65 Kts
8	Canopy	Open before touchdown
	Note : IF FIRE	Release canopy and seat belts just before touchdown. Cushion face at touchdown with folded coat or cushion
9	Touchdown	level attitude

DITCHING (FORCED WATER LANDING)

1	Radio	Transmit MAYDAY on area frequency, giving location and intentions.
2	Heavy Objects	SECURE
3	Approach	High winds, heavy seas INTO wind. Light winds, heavy swells Parallel to Swells
4	Wing Flaps and Gears	UP
5	Power	establish 50 ft/min descent at 65 kts
6	Canopy	Just before splashdown open canopy
7	Touchdown	level attitude
8	Face	Cushion at touchdown with folded coat or cushion
9	Aeroplane	Release seat belts. Evacuate through canopy.
10	Lifevests	Inflate

LANDING WITH A FLAT MAIN TYRE

1	Wing Flaps	FULL
2	Approach	Normal
3	Touchdown	GOOD TYRE FIRST hold aeroplane off flat tyre as long as possible with aileron control.

3.3.4. GEAR EMERGENCIES

UNSAFE GEAR INDIC. DURING RETRACTION

NOTE1

If the landing gear cannot be retracted to the final UP position, the flight may
be continued with all the gear legs in the down & locked position. However,
higher aerodynamic drag, degraded flight performance, increased fuel consumption& decreased range should be considered.

Speed	Max 85 Kts
Gear Hyd Pump & Gear Control C/B	check

NOTE2

One reset of any C/B may be attempted after a cooling time of approximately 2 min.
If the C/B trips again do not attempt another reset.
Consider 85 KcasVmax and degraded flight performances for the continuation of the flight.
Landing as soon as possible

UNSAFE GEAR INDIC. DURING EXTENTION

NOTE1

With the gear lever DOWN, The 3 green lights must be on

Speed	Max 85 Kts
Gear Hyd Pump & Gear Control C/B	check

NOTE2

One reset of any C/B may be attempted after a cooling time of approximately 2 min.
If the C/B trips again do not attempt another reset.
After the reset attempt, if successful the three green lights will be on

if reset unsuccessful or all three GREEN lights not ON

Be ready to lower manually the landing gear

MANUAL GEAR EXTENSION

1	Speed	Max 85 kts
2	Gearhyd pump breaker	OUT (OFF)
2	Gear Switch	DOWN
3	Two gear hyd. valves (on middle cockpit)	Open
4	Operation	Pumpinguntil the three green lights illuminate or untill pressure raises enough to block the manual action

NOTE1
IF one or more green lights are off, if press-to-test lights are not present, ask an observer at the ground by radio to check the landing gear down while flying at a low height.

LANDING WITH GEAR UP

1	Ground Personnel	INFORM
2	Passenger	Brief (if applicable)
3	Seat belts	Tighten
4	L/G	UP
	MAKE A NORMAL APPROACH	
5	Flap	As required
6	Canopy	OPEN
7	Landing	Minimum speed
8	Master/Ignition switches	OFF

3.3.5. MAXIMUM GLIDE

For Minimum Rate of Sink: 70kts
For Maximum Distance in Still Air: 78kts

To maximize distance achieved into wind, increase glide speed by approximately 1/3 of wind velocity.

Glide performance will be improved (if time permits) by stopping propeller if windmilling

3.3.6. RECOVERY FROM AN INADVERTENT SPIN

While inadvertent spins are unlikely, should this occur,proceed as follows:

1	Throttle	IDLE
2	Ailerons	NEUTRALISE
3	FLAPS	UP
4	Spin Direction	Establish
5	Rudder	Opposite direction of spin and HOLD
6	Just AFTER rudder reaches the stop, move the control stick FORWARD fully and abruptely to break the stall.	
5	HOLD these control inputs until rotation stops. Premature relaxation of control inputs may extend the recovery.	
6	As rotation stops, neutralise rudder and make a smooth recovery from the resulting dive. **Prevent V_{NE} and max G's**	

3.4. OTHER PROCEDURES

3.4.1. IGNITION MALFUNCTION

A sudden engine roughness or misfiring is usually evidence of ignition problems. Switching from both ON to alternately switching each system OFF will identify which system is malfunctioning. Switch to the good system and proceed to the nearest airport for repairs.

3.4.2. LOW OIL PRESSURE

1	**A rapid drop from normal indicated pressure to indication "0"**	
	Action	Observe for smell of oil
		Open cabin air vents
		Observe for signs of spilt oil on cowls, windscreen, wing surface.
		If strong smell of oil and oil appearing on airframe, reduce power to minimum to sustain level flight and proceed to nearest landing area.
		Be prepared to make an emergency landing enroute, should the engine fail.
2	**Gradual reduction in oil pressure below observed normal position:**	
	Action:	Observe oil temperature indications
		If oil temperature is higher than normal indications and all other engine functions are normal, proceed to the nearest landing area, land and check oil levels and external oil system for leaks
		If oil level is low, top-up to full mark on dipstick
		Allow engine to cool, start engine, run to full power and recheck oil pressure
		If oil pressure readings are normal, proceed with flight, observing both oil pressure and temperature readings.
		If, after the run-up check, the oil pressure remains low, have the engine checked by an authorised person.

3.4.3. ALTERNATOR OUT

Ammeter (recommended optional)	Checkamp OUTPUT

In case of generator failure, battery voltage showed on screen drops below 13.5 V permanently.
Turn off all not indispensable electric consumptions
Navigation lights, strobe lights, cabin lights, co-pilot EFIS
Be aware that the battery autonomy could not ensure the lowering of the landing gear
If this occurs, use the manual lowering procedure

WARNING

Battery power is expected to feed the aircraft system for 20 minutes:land ASAP.

3.4.4. COOLANT TEMPERATURE TOO HIGH

Oil Temperature	check
If oil temp. is above green range	
Landing	ASAP
Speed	73-78 kts
Power setting	Minimum possible

Be prepared to apply the FORCED LANDING procedure should engine stop

If oil temp. is within green range	
Power setting	reduce
Speed	Increase if possible
If coolant temp. returns within green range	
Power setting	AS required

Engine parameters	check
If coolant T. does not return in green range	
Landing	ASAP
Speed	73-78 kts
Power setting	Minimum possible

Be prepared to apply the FORCED LANDING procedure should engine stop

3.4.5. TRIM RUNAWAY

Trim actuator c/b	Pull out
Speed	Adjust as required
Landing	ASAP

3.4.6. LOW FUEL PRESS (no more than 2.8 bar)

Fuel pump switches	check
Fuel tank selector	Set on fuller tank
If fuel press does not return in green range	
Engine rpm / MAP	5000 max / 30"max
Speed	Adjust as required
Landing	asap

Be prepared to apply the FORCED LANDING procedure should engine stop

Section 4 - Normal Operations

Table of Contents

4.1. INTRODUCTION

Section 4 provides checklist and other procedures for the conduct of normal operations .

4.2. SPEEDS FOR NORMAL OPERATION

The following speeds are based on a maximum weight of 650 Kg (1433 Lbs) and may be used for any lesser weight.

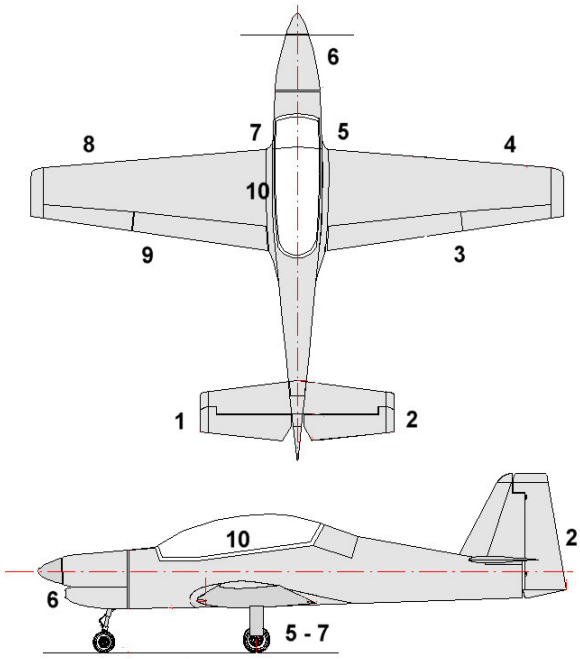
Takeoff		**kts**
	Initial Climb Out, 1st Stage Flap	70
	Short Field Takeoff, 1st Stage Flap Speed at 15 meters..	65
	When Clear obstacles retract gear and flaps and climb at	80
Climb, Flaps and Gear Up kts		
	Normal best angle	70
	Best Rate of Climb, at low altitude	75
	Note: Best Obstacle clearance gradient is with 1st Stage Flaps at 65kts; but pay attention in maintaining this condition for longer than necessary as this may cause excessive engine temperatures	
Landing Approach: kts		
	Normal Approach, Full Flap	70
	Short Field Approach, Full Flap.	65
Baulked Landing: kts		
	Apply full power; allow speed to increase to	65
	Retract Flap to 1st Stage and gears until clear of obstacles	
	Then retract flap and gears and continue to climb at or above	80

	Maximum Recommended Turbulent Air Penetration	125
	Maximum Demonstrated Crosswind Velocity	15

4.3. CHECKLIST & PROCEDURES

4.3.1. PREFLIGHT INSPECTION

Prior to flight, the aircraft should be inspected in accordance with the following checklists and in the sequence shown in the following diagram:



NOTE

Visually check airplane for general condition during walk-around inspection. In cold weather, remove even small accumulations of frost, ice or snow from wing, tail and control surfaces. Also, make sure that control rods and cables are free of ice and move freely.

PREFLIGHT INSPECTION CHECKLISTS

1 – CABIN		
1	Flight manual	AVAILABLE IN THE AIRCRAFT.
2	Control lock.	REMOVE Seatbelt Fastening
3	Ignition Switches	OFF
4	Master Switch	OFF
5	Gear switch	Down
6	Backseat gear switch (optional)	UP
7	Fuel Shutoff Valve	ON
8	Seatbelts and Shoulder Harnesses	CHECK condition and security
9	Aileron Cable Mountings & Rod Ends	CHECK for free rotation & excessive movement, bolts secure & anchors.
10	Elevator Cable Mounting & Rod End	CHECK for free rotation & excessive movement, bolt secure & anchor on Main Beam secure.
11	Rudder & Nose Wheel Steering Push Rods & Rod Ends	CHECK for security & free movement
12	MASTER SWITCH	ON
13	Constant speed instrument	Check (if applicable)
14	Fuel gauge	Check level
15	TRIM - TRIM INDICATOR	CHECK
16	Flap Control	CHECK free movement
17	MASTER SWITCH	OFF

18	Throttle	CHECK for full & free travel.
19	Brake Lever and oil level	CHECK for free travel & pressure.
20	L/G Hyd. oil level	CHECK

2– FUEL		
1	Fuel Quantity	CHECK level in tank through **visual** or little rod.
2	Water Check	Before first flight of the day & after each refueling, use sampler cup & drain small quantity of fuel from fuel tank sump quick-drain valve & check for water & sediment.
3	Fuel Filler Cap	CHECK secure

3– EMPENNAGE		
1	Tail Tie-down	DISCONNECT
2	Control Surfaces	CHECK freedom of movement & security
3	Rudder, Elevator & Trim	CHECK freedom of movement & security

4 - RIGHT WING - TRAILING EDGE		
1	Aileron	CHECK freedom of movement & security.
2	Flap	CHECK security
3	Control Rods & Cables	CHECK aileron & flap control bolts & nuts & flap control rod for security. CHECK rod ends for freedom of rotation & excessive movement

5 – PITOT TUBE		
1	Static & Dynamic Source	Remove cup, CHECK for blockage.

6 - RIGHT WING

1	Wing Tie-down	DISCONNECT.
2	Main Wheel & Tire	CHECK for security. Proper tire inflation & wear or damage.
3	Wing Root Mount Bolts	CHECK for security.

7– NOSE		
1	Propeller & Spinner	CHECK for nicks & security
2	Cowling	REMOVE & CHECK security of engine components & systems, particularly mounts, spark plugs, wiring,fuel lines, baffles CHECK for oil leaks
3	Engine Oil & Cooling liquid Level	CHECK & top up if necessary. Clean up any spilt oil.
4	Cowling	REPLACE & CHECK clips fastened & secure
5	Front Wheel	CHECK for proper tire inflation or damage.

8 - LEFT WING		
1	Main Wheel & Tire	CHECK for security. Proper tire inflation or damage.
2	Wing Root Mount Bolts	CHECK for security
3	Wing Tie-down	DISCONNECT

9 - LEFT WING - TRAILING EDGE		
1	Aileron	CHECK freedom of movement & security
2	Flap	CHECK security.
3	Control Rods & Cables	CHECK aileron & flap control bolts & nuts & flap control rod for security. CHECK rods for freedom of rotation & excessive movement

4.3.2. BEFORE STARTING ENGINE

1	Preflight Inspection	COMPLETE
2	Seatbelts & Harness	ADJUST & LOCK
3	Fuel Shutoff Valve	ON
4	Radio/Intercom	OFF
5	Brakes	TEST & SET

4.3.3. STARTING ENGINE - COLD ENGINE.

1	Propeller Area	CLEAR
2	Master Switch	ON
3	Fuel pumps	BOTH ON
4	Activate ECU	Lane A/B switches ON and guarded
5	Start power switch	ON
6	Warn A/B lights	ON (3 sec) then Off
7	Throttle	40-45%
8	Start Button	PRESS
	Note: If the engine is cranking below 600 RPM, it will not start	
	As soon as engine is running release "start power switch" and throttle back to an idle speed of 1500 - 2300 RPM	
9	Check all engine instruments for proper function	
10	Generator switching	Increase engine speed above 2400rpm and hold for 8 seconds
11	Battery voltage	Check (rise above 13.5v)
12	Throttle	Idle

IMPORTANT. Check the engine oil pressure.

If you do not see oil pressure rise within 10 seconds, shut down the engine immediately and determine the cause.

4.3.4. STARTING ENGINE - HOT ENGINE

Proceed as for cold engine above.

4.3.5. WARM-UP and FUNCTIONAL CHECK

Warm-up the engine with a fast idle of 2000 - 2500 RPMuntil the oil temperature reaches 50° C. During this phase, the cooling is insufficient due to reduced airflow. It is therefore advisable not to shorten the warm-up time by running the engine at higher RPM. The aircraft should be pointed into wind to allow additional cooling air. As soon as the oil reaches 50° C, it is possible to do the run-up.

4.3.6. BEFORE TAKEOFF

1	Brakes	CHECK
2	Cabin Doors	CLOSED & LATCHED
3	Flight Controls	FREE & CORRECT
4	Flight Instruments	SET
5	Fuel Shutoff Valve	ON
6	Elevator Trim	NEUTRAL
7	Flaps	SET FOR TAKEOFF
8	Lane and Ignition Check	Throttle to 3500 RPM Hold this engine speed for 10 seconds

		Switch OFF Lane A switch and check RPM Switch ON Lane A switch and wait for Warn A lamp to extinguish
		Switch OFF Lane B switch and check RPM Switch ON Lane B switch and wait for Warn B lamp to extinguish
		RPM drop should not exceed 250 RPM on either lanes
		If drop is excessive, shut down & determine the reason
	NOTE During the check with one system only, the inactive sparkplugs may tend to load up slightly. To clean plugs, run the engine with both ignitions for a few seconds, then recheck the second system.	
9	Power Check	Throttle to 5500 RPM Open the throttle fully & slowly to check if maximum performance can be reached Wind conditions may effect, but as an average 5500 RPMshould be seen.
	NOTE If the RPM is found to be more than 300 RPM lower than normal, the engine should be examined to determine the reason.	
10	Fuel pump check	Throttle to 2000 RPM
		Deactivate fuel pump 1 and check fuel pressure. Activate fuel pump 1
		Deactivate fuel pump 2 and check fuel pressure. Activate fuel pump2
		If fuel pressure is not within the limits turn off engine and determine the cause

11	Idle Check	Throttle to idle position & check that the engine runs smoothly. With too low an idle speed, or rough running, the cause must be located & corrected to avoid the potential for an in-flight stoppage
12	Carburettor Heat Check (if applicable)	Throttle up to 4000 RPM Pull out the Carburettor Heat Control & look for an RPM drop. Return the Carburettor Heat Control to the Full IN or cold position.

4.3.7. TAKEOFF

Normal Takeoff		
1	Wing Flaps	1st Stage
2	Throttle	FULL.....OPEN
3	Elevator Control	LIFT NOSE WHEEL AT 50-55kts and wait for aircraft to fly itself off (at around 60 kts)
4	Climb Speed	70 kts until Flaps retracted, then 80 kts
5	Landing Gear	UP (check positive rate of climb)

Short Field Takeoff		
1	Wing Flaps	1st Stage
2	Brakes	APPLY
3	Throttle	FULL OPEN
4	Brakes	RELEASE
5	Elevator Control	SLIGHTLY TAIL LOW
6	Climb Speed	65 kts (until all obstacles are cleared).
7	Landing Gear	UP (check positive rate of climb)
8	Wing Flaps	RETRACT slowly increasing speed to 80kts

4.3.8. ENROUTE CLIMB

1	Airspeed	90 kts
2	Throttle	FULL OPEN
	NOTE : During climb, monitor the water & oil temperatures to avoid exceeding their limits. The aircraft has been tested to ensure adequate cooling in climb, therefore any excessive readings may indicate a malfunction. Should this occur, decrease the rate of climb in order to increase the airspeed for improved cooling.	

4.3.9. CRUISE

1	Power	Not above maximum continuous power of 5500 RPM.5000-5400 Normal.
2	Elevator Trim	ADJUST.

4.3.10. BEFORE LANDING

1	Seatbelts & Harnesses	ADJUST & LOCK
2	Carburettor Heat	as required
3	Fuel Pump	CHECK BOTH ON

4.3.11. LANDING

Normal Landing		
1	Approach Airspeed	70kts
2	Landing Gear	Landing Gear DOWN
3	Wing Flaps	FULL DOWN (below 82 kts)
4	Touchdown	MAIN WHEELS FIRST
5	Landing Roll	LOWER NOSE WHEEL GENTLY
6	Braking	MINIMUM REQUIRED

Short Field Landing		
1	Approach Airspeed	65 kts
2	Landing Gears	DOWN
3	Wing Flaps	FULL DOWN (below 82 kts)
4	Power	REDUCE to idle as obstacle is cleared
5	Touchdown	MAIN WHEELS FIRST
6	Brakes	APPLY AS REQUIRED
7	Wing Flaps	RETRACT when convenient for better braking

Balked Landing		
1	Throttle	FULL OPEN
2	Climb	ESTABLISH
3	Landing Gear	UP (check positive rate of climb)
4	Wing Flaps	RETRACT to 1-2 DOWN
5	Airspeed	65 Kts until clear of obstacles
6	Wing Flaps	RETRACT TO 1st STAGE until clear of obstacles then retract fully and continue to climb at or above 80 kts

4.3.12. AFTER LANDING

1	Wing Flaps	UP
2	Elevator Trim	ADJUST

4.3.13. ENGINE SHUT OFF and SECURING AIRPLANE

1	Radio/Intercom	OFF
2	Throttle	Idle and wait >2 mins for cool down
3	Lane Switch A/B	OFF
4	Master Switch	OFF
5	Fuel pumps	OFF
6	Controls	LOCK with seatbelt
7	Fuel	OFF

4.4. OTHER PROCEDURES

4.4.1. REFUELING

SAFETY WARNINGS

> Never prepare fuel in an area that is enclosed or where fumes could reach ignition point. DO NOT SMOKE or allow open flames or sparks in the vicinity. Never add fuel while the engine is running.

> Never refuel an aircraft if fuel could be spilled on hot engine components.

> Use only approved fuel containers and never transport fuel in an unsafe manner.

> Always check for fuel contamination. Contamination is a major cause of engine failure. The best place to avoid contamination is at the source. Once your fuel is in the container a very hazardous potential exists. Use a clean safety approved storage container. Do not overfill the container - allow for expansion.

> The engine is designed for use with unleaded MOGAS, which has an Octane Rating of 98 RON of higher. Use aviation gasoline only for short period time and with carbon level inspection. Be sure to use products of at least the standard shown in Section 1.

> Alwaysground the aircraft through the grounding Point provided at the fuel filler before removing the fuel cap.

> Before first flight of the day, and after each refueling, use a sampler cup and drain a small quantity of fuel from the fuel tank sump quick drain valve -check for water, sediment and contamination.

FUEL SYSTEM WATER DRAINAGE

Where there is a suspicion that water may be present in the fuel tank, the following procedure is to be followed.

> Lower the empennage of the aircraft to near the ground and rock the aircraft up and down and side to side at the same time. Repeat up to 10 (ten) times.

> Check fuel tank sump by sampling fuel.

> If water is present, repeat the entire procedure until you are certain that no water remains in the tank or fuel system.

Where doubt still exists the aircraft fuel system should be examined by a qualified person and fully stripped and drained before flight.

FILLING THE TANK

When fueling from a pump to a full tank condition lift the nozzle out slightly for the last four liters and slow the speed down as you can create a siphon motion that will dump the last four liters out until the vent is above the fuel level. If this happens quickly replace the fuel cap to break the siphon.

4.4.2. TAXIING

When taxiing, it is important that speed and use of brakes be kept to a minimum and that all controls be utilized to maintain directional control and balance.

The carburetor heat control knob should be pushed full IN (that is, NOT selected) during all ground operations unless heat is absolutely necessary.

Taxiing over loose gravel or cinders should be done at low engine speed to avoid abrasion and stone damage to the propeller.

DO NOT accelerate over loose gravel or cinders or propeller damage will result.

4.4.3. PROPELLER CARE

Full throttle run up over loose gravel is especially harmful to propeller tips. When takeoffs must be made over a gravel surface, it is very important that the throttle is advanced slowly. This allows the airplane to start rolling before high RPM is developed, and the gravel will be blown behind the propeller rather than pulled into it. When unavoidable small nicks appear in the propeller, they should be immediately corrected.

4.4.4. CROSSWIND TAKEOFF

Take off into strong crosswinds are normally performed with the minimum flap setting necessary for the field length, to minimize the drift angle immediately after takeoff. With the ailerons partially deflected into the wind, the airplane is accelerated to a speed slightly higher than normal, and then pulled off positively and smoothly to prevent possible settling back to the runway while drifting. When clear of the ground, make a coordinated turn into the wind to correct for drift.

4.4.5. CRUISE

Normal cruising is performed between 75% and 90% power. Continuous cruise should not be above 5500 RPM.

Flights should be planned at 8gals per hour with 45 minutes reserve, with appropriate allowances for wind conditions which will assist in determining the most favorable altitude and power setting for a given trip.

4.4.6. CROSSWIND LANDING

The limiting crosswind velocity of 15 ktshas been demonstrated at FULL Flap. However, in strong crosswind conditions use the minimum flap consistent with the strip length available.

Use the Wing Low technique right through to touchdown and land on Mains first.

4.4.7. BALKED LANDING

In a balked landing (go-around) climb, the wing flap setting should be reduced to the First Stage and landing gears retracted, immediately after full power is applied and the aircraft has accelerated to a safe climb speed. Upon reaching a safe airspeed, the flaps should be slowly retracted to the full up position, whilst allowing the aircraft to accelerate to the best climb speed.

4.4.8. NOISE ABATEMENT

Increased emphasis on improving the quality of our environment requires renewed effort on the part of all pilots to minimize the effect of airplane noise on the public.

As pilots, we can demonstrate our concern for environmental improvement by application of the following procedures:

1	At altitudes under 2000 feet, avoid flying in close proximity to houses or over parks and recreational areas
2	During approach to or departure from an airport, climb after takeoff and descent for landing should be made so as to avoid prolonged flight at low altitude near noise sensitive areas.

4.4.9. VISIBLE MOISTURE

Where flights are likely to include operations in visible moisture or rain, the use of window treatment is recommended.

4.4.10. STOPPING THE ENGINE

To stop the engine, turn OFF the ignition switches and turn OFF the Master Switch.

4.4.11. STARTING THE ENGINE FROM EXTERNAL POWER SOURCE

Where it is necessary to start the engine from an external power source:

		Remove Top cowl
		Place jumper leads directly on battery terminals, ensuring positive to positive and negative to negative
		Start as for normal operation
		Stop engine, remove jumper leads,refit cowl
	W A R N I N G Wheels must be chocked. Ensure propeller is clear. Ensure qualified person is in the operator seat. Do not attempt to refit cowl with propeller running.	

Section 5 - Performance

Table of Contents

5.1. PERFORMANCE

The following performance are based on:
-atweight of 650 Kg and may be used for any lesser weight;
- max engine power 140Hp;
- max efficiency of propeller;
All speed are calibrated air speed

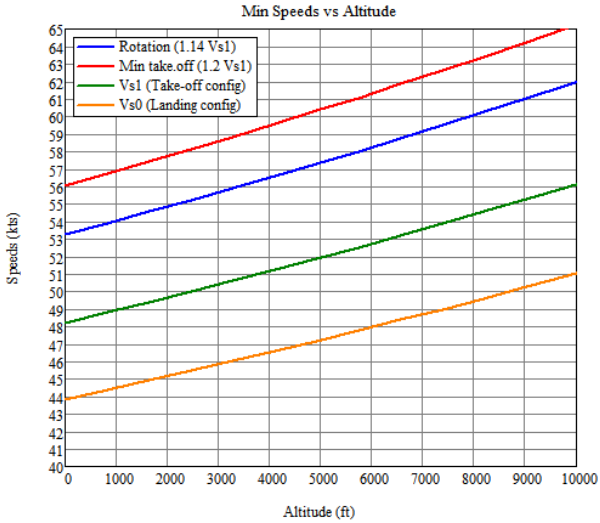
5.2. AIRSPEEDS CALIBRATION

Expl note: Due to great importance of airspeed displayed it is mandatory during flying test to verify, to control and calibrate the installed pitot and air speed indicator

5.3. STALL

Aircraft buffeting announce the stall.
(In kts and power off condition – Maximum Takeoff & Landing Weight)

Flap Setting	Zero *Clean* V_s	1st Stage 15° *Takeoff* V_{s1}	2nd Stage 35° *Landing* V_{s0}
kts	**60**	**58**	**50**



5.4. TAKEOFF & LANDING DISTANCES

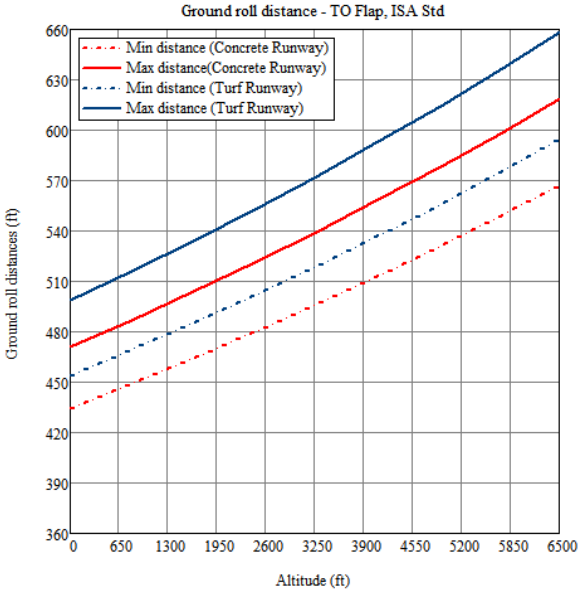
Takeoff safety speed	65 kts
Landing Approach speed (Full Flap)	65-70 kts

See graphs on following pages for distance evaluation function of related parameters

Any airfield surface that is not hard and smooth will increase the ground roll during take off. This is due to the inability of the tires to roll smoothly along the runway. Tires can sink into soft, grassy, or muddy runways. Potholes or other ruts in the pavement can be the cause of poor tire movement along the runway. Obstructions such as mud, snow, or standing water reduce the airplane's acceleration down the runway. Although muddy and wet surface conditions can reduce friction between the runway and the tires, they can also act as obstructions and reduce the landing distance. Braking effectiveness is another consideration when dealing with various runway types. The condition of the surface affects the braking ability of the airplane.

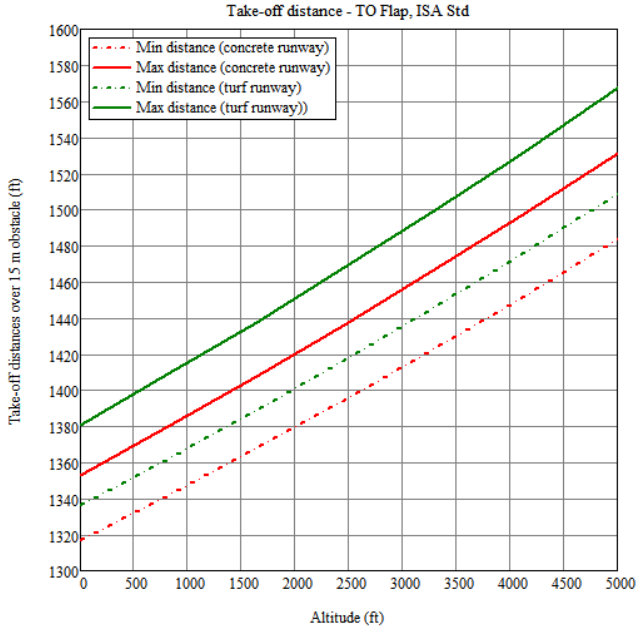
The amount of power that is applied to the brakes without skidding the tires is referred to as braking effectiveness. Ensure that runways are adequate in length for takeoff acceleration and landing deceleration when less than ideal surface conditions are being reported.

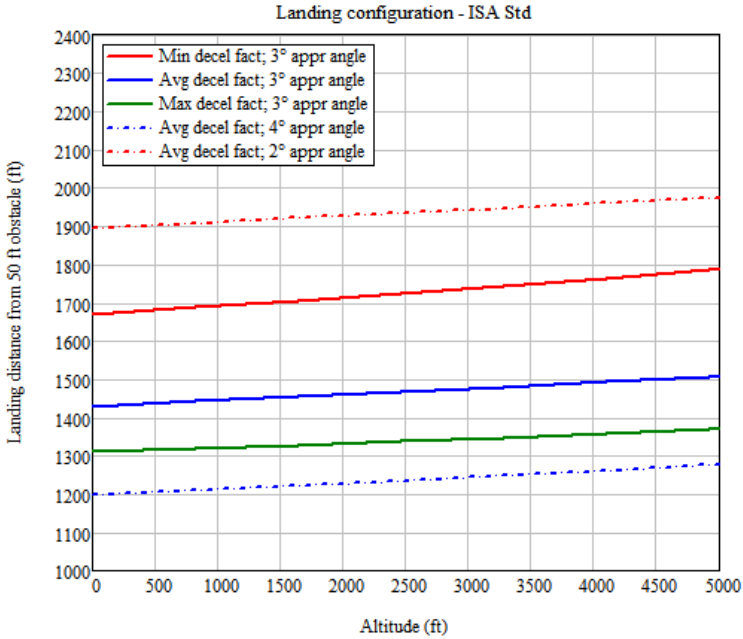
Therefore on the following graphs are reported the calculated distance for concrete and turf runway with minimum and best conditions of tires and brakes.



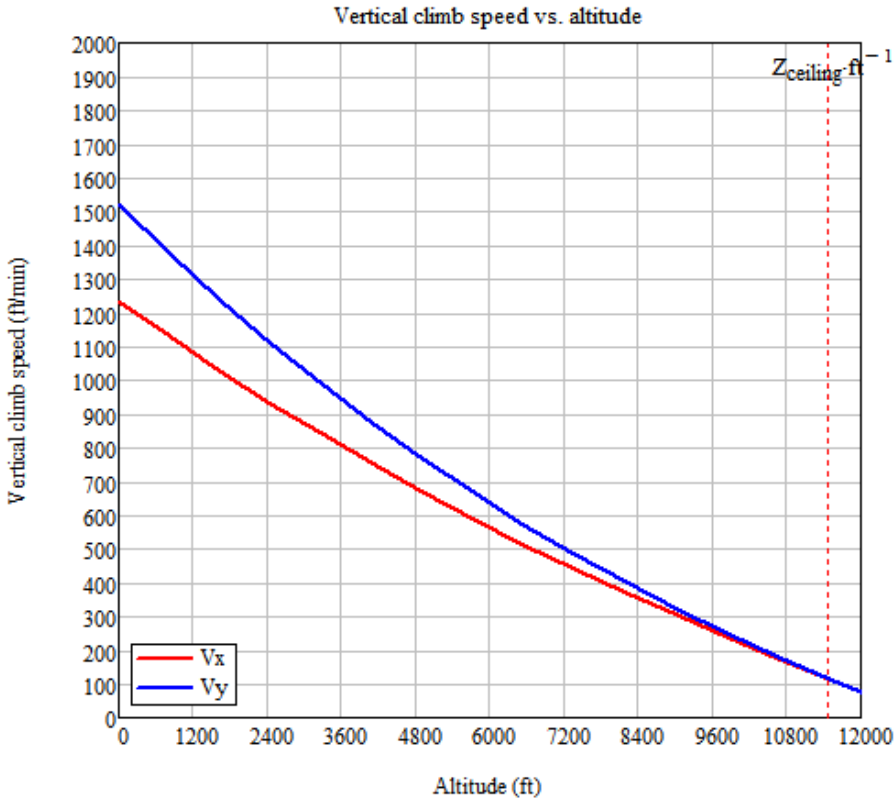
Must be taking also in account that: The gradient or slope of the runway is the amount of change in runway height over the length of the runway. The gradient is expressed as a percentage such as a 3 percent gradient. This means that for every 100 feet of runway length, the runway height changes by 3 feet. A positive gradient indicates the runway height increases, and a negative gradient indicates the runway decreases in height. An upsloping runway impedes acceleration and results in a longer ground run during takeoff. However, landing on an upsloping runway typically reduces the landing roll. A downsloping runway aids in acceleration on takeoff resulting in shorter takeoff distances. The opposite is true when landing, as landing on a downsloping runway increases landing distances.

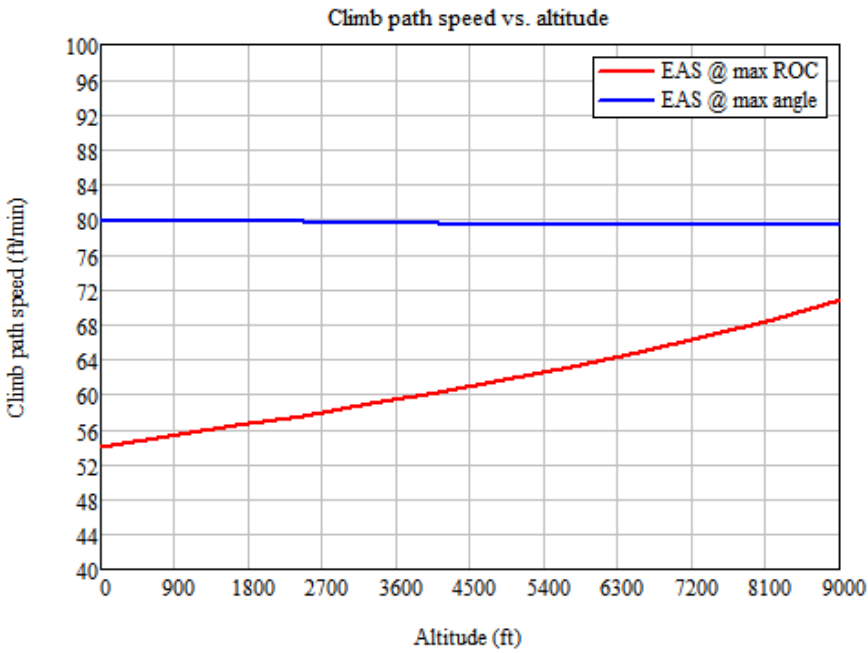
Example for estimate safety distance from graph:
The sea-level total (to 50 ft altitude) takeoff **distance**read on the graph at 0 wind, on a dry grass surface, is 1330 ft (405 m).
The sea-level take-off **strip length** must exceeds the landing take-off distance.
Therefor takeoff and landing strip distance must be at least 1.4 times the total TO distance [1330 ft times 1.4 = 1860 ft (600 m)]

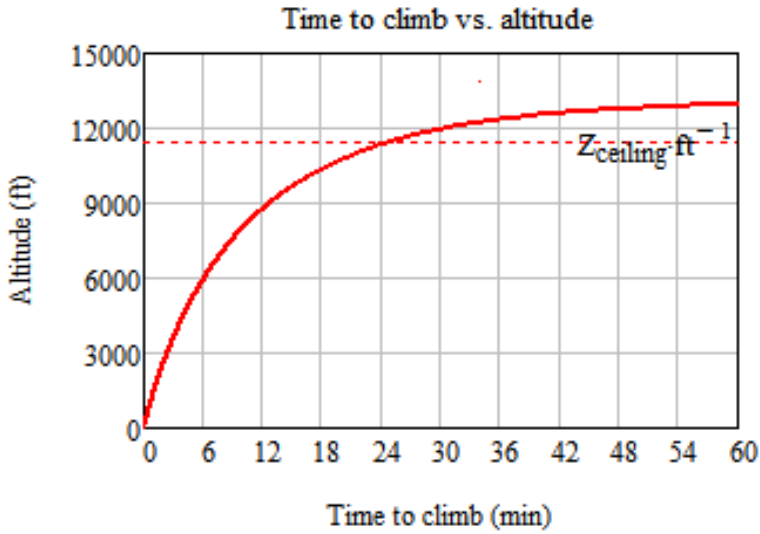



Landing configuration - ISA Std
Min decel fact; 3° appr angle
Avg decel fact; 3° appr angle
Max decel fact; 3° appr angle
Avg decel fact; 4° appr angle
Avg decel fact; 2° appr angle
Landing distance from 50 ft obstacle (ft)
2400
2300
2200
2100
2000
1900
1800
1700
1600
1500
1400
1300
1200
1100
1000
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
Altitude (ft)

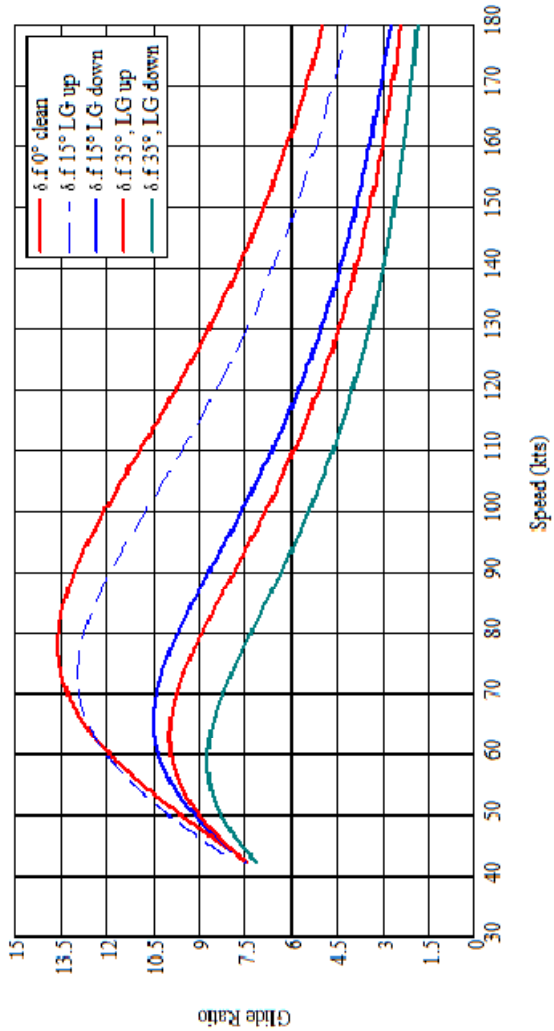
5.5. CLIMB PERFORMANCE

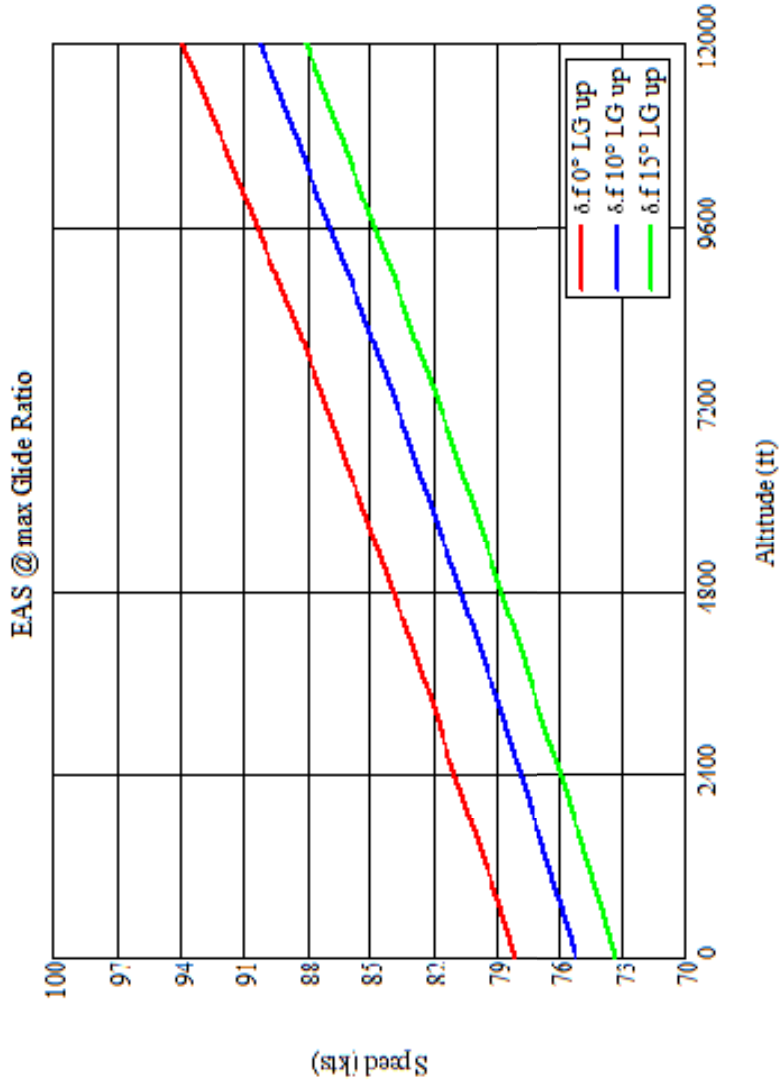


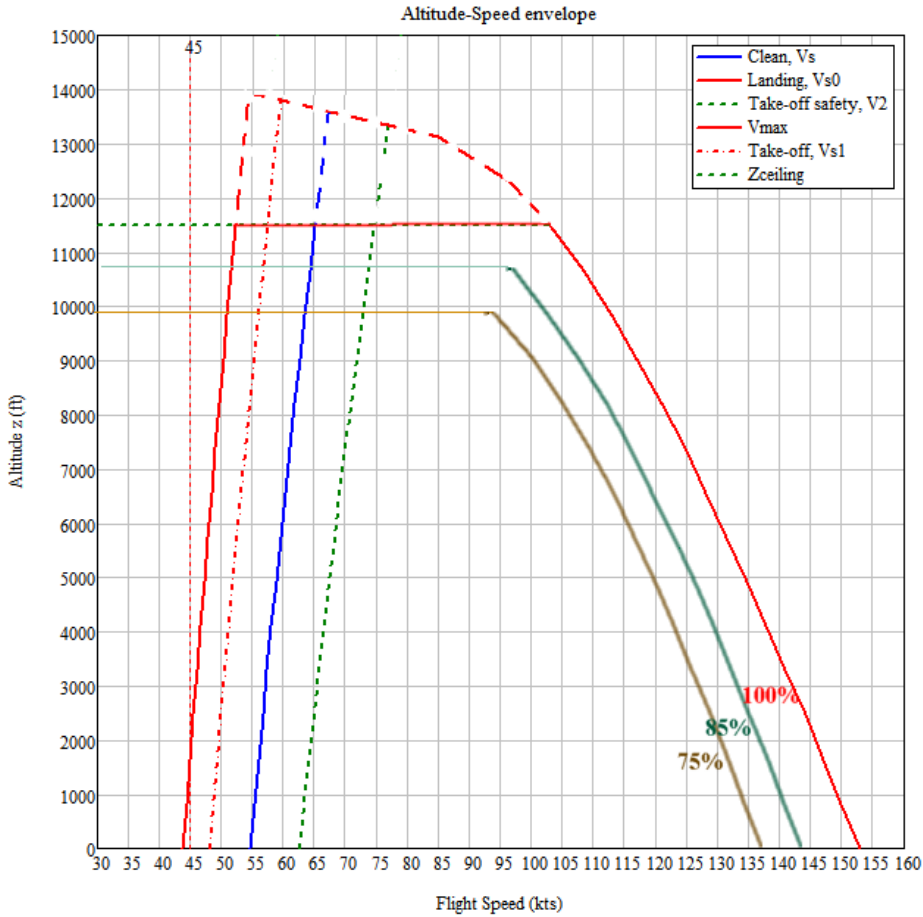

Climb path speed vs. altitude
EAS @ max ROC
EAS @ max angle
Climb path speed (ft/min)
100
96
92
88
84
80
76
72
68
64
60
56
52
48
44
40
0
900
1800
2700
3600
4500
5400
6300
7200
8100
9000
Altitude (ft)


Time to climb vs. altitude
Altitude (ft)
15000
12000
9000
6000
3000
0
$Z_{ceiling}$ ft − 1
0
6
12
18
24
30
36
42
48
54
60
Time to climb (min)

5.6. CRUISE PERFORMANCE




EAS @ max Glide Ratio
Speed (kts)
100
97
94
91
88
85
82
79
76
73
70
Altitude (ft)
0
2400
4800
7200
9600
12000
δ.f 0° LG up
δ.f 10° LG up
δ.f 15° LG up


Altitude-Speed envelope
Clean, Vs
Landing, Vs0
Take-off safety, V2
Vmax
Take-off, Vs1
Zceiling
45
100%
85%
75%
Altitude z (ft)
Flight Speed (kts)
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
11000
12000
13000
14000
15000
30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160

Section 6 - Weight and Balance

Table of Contents

6.1. INTRODUCTION

This section contains basic weight and center of gravity information necessary to ensure correct loading. It records the weight and balance of the empty aircraft, together with the Aircraft Weight & Balance diagram.

These documents are to be carried in the Flight Manual at all times.

6.2. Aircraft Weight Record

Registration No.	???????
Aircraft Model	Tucano Replica
Serial Number	**TR-.....**
Issue	1
Date	
Expiry Date	

Aircraft	Empty
Weight Lb	1038 lb
Arm	21.2%

Note: Empty aircraft includes Full Engine oil, unusable fuel 1.45 kg

Weight Control Manager Signature :.....

Date.....

6.3. CENTER OF GRAVITY LIMITS

Forward Limit	18% MAC = 49" aft of datum
Aft Limit	32% MAC = 56" aft of datum
Datum	Firewall
MAC L.E. station	40" aft of datum (M.A.C. = 50.6")
Leveling Means:	
Longitudinal	Spirit Level placed lateral canopy strut
Lateral	Spirit Level crossing canopy

Can be used following software to verify W&B of an aircraft and its loading condition:

1. USA W&B report-WF04Rev0-FORM.xlsx
2. USA W&B Calculator.xlsx

Knowing

CG arm	inch
Empty W (1038lb)	51.8
Pilot	43.3
Pax	78.4
Fuel	49.6
Bagg	106.3
Bagg 2 (parachute)	128.3

CONVERSION FORMULA:

-from PERCENTAGE of M.A.C. to Inches aft of DATUM

X= percentage of M.A.C.

$$\frac{50.6 * X}{100} + 40 = Inches\ aft\ of\ Datum$$

-from INCHES aft of DATUM to PERCENTAGE of M.A.C.

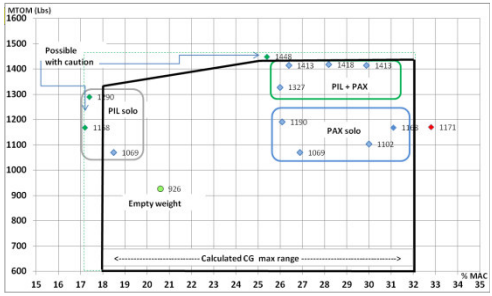
X= inches aft of DATUM

$$\frac{X - 40}{50.6} * 100 = \ Percentage\ of\ M.A.C.$$

6.4. LOADING SCENARIOS

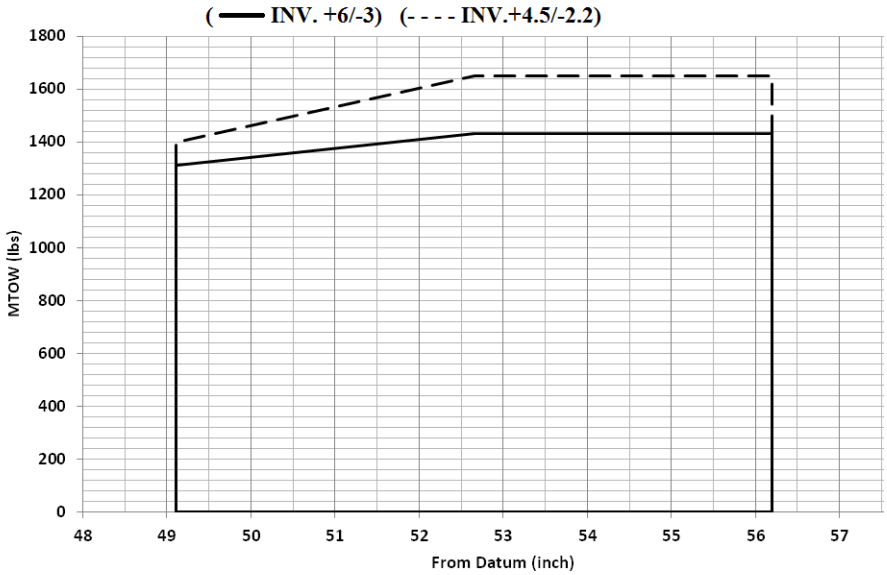
Load configurations list	
Min W	Pil 55 + 10 Fuel
2	Pil 100 + 10 Fuel
3	Pil 100 + max Fuel
4	Pil 86 + Pax 86 + 10 Fuel
5	Pil 86 + Pax 86 + max Fuel
6	Pax 55 + 10 Fuel
7	Pax 55 + max Fuel
8	Pax 100 + 10 Fuel
9	Pax 86 + 10 Fuel + Bagg 15
10	Pax 55 + 10 Fuel + Bagg 15
11	Pil 86 + Pax 86 + 50lt Fuel + bagg 15
12	Pil 100 + Pax 70 + 50lt Fuel + Bagg 15
13	Pil 70 + Pax 100 + 50lt Fuel + Bagg 15

Over CG range
XXX Over weight
Pax solo
Pil + Pax



Config	Empty	Min W	2	3	4	5	6	7	8	9	10	11	12	13
MTOM (kg)	420	485	530	585	602	657	485	540	530	531	500	643	641	641
Lbs	**926**	**1069**	**1168**	**1290**	**1327**	**1448**	**1069**	**1190**	**1168**	**1171**	**1102**	**1418**	**1413**	**1413**
% CG	20.6	18.5	17.2	17.4	26	25.4	26.9	26.1	31.1	32.8	30	28.2	26.4	29.9

6.5. PERMISSIBLE C.G. ENVELOPE



6.6. AIRCRAFT EQUIPMENT LIST

Items listed in the following table were fitted to the standard aircraft at manufacture and were included in the aircraft basic weight.

Generic Item	Specific Item
Engine	Rotax915iS A
Propeller	v.p.elitest 3 blade
Flight Instruments	DYNON SkyView HDX 1100+800 (rear)
AirspeedIndicator + analogic / Altimeter	Included (efis)
Slip/Skid indicator / compass + analogic	Included (efis)
Vertical SpeedIndicator/G-meter	Included (efis)
Prop. Governor	FlyboxPR1P
FLAPS Electrical (control stick)	Included (rear)
Engine Instruments	
Tachometer analogic + digital	Included (efis)
Oil PressureGauge	Included (efis)
Oil Temperature Gauge	Included (efis)
Coolant Temperature Gauge	Included (efis)
Hobbs meteranalogic + digital	Included (efis)
EGT	Included (efis)
Communications Equipment	
VHF Transceiver/intercom	DYNON SV-COM-C25
Transponder	DYNON SV-XPNDR-261
MiscellaneousEquipment	
trim - brake (rear)	included
Luci nav. +luce land. + strobo	included
Seat Belts + bags	included
Battery	SPARK 500

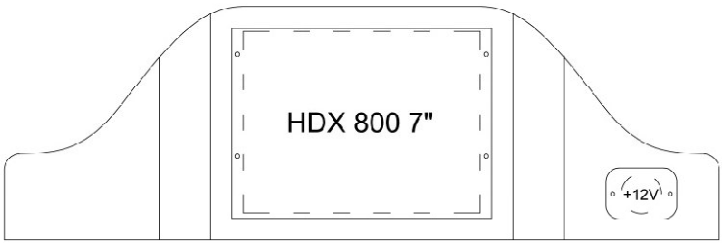
Annex A - SYSTEMS description

General

The installed systems are designed for normal operations as recreational, light aircraft only flown during Visual Meteorological Conditions (VMC)

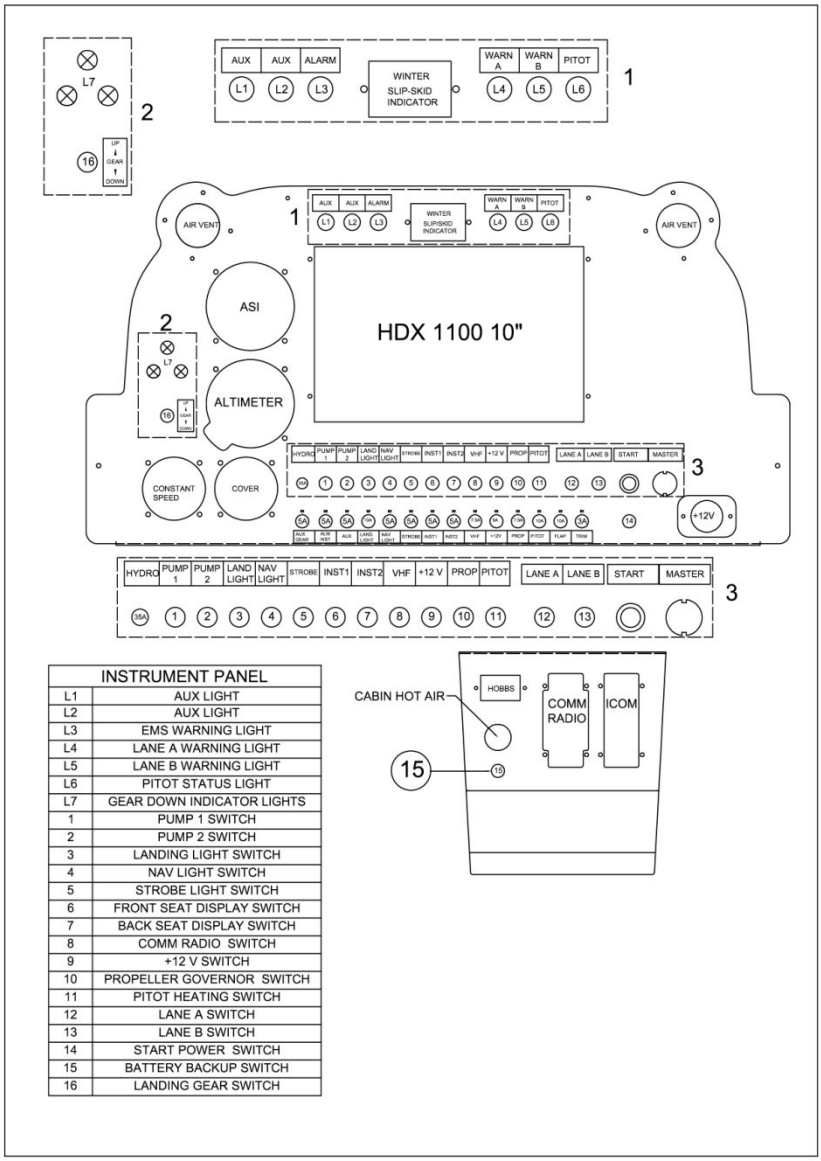
Instrument Panel

A pictorial view of the instrument panel is reported in the following picture:



Rear Panel

Front Panel



INSTRUMENT PANEL	
L1	AUX LIGHT
L2	AUX LIGHT
L3	EMS WARNING LIGHT
L4	LANE A WARNING LIGHT
L5	LANE B WARNING LIGHT
L6	PITOT STATUS LIGHT
L7	GEAR DOWN INDICATOR LIGHTS
1	PUMP 1 SWITCH
2	PUMP 2 SWITCH
3	LANDING LIGHT SWITCH
4	NAV LIGHT SWITCH
5	STROBE LIGHT SWITCH
6	FRONT SEAT DISPLAY SWITCH
7	BACK SEAT DISPLAY SWITCH
8	COMM RADIO SWITCH
9	+12 V SWITCH
10	PROPELLER GOVERNOR SWITCH
11	PITOT HEATING SWITCH
12	LANE A SWITCH
13	LANE B SWITCH
14	START POWER SWITCH
15	BATTERY BACKUP SWITCH
16	LANDING GEAR SWITCH

Flaps

The fowler flaps are located along about three quarter of the wing trailing edge and are powered by means of an electric motor installed in the floor of the rear part of the cockpit area.
Flap extension and retraction is activated by means of an electric switch on the instrument panel or with switches on both control sticks.

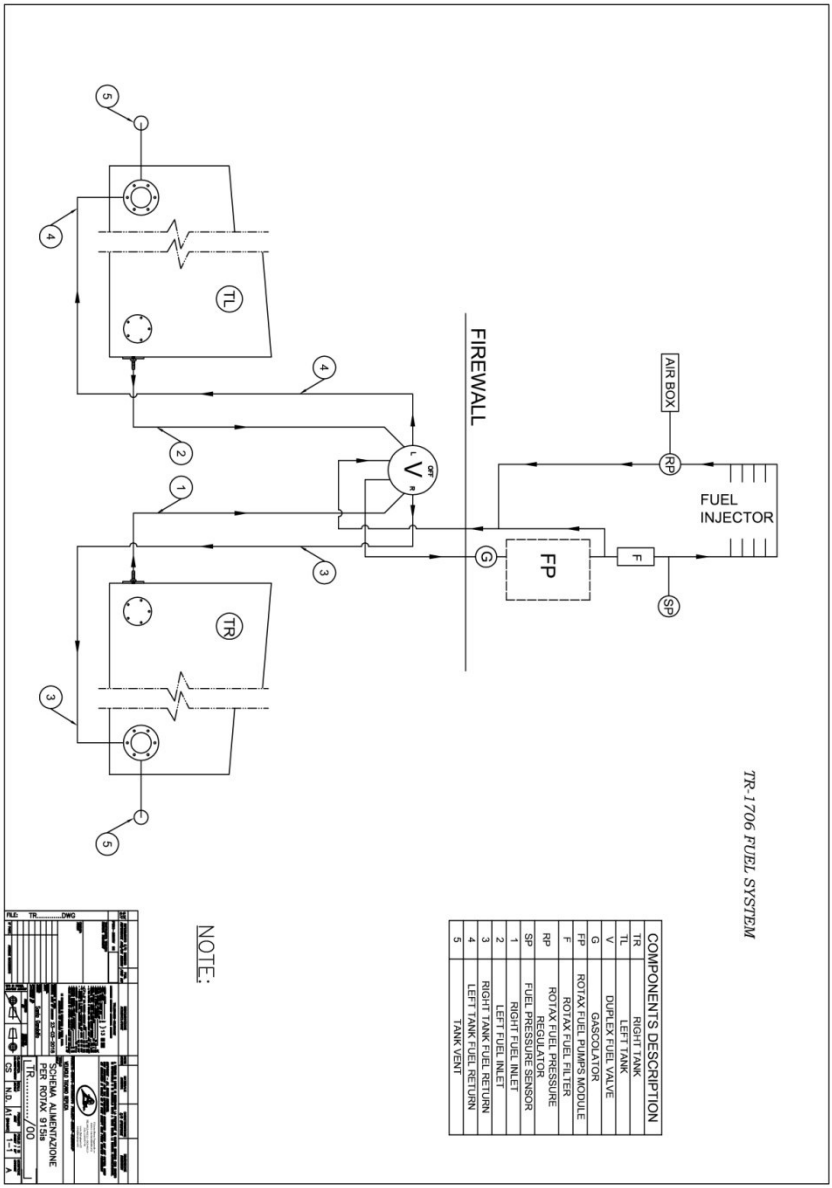
Engine

The aircraft is powered by a ROTAX 915iSfour-cylinder, horizontally opposed, turbocharged engine rated at 140 HP at 5800 RPM and has a combined liquid and air cooling.
The engine cowling can easily be removed for maintenance and checks.

Fuel System

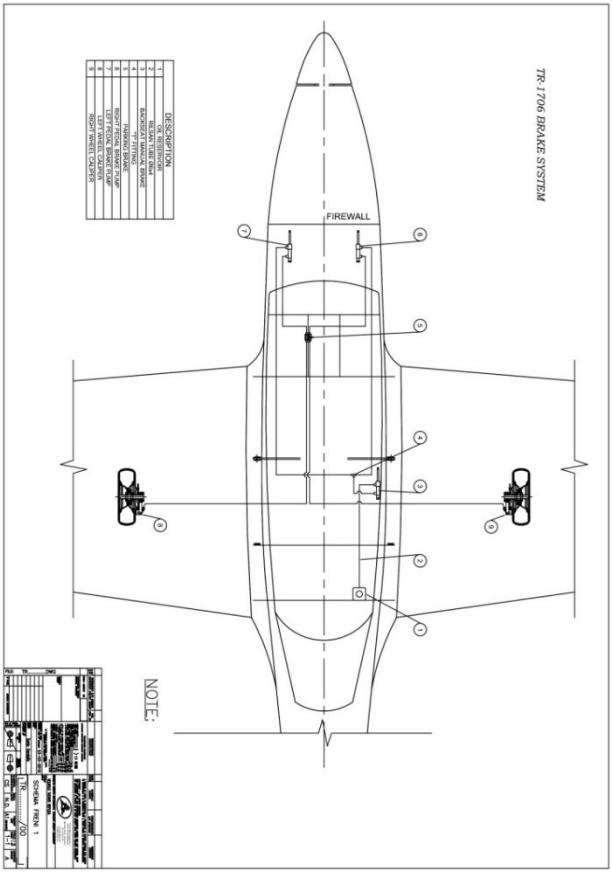
Both wings are equipped with fuel tanks. They are vented and have a fuel drain under the wing. There aretwo electrical fuel pumps,they are controlled by two lockable panel switches. Fuel pumps have to be always ON during all phases of flight EXCEPT during engine start. Only switch on one fuel pump when starting the engine. Switching on both fuel pumps can lead to a bad start behavior of the engine
The fuel valve is located at the center console with positions LEFT, RIGHT and OFF. During cruise flight the pilot has to switch to the fullest tank in intervals of not more than 60 minutes. The maximum difference between left and right tank shall not exceed 15 Ltr (10 kg). For takeoff and landing the fullest tank has to be selected.
In the cockpit an electrical gauge is available but for safety reason is recommended to check fuel quantity before flight by means of a calibrated stick.

A pictorial view of the fuel system is presented in the following figure


TR-1706 FUEL SYSTEM
FIREWALL
AIR BOX
RP
FUEL INJECTOR
F
SP
FP
G
V
OFF
L
R
TL
TR
1
2
3
4
5
NOTE:
COMPONENTS DESCRIPTION
TR RIGHT TANK
TL LEFT TANK
V DUPLEX FUEL VALVE
G GASCOLATOR
FP ROTAX FUEL PUMPS MODULE
F ROTAX FUEL FILTER
RP ROTAX FUEL PRESSURE REGULATOR
SP FUEL PRESSURE SENSOR
1 RIGHT FUEL INLET
2 LEFT FUEL INLET
3 RIGHT TANK FUEL RETURN
4 LEFT TANK FUEL RETURN
5 TANK VENT

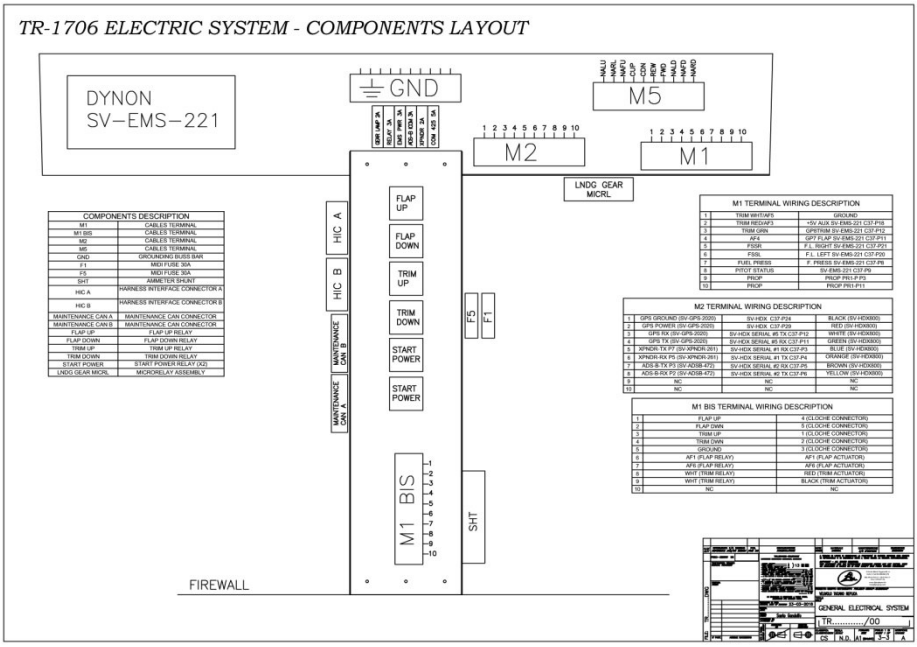
Brakes

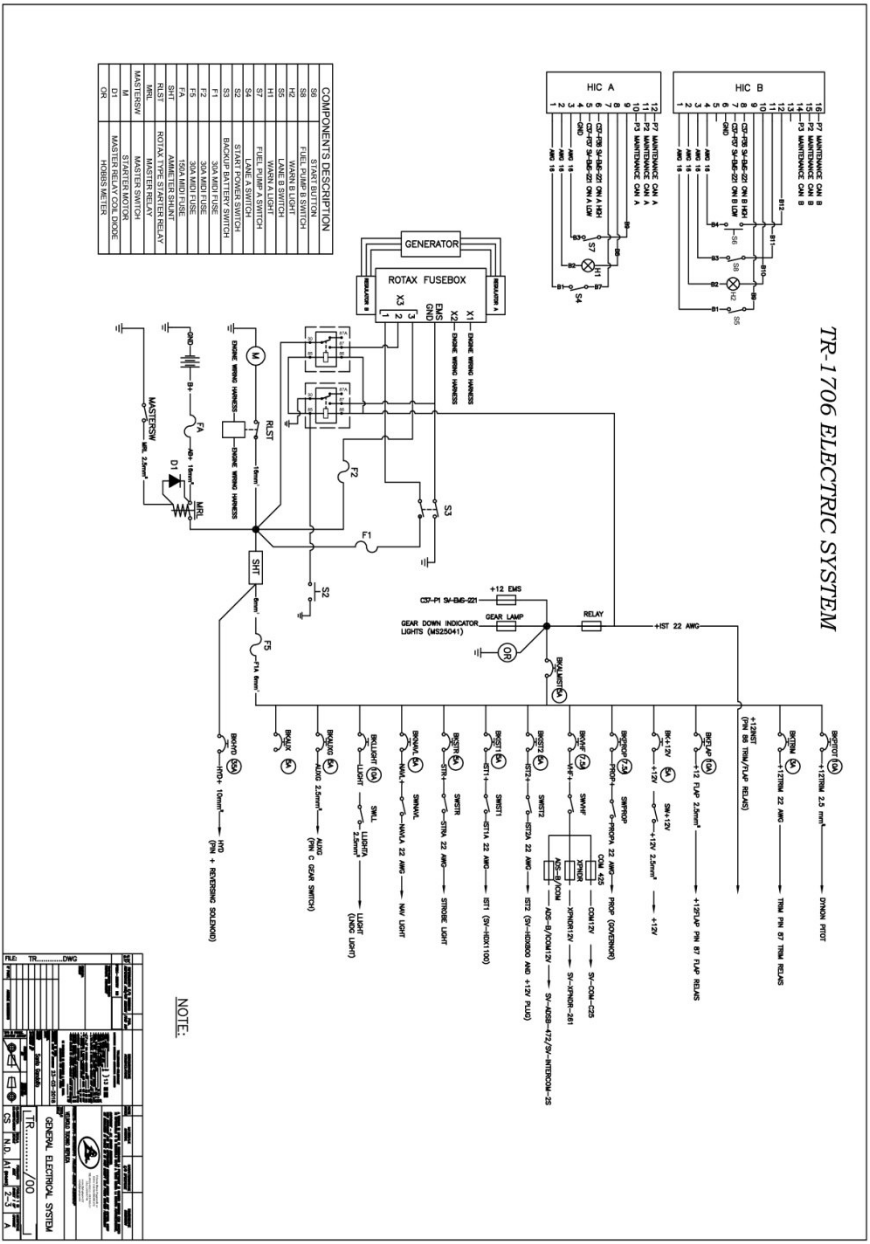
Brakes are controlled by levers installed on rudder pedals for front seat and manual pump for back seat (optional); braking power can be applied differentially on the two main gear wheels (only for front seat).
By closing a valve at the center console (Optional) when pressure has been applied, the hydraulic brake can act as a park brake.
A schematics of the brake system is presented in the following picture:
OIL type: Aeroshell 41



Electrical System

The ROTAX 915iS is equipped with two engine-driven generators that are responsible for supplying, thru the fusebox and voltage regulators, the Engine Management System (EMS) and the Airframe with electrical power. This system doesn't provide indication of generator failure, which require constant monitoring of battery voltage showed on screen.
The electrical system is designed for a maximum load of 45 A.
Connecting a lot of high-drain energy components (landing lights etc.) may result in a higher load. And this can lead to an overheating and/or an electrical smoke/fire condition and must be avoided under all circumstances.
Schematics of the electrical system are presented in the following figures:




TR-1706 ELECTRIC SYSTEM
COMPONENTS DESCRIPTION
S6 START BUTTON
S8 FUEL PUMP B SWITCH
H2 WARN B LIGHT
S5 LANE B SWITCH
H1 WARN A LIGHT
S7 FUEL PUMP A SWITCH
S4 LANE A SWITCH
S2 START POWER SWITCH
S3 BACKUP BATTERY SWITCH
F1 30A MIDI FUSE
F2 30A MIDI FUSE
F5 30A MIDI FUSE
FA 150A MIDI FUSE
SHT AMMETER SHUNT
RLST ROTAX TYPE STARTER RELAY
MRL MASTER RELAY
MASTERSW MASTER SWITCH
M STARTER MOTOR
D1 MASTER RELAY COIL DIODE
OR HOBBS METER
HIC A
HIC B
GENERATOR
ROTAX FUSEBOX
NOTE:
GENERAL ELECTRICAL SYSTEM

Landing gear system

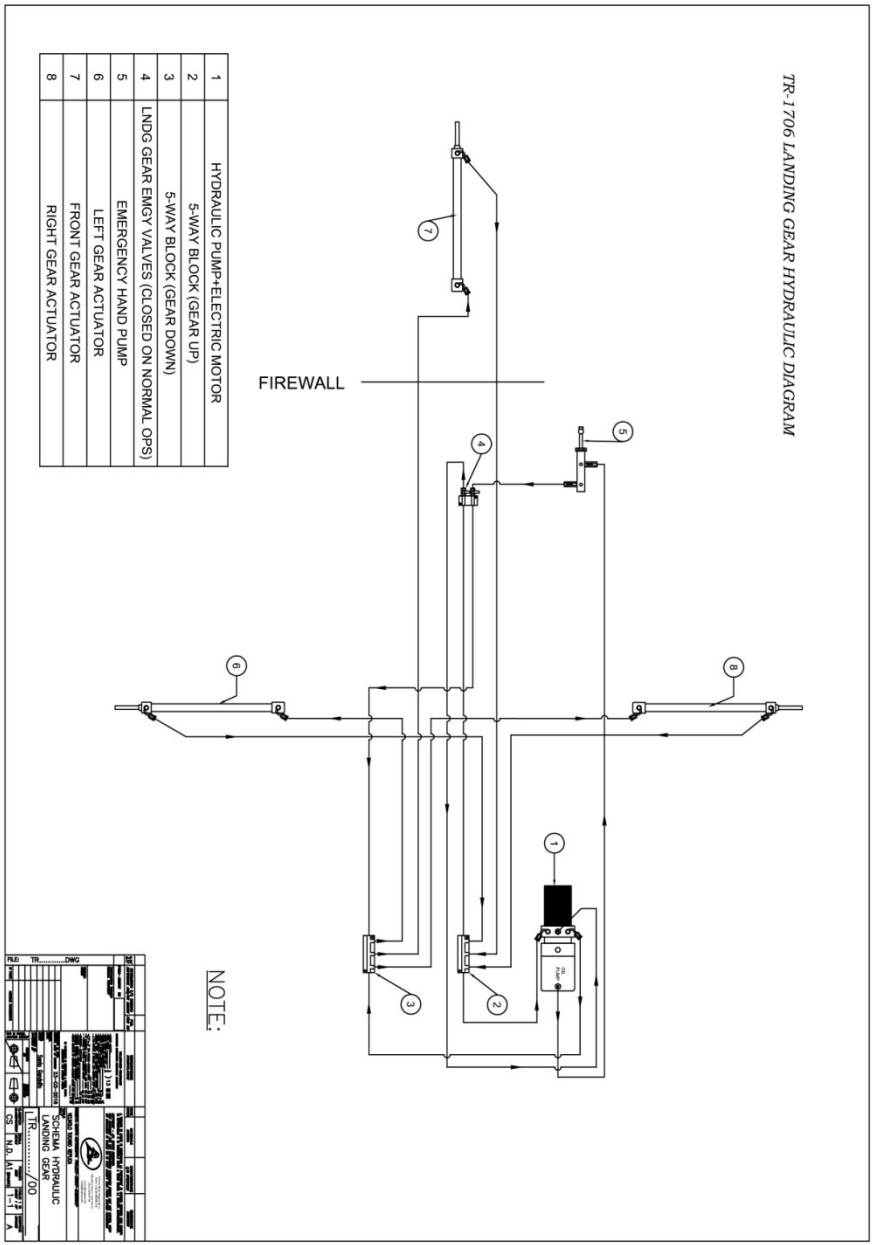
The landing gear is a fully retractable, hydraulically operated, tricycle landing gear. Strutsfor the landing gear are air/oil assemblies.
The hydraulic pressure for the landing gear operation is provided by an electrically poweredhydraulic pump. A hydraulic pressure gauge (Optional) in the cockpit indicates to the pilot the hydraulic pressure in the system.
The gear selector switch is located on the instrument panel. Gear extension normally takes 8-10Seconds.

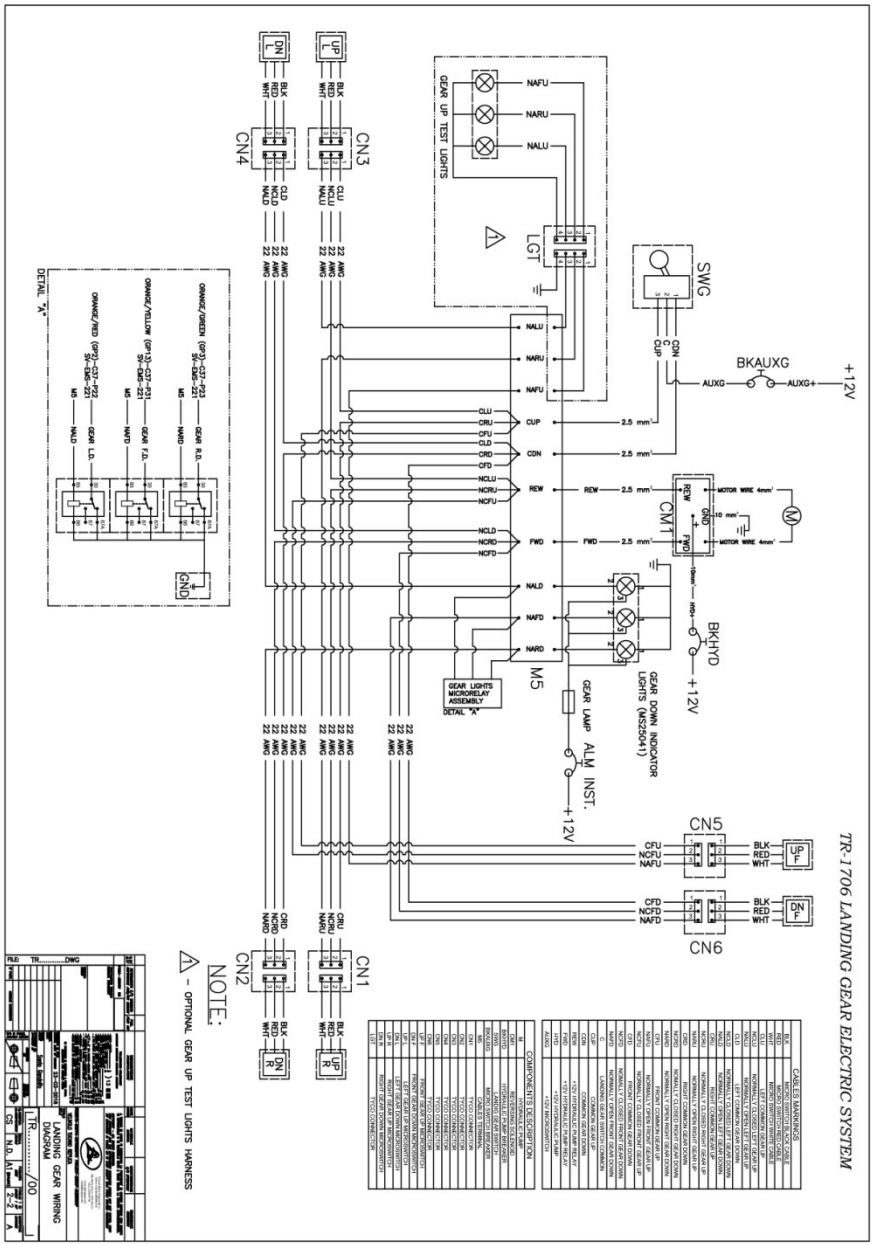
When the landing gear is retracted, the main wheels retract inboard into the center wingand the nose wheel retracts backward into the nose section. Hydraulic pressure on theactuators keeps the landing gear in the retracted position.

The three green lights directly next to the landing gear operating switch illuminate toindicate that each gear is in the down position and locked. If the gear is in neither thefull up nor the full down position, a red warning light on the instrument panel illuminates (optional).
The landing gear may be extended or retracted at any speed up to 85 KTS

The landing gear is designed to be manually operated in the event of failure. To extend and lock the gears in the event of failure, it is necessary to open the two landing gear emergency valves which are located on the right side of the fuel valve compartment and operate the manual emergency hydraulic pump until three green lights are obtained.

Before operating the emergency gear extension disconnect Hydraulic pump breaker and place the gear selector switch in theDOWN position.
A schematic of the landing gear system is presented in the following figure:
OIL type: AW 46


TR-1706 LANDING GEAR HYDRAULIC DIAGRAM
FIREWALL
NOTE:
1 HYDRAULIC PUMP+ELECTRIC MOTOR
2 5-WAY BLOCK (GEAR UP)
3 5-WAY BLOCK (GEAR DOWN)
4 LNDG GEAR EMGY VALVES (CLOSED ON NORMAL OPS)
5 EMERGENCY HAND PUMP
6 LEFT GEAR ACTUATOR
7 FRONT GEAR ACTUATOR
8 RIGHT GEAR ACTUATOR
SCHEMA HYDRAULIC LANDING GEAR
TR...../00


TR-1706 LANDING GEAR ELECTRIC SYSTEM
GEAR UP TEST LIGHTS
NAFU
NARU
NALU
LGT
SWG
BKAUXG
AUXG
AUXG+
+12V
CN3
CN4
CN1
CN2
CN5
CN6
CM1
M5
BKHYD
GEAR LAMP ALM INST.
GEAR DOWN INDICATOR LIGHTS (MS25041)
GEAR LIGHTS MICRORELAY ASSEMBLY
DETAIL "A"
NOTE:
A – OPTIONAL GEAR UP TEST LIGHTS HARNESS
LANDING GEAR WIRING DIAGRAM

ANNEX B
GROUND SERVICES & MAINTENANCE

GENERAL

In this section you find the recommended procedures for the service on the ground and maintenance. There're specific inspections and maintenance to carry out in order to make the aircraft keeping the reliability of a new one. It's advisable to set a plan of lubrications and precautionary maintenance, based on the general conditions of ENVIRONMENT and USE that the aircraft is undergoing.

REPAIRS and/or AIRCRAFT MODIFICATIONS

The aircraft's owner has to contact necessary the building company, explaining the kind of repair he needs to make by himself and he is allowed to start it only after obtaining a written permit. Moreover, the aircraft's owner has to contact the responsible authority to not compromise the aircraft airworthiness.
FORBIDDEN is every MODIFICATION made to the aircraft, which was not first authorised by the building company, because it can damage the aircraft's reliability.

TOWING and MOVEMENT ON THE GROUND

For short movements you can tow from the propeller, exerting force on the blades in proximity of the propeller hub.
For sweeping rotational movements on the ground you can low the tail by the dorsal fin drift and the stabilizer, so that the front wheel will be lifted.
It's possible to prearrange the use of a tow bar, locating it by the hub/front landing gear fork.

PARKING andANCHORAGE

If the aircraft has to stop for a long time outdoors, place it against wind, block the canopy, put the parking brakes on, and insert some chocks if necessary.
In case of weather conditions with high wind or blasts of wind, it's advisable to anchor the aircraft with pegs at the ground, tying it with ropes by the landing gears forks.
In addition, block the flight controls to avoid sharp movements of the moving parts, use the safety belts to block the bar.

LIFTING

The lifting of the aircraft by the main landing gear can be carried out even without using jacks; while one operator is lifting an outer wing, exerting force on the main longeron, the other operator can insert the needed support.
For the lifting of the whole aircraft, for example to carry out the landing gear retraction test, insert a support (a wood stand, suitably covered to protect the aircraft surface) by the main longeron of the central fuselage body and another smaller wood support by the frame adjoining to the tunnel of the nose gear. Check the stability of the aircraft before going on with the retraction tests.

LEVELING

The aircraft leveling is the first and main step to set the exactly position of the centre of mass, the keying, and the dihedral of the aircraft. The reference point is the upper fuselage longeron (find the centre of the two lines of rivets) and the first two horizontal laterals of the fuselage beyond the cockpit (do the leveling with opened canopy).

CLEANING AND CARE

It's advisable to use a gentle product, such as a car shampoo, to clean the painted parts and a soft cloth (like a doeskin) to wipe.
In order to avoid matting and lasting scratches, the canopy must be not dry-dusted or washed using alcohol, acetone or solvents in general. Therefore, use the recommended product by the manufacturing company or just water, and wipe it after with a doeskin.
For the interiors (seats or upholstery), it's advisable the use of soft cloths, damped with water or dry-soap.

PLANNED INSPECTIONS OF THE AIRCRAFT

WARNING: in case of aerobatics maneuvers for more then 1/3 of total flight time it's suggested to inspect the cell every 25 hours

In order to maintain the reliability and the flight performance of the aircraft, just like a new one, you have to carry out periodic checks and inspections to the cell, to the moving mechanical elements, and to the engine. Usually, checks are carried out every 50 hours and 100 hours, following fixed plans. Regarding the engine checks instead, please follow its maintenance manual.
It's necessary for the good working of the mechanical moving parts (controls transmissions, gear retraction mechanics, moving parts with cables, electrical systems, hydraulic circuits, fuel system etc.) to fly once a month and to start the engine every ten days at the latest. If not possible, it's highly advisable to carry out the checks and maintenances of the 50 HOURS.

50 HOURS

CELL

- Perform and check the bolts tightening and the Uniballs of the moving parts: hinges, control lines of ailerons, flaps, elevator, and rudder.
- Gear retraction mechanics (main and front), limit stops of the micro-switches, and flaps actuator.
- Wing connections to the fuselage from the inspection apertures.
- Stabilizer, elevator, drift connections.
- Engine mount connection to the fire wall and its engine supports.
- Check the cables screw couplings of the rudder and be sure that the plastic elements by the fuselage frames are in good condition, and that the cable deviation wheels are not worn.
- Check the absence of cracks on the transparent canopy, hinges intactness, and the locking.
- Check the pedal bolts and the whole control rod.
- Check the bolts tightening on the steering bar of the front wheel; check even the springs of the gear oscillating head and its Uniballs (check safety clips).
- Check the correct insertion of the split pins on the pedals.
- Check the correct gear retraction; check even the manual emergency opening (look at “LIFTING” in the section Ground Service and Maintenance).
- Clean and lubricate each moving part.
- Check the bolts tightening of the wheels, disks insertion, rim, and locking wires.
- Check tires pressure (main 2.5 bar - front 2.2 bar).
- General outside check of the good condition of rivets.

ENGINE COMPARTMENT

- Carry out the maintenance required by the engine manual.
- Carry out the maintenance required by the variable pitch propeller manual.
- Check and clean the gascolator and each filter of the fuel feeding system.
- Check the wear status and the seal of the fuel drainage valve.
- Check the wear condition of exhaust manifolds, coverings, silencers welding, and springs.
- Check the wear condition and the clamping of each fillets and circuit ties (water, oil, fuel), and the good condition of their tubes.
- General check of the engine mount condition; checking even for cracks and damage.
- Visual check of the right locking of the electrical parts (battery, voltage regulator, master relay etc).

100 HOURS

CELL

- Carry out all checks of the 50 HOURS.

ENGINE COMPARTMENT

- Carry out the maintenance required by the engine manual.
- Carry out the maintenance required by the variable pitch propeller manual.
- Carry out all checks of the 50 HOURS.

200 HOURS

CELL

- Carry out all checks of the 50 HOURS.
- Replace the brake systems oil and the gear hydraulic system oil (to be replaced every 2 years anyway).
- Check the wear condition of tires, callipers, and disc brakes (it's advisable to replace them even if seeming in good condition).
- Check the calibration of the fuel level indicators, and check the breather pipes.
- Check the intactness of the feeding system tubes.

ENGINE COMPARTMENT

- Carry out the maintenance required by the engine manual.
- Carry out the maintenance required by the variable pitch propeller manual.
- Carry out all checks of the 50 HOURS.

500 HOURS

CELL

- Carry out all checks of the 200 HOURS.
- Replace brakes system tubes.
- Replace feeding system tubes.
- Replace springs and Uniballs of the oscillating head of the front gear.

ENGINE COMPARTMENT

- Carry out the maintenance required by the engine manual.
- Carry out the maintenance required by the variable pitch propeller manual.
- Carry out all checks of the 50 HOURS.

1000 HOURS

CELL

- Carry out all checks of the 500 HOURS.
- Replace brakes system tubes.
- Replace feeding system tubes.
- Check the hydraulic gear system and the intactness of each fillet (replace if necessary).
- Replace the main AN bolts of the aircraft (wing connection, stabilizer connection, drift connection, bolts of the gear mechanics)
- Check every bolt described in the 50 HOURS, and replace them if oxidized.

ENGINE COMPARTMENT

- Carry out the maintenance required by the engine manual.
- Carry out the maintenance required by the variable pitch propeller manual.
- Replace the connection bolts of the engine mount, and its support.
- Carry out all checks of the 50 HOURS.

ANNEX C -
BASIC AEROBATIC MANEUVERS

The TUCANO Replica 650-6G-R is NOT a certified aerobatic airplane,

It is recommended that basic aerobatic maneuvers have to be done solely for the enjoyment of the pilot and not for Competition.

The pilot must be knowledgeable and prepared to perform this kind of flight

The TUCANO Replica 650-6G-R can perform all the usual basic aerobatic maneuvers (see below) easily and gracefully at low g loads

MANEUVERS:

- Loops
- Aileron rolls / Barrel rolls
- Cuban 8
- Hammerhead

The entry speeds for some maneuvers can vary over a wide range due to thelarge ratio of maximum speed to stall speed. For vertical maneuvers, Loops,and Cuban eights, entry speed has an inverse relationship to g forces required to complete the maneuver. An entry speed at lower speedswill require a higher G pull up than for entry near top end of speed range