PILOTS OPERATING MANUAL

SG Aviation
"STORM R.G. 750 k"
S.g. aviation Aircraft design

(Equipped with ROTAX 912 ULS Engine Option ROTAX 914 TURBO)

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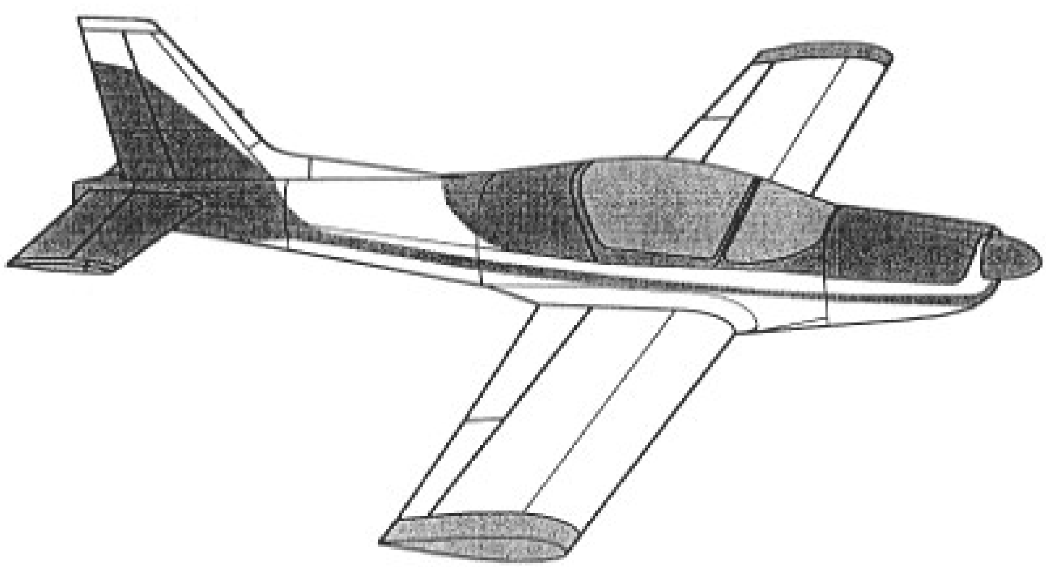


PERFORMANCE SPECIFICATIONS FOR ULM ACTIVITY

SPEED:
maximum at sea level .... 285 kmh
cruise (75% power at 2000 ft, ISA conditions) ....255 kmh
CRUISE:
75% at 2000 ft (ISA Conditions)... range 1530 km
120 lt usable fuel .... time 6 hrs
RATE OF CLIMB AT SEA LEVEL: .... 1200 fpm
SERVICE CEILING: .... 12000 ft

TAKEOFF PERFORMANCE (ISA Conditions, Sea Level):
ground roll .... 90 mt
total distance over 50 ft obstacle .... 180 mt
LANDING PERFORMANCE (ISA Conditions, Sea Level):
ground roll .... 140 mt
total distance over 50 ft obstacle .... 330 mt

STALL SPEED:
flaps up, landing gears up, power off .... 70 kmh
flaps down, landing gear down, power off .... 65 kmh

MAXIMUM WEIGHT: ....750 kg
STANDARD EMPTY WEIGHT: ....392 kg
MAXIMUM USEFUL LOAD: .... 298 kg
BAGGAGE ALLOWANCE: .... 70 kg
WING LOADING: 62,5 kg/m2
POWER LOADING: .... 6,5 kg/hp

TOTAL FUEL CAPACITY:
standard tank .... 120 lt
OIL CAPACITY: .... 3 lt

ENGINE:
model .... ROTAX 912 ULS
power/rpm .... 100 hp / 5800 rpm
option.. ROTAX 914 TURBO
power.. 115 hp
PROPELLER:
type .... fixed pitch or in flight variable pitch option
diameter .... 172 cm

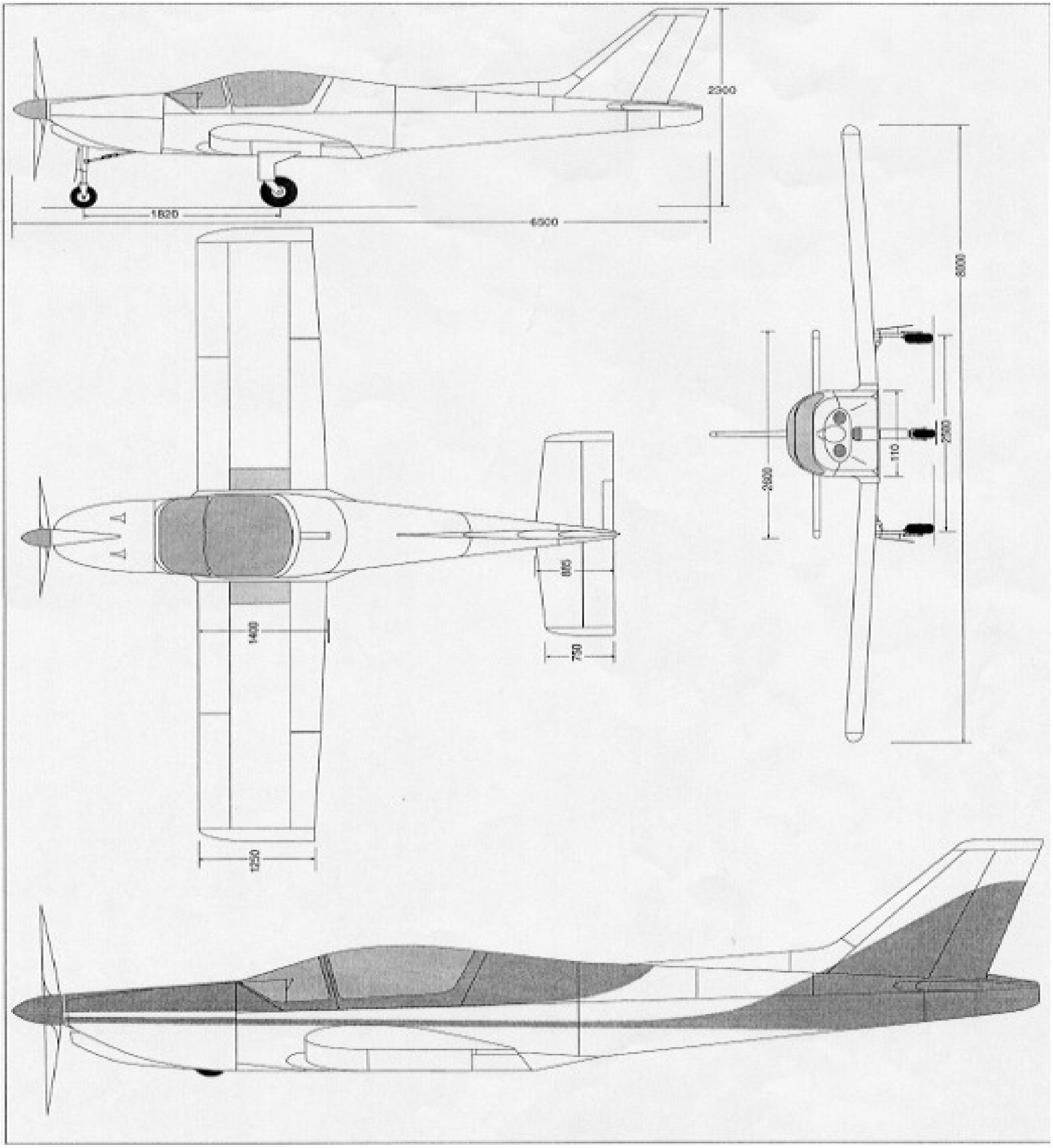


fig. 1-1 Principal Dimensions

SECTION 1 - GENERAL

INTRODUCTION

Section 1 provides basic data and information of general interest.

DESCRIPTIVE DATA

Engine:

number of engines 1
engine manufacturer .... ROTAX
engine model .... 912 ULS (Option 914 TURBO)
engine type ....………… normally aspirated, 4-cyl, 4-stroke, liquid/air cooled engine with opposed cylinders, dry sump forced lubrication with separate 3 lt oil tank, 2 carburetors, mechanical and electric fuel pumps, Ducati electronic dual ignition, electric starter, integrated reduction gear 1/2,43.

Horsepower rating and engine speed .... 100 BHP at 5800 RPM (max. 5 min.)
95 BHP at 5500 (continuous).

Propeller:

number of blades 2
propeller type .... fixed pitch or in flight variable pitch option
propeller diameter .... 172 cm

Fuel:

number of tank ....………… 2 Leading Edges tanks
fuel capacity …………………………....... 130 lt
total usable ....………….. 120 lt

Oil:

Oil tank capacity .... 3 lt

Detailed information on the ROTAX 912 ULS engine shall be found on the engine Manufacturer operating manual.

Maximum Aircraft Weights:

Aircraft Rules
standard empty weight .... 392 kg
maximum useful load .... 298 kg

Cabin and Entry Dimensions:

detailed dimensions of the cabin interior and canopy opening are illustrated in sect. 6.

Baggage Space Dimensions:

dimensions of the baggage area are illustrated in detail in section 6.

Specific Loading ULM Aircraft:

wing loading 62,5 kg/m2
power loading .... 6,5 kg/hp

SECTION 2 - LIMITATIONS

INTRODUCTION

Section 2 includes operating limitations and instrument markings necessary for the safe operation of the airplane, its engine, standard system and standard equipment.

AIRSPEED LIMITATIONS

Airspeed limitation and their operational significance are shown in figure 2-1.

SPEED	Km/h	REMARKS
VNE never exceed speed	**310**	do not exceed this speed in any operation.
VNO maximum structural cruising speed	**280**	do not exceed this speed except in smooth air, and then only with caution.
VA maneuvering speed	**220**	do not make full or abrupt control movements above this speed.
VFE **VLE** max. flap & L.G. extended speed	**120**	do not exceed this speed with flaps & L.G. down.

fig. 2-1 Airspeed Limitations

AIRSPEED INDICATOR MARKINGS

Airspeed indicator markings and their color code significance are shown in figure 2-2.

MARKING	Km/h VALUE OR RANGE	SIGNIFIANCE
white arc	65 - 120	full flap operating range.
green arc	90 - 260	normal operating range.
yellow arc	260 - 310	operation must be conducted with caution.
red line	310	max. speed all operations

fig. 2-2 Airspeed Indicator Markings

POWER PLANT LIMITATIONS

Engine operation limits for takeoff and continuous operation:
maximum power .... 95 hp
maximum engine speed .... 5500 rpm
Maximum oil temperature .... 110°C
maximum oil pressure .... 6 bar
minimum oil pressure .... 3 bar
Detailed operating information shall be found in the Engine Manufacturer Manual.

POWER PLANT INSTRUMENT MARKINGS

Power plant instrument markings and their color code significance are shown in figure 2-3.

INSTRUMENT	**RED LINE** min. limit	**GREEN ARC** normal operating	**RED LINE** max. limit
tachometer	not ind.	1500 - 5500 rpm	5800 rpm
oil temp.	not ind.	50°C - 120°C	130° - 140°C
oil pressure	2 bar	2 - 7 bar	7 - 10 bar
water temp.	not ind.	50°C - 120°C	120° - 140°C
fuel pressure	0,2 bar	0,2 - 0,5 bar	0,5 bar

fig. 2-3 Power Plant Instrument Markings

WEIGHT LIMITS FOR ULTALIGHT AIRCRAFT FLYING ACTIVITY

maximum takeoff weight (MTOW) .... 750 kg
maximum landing weight .... 750 kg
maximum weight in baggage area .... 70 kg

DESIGN CENTER OF GRAVITY LIMITS AND RANGE

Forward: 900 mm aft of datum at 410 kg or less, with straight line variation to 940 mm aft of datum at 750 kg.
Afterward: 1020 mm aft of datum at all weights.
The reference datum is the front face of firewall.
Note: although the aircraft is designed for a MTOW of 750 kg.

MANEUVER LIMITS

This airplane is designed for limited aerobatics flight.
No aerobatics maneuvers are approved except those listed below:
To use the Aircraft in aerobatic maneuvers we raccomand ony one pilot on board and maximun 50 lt of Fuel

chandelles	maximum entry speed .... 240 km/h
lazy eights	maximum entry speed .... 240 km/h
steep turns	maximum entry speed .... .240 km/h
stalls	use slow deceleration

Higher speed can be used if abrupt use of controls is avoided.

Aerobatics that may impose high loads should not be attempted.

The important thing to bear in mind in flight maneuvers is that the airplane is clean in aerodynamic design and will build up speed quickly with nose down attitude.
Proper speed control is an essential requirement for execution of any maneuver, and care should always be exercised to avoid excessive speed which in turn can impose excessive loads.
In the execution of all maneuvers avoid abrupt use of controls.

FLIGHT LOAD FACTOR LIMITS (Normal Category Rules)

Flaps up ....…	+ 4,4 g	- 1,76 g
Flaps down	+ 4 g	- 1 g

The design load factors are at least 150% of the above, calculated for the “Experimental” version of the aircraft (i.e. MTOW of 750 kg), and in all cases, the structure meets or exceed the design loads.
However, it is highly recommended not to reach the above mentioned Load Factor Limits.

KIND OF OPERATION LIMITS

If the aircraft is designated for Ultra light Aircraft activity, it shall be equipped only for day VFR. In any event, the flight into known icing condition is prohibited.

FUEL LIMITS

The aircraft is equipped with 1 fuel tank, located behind the pilots, for 130 lt total capacity.
However the total usable fuel (all flight conditions) is 120 lt .
The unusable fuel which remains in the bottom of the fuel tank is 5 lt.

Approved fuel grades and colors:

- Leaded or Unleaded automotive fuel
- 100LL grade aviation fuel (blue)

SECTION 3 - EMERGENCY PROCEDURES

INTRODUCTION

Section 3 provides checklist and amplified procedures for coping with emergencies that may occur. Emergencies caused by airplane or engine malfunctions are extremely rare if proper preflight inspections and maintenance are practiced. Enroute 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 described in this section should be considered and applied as necessary to correct the problem.

AIRSPEEDS FOR EMERGENCY OPERATION

Engine failure after takeoff .... 90 km/h
Maneuvering speed:
750 kg .... 220 km/h
550 kg .... 200 km/h
450 kg .... 180 km/h
Maximum glide speed .... 110 km/h
Landing without engine power flap up .... 100 km/h
Landing without engine power flap down .. 90 km/h

OPERATIONAL CHECKLISTS

ENGINE FAILURE

Engine failure during takeoff run:
1) Throttle .... IDLE
2) Brakes .... APPLY
3) Wing flap .... RETRACT
4) Fuel pump .... OFF
5) Ignition switch .... OFF
6) Master switch .... OFF

Engine failure immediately after takeoff:

1) Airspeed .... 90 km/h
2) Fuel shut off valve .... OFF
3) Fuel pump .... OFF
4) Ignition switch .... OFF
5) Wing flap .... AS REQUIRED
6) Master switch .... OFF

Engine failure during flight:

1) Airspeed .... 90 km/h
2) Fuel shut off valve .... ON
3) Fuel pump .... ON
4) Ignition switch .... START if propeller is stopped

FORCED LANDINGS

Emergency landing without engine power:

1) Airspeed .... 80 km/h (flap up) 75 km/h (flap down)
2) Fuel shut off valve .... OFF
3) Fuel pump .... OFF
4) Ignition switch .... OFF
5) Wing flap .... AS REQUIRED (in short final FULL)
6) Landing Gear ………….. DOWN
7) Master switch .... OFF
8) Canopy .... UNLATCH PRIOR TO TOUCHDOWN
9) Touchdown .... SLIGHTLY TAIL LOW
10) Brakes ....… APPLY HEAVILY

Precautionary landing with engine power:

1) Airspeed .... 90 km/h
2) Wing flap .... 15°
3) Selected field .... FLY OVER note terrain and obstruction
4) Wing flap .... RETRACT after reached safe altitude and speed
5) Radio and electrical switches .... OFF
6) Wing flap .... FULL DOWN in short final
7) Landing Gear ………….. DOWN
8) Airspeed .... 75 km/h
9) Master switch .... OFF
10) Canopy .... UNLATCH PRIOR TO TOUCHDOWN
11) Touchdown .... SLIGHTLY TAIL LOW
12) Ignition switch .... OFF
13) Brakes .... APPLY HEAVILY

Ditching:

1) Radio .... TRANSMIT MAYDAY on 121,5 MHz
2) Object in baggage area .... SECURE or JETTISON
3) Approach with high winds, heavy seas ... INTO THE WIND
4) Approach with light winds, heavy swells .. PARALLEL TO SWELLS
5) Wing flap .... FULL IN SHORT FINAL
6) Landing Gear ……… DOWN
7) Power .... ESTABLISH 300 FT/MIN DESCENT AT 75 KM/H
8) Canopy .... UNLATCH
9) Touchdown .... LEVEL ATTITUDE AT 300 FT/MIN DESCENT
10) At touchdown protect face with folded coat or similar
11)Airplane .... EVACUATE
12)Life vest and raft ..... INFLATE AS LIVING THE AIRCRAFT

FIRES

During start on ground:

1) Cranking .... CONTINUE to get a start which would suck the flames and accumulated fuel through the carburetor and into the engine.

IF ENGINE STARTS

2) Power .... 2500 RPM for a few minutes.
3) Engine .... SHUTDOWN and inspect for damage.

IF ENGINE FAILS TO START

4) Cranking .... CONTINUE to obtain a start
5) Fire extinguisher .... OBTAIN
6) Engine .... SECURE
   a) Master switch ...... OFF
   b) Ignition switch .... OFF
   c) Fuel pump .... OFF
   d) Fuel valve .... OFF
7) Fire .... EXTINGUISH using fire extinguisher, wool blanket or dirt.
8) Fire damage .... INSPECT.

Engine fire in flight:

1) Mixture .... IDLE CUT OFF
2) Fuel shutoff valve .... OFF
3) Master switch .... OFF
4) Cabin heat and air .... OFF
5) Airspeed .... 200 km/h (if fire is not extinguished increase glide speed to find an airspeed which will provide an incombustible mixture).
6) Forced landing .... EXECUTE as described in emergency landings.

Electrical fire in flight:

1) Master switch .... OFF
2) All other switches .... OFF (except ignition switch)
3) Cabin heat and air .... OFF
4) Fire extinguisher .... ACTIVATE if available

WARNING

After discharging an extinguisher within a closed cabin, ventilate the cabin.

If fire has been extinguished and electrical power is necessary for continuance of flight:
5) Master switch .... ON
6) Circuit breakers .... CHECK for faulty circuit, DO NOT RESET
7) Radio-elect. switches ...... ON one at time to localize short circuit
8) Cabin heat and air .... ON

Cabin fire:

1) Master switch .... OFF
2) Cabin heat and air .... OFF
3) Fire extinguisher .... ACTIVATE if available

WARNING

After discharging an extinguisher within a closed cabin, ventilate the cabin.

4) Land the airplane as soon as possible.

ICING

Inadvertent icing encounter:

1) Turn pitot heat switch ON if installed
2) Turn back or change altitude to obtain an outside air temperature that is less conducive to icing
3) Pull cabin heat control full out to obtain maximum defrosting temperature
4) Open the throttle to increase engine speed and minimize ice build-up on propeller blades
5) Plan a landing at the nearest airport. In case select a suitable off airport landing site
6) With an ice accumulation of 1 cm or more on the wing leading edge, be prepared for significantly higher stall speed
7) Approach at 100 to 110 km/h depending upon the amount of ice accumulation
8) Perform a landing in level attitude.

LANDING WITH A FLAT MAIN TIRE
1) Wing flap .... FULL DOWN
2) Approach .... NORMAL
3) Touchdown .... GOOD TIRE FIRST
Note:
Hold airplane off flat tire as long as possible with aileron control.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS
Over-voltage light illuminates:
1) Master switch .... OFF
2) Master switch .... ON
3) Over-voltage light .... OFF
If over-voltage light illuminates again:
4) Flight .... TERMINATE as soon as practical.

Ammeter shows discharge:
1) Alternator .... OFF
2) Non essential electrical equipment ...... OFF
3) Flight .... TERMINATE as soon as practical.

AMPLIFIED PROCEDURES

ENGINE FAILURE

If an engine failure occurs during the takeoff run, the most important thing to do is to stop the airplane on the remaining runway.
Those extra items on the checklist will provide added safety during a failure of this type.

Prompt lowering the nose to maintain airspeed and establish a glide attitude is the first response to an engine failure after takeoff. In most cases, the landing should be planned straight ahead with only small changes in direction to avoid obstructions.
Altitude and airspeed are seldom sufficient to execute a 180° gliding turn necessary to return to the runway.

<u>Never try to get back to the runway</u>.

The checklist procedures assume that adequate time exists to secure the fuel and ignition system prior to touchdown.

After an engine failure in flight, the best glide speed of 85-90 km/h should be established as soon as possible.
While gliding toward a suitable landing area, an effort should be made to identify the cause of the failure.
If time permits, an engine restart should be attempted as shown in the checklist.
If the engine cannot be restarted, a forced landing without power must be completed.

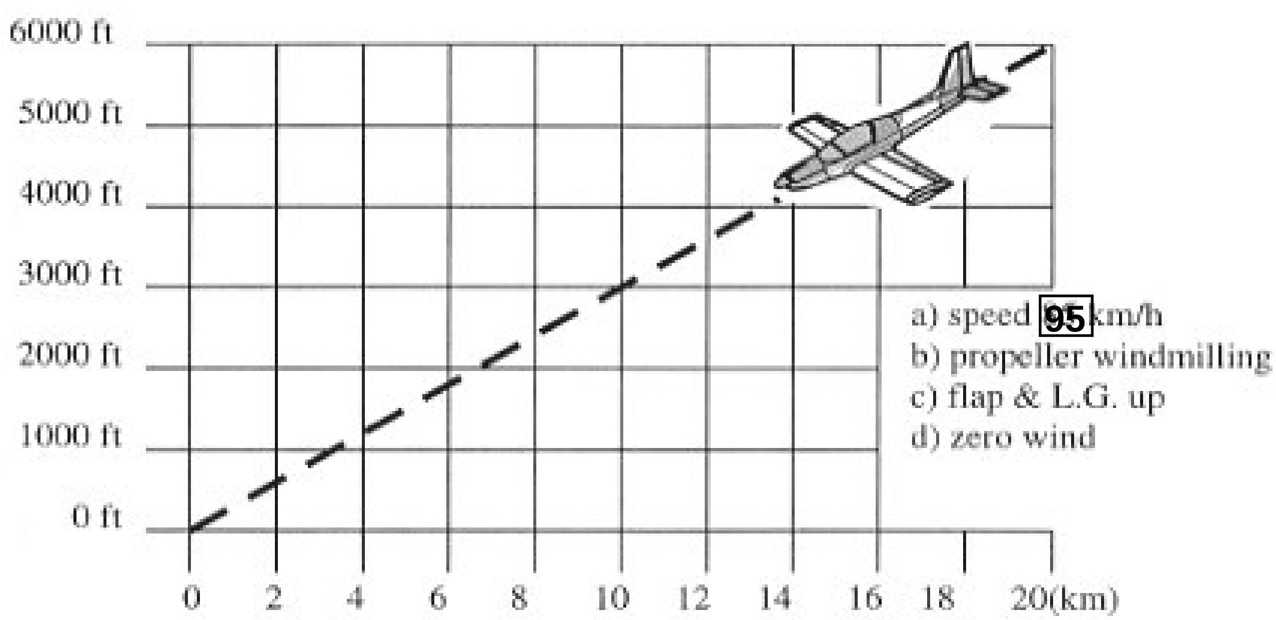


figure 3-1 Maximum glide

FORCED LANDINGS

If all attempts to restart the engine fail and a forced landing is imminent, select a suitable field and prepare for the landing as discussed in the checklist for engine-off emergency landings.
Before attempt an off airport landing with engine power available, one should drag the landing area at a safe but low altitude to inspect the terrain for obstructions and surface conditions, proceeding as discussed under the precautionary landing with engine power checklist.

Prepare for ditching by securing or jettisoning heavy objects located in the baggage area and collect folded coats for protection of occupants face at touchdown.
Transmit Mayday message on 121,5 Mhz giving location and intentions.

LANDING WITHOUT ELEVATOR CONTROL

Trim the airplane for horizontal flight with an airspeed of approximately
85-90 km/h and flap lowered to 15° by using throttle and elevator trim controls.
Then, DO NOT CHANGE THE ELEVATOR TRIM SETTING; control the glide angle by adjusting power exclusively.

At flareout, the nose-down moment resulting from power reduction is an adverse factor and the airplane may hit on the nose wheel. Consequently, at flareout, the trim control should be set at the full nose-up position and the power adjusted so that the airplane will rotate to the horizontal attitude for touchdown.
Close the throttle at touchdown.

FIRES

Although engine fires are extremely rare in flight, the steps of the appropriate checklist should be followed if one is encountered.
After completion of this procedure, execute a forced landing.
DO NOT ATTEMPT TO RESTART THE ENGINE.

The initial indication of an electrical fire is usually the odor of burning insulation.
The checklist for this problem should result in elimination of the fire.

FLIGHT IN ICING CONDITION

The flight into icing condition is prohibited. An inadvertent encounter with this condition can best be handled using the checklist procedures.
The best procedure, of course, is to turn back or change altitude to escape icing conditions.

SPINS

INTENTIONAL SPINS ARE PROHIBITED

Should an inadvertent spin occurs, the following recovery procedure should be used:

1) Retard throttle to idle position
2) Place aileron in neutral position
3) Apply and HOLD full rudder opposite to the direction of rotation
4) Just AFTER the rudder reaches the stop, move the control stick BRISKLY forward far enough to break the stall
5) HOLD these control inputs until rotation stops
6) As rotation stops, neutralize rudder, and make smooth recovery from the resulting dive.

ROUGH ENGINE OPERATION OR LOSS OF POWER

Spark plug fouling:
A slight engine roughness in flight may be caused by one or more spark plugs becoming fouled by carbon or lead deposits.
Proceed to the nearest airfield for repairs.
An obvious power loss in single ignition operation is evidence of spark plug or ignition unit trouble.

Ignition malfunction:
A sudden engine roughness or misfiring is usually evidence of ignition problems. Proceed to the nearest airfield for repair.

Low oil pressure:
If a loss of oil pressure is accompanied by normal oil temperature, there is the possibility that the oil pressure gage or relief valve is malfunctioning.
A leak in the line to the gage is not necessarily cause for an immediate precautionary landing because an orifice in this line will prevent a sudden oil loss from the engine sump.
However, a landing at the nearest airfield would be advisable to inspect the source of trouble.
If a total loss of oil pressure is accompanied by a raise in oil temperature, there is a good reason to suspect that an engine failure is imminent. Reduce engine power immediately an select a suitable forced landing field.
Use only the minimum power required to reach the desired touchdown spot.

ELECTRICAL POWER SUPPLY SYSTEM MALFUNCTIONS

Introduction:
Malfunctions in the electrical power supply system can be detected by periodic monitoring of the ammeter and over-voltage warning light.
However the cause of these malfunctions is usually difficult to determine.
Broken or loose alternator wiring is most likely the cause of alternator failures, although other factors could cause the problem.
A damaged or improperly adjusted voltage regulator can also cause malfunctions.
Problem of this nature constitute an electrical emergency and should be dealt with immediately.

Electrical power malfunctions usually fall into two categories:
1) excessive rate of charge
2) insufficient rate of charge
The paragraphs below describe the recommended remedy for each situation.

Excessive rate of charge:
After engine starting and heavy electrical usage at low engine speeds (such as extended taxiing) the battery condition will be low enough to accept above normal charging during the initial part of the flight.
However, after thirty minutes of cruising flight, the ammeter should be indicating less than two needle widths of charging current. If the charging rate were to remain above this value on a long flight, the battery would overheat and evaporate the electrolyte at an excessive rate.
Electronic components in the electrical system could be adversely affected by higher than normal voltage if a faulty voltage regulator setting is causing the overcharging.

To preclude these possibilities, an over-voltage sensor will automatically shut down the alternator and the over-voltage warning light will illuminate if the charge voltage reach approximately 16 volts.
Assuming that the malfunction was only momentary, an attempt should be made to reactivate the alternator system.
To do this, turn the master switch off and then on again.
If the problem no longer exists, normal alternator charging will resume and the warning light will go off.
If the light comes on again, a malfunction is confirmed.
In this event, the flight should be terminated and/or the current drain on the battery minimized because the battery can supply the electrical system for only a limited period of time.

Insufficient rate of charge:

If the ammeter indicates a continuous discharge rate in flight, the alternator is not supplying power to the system and should be shut down since the alternator field circuit may be placing an unnecessary load on the system. All nonessential equipment should be turned off and the flight terminate as soon as practical.

SECTION 4 - NORMAL PROCEDURES

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

SPEEDS FOR NORMAL OPERATION
Unless otherwise noted the following speeds are based on maximum weight of 450 kg and may be used for any lesser weight.

Climb right after Takeoff:
- normal climb out .... 95 - 110 km/h
- short field takeoff (flaps 15°) .... 80 km/h

Climb, flaps up:
- normal .... 110 - 130 km/h
- best rate of climb (sea level) .... 130 km/h
- best rate of climb (10000 ft) .... 120 km/h
- best angle of climb .... 110 km/h

Landing approach:
- normal approach (flaps up) .... 90 - 95 km/h
- normal approach (flaps 15°) .... 85 km/h
- short field approach (full flaps) .... 80 km/h

Balked landing (go around):
- maximum power (flaps 15°) .... 90 km/h

Maximum recommended turbulent air penetration speed:
- weight 750 kg .... 200 km/h
- weight 550 kg .... 180 km/h
- weight 450 kg .... 170 km/h

In case of severe turbulence reduce to 140 km/h at all weight.

Maximum demonstrated crosswind velocity:
- all weights .... 42 km/h

CHECKLIST PROCEDURES

Preflight inspection

Visually check the airplane for general conditions during walk around inspection.
In cold weather, remove even small accumulation of frost, ice or snow from wing, tail and control surfaces. Also make sure that control surfaces contain no internal accumulation of ice or debris.

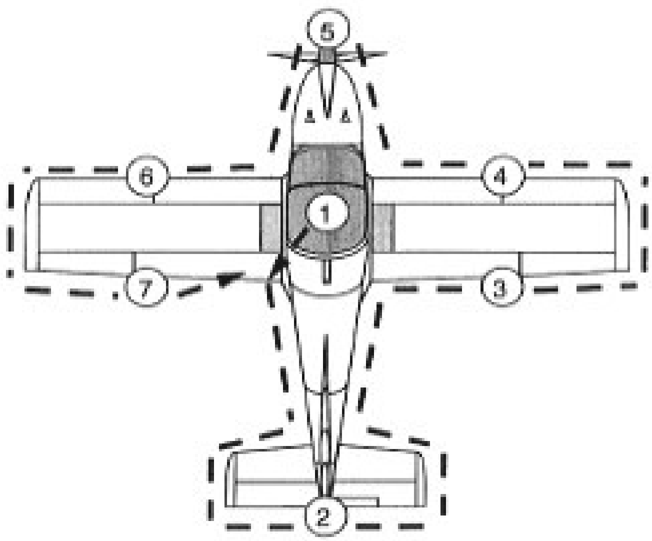


fig. 4-1 Preflight inspection

Cabin:
1) control stick lock .... REMOVE
2) ignition switch .... OFF
3) master switch .... ON
4) fuel quantity indicator .... CHECK QUANTITY
5) master switch .... OFF
6) fuel shutoff valve .... ON

Empennage:
1) rudder gust lock .... REMOVE
2) tail tie down .... DISCONNECT
3) control surfaces .... CHECK freedom of movement and security

Right wing trailing edge:
1) aileron .... CHECK freedom of movement and security
2) wing flap .... CHECK security

Right wing leading edge:

1) wing tie down	DISCONNECT
2) stall warning opening	CHECK for stoppage (if installed)
3) main wheel strut- tire	CHECK for proper inflation and wear

Nose:

1) engine oil level	CHECK fill to 3 lt for extended flight
2) propeller and spinner	CHECK for nicks and security
3) carburetor air filter	CHECK for foreign matter
4) nose wheel strut-tire	CHECK condition
5) nose tie down	DISCONNECT

Left wing leading edge:

1) main wheel strut-tire	CHECK for proper inflation and wear
2) static source and pitot	CHECK for cleanliness.
3) landing lights	CHECK for condition and cleanliness (if inst.)
4) wing tie down	DISCONNECT

Left wing trailing edge:

1) aileron	CHECK freedom of movement and security
2) wing flap	CHECK security

Before first flight of the day and after each refueling, use sampler cap and drain small quantity of fuel from fuel tank sump quick drain valve to check for water, sediment and proper fuel grade.

Before staring engine:

1) preflight inspection	COMPLETE
2) seats, belts, shoulder harnesses	ADJUST and LOCK
3) fuel shutoff valve	ON
4) radios, electrical equipment	OFF
5) brakes	TEST and SET
6) circuit breakers	CHECK IN

Staring engine:
1) master switch .... ON
2) fuel pump .... ON
3) primer .... AS REQUIRED
4) throttle .... OPEN 1 cm
5) propeller area .... CLEAR
6) ignition switch .... START (release when engine starts)
7) oil pressure .... CHECK

Before takeoff:
1) canopy .... CLOSED and LATCHED
2) parking brake .... SET
3) flight controls .... FREE and CORRECT
4) flight instruments .... SET
5) fuel shutoff valve .... ON
6) fuel pump .... ON
7) elevator trim .... TAKEOFF position
8) throttle .... 3000 RPM
9) throttle .... CHECK IDLE
10) throttle .... 1500 - 2000 RPM
11) engine instruments and ammeter ...... CHECK
12) radios .... SET
13) flashing beacon, nav. lights .... AS REQUIRED (if installed)
14) throttle friction .... ADJUSTED

TAKEOFF

Normal takeoff:
1) wing flaps .... TAKEOFF position
2) landing gear .... DOWN
3) throttle .... FULL OPEN
4) elevator control .... LIFT NOSE WHEEL at 65-70 km/h
5) climb out .... 90 - 110 km/h

Short field takeoff:
1) wing flaps .... TAKEOFF position
2) landing gear .... DOWN
3) brakes .... APPLY
4) throttle .... FULL OPEN
5) brakes .... RELEASE
6) elevator control .... SLIGHTLY TAIL LOW
7) climb out .... 100 km/h (with obstacles ahead)

ENRUTE CLIMB

Normal climb:

1) airspeed .... 130 - 150 km/h
2) throttle .... FULL OPEN (5500 RPM)
3) fuel pump .... OFF

If maximum performance climb is necessary, use speeds shown in the "Rate of Climb chart" in Section 5.

CRUISE

Normal cruise:

1) power .... 4000 - 4500 RPM
2) elevator trim .... ADJUST

BEFORE LANDING

Prior to the downwind:

1) seats, belts, harnesses ..... ADJUST and LOCK
2) airspeed ………………. Reduce and trim to 120 km/h

In the traffic pattern:

1) altitude ………………. As required (standard 1000 ft over airfield)
2) fuel pump ……………. ON
3) airspeed ……………… 100 - 120 km/h
4) flaps …………………. 15°
5) landing gear ………… DOWN

LANDING (Final leg)

Normal landing:

1) airspeed .... 90 - 100 km/h
2) wing flaps .... FULL DOWN
3) airspeed .... 85 - 90 km/h
4) touchdown .... MAIN WHEELS FIRST
5) landing roll .... LOWER NOSE WHEEL GENTLY
6) braking .... MINIMUM REQUIRED

Short field landing:

1) airspeed .... 90 - 100 km/h
2) wing flaps .... FULL DOWN
3) airspeed .... MAINTAIN 80 km/h
4) power .... REDUCE to idle as obstacle is cleared
5) touchdown .... MAIN WHEELS FIRST
6) brakes .... APPLY HEAVILY
7) flaps .... RETRACT

Balked landing (Go Around):

1) throttle .... FULL OPEN
2) wing flaps .... RETRACT to 15°
3) airspeed .... 90 km/h
4) landing gear …………. UP
5) wing flaps .... RETRACT slowly

After landing:

1) wing flaps .... UP
2) fuel pump .... OFF

SECURING AIRPLANE

Engine shutoff:

1) brakes .... SET
2) radios, electrical equipment ...... OFF
3) throttle .... 1500 RPM
4) ignition switch .... OFF
5) master switch .... OFF
6) control lock .... INSTALLED

AMPLIFIED PROCEDURES

STARTING ENGINE

Ordinarily the engine starts easily with one or two strokes of primer in warm temperatures to six strokes in cold weather, with the throttle open approximately 1 cm. In extremely cold temperatures, it may be necessary to continue priming while cranking.

Weak intermittent firing followed by puffs of black smoke from the exhaust stake indicate overpriming or flooding.
The starting should be suspended for a while before attempting again without priming.
If the engine is underprimed, most likely in cold weather with a cold engine, it will not fire at all and additional priming will be necessary.
As soon as the cylinders begin to fire, open the throttle slightly to keep it running.
After starting, if the oil gage does not begin to show pressure within 30 seconds in the summertime and about twice that long in very cold weather, stop the engine and investigate.
Lack of oil pressure can cause serious engine damage.

TAXIING

While taxiing, it is important that speed and use of brakes be held to a minimum and that all controls be utilized to maintain directional control and balance.
See figure 4-2 Taxiing diagram.
Taxiing over loose gravel or cinders should be done at low engine speed to avoid abrasion and stone damage to the propeller tips.
The nose wheel is designed to automatically center straight ahead.
Taxiing the airplane is accomplished by the use rudder pedals and brakes.

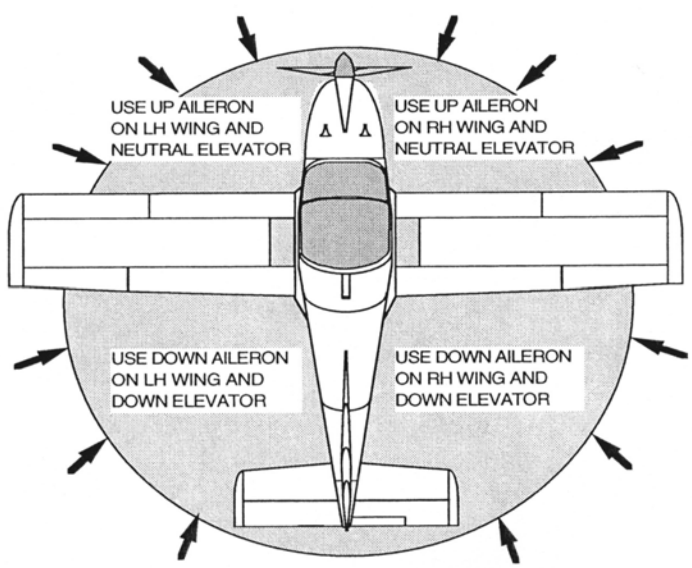


fig. 4-2 Taxiing diagram

BEFORE TAKEOFF

Warm-up:
Most of the warm-up will have been conducted during taxi, an additional warm-up before takeoff should be restricted to the checklist procedure.
Since the engine is cowled for efficient in-flight cooling, precaution should be taken to avoid overheating on the ground.

ALTERNATOR CHECK

Prior to flights verification of proper alternator and voltage regulator operation is essential. Such verification can be made by loading the electrical system momentarily (3 to 5 seconds) with the landing light or by operating the wing flaps during the engine run-up (3000 rpm) if electrical flaps are installed.

In all the cases, the ammeter will remain within a needle width of its initial position if the alternator and voltage regulator are operating properly.

TAKEOFF

Power check:
It is important to check full-throttle engine operation early in the takeoff run. Any sign of rough engine operation or sluggish engine acceleration is good cause for discontinuing the takeoff. If this occurs you are justified in making a thorough full-throttle static run-up before another takeoff is attempted.
In the takeoff run the engine should run smoothly and turn approximately 5500 to 5600 RPM.
Full throttle run-ups over gravel are especially harmful to propeller tips; when takeoff must be made over a gravel surface, it is very important that the throttle be advanced slowly.
This allows the airplane to start rolling before high RPM is developed, and the gravel will be blow back of the propeller rather than pulled into it.
When unavoidable small dents appear in the propeller blades, they should be immediately corrected as described in Section 8 under Propeller care.
After full throttle is applied, adjust the throttle friction lock (if installed) clock-wise to prevent the throttle from creeping back from a maximum power position.
Similar friction lock adjustment should be made as required by other flight conditions to maintain a fixed throttle setting.

Flap setting:

Normal and short field takeoffs are performed with flaps at 15° down position.
Takeoffs with no flap is however suggested in case of sensible cross wind component.

Short field takeoff:

If an obstruction dictates the use of a steep climb angle, after liftoff accelerate to and climb out at 110 km/h with landing gears and flaps retracted. This speed provides the best overall climb speed to clear obstacles when taking into account the turbulence often found near ground level.

Crosswind takeoff:

Takeoff into strong crosswinds normally are performed with the minimum or no flap setting necessary for the field length, in order to minimize the drift angle immediately after takeoff.
The airplane must be accelerated to a speed slightly higher than normal, than pulled off firmly to prevent possible setting back to the runway while drifting.
When clear of the ground, make a coordinated turn into the wind to correct for drift.

ENROUTE CLIMB

When conducting the following climbs, the engine shall be set at 5500 RPM.

Normal climb:
normal climbs are conducted at 130 km/h with landing gears and flaps up and full throttle for best engine cooling.

Best rate of climb:
the best rate of climb speeds range from 130 km/h at sea level to 120 km/h at 10000 ft with landing gears and flaps up and full throttle.

Best angle of climb:
if enroute terrain dictates the use of a steep climb angle, climb at the best angle of climb speed of 110 km/h with landing gears and flaps up and full throttle.

CRUISE

Normal cruising is performed between 55% and 75% power. The engine RPM and corresponding fuel consumption for various altitudes can be determined by the data contained in Section 5.
The data in Section 5 shows the increased range and improved fuel economy that is obtainable when operating at lower power settings and higher altitudes.

The use of lower power settings and the selection of cruise altitudes on the basis of the most favorable wind conditions are significant factors that should be considered on every trip to reduce fuel consumption.
To determine the most reliable and most favorable altitude and power setting for a given trip, refer to Section 5, fig. 5-5.

STALL

The stall characteristics are conventional for the flaps up and flaps down configurations. Slight elevator buffeting may occur just before the stall with flaps and landing gears down.
The stall warning horn (if installed) produce a steady signal 10 to 20 km/h before the actual stall is reached and remains on until the airplane attitude is changed.
Stall speeds for various combinations of flap setting and bank angle are summarized in Section 5.

SPINS

INTENTIONAL SPINS ARE PROBIED

In case an inadvertent spin occurs, the following recovery technique should be used:

1) VERIFY THAT THROTTLE IS IN THE IDLE POSITION AND AILERONS ARE NEUTRAL
2) APPLY AND HOLD FULL RUDDER OPPOSITE TO THE DIRECTION OF ROTATION
3) JUST AFTER THE RUDDER REACHES THE STOP, MOVE ELEVATOR CONTROL BRISKLY FORWARD FAR ENOUGH TO BREAK THE STALL
4) HOLD THIS CONTROL INPUT UNTIL ROTATION STOPS
5) AS ROTATION STOPS, NEUTRALIZE RUDDER AND MAKE A SMOOTH RECOVERY FROM THE RESULTING DIVE.

Variations in basic airplane rigging or in weight and balance due to installed equipment or cockpit occupancy can cause differences in behavior, particularly in extended spins. However the above recovery procedure should always be used and will result in the most expeditious recovery from any spin.

LANDING

The traffic pattern can be made with power-on or power-off at speed of 100-120 km/h with flaps up, in "Base" and "Final" legs, reduce speed to 85 to 90 km/h with flaps and landing gear down.
Surface winds and air turbulence are usually the primary factors in determining the most comfortable approach speed.
Actual touchdown should be made with power-off and on the main wheels first.
The nose wheel should be lowered smoothly to the runway as speed is diminished controlling direction with rudder.

Short field landing

For a short field landing in very smooth air conditions, make a short final approach at 80 km/h with full flaps and landing gear down, using enough power to control the glide path and the speed.
After all approach obstacles are cleared, progressively reduce power and maintain 80 km/h by lowering the nose of the airplane.
Touchdown should be made with power-off and on the main wheels first.
Immediately after touchdown, apply heavy braking as required.
For maximum brake effectiveness, retract the flaps, hold full nose-up elevator, and apply maximum brake pressure without sliding the tires.
Slightly higher approach speeds (85 Km/h) should be used under turbulent air conditions.

Crosswind landing

When landing in a strong crosswind, use the minimum flap setting required for the field length and at an airspeed of 95 km/h.
Use a low wing into the wind, crab angle, or a combination method of drift correction and land in a nearly level attitude.

Balked landing

In a balked landing (go-around) climb, the wing flaps setting should be reduced to 15° and the landing gear retracted immediately after full power is applied.
Upon reaching a safe altitude and airspeed, the flaps should be retracted to the full up position.

COLD WEATHER OPERATION

Prior to starting in cold mornings, it is advisable to pull the propeller through several times by hand to break loose or limber the oil, thus conserving battery energy.

WARNING

When pulling the propeller through by hand, treat it as if the ignition switch is turned on.

A loose or broken ground wire on either magneto could cause the engine to fire.

In extremely cold weather, the use of an external preheater is recommended to reduce wear and abuse to the engine and its electrical system.

Cold weather starting procedures are as follows:

1) with ignition switch OFF and throttle closed, PRIME the engine four to ten strokes as the propeller is being turned over by hand

NOTE

After priming, push the primer all the way in and lock in position to avoid possibility of engine drawing fuel through the primer.

2) propeller area .... CLEAR
3) master switch .... ON
4) fuel pump .... ON
5) throttle .... OPEN 1 cm
6) ignition switch .... START
7) oil pressure .... CHECK

NOTE

If the engine does not start during the first few attempts, it is probable that the spark plugs have been frosted over. Preheat must be used before another start is attempted.

WARNING

Pumping the throttle may cause raw fuel to accumulate in the intake air duct, creating a fire hazard in the event of a backfire.

If this occurs, maintain a cranking action to suck flames into the engine.

During cold weather operations, no indication will be apparent on the oil temperature gage prior to takeoff if outside air temperatures are very cold.

After a suitable warm-up period (2 to 5 minutes at 2000 RPM), accelerate the engine several times to higher engine RPM. If the engine accelerates smoothly and the oil pressure remains normal and steady, the airplane is ready for takeoff.

SECTION 5 - PERFORMANCE

INTRODUCTION

Performance data charts on the following pages are presented so that you may know what to expect from the airplane under various conditions, and also, to facilitate the planning of flights in detail and with reasonable accuracy.
The data in the charts has been computed from actual flight tests with the airplane and engine in good condition and using average piloting techniques.

USE OF PERFORMANCE CHARTS

Performance data is presented in tabular form to illustrate the effect of different variables. Conservative values can be selected and used to determine the particular performance figure with reasonable accuracy.

SAMPLE PROBLEM

The following sample flight problem utilize information from the various charts to determine the predicted performance data for a typical flight.

The following information is known:

Airplane configuration:
- takeoff weight .... 750 kg
- usable fuel .... 120 lt

Takeoff conditions:
- field pressure altitude .... 1500 ft
- temperature .... 28°c (16°c above standard)
- wing component along runway ..... 24 km/h headwind
- field length .... 400 mt

Cruise conditions:
- total distance .... 660 km
- pressure altitude .... 5500 ft
- temperature .... 20°c (16°c above standard)
- expected wind enroute ..... 20 km/h headwind

Landing conditions:
- field pressure altitude .... 2000 ft
- temperature .... 25°c
- field length .... 450 mt

TAKE-OFF

The takeoff distance chart (fig.5-3) should be consulted keeping in mind that the distances shown ore based on normal takeoff technique.
Conservative distances can be established by reading the chart at the next higher value of altitude and temperature.
For example, in this particular sample problem, the take-off distance information presented for a pressure altitude of 2000 ft and a temperature of 30°c should be used and results in the following:

- ground roll .... 163 mt
- total distance to clear a 50 ft obstacle .... 390 mt

These distances are well within the available take-off field length, however, a correction for the effect of wind may be made based on **Note 3** of the take-off chart: decrease the ground roll by 10% for 18 km/h (9 knots) head wind.

The correction for a 24 km/h headwind is:

(24 km/h : 18 km/h) x 10 = 13%

This results in the following distances corrected for wind:
- a) ground roll (zero wind) .... 163 mt
- b) decrease in ground roll (163 mt x 13%) .... 21 mt
- c) corrected ground roll (a-b) .... 142 mt

- d) total distance to clear a 50 ft obstacle (zero wind) .... 390 mt
- e) decrease in total distance (390 mt x 13%) .... 51 mt
- f) corrected total distance to clear a 50 ft obstacle (d-f) ... 339 mt

CRUISE

The cruising altitude should be selected based on a consideration of trip length, wind aloft, and the airplane's performance.
A typical cruising altitude and the expected wind enroute have been given for this sample problem.
The cruise performance chart (fig. 5-5) is entered at 6000 ft altitude and 20°c above standard temperature.
The engine speed chosen is 4500 RPM, which result in the following:

- power 48%
- true airspeed .... 189 km/h
- cruise fuel flow .... 14,4 lt per hour

FUEL REQUIRED

The total fuel requirement for the flight may be estimated using the performance information in figure 5-4 and 5-5. For this sample problem, figure 5-4 shows that a climb from 2000 ft to 6000 ft requires 4,2 lt of fuel.
The corresponding distance during the climb is 18 km.
These value are for standard temperature and are sufficiently accurate for most flight planning purposes.
However, a further correction for the effect of a non-standard temperature is to increase the time, fuel, and distance by 10% for each 8°c above standard temperature, due to the lower rate of climb.

In this case, assuming a temperature 16°c above standard, the correction would be:

(16°c : 8°c) x 10 = 20%

With this factor included the fuel estimate would be calculated as follows:
- a) fuel to climb (standard temperature) .... 4,2 lt
- b) increase due to non-standard temp. (4,2 lt x 20%) .... 0,8 lt
- c) corrected fuel to climb (a + b) .... 5,0 lt

Using a similar procedure, the distance to climb results 22 km.
The resultant cruising distance is:
- d) total distance .... 660 km
- e) climb distance .... 22 km
- f) cruise distance (d - e) .... 638 km

With an expected 20 km/h headwind, the ground speed for cruise is predicted to be:

189 km/h - 20 km/h = 169 km/h.

Therefore, the time required for the cruise portion of the trip is:

638 km : 169 km/h = 3.8 hours

The fuel required for cruise is: 3.8 hours x 14,4 lt/h = 54,7 lt

The total estimate fuel required is as follows:
- g) engine start, taxi, and takeoff .... 3,0 lt
- h) climb .... 5,0 lt
- i) cruise .... 54,7 lt
- j) total fuel required (g + h + i) .... 62,7 lt

This will leave a reserve of: 130 lt - 62,7 lt = 67,3 lt

Once a flight is underway, ground speed checks will provide a more accurate basis for estimating the time enroute and the corresponding fuel required to complete the trip with ample reserve.

LANDING

A procedure similar to takeoff should be used for estimating the landing distance at the destination airport.
Figure 5-6 presents landing distances for various airport altitude and temperature combinations using the short field landing technique.
The distances corresponding to 2000 ft and 30°c are as follows:

- ground roll .... 129 mt
- total distance to clear a 50-ft obstacle ...... 317 mt

A correction for the effect of wind may be made based on Note 2 of the landing chart using the same procedure as outlined for takeoff.

STALL SPEEDS CHART

Condition: power off; landing gears up.

Weight kg	Flap deflection	Angle of bank 0° km/h	30° km/h	45° km/h	60° km/h
550	UP	75	80	92	110
	15°	70	75	83	98
	30°	65	67	75	90

fig. 5-1 Stall speed chart

RATE OF CLIMB (maximum)

Conditions: flaps up; landing gears retracted; full throttle.

Weight kg	Pressure altitude feet	Climb speed km/h	Rate of climb-fpm -20°c	0°c	20°c	40°c
550	s.l.	135	770	710	655	595
	2000	132	675	615	560	500
	4000	130	580	520	465	405
	6000	128	485	430	375	310
	8000	126	390	335	280	215
	10000	124	295	240	185	---
	12000	122	200	150	---	---

fig. 5-2 Rate of climb chart

TAKE-OFF DISTANCE CHART

Conditions: flaps 15°; full throttle prior to brake release; paved, level, and dry runway; zero wind; distances are given in meters.

Notes:

1) normal take-off technique as specified in Section 4
2) decrease distances 10% for each 18 km/h headwind. For operation with a tailwind up to 20 km/h, increase distances 10% for each 4 km/h
3) where distance value has been deleted, climb performance after lift-off is less than 150 fpm at take-off speed
4) for operation on a grass runway, increase distances by 15% of the ground roll figure
5) "A" means ground roll distance; "B" means total distance to clear a 50-ft obstacle.

Weight kg	**Take-off speed km/h**		**Press alt feet**	**0°c**		**10°c**		**20°c**		**30°c**		**40°c**	
	lift off	**at 50 ft**		**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**	**A**	**B**
			s.l	70	130	81	146	94	186	114	236	140	314
			1000	80	145	93	184	112	234	137	310	165	395
			2000	92	182	109	232	135	307	163	390	204	479
550	**75**	**100**	3000	108	230	133	304	160	386	199	473	263	574
			4000	130	302	158	383	195	468	256	567	326	676
			5000	156	380	192	464	250	560	318	668	378	780
			6000	190	460	244	555	311	660	370	773	453	915
			7000	240	550	304	655	365	766	446	900	---	---
			8000	300	650	360	760	440	890	---	---	---	---

fig. 5-3 Take-off distance chart

TIME, FUEL, AND DISTANCE TO CLIMB CHART (maximum rate of climb)

Conditions: flaps up; full throttle (5500 RPM); landing gear up; standard temperature; zero wind.

Notes:
1) add 3 lt of fuel for engine start, taxi and takeoff
2) increase time, fuel and distance by 10% for each 8°c above standard temp.

Weight kg	Pressure altitude feet	Temp. °c	Climb speed km/h	Rate of climb fpm	Time min.	From sea level Fuel used lt	Distance km
	s.l.	15	135	720	0	0	0
	1000	13	135	700	2	0,8	4
	2000	11	132	660	3	1,9	7
	3000	9	132	620	5	2,7	11
	4000	7	130	580	7	3,8	15
	5000	5	130	530	9	4,9	19
550	6000	3	128	480	11	6,1	25
	7000	1	128	425	14	7,2	30
	8000	-1	126	375	17	8,7	35
	9000	-3	126	315	20	10,3	43
	10000	-5	124	275	23	12,2	50
	11000	-7	124	220	27	14,1	59
	12000	-9	122	180	33	16,3	70

fig. 5-4 Time, fuel and distance to climb chart

CRUISE PERFORMANCE CHART

Conditions: weight 550 kg; zero wind.

Pres. Alt.	RPM	20°c below standard temp.			standard temperature			20°c above standard temp.		
		BHP	km/h	lt/h	BHP	km/h	lt/h	BHP	km/h	lt/h
2000	5500	95	240	26,5	95	235	27,5	72	230	20,4
	5200	90	230	22,6	73	225	20,7	68	220	19,2
	5000	75	218	19,9	65	213	18,5	60	208	17,3
	4500	65	205	17,7	57	202	16,3	53	199	15,5
	4400	54	195	15,5	50	191	14,7	47	187	13,9
	4200	47	185	13,9	44	180	13,2	42	175	12,4
4000	5500	90	235	25,2	78	230	21,9	70	225	19,6
	5200	85	225	21,1	69	220	19,6	64	215	18,1
	5000	70	207	18,8	61	205	17,3	57	203	16,6
	4500	60	202	16,6	54	199	15,5	50	195	14,7
	4400	51	194	14,7	48	190	13,9	45	186	13,2
	4200	45	184	13,2	42	180	12,4	40	176	12,1
6000	5500	84	230	24,0	77	225	20,9	69	220	20,0
	5400	79	223	22,2	73	218	20,4	67	213	19,2
	5200	70	215	19,6	64	210	18,1	60	205	16,9
	5000	62	205	17,7	57	200	16,6	53	195	15,5
	4500	54	197	15,8	51	193	14,7	48	189	14,4
	4400	48	187	13,9	45	184	13,2	42	180	12,1
8000	5400	74	223	20,7	68	220	19,2	63	197	18,1
	5200	65	213	18,5	60	210	17,3	57	206	16,6
	5000	58	205	16,6	54	201	15,5	51	197	14,7
	4500	52	195	15,1	48	193	13,9	45	190	13,2
	4400	46	187	13,6	43	183	12,1	40	180	12,1
10000	5400	69	220	19,6	64	217	18,1	59	214	16,9
	5200	61	213	17,3	57	211	16,6	53	208	15,5
	5000	55	203	15,8	51	201	14,7	48	199	13,9
	4500	49	193	14,3	45	191	13,6	43	189	12,1
12000	5300	61	215	17,3	57	212	16,6	53	209	15,5
	5200	58	210	16,6	54	208	15,5	50	206	14,7
	5000	52	201	15,1	48	199	13,9	45	197	13,2
	4500	46	195	13,6	43	193	12,1	41	191	12,4

fig. 5-5 Cruise performance chart

LANDING DISTANCE CHART

Conditions: flaps 30°; power off; normal braking; paved, level, and dry runway; zero wind.

Notes:
1) normal landing technique as specified in Section 4
2) decrease distances 10% for each 18 km/h headwind. For operation with a tailwind up to 20 km/h, increase distances 10% for each 4 km/h
3) for operation on a grass runway, increase distances by 15% of the ground roll figure
4) "**a**" column is ground roll distance; "**b**" column is total distance to clear a 50-foot obstacle.

Weight kg	**Speed at 50 ft km/h**	**Press alt feet**	**Ground Temperature** 0°c		10°c		20°c		30°c		40°c	
			a	**b**	**a**	**b**	**a**	**b**	**a**	**b**	**a**	**b**
		s.l	129	317	133	323	139	330	142	336	147	344
		1000	133	323	139	330	142	336	147	344	153	353
		2000	139	330	142	338	148	345	153	353	158	359
550	**80**	3000	142	338	148	345	153	353	159	362	164	368
		4000	148	345	153	353	159	362	165	371	170	377
		5000	155	356	159	362	165	371	171	380	177	389
		6000	161	364	165	371	171	380	177	389	183	398
		7000	167	373	173	382	179	391	185	400	191	409
		8000	173	382	179	391	185	400	191	409	198	420

fig. 5-6 Landing distance chart

SECTION 6 - WEIGHT AND BALANCE

INTRODUCTION

This section describes the procedure for establishing the basic empty weight and moment of the airplane. Sample forms are provided for reference.
Procedures for calculating the weight and moment for various operations are also provided.

AIRPLANE WEIGHING PROCEDURE

a) Preparation:
1) inflate tires to recommended operating pressure
2) drain all fuel
3) drain all oil
4) raise flap to the fully retracted position
5) place the aircraft leveled

b) Leveling:
1) place scales under each wheel (200 kg minimum capacity for scales)
2) release brakes
3) check aircraft leveled

c) Weighing:
1) record the weight shown on each scale deducting the tare if any.

d) Measuring (ref. figure 6-1):
1) obtain measurement A by measuring horizontally (along the airplane center line) from a line stretched between the main wheel centers to a plumb bob dropped from the firewall
2) obtain measurement B by measuring horizontally and parallel to the airplane center line, from center of nose wheel axle, left side, to a plumb bob dropped from the line between the main wheel centers. Repeat on right side and average the measurements.

Using weights from (c) and measurements from (d) the airplane weight and C.G. can be determined by completing figure 6-5.
The basic empty weight may be determined completing figure 6-6.

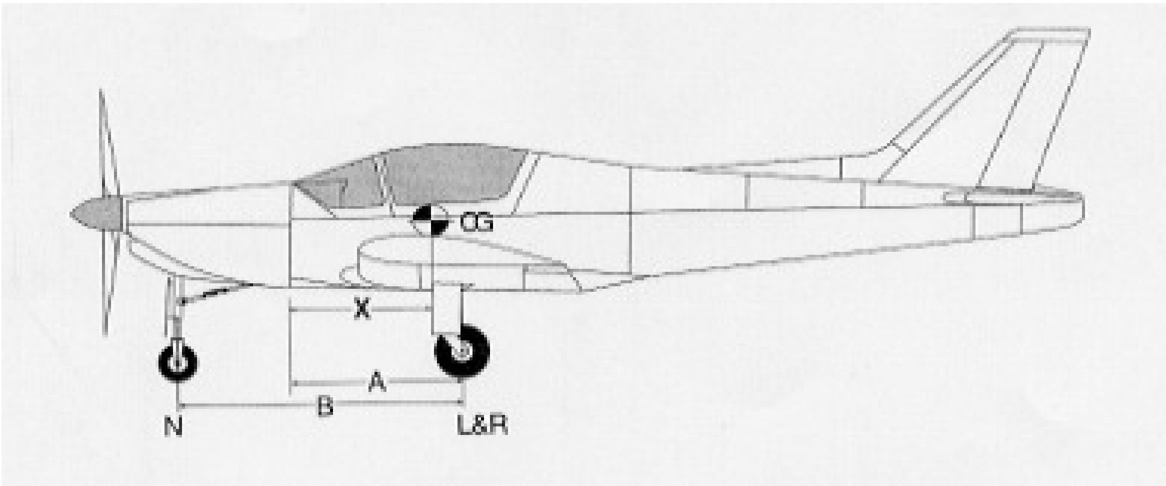


fig. 6-1 Measurements

WEIGHT AND BALANCE

The following procedure will enable you to operate your aircraft within the prescribed weight and C.G. limitations.
To figure weight and balance, use the sample problem form, loading graph and C.G. moment envelope as follows:
take the basic empty weight and moment from appropriate weight and balance records carried in your airplane and enter them in the column titled "YOUR AIRPLANE" on the sample loading problem.
Use the loading graph to determine the moment/1000 for each additional item to be carried on the aircraft, then list these on the loading problem.
Total the weights and moments/1000 and plot these values on the C.G. moment envelope to determine whether the point falls within the envelope, and if the loading is acceptable.

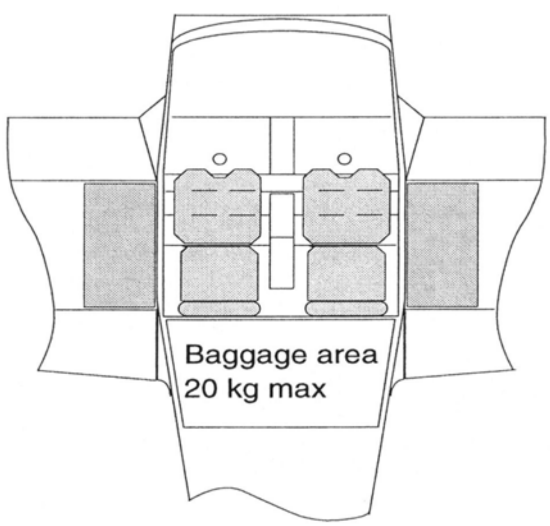


fig. 6-2 Loading arrangements

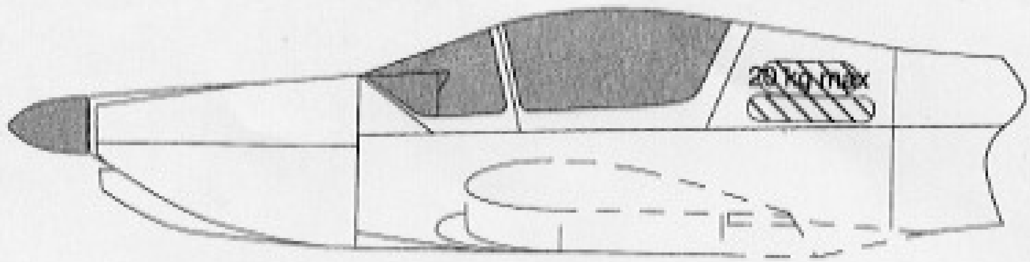


fig. 6-3 Baggage loading

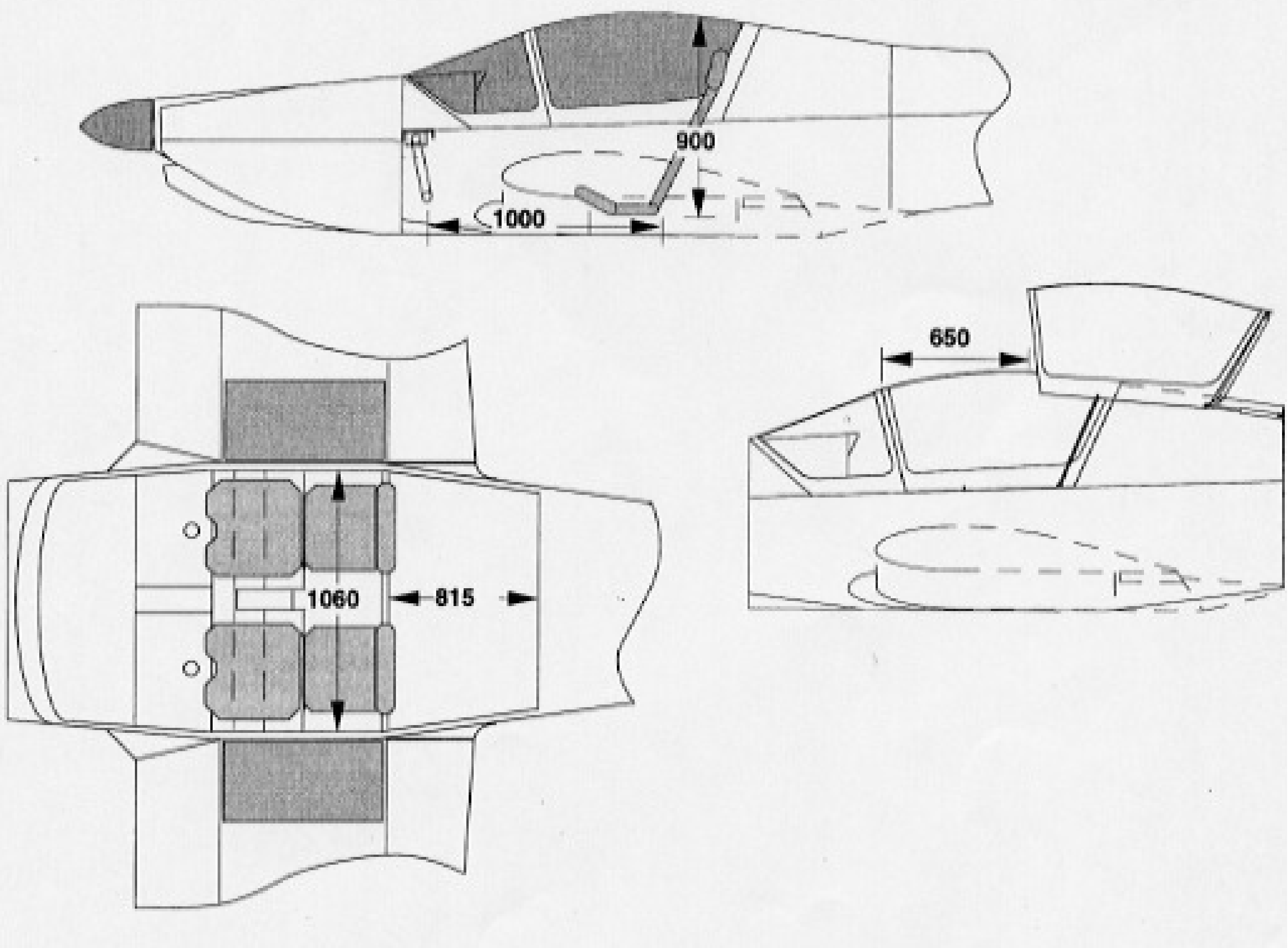


fig. 6-4 Internal cabin and entry dimensions

SCALE POSITION	SCALE READING	TARE	SYMBOL	NET WEIGHT (kg)
LEFT WHEEL	160	0	**L**	**160**
RIGHT WHEEL	160	0	**R**	**160**
NOSE WHEEL	72	0	**N**	**72**
SUM OF NET WEIGHTS			**W**	**392**

$$X = ARM = (A) - \frac{(N) * (B)}{W}$$

(A) = 122 cm
(B) = 194 cm

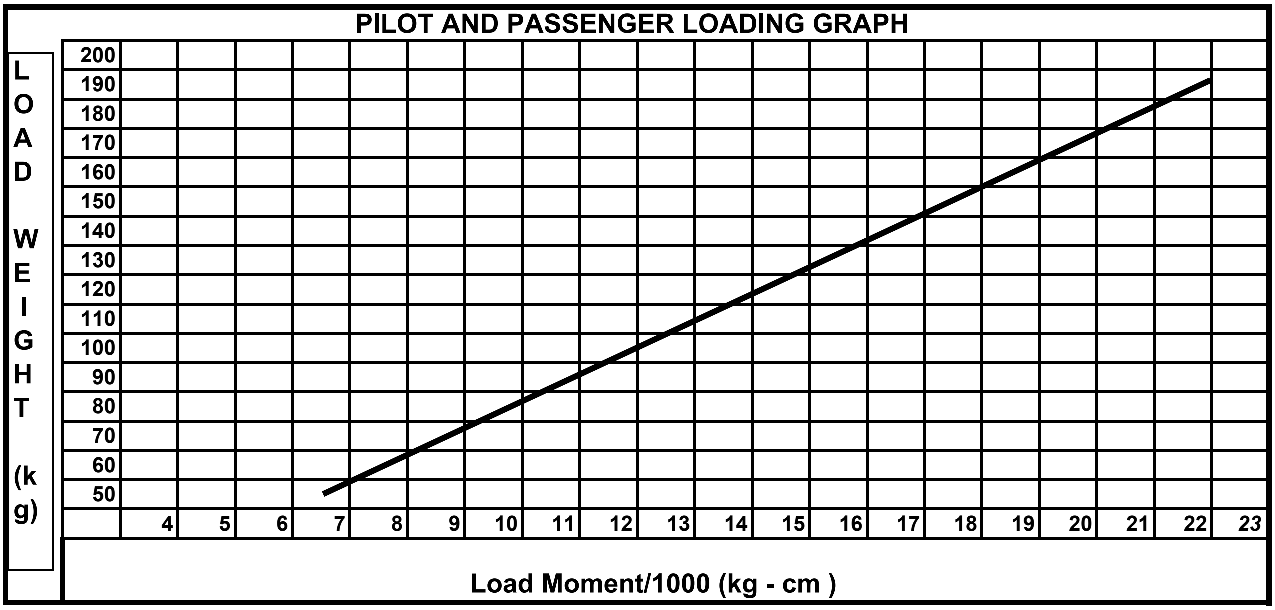
Fig. 6-5 Sample Aircraft Weighing and determination of CG station

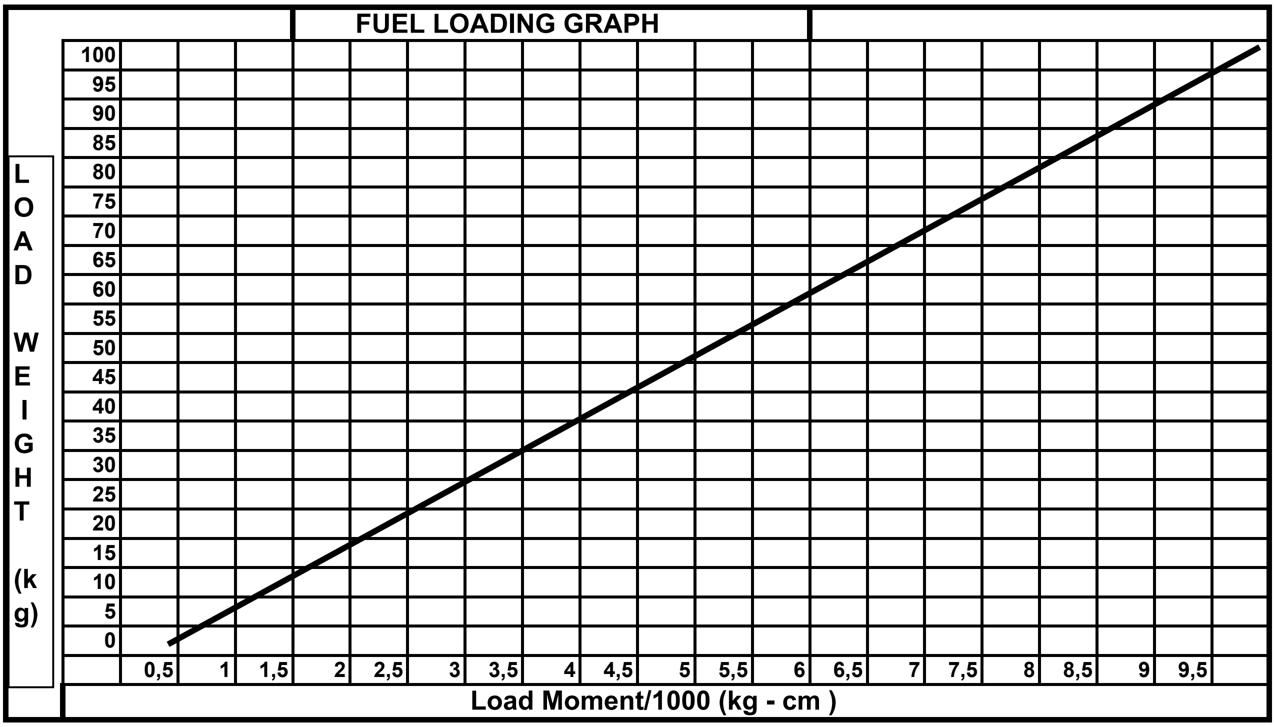
ITEM	WEIGHT (kg) X	CG ARM (cm) =	MOMENT/1000 (kg/cm)
AIRCRAFT BASIC EMPTY WEIGHT	392	82,3	28.9

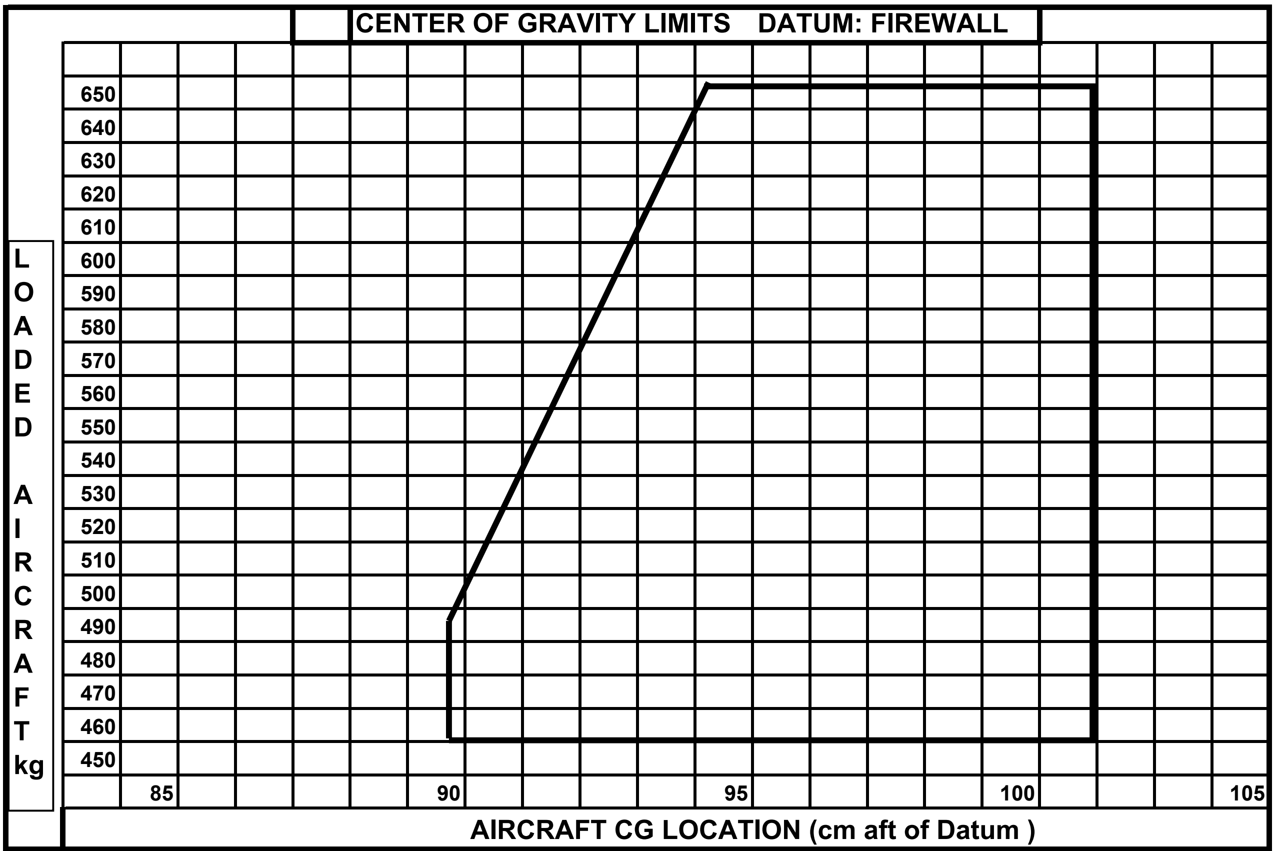
Fig. 6-6 Sample Aircraft Basic Empty Weight and Moment

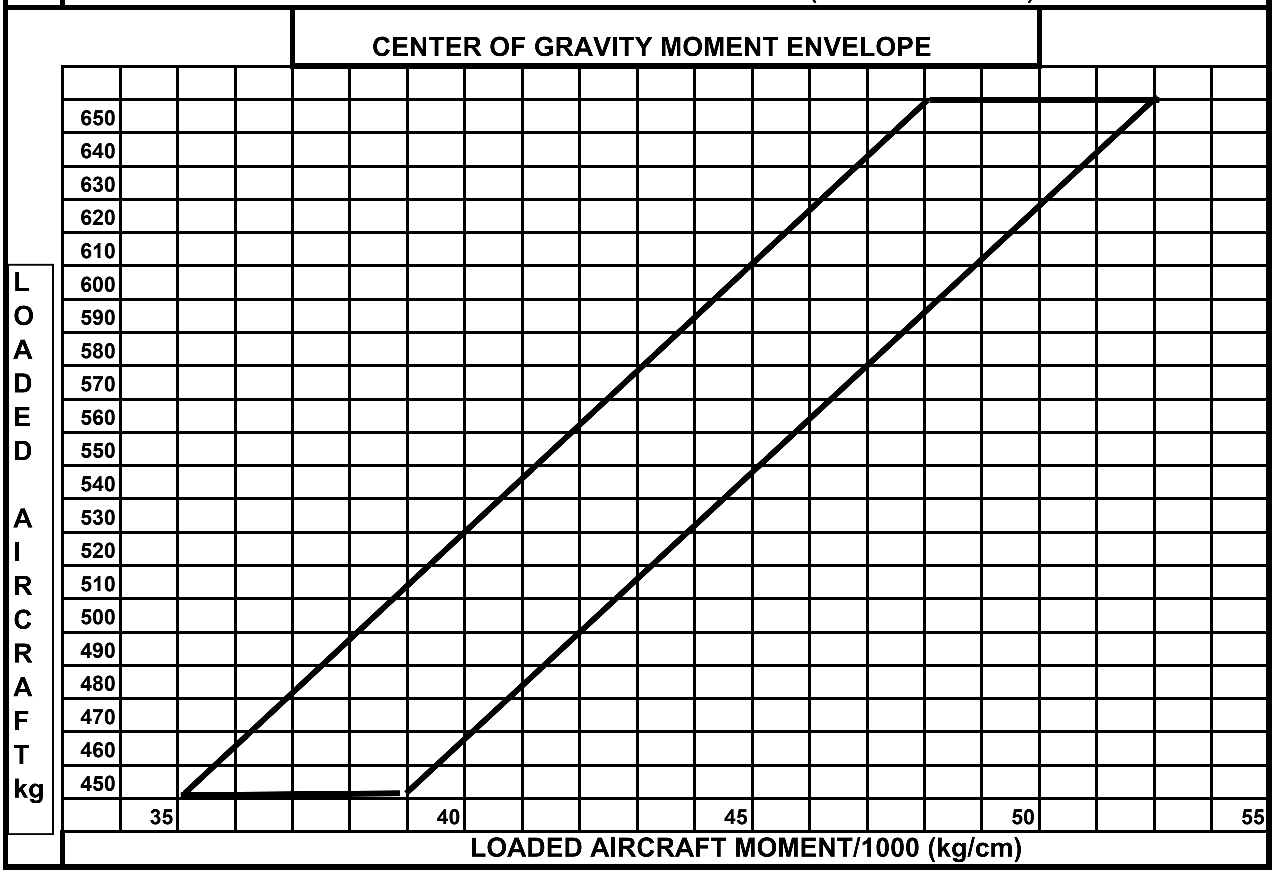
SAMPLE LOADING PROBLEM	SAMPLE AIRPLANE WEIGHT (kg)	- MOMENT/1000	**YOUR AIRPLANE** WEIGHT (kg)	- MOMENT/1000
BASIC EMPTY WEIGHT -	392	28,9		
FUEL (0,72 kg/lt) 100 lt	72	2,2		
PILOT & PASSENGER	150	17,4		
BAGGAGE AREA	20	0,37		
TOTAL WEIGHT & MOMENT	**634**	**48,7**		

Locate this point (634 at 48,7) on the CG Moment Envelope graph


PILOT AND PASSENGER LOADING GRAPH
LOAD WEIGHT (kg)
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
Load Moment/1000 (kg - cm)


FUEL LOADING GRAPH
LOAD WEIGHT (kg)
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
5
0
0,5 1 1,5 2 2,5 3 3,5 4 4,5 5 5,5 6 6,5 7 7,5 8 8,5 9 9,5
Load Moment/1000 (kg - cm)


CENTER OF GRAVITY LIMITS DATUM: FIREWALL
LOADED AIRCRAFT kg
650
640
630
620
610
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
85
90
95
100
105
AIRCRAFT CG LOCATION (cm aft of Datum)


CENTER OF GRAVITY MOMENT ENVELOPE
LOADED AIRCRAFT kg
650
640
630
620
610
600
590
580
570
560
550
540
530
520
510
500
490
480
470
460
450
35
40
45
50
55
LOADED AIRCRAFT MOMENT/1000 (kg/cm)

SECTION 7 - AIRPLANE AND SYSTEMS DESCRIPTIONS

INTRODUCTION

This section provides description and operation of the airplane and its systems, however some equipment described herein are optional and may not be installed in your airplane, thus the following information must be considered as a suggested reference.

AIRFRAME

Simplicity of design, combined with sound construction principles, were the basic objectives when designing the **"STORM RG"** aircraft.

The construction of the fuselage, for example, is constructed of 2024 or 2017 aluminum angles that are cut to specific length and then joined by gusset cut from aluminum flat sheet. The entire structure is then covered by aluminum skin.
The resulting fuselage framework is so strong that all primary loads are carried by this structure.
Major items of the fuselage structure are the central console, central wing box, seats structure and backrest, baggage compartment, and fuselage bulkheads.

The wings, are constructed of a spar with formed sheet metal ribs.
The entire structure is covered with aluminum skin.
Conventional hinged ailerons and flaps are attached to the trailing edge of the wings.

The ailerons are formed by ribs covered with aluminum skin; the ailerons shall be balanced with balance weight if necessary.
The flaps are constructed basically the same as the ailerons, with the exception of balance weight.

The empennage consists of a conventional vertical stabilizer, rudder, and horizontal stabilizer and elevator.
The vertical stabilizer consists of two spars, ribs and reinforcements, wrap-around skin panels, form the leading edge and the stabilizer's sides.

The rudder is constructed of a formed wrap-around skin panels and ribs.

The horizontal stabilizer is constructed of a main spar, formed sheet metal ribs, wrap-around skin panels, and formed leading edge skins.

The elevator is constructed of a formed wrap-around skin panels and ribs and shall be balanced with balance weight if necessary.

FLIGHT CONTROLS

The airplane's flight control system consists of a conventional ailerons, rudder and elevator control surfaces (see figure 7-1). The control surfaces are manually operated through mechanical linkage using a control stick for the ailerons and elevator, and rudder pedals for the rudder and ground steering.

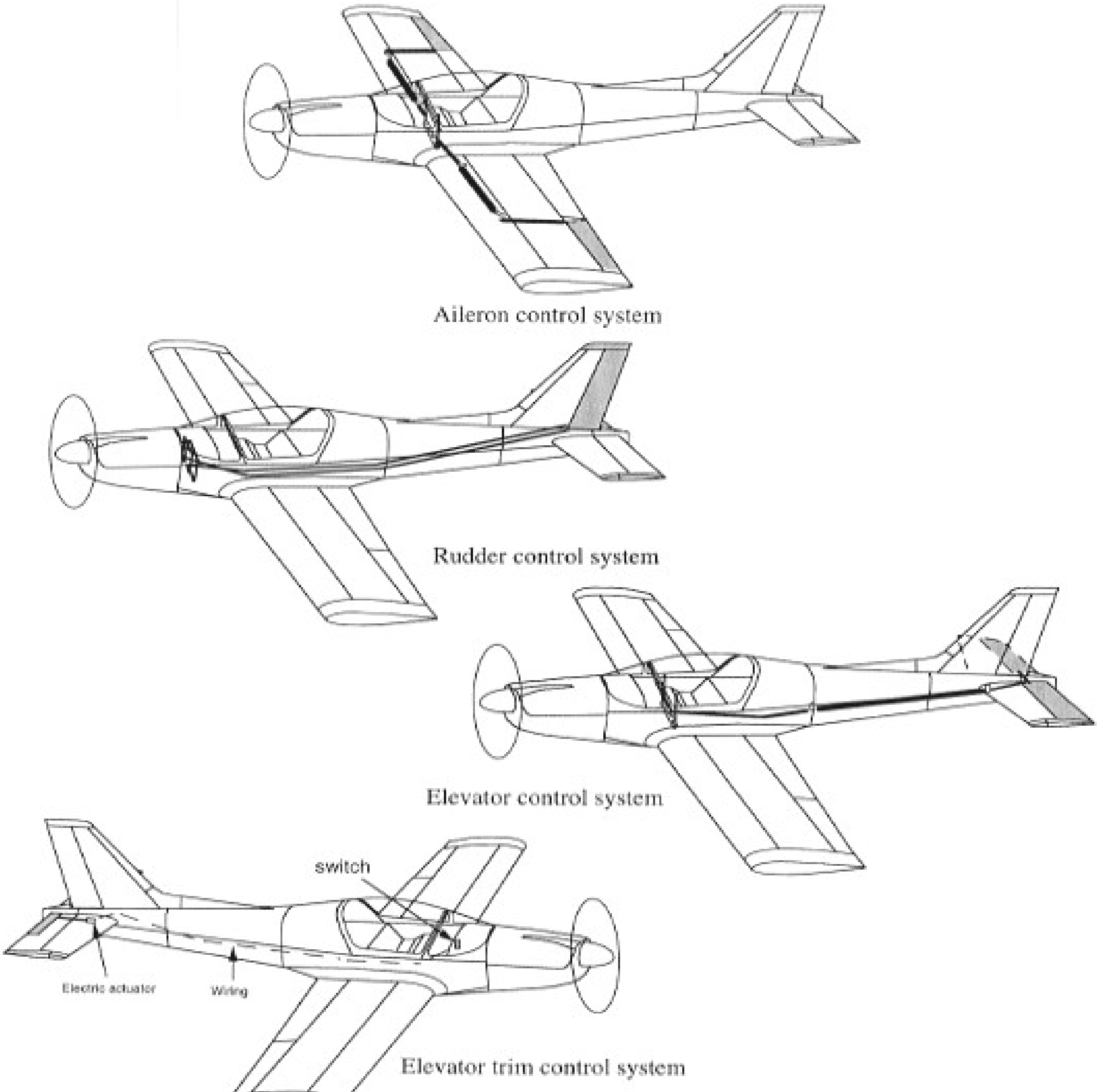


Fig. 7-1 Flight control and trim system

TRIM SYSTEM

A manually operated elevator trim tab can be fitted.
Elevator trimming is accomplished through the elevator trim tab by utilizing the vertical mounted trim control wheel (or electrical switch) located in the central console or on top of the control stick..
Forward rotation of the trim wheel will trim nose-down; conversely, aft rotation will trim nose-up.

INSTRUMENT PANEL

Instruments play a big role in the empty weight of the aircraft, thus, it is highly recommended to limit the instruments of your plane to the standard configuration.
The standard instruments for a Ultralight Aircraft safe flight activity are the following:
- Airspeed indicator - Altimeter - Rate of climb - Magnetic compass - Clock
and Engine instruments.
The instrument panel layout (figure 7-2), shown here just for information purpose, is designed to place the primary flight instruments directly in front of the pilot.

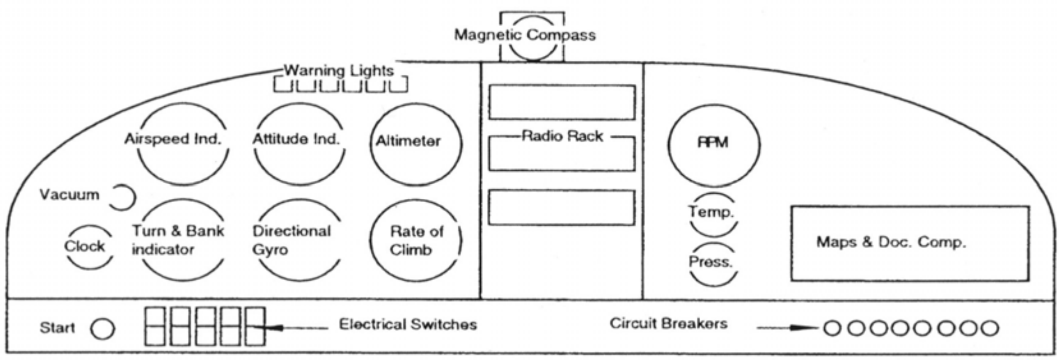


Fig. 7-2 Instrument panel

GROUND CONTROL

Effective ground control while taxiing is accomplished through nose wheel steering by using the rudder pedals; left rudder pedal to steer left, right rudder pedal to steer right.
The minimum turning radius of the airplane is approximately 3 mt.

Moving the airplane by hand is most easily accomplished by attaching a tow bar to the nose gear strut.
If a tow bar is not available use the propeller blades as pushing or pulling points.
Do not use the vertical or horizontal surfaces to move the airplane.

WING FLAP SYSTEM

The wing flaps are of the flower type (see figure 7-3) and are extended or retracted, mechanically or electrically, by positioning the wing flap lever to the desired flap deflection position: 0°, 15°, 30°.

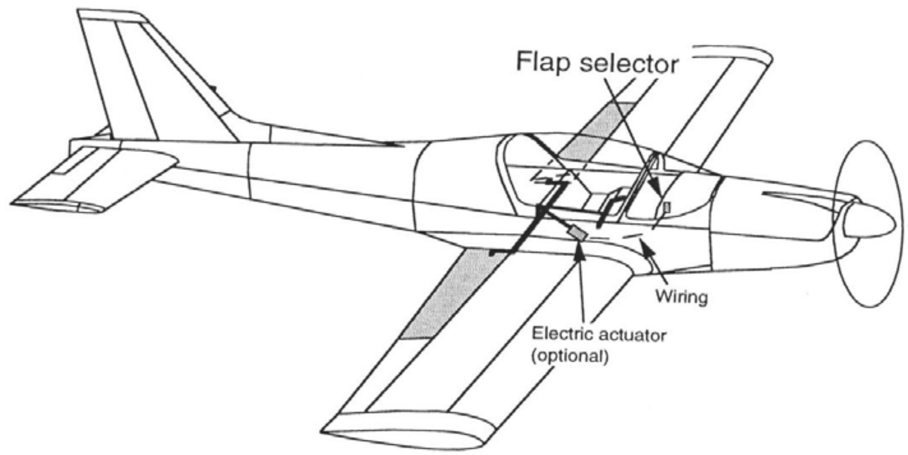


Fig. 7-3 Wing flap system

LANDING GEAR SYSTEM

The landing gear system is of the retractable tricycle type with a steering nose wheel and two main wheels under the wings.
Landing gears extension and lock is accomplished by gravity, while landing gear retraction is accomplished by a lever commanding three hydraulics actuators, one for each landing gear.
The landing gear system is schematically illustrated in fig. 7-4.
Shock absorption is provided by the main landing gear rubber shock absorber.
Each main landing gear wheel is equipped with a disc-type brake hydraulically activated.

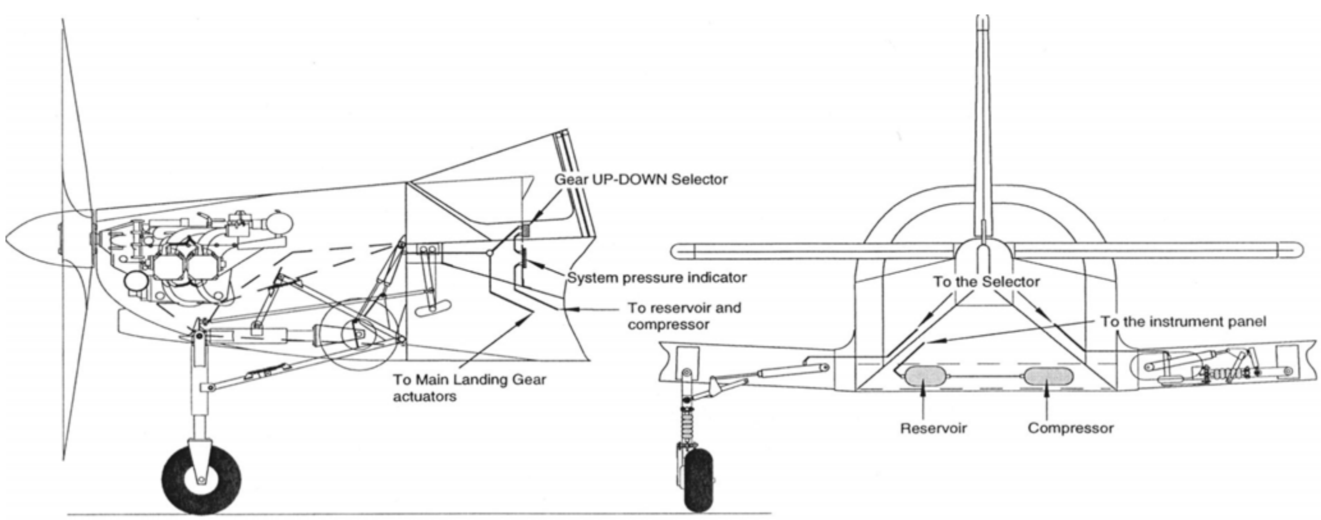


Fig. 7-4 Landing Gear system

BAGGAGE COMPARTMENT

The baggage compartment consists of the area from the back of the pilot to the aft cabin bulkhead.
Access to the baggage compartment is gained from within the airplane cabin.
For baggage area dimensions, refer to Section 6.

SEATS

The seating arrangement consists of two seats for the pilot and co-pilot/passenger. 2 back seats rear max 70 kg

COCPIT ENTRANCE

Entry to, and exit from the airplane is accomplished through the canopy on each side of the cabin, walking on marked walk area on wings.
Do not walk on wing flaps.

CONTROL LOCKS

A control lock could be fitted to lock the ailerons and elevator control surfaces in a neutral position and prevent damage to these systems by wind buffeting while the airplane is parked.
The locks must be removed before starting the engine.
In areas where high or gusty winds occur, a control surface lock should be installed over the vertical stabilizer and rudder.

ENGINE

The airplane is powered by a horizontally-opposed, four cylinder, integrated reduction gear box, air/liquid cooled, carburetor fitted engine with a dry sump forced lubrication system.
The engine is a ROTAX model 912 and is rated at 95 HP at 5500 RPM.
In case of need, but just for maximum 5 minutes, the engine can deliver 100 HP at 5800 RPM.

ENGINE CONTROLS

Engine power is controlled by a throttle located in the central console between the pilot and co-pilot/passenger seats.
The throttle is a black lever and operates in a conventional manner: in the full forward position the throttle is open (full power), and in the aft position the throttle is closed (idle).A friction lock is located on the throttle right side (if installed) and is operated by rotating the lock clockwise to increase friction or counterclockwise to decrease it.

IGNITION AND STARTER SYSTEM

Engine ignition is provided by two electronic ignition units, and two spark plugs in each cylinder.

AIR INDUCTION SYSTEM

The engine air induction system receives ram air through two NACA intakes in the upper portion of the engine cowling.
Airflow enters an airbox. After passing through the airbox induction air enters the inlet in the two carburetors which are behind the engine, and is then inducted to the engine cylinders through intake manifold tubes.

EXHAUST SYSTEM

Exhaust gas from each cylinder passes through riser assemblies to a muffler and tailpipe on each side of the engine. The muffler is constructed with a shroud around the outside which forms a heating chamber for cabin heater air.

CARBURETOR AND PRIMING SYSTEM

The engine is equipped with two carburetors mounted behind the engine.
In the carburetors, the fuel is atomized, proportionally mixed with intake air and delivered to the cylinders through intake manifold tubes.
For easy starting in cold weather, the engine is equipped with a manual primer.

COOLING SYSTEM

Ram air for engine cooling enters through two intake openings in the front of the engine cowling. The cooling air is directed around the cylinders, radiator, and other areas of the engine by baffling, and it is exhausted through an opening at the bottom of the cowling. No manual cooling system control is provided.

PROPELLER

The airplane is equipped with a two-bladed, fixed pitch propeller with a diameter of 172 cm.

FUEL SYSTEM

The fuel system consists of a vented fuel tank located behind the pilots, a fuel shutoff valve, fuel filter, mechanical fuel pump, electrical fuel pump (optional), manual primer, and carburetors (see figure 7-5).
Fuel flows from the tank to the fuel shut of valve. With the valve in the ON position, fuel flows through a filter to the fuel pump, then to the carburetor, then mixed fuel and air flows to the cylinders through intake manifold tubes.
Fuel system venting is essential to the system operation in fact blockage of the venting system will result in a decreasing fuel flow and eventual engine stoppage.

Fuel quantity is measured by a float-type fuel quantity transmitter and indicated by an electrically operated fuel quantity indicators on the instrument panel.
The fuel system is equipped with drain valves to provide a means for the examination of fuel in the system for contamination and grade.

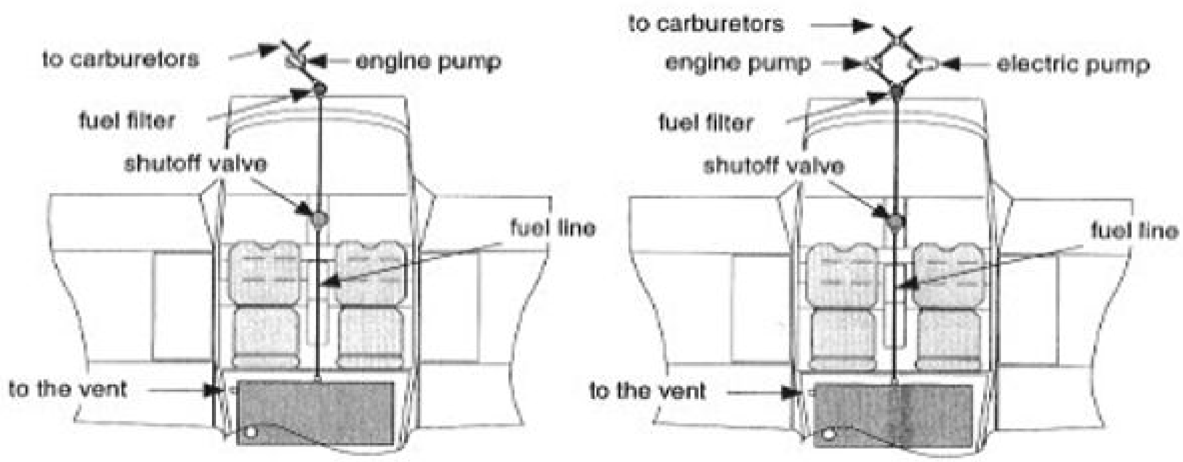


Fig. 7-5 Fuel systems

BRAKE SYSTEM

The airplane has a single-disc, hydraulically actuated brake on each main landing gear wheel.
Both brakes are connected, by a hydraulic line to master cylinders attached on each rudder pedal.

For maximum brake life, keep the brake system properly maintained and minimize brake usage during taxi operations and landings.

ELECTRICAL SYSTEM

Electrical energy is supplied by a 13.5-volt direct current system powered by an engine driven alternator and by the 12-volt, 25-ampere hour battery located on the forward side of the firewall.
Power is supplied through a single bus bar; a master switch controls this power to all circuits except the engine ignition system.
All avionics equipment, if installed, should be turned off prior to starting the engine to prevent harmful transient voltages from damaging the transistors in this equipment.

CABIN HEATING, VENTILATING AND DEFROSTING SYSTEM

The temperature and volume of airflow into the cabin can be regulated to any degree desired by manipulation of the push-pull cabin air system control knobs.
This system could optionally be fitted in the aircraft and it is schematically illustrated in figure 7-6.
Heated fresh air and outside air are blended in a cabin manifold just aft of the firewall by adjustment of the heat and air control knobs.
This air is then vented into the cabin from outlets in the cabin manifold near the pilot's and passenger's feet.
Windshield defrost air could also be supplied by a duct leading from the same manifold.

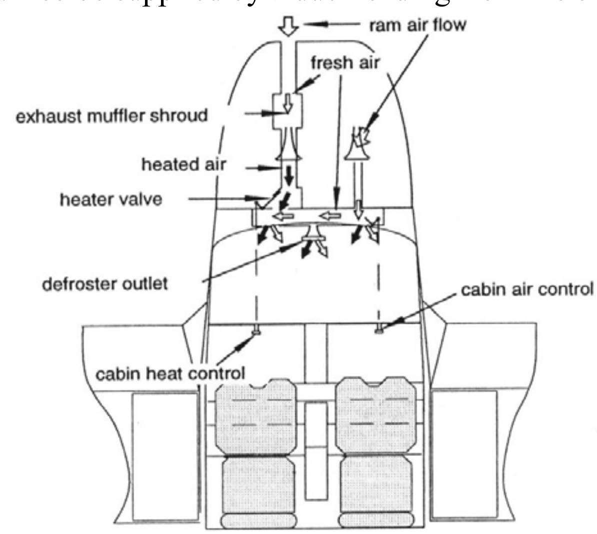


Fig. 7-6 Cabin heating, ventilating and defrosting system

PITOT-STATIC SYSTEM

The pitot-static system supplies ram air pressure to the airspeed indicator and static pressure to the airspeed indicator, rate-of-climb indicator and altimeter. The system is composed of a pitot tube and external static port mounted on the lower surface of the right wing, and the associated plumbing necessary to connect the instruments to the sources.

SECTION 8 - HANDLING, SERVICE AND MAINTENANCE

INTRODUCTION

This section contains recommended basic procedure for proper ground handling, routine care and servicing of your airplane.

GROUND HANDLING

The airplane is maneuvered on ground by hand with the tow-bar attached to the nose wheel or by pulling the aircraft by the propeller blades.
When towing with a vehicle, do not exceed the nose gear turning angle of 35° either side of center, or damage to the gear may result.
While towing with a vehicle, do not exceed the man-walk speed.

PARKING

When parking the airplane, head into the wind and set the parking brakes.
Do not set the parking brakes during cold weather when accumulated moisture may freeze the brakes, or when the brakes are overheated.
Tie-down the aircraft if parking brakes are not installed.

TIE-DOWN

In severe weather, proper tie-down procedure is the best precaution against damage by gusty or strong winds.
To tie-down the airplane proceed as follows:
1) set the parking brake and install the control stick lock
2) install surface control locks on ailerons and rudder
3) tie sufficiently strong ropes to the wing and tail tie-down fittings and secure each rope to a ramp tie-down
4) tie a rope to an exposed portion of the engine mount and secure to a ramp tie-down
5) install pitot and static source tubes cover.

JACKING

When a requirement exists to jack the entire airplane off the ground, i.e. for landing gears maintenance and operational tests, use the jacking points located under each wing root, firewall pad and in the tail skid
Individual main landing gear may be jacked by using the jack pad which is incorporated in the main landing gear vertical strut (optional).

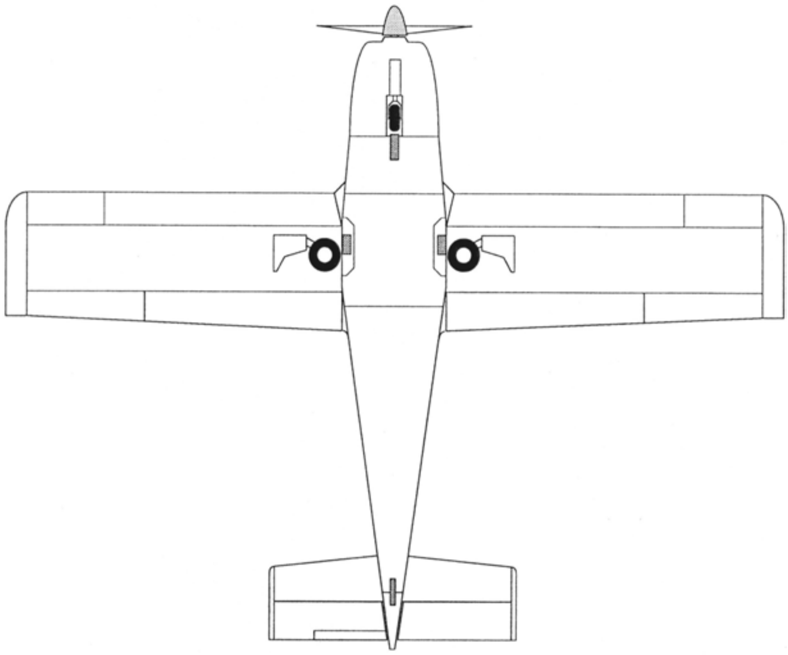


Fig. 8-1 Jacking points

LEVELING

Longitudinal leveling of the airplane is accomplished by placing a level on the baggage compartment floor behind the pilot and passenger seat.

FLYABLE STORAGE

Airplanes placed in a non-operational storage for a maximum of 30 days are considered in flyable storage status.
Every seventh day during these periods, the propeller should be rotated by hand through at least five revolutions; this action limbers the oil and prevents any accumulation of corrosion on engine cylinder walls.
For maximum safety check that the ignition switch is OFF, the throttle is CLOSED, and the airplane is secured before rotating the propeller by hand.

After 30 days the airplane should be flown for 30 minutes or a ground run-up should be made just long enough to produce an oil temperature within the lower green arc range.
Engine run-up also helps to eliminate excessive accumulations of water in the fuel system and other air spaces in the engine.
Keep fuel tank full to minimize condensation in the tank.

SERVICING
In addition to the preflight inspection covered in Section 4, servicing the airplane is also necessary.

OIL SERVICING

Use only lubricating oils recommended by the engine manufacturer.
Do not operate on less than 2 liters of oil in the engine oil tank.
For normal flight less than 3 hours, fill to 2 liters; for extended flight fill to 3 liters.
Change engine oil at least every 6 months even though less than the recommended hours have accumulated.
Reduce intervals for prolonged operation in dusty areas and cold climates.

FUEL SERVICING

The approved fuel are:
- SUPER Automotive gasoline
- Unleaded Automotive gasoline
- 100LL grade aviation fuel (blue)

LANDING GEAR

The nose wheel tire pressure is 2,4 bar, while the main wheels tire pressure is 2,2 bar.

EXTERIOR CLEANING AND CARE

The plastic windshield and canopy should be cleaned with an aircraft windshield cleaner; if it is not available, the plastic can be cleaned with soft cloths moistened with Stoddard solvent to remove oil and grease; then, carefully washing with mild detergent and plenty of water; rinse and dry with a clean moist chamois.
Never use gasoline, benzene, acetone, carbon tetrachloride, anti-ice fluid or glass cleaner to clean the plastic since these materials will attack the plastic and may cause it to craze.
Unless freezing rain or sleet is anticipated, do not use a canvas cover on the windshield since the cover may scratch the plastic surface.
Normally, waxing is unnecessary to keep the painted surfaces bright, however, if desired, the airplane may be waxed with a good automotive wax.

PROPELLER CARE

Preflight inspection of propeller blades for nicks, and wiping them occasionally with an oily cloth to clean of grass and bug stains, will assure long trouble-free service.
Small nicks on the propeller should be dressed out as soon as possible since these nicks produce stress concentrations, and if ignored may result in cracks.
Never use an alkaline cleaner on the blades.

ENGINE CARE

The engine may be cleaned with Stoddard solvent, or equivalent, then dried thoroughly. Particular care should be given to electrical equipment before cleaning; ignition units, starter, alternator etc., should be protected before using solvents.

INTERIOR CARE

To remove dust and loose dirt from the upholstery and carpet, clean interior regularly with a vacuum cleaner.
Oily spots may be cleaned with household spot removers.
The plastic trim, instrument panel and control knobs need only to be wiped off with a damp cloth.
Never use volatile solvents since they likely craze the plastic.