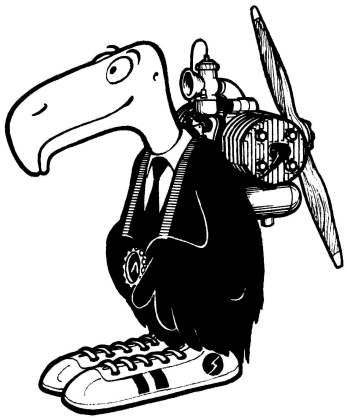
PILOT'S OPERATING HANDBOOK

and

FLIGHT MANUAL

for



Airplane UL category
controlled by aerodynamic devices

Serial Number :

Registration Number :

Date :

Approved by : _____

THIS HANDBOOK MUST BE
IN THE AIRPLANE AT ALL TIME

The airplane must be operated by the information and limitations which are presented in this handbook !

Table of contents

1

GENERAL INFORMATION

1.1 List of the revisions and the repairs

Ordinal No.	Number of document - bulletin	It concerns to pages No.	Date of issue	Signature

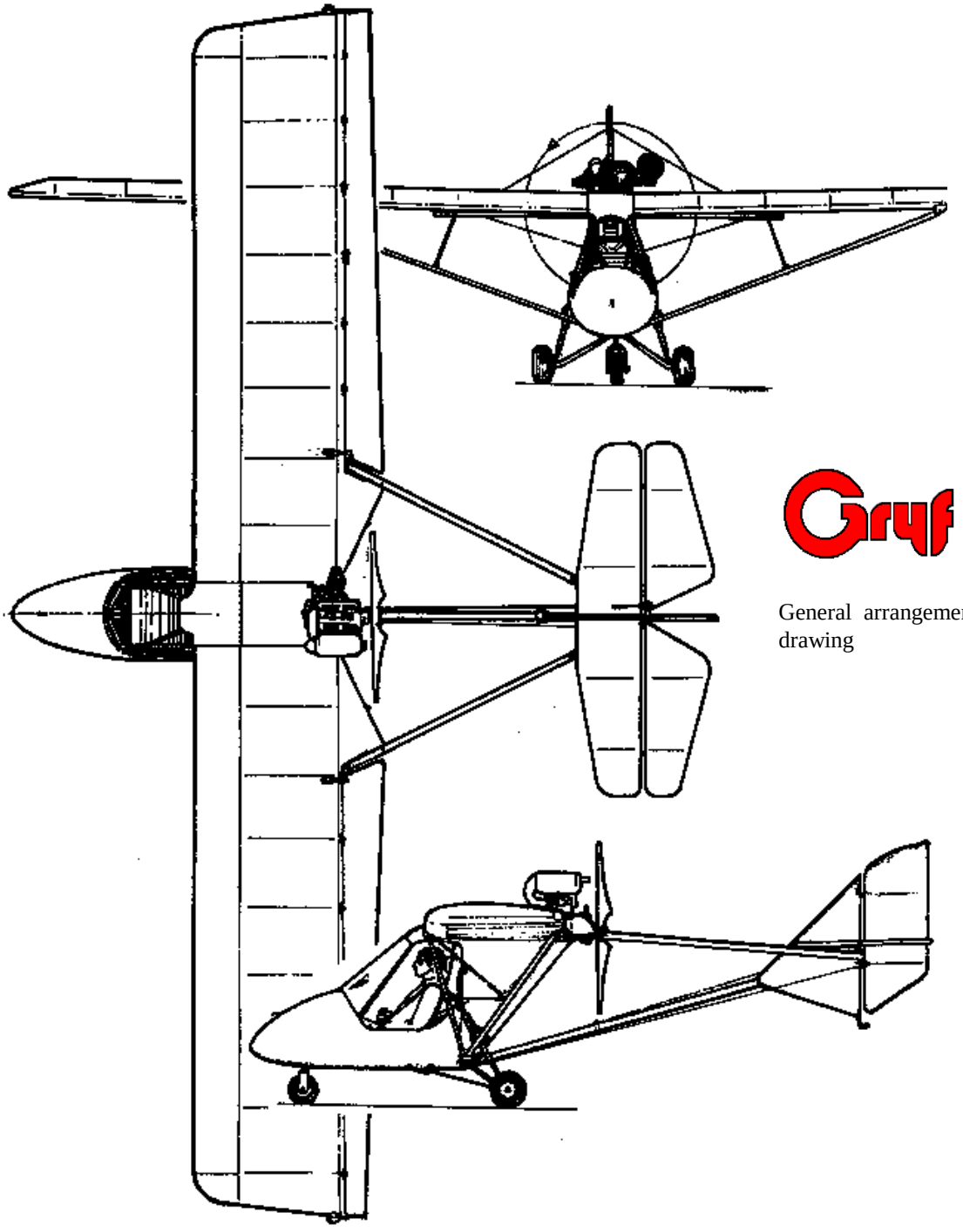
1.2 BASIC TECHNICAL DATA

This handbook is valid for all types of the airplane :

Gryf 447 basic version of the airplane for take-off weight to 270 kg

Gryf 503 the airplane versions with ROTAX engine 503

Gryf ... -E version of the airplane with electric engine starting
Concrete identification mark can be composed : for example **Gryf 503E**



General arrangement drawing

1.2.1 DIMENSIONS

Wing span	10.02	m
Length	5.73	m
Height	2.20	m
Wing area	13.96	m^2

1.2.2 TIRES - INFLATION

Nose landing gear - Bantam 12x4	100	kPa
Main landing gear - Bantam 12x4	160	kPa

1.2.3 WEIGHTS

	Gryf 447	Gryf 503
Empty weight (with basic equipment only)	150 kg	158 kg
Maximum take-off weight	250 kg	250 kg

1.2.4 POWER PLANT

1.2.4.1 **Engine ROTAX** type in pusher configuration	**447 UL-1V**	**503 UL-2V**
Maximum power (for 6500 rpm)	29.5 kW	37.0 kW
Cylinder volume	436,5 ccm	496,7 ccm
Dry weight	38,0 kg	41,0 kg
Carburetter	1x BING 36	2x BING 36
Fuel pump	MIKUNI DF 44	MIKUNI DF 52

electric engine starting + 3,5 kg

1.2.4.2 OPERATION FILLINGS

Fuel	**27 l**	automotive petrol SUPER - BA 96
Oil		Castrol TTS
Proportion of mixture		1 : 50
Gear box oil		API-GL5 (0,5 l)

1.2.4.3 PROPELLER

SPORTPROP 03	- laminate two blade	1.4 m	2.0 kg
	- laminate three blade	1.4 m	2.4 kg
KØEMEN PROPELLER	- wooden two blade	1.4 m	2.8 kg
	- wooden three blade	1.4 m	3.5 kg
			.... on the ground variable pitch
IVOPROP	- composite three blade	1.4 m	2.9 kg
			... with electrical variable pitch

1.2.5 EQUIPMENT

BASIC :	**RECOMMENDABLE :**	**OPTIONS :**
Airspeed indicator	Revolution indicator	Engine temperature indicator
Altimeter	Bank indicator	Tachometer
Fuel gauge	Compass	Radio station
	vertical velocity indicator	GPS

Kinds and marks of the airplane instruments which are used on the concrete airplane are presented in the chapter 4.

OPERATIONAL LIMITATIONS

2.1. Airspeeds

AIRSPEED	abbreviation	IAS km/h	IAS mph
Maximum permissible speed	**VNE**	**130**	
Maximum maneuvering speed	**VA**	**100**	
Maximum cruising speed	**VC**	**110**	
Minimum - stall speed	**VSO**	**48**	

2.2. OPERATIONAL SPEED RANGE

MEANING OF THE MARK	INCREASED ATTENTION	OPERATIONAL MODE RANGE	INCREASED ATTENTION MODE	LIMIT. VALUES
Speed km/hod	**48 - 60**	**60 - 90**	**90 - 130**	**130**
mph				
Colored mark	yellow arc	green arc	yellow arc	red radial

2.3 OPERATIONAL LIMITATION FOR WIND

Maximum permission velocity component of wind for take-off and landing :

- perpendicularly to the runway axis **5 m/s**
- parallel to the runway axis **12 m/s**

For training flights and practice flights there are valid limitations in accordance with the national regulations for ULL.

2.4 LIMITATIONS FOR POWER UNIT

M O D E	**447**	**503**
Maximum permissible revolutions - 2 minutes	**6800 rpm**	**6800 rpm**
Maximum continuous power	**6500 rpm**	**6500 rpm**
Normal temperature for cylinder heads	**to 220 ^{o} C**	**to 220 ^{o} C**
Maximum temperature for cylinder heads	**250 ^{o} C**	**250 ^{o} C**
Difference between two cylinders	**10 ^{o} C**	**10 ^{o} C**

2.5 WEIGHTS

Minimum pilot's weight **65 kg** (lighter pilot must be balanced to limitation of balance)
Maximum pilot's weight **95 kg**

2.6 CENTER OF GRAVITY

Max. forward center of gravity	**25 % MAC**
Max. rear center of gravity	**32 % MAC**

2.7 OPERATIONAL LOAD FACTORS

Maximum positive load factor in the center of gravity	**+ 4,0**
Maximum negative load factor in the center of gravity	**- 2,0**

2.8 PERMISSIBLE MANOEUVRES

M A N O E U V R E S	Maximum inlet speed	
	IAS km/h	IAS mh
Strong banked turn to 60 degrees	**100**	
Climbing turn	**100**	

Acrobatic maneuvers and intentional spin are PROHIBITED !!!

2.9 KINDS OF OPERATION

The airplane is approved only for day flight according to VFR.
Other kinds of flight are P R O H I B I T E D !!!

2.10 AIR TEMPERATURE LIMITATION

Recommendable maximum ambient temperature	**+ 40 ^{o} C**
Recommendable minimum ambient temperature	**- 10 ^{o} C**

2.11 INFLUENCE OF RAIN AND MOISTURE

The airplane lifting surface and control surfaces are covered with fabrics. These fabrics can release owing to influence of the extensive moisture. It can cause mild decrease airplane performance. Stability and controllability are not dangerously endangered owing to influence of rain. During the flight with expressive moisture we still recommend to increase the take-off and landing speed approximately about 10 km/hour.

3
EMERGENCY PROCEDURES

3.1 ENGINE FAILURE DURING TAKE-OFF

1. **Speed** - to keep **gliding flight** with speed **75 km/h**
2. **Altitude** - to altitude 15 m the **landing in take-off direction**
3. **Course** - recommended is in runway direction, in free space without obstacles, with head wind
4. **Engine ignition** - **switch OFF**

3.2 FIRE

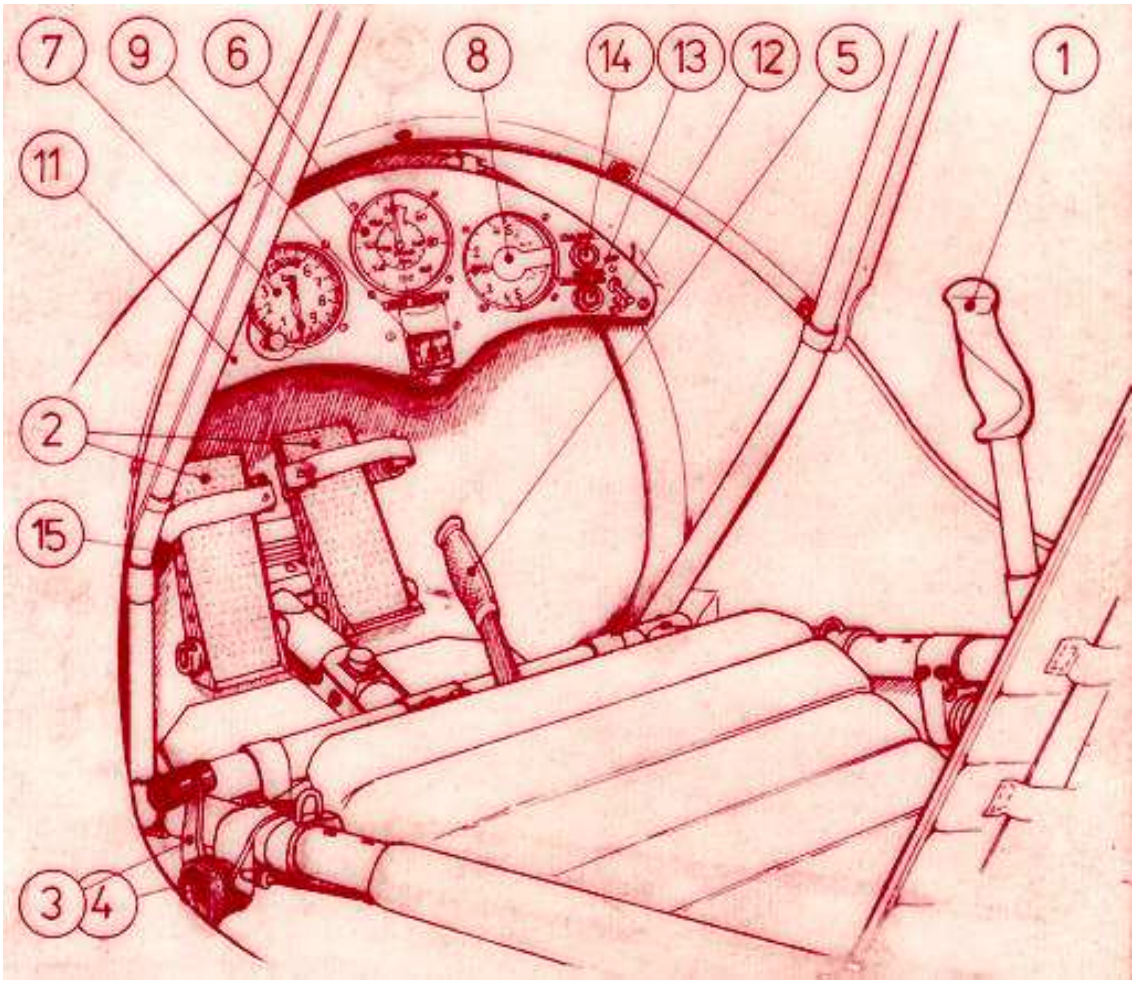
1. Fuel cock - shut (if it is installed)
2. Engine throttle - maximum
3. Engine igniter - switch OFF
4. Continue - in accordance with paragraph 3.1 points 1 to 3

3.3 LANDING ON THE GROUND AFTER ENGINE FAILURE

1. Area for landing - choice
2. Wind - direction and speed
3. Engine igniter - switch OFF
4. Safety belts - tighten up
5. Continue - in accordance with paragraph 3.1 points 1 to 3

4
NORMAL PROCEDURES

4.1COCKPIT



Cockpit equipment

Pos.	Name	Type
1	control side stick	
2	Pedals for yaw and front wheel control	
3	Engine throttle	
4	Engine control lock	
5	Brake lever	
6	Speed indicator	
7	Altimeter	
8	Vertical speed indicator	
9	Compass	
10	Fuel gauge	

	safety belts	

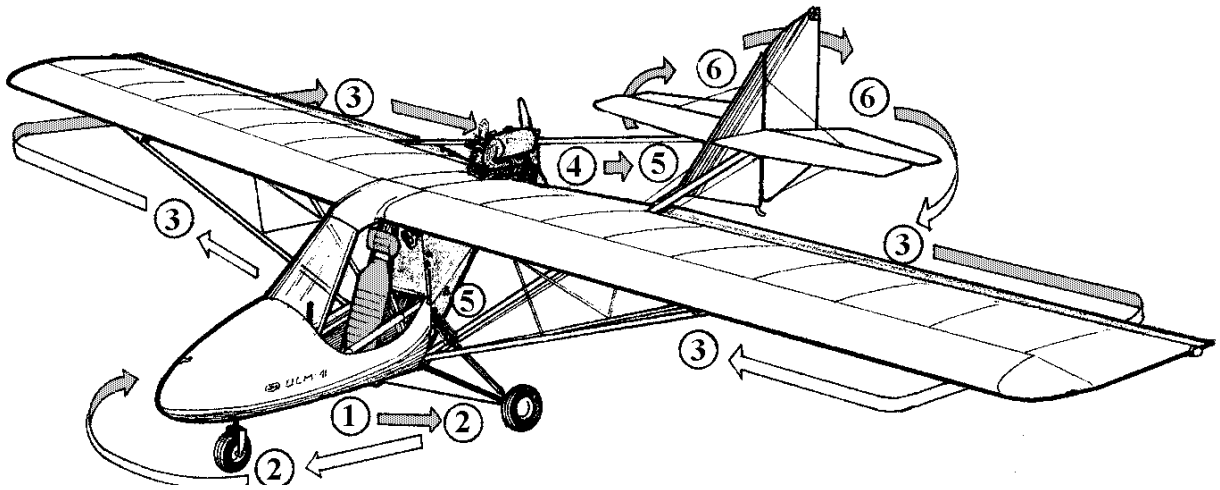
Handle of self-starter

11	Engine ignite switch	
12	Master switch	
13	Battery test switch	
14	Minimum fuel signaling	
15	Fuel valve lever	

option :

16	Engine temp. indicator	
17	Exhaust temp. indicator	
18	Engine hours counter	
19	Navigation GPS	
20		
21	Bank indicator	
22		
23		

4.2 PRE - FLIGHT INSPECTION



1. COCKPIT

- Engine igniter switch OFF
- Attachment and position of the pilot seat
- Check of the safety belts
- Condition of the instruments equipment
- Function of the hand control
- Function of the directional control
- Attachment and freedom of engine control
- Brake function
- Condition of the laminate shell and transparent canopy

2. LANDING GEAR

- Condition of the landing gear and brake control
- Attachment of the landing gear and check of the shock absorber
- Inflation of the tires

3. WING

- Attachment of the struts and locking of the connecting bolts
- Checking of the skin and skin strain
- Condition and deflection of the ailerons, skin strain and locking of the control pins.
- Checking of the rubber cables of wing skin strain

4. POWER PLANT

- Condition of the engine, propeller and locking of bolted connection
- Condition of the silent blocks and engine attachment to fuselage structure
- Condition and attachment of the exhaust with special emphasis on SPRING
- Engine electrical fixation
- Condition of the ignition system
- Condition of the fuel system and pump
- Attachment and static electricity fixation of the fuel tank
- Checking amount of fuel
- Attachment condition of the accumulator + input conductors (by sub-version E)

5. Control cables

- condition and tension of the rudder and elevator cables
- checking of locking of the turnbucles and guide-bowdens and hoses

6. Tail unit

- condition of the horizontal and vertical surfaces, skin strain and connection to aluminum alloy tubes fuselage - tail beams
- checking of the elevator and rudder deflection and locking of the hinges
- tension of the stabilizer cables, locking of the turnbucles
- checking of the tail skid

4.3 BEFORE ENTRANCE INTO THE PILOT'S COCKPIT

1. **Wing surface** - checking of the entirety and strain skin, checking of the strut system
2. **Tail unit surface** - checking of the skin entirety
   - checking of the bracing cables
3. **Dismounting juncture** - checking of the locking
4. **Power unit** - condition of the propeller fittings
   - engine inspection and inspection of its attachment
5. **Fuel system** - checking of the fuel quantity
   - checking of shut-down of fuel tank
6. **Pilot's cockpit** - attachment and condition of the safety belts
   - purity of the transparent canopy
7. **Balance** - for heavy pilots - fletner position **"down"**
   - for light pilots - fletner position **"neutral"**
   (manual operated on elevator trailing edge)

4.4 AFTER ENTRANCE INTO THE PILOT'S COCKPIT

1. **Engine igniter** - switch OFF
2. **Directional control** - free movement (directional control is connected by nose-wheel steering, so if you need to proof true force in this system, you have to try it after lifting of the nose wheel by pressure of tail unit girder by assistant)
3. **Hand control** - free movement
4. **Brake** - checking of function
5. **Instruments** - checking of values
6. **Safety belts** - button up and tighten up

4.5 ENGINE STARTING

1. **Engine igniter** - switch OFF
2. **Fuel condition lever** - open
3. **Engine throttle** - idling speed / **during the cold engine start use saturator !**
4. **Hand fuel pump** - overfull carburetor
5. **Brake** - apply the brake or the main gear must be secured by Scotch blocks
6. **Engine igniter** - to position **S W I T C H O N**
7. **Starting** - carry out the starting by handle of manual staring or by the pushbutton if the airplane has electrical starting.

After engine starting increase revolutions moderately and switch off the saturator **as soon as possible**.

8. **Engine revolutions** - idling speed

4.6 ENGINE TEST

1. **Operating minimum** - 2 minutes are minimum time since engine starting. Warm up the engine with increasing revolutions (2500 - 3000 rpm)
2. **Handle control** - neutral position
3. **Brake** - the brake tighten up, the main gear must be secured by Scotch blocks or an assistant must hold the airplane
4. **Acceleration** - reach maximum revolutions during 3 sec. watch equability of engine starting and regularity of engine operation
5. **Max. power mode** - watch regularity of engine operation
6. **No-load speed** - equable engine operation

N O T I C E : Carry out the engine test up the wind !

4.7 TAXIING

On an airfield the taxiing speed is maximum 12 km/h (walking speed)

4.8 PROCEDURES BEFORE TAKE-OFF

1. **Directional control** - freedom of movement
2. **Handle control** - freedom of movement
3. **Instruments** - checking of values, fuel quantity
4. **Safety belts** - checking of connection and tightness
5. **Fuel condition lever** - position **" O P E N "**
6. **Change over switch for igniter** - position **" O N "**
8. **Choke** - checking of the shut-down and locking
9. **Checking of the space for final airport pattern**
   - stop on the holding patter upright to the runway on the runway threshold
10. **Announce to radio service** (if the airplane is equipped with a transceiver)

4.9 TAKE - OFF

1. **Checking of opening fuel**
2. **Instruments**
3. **Clear runway**
4. **Checking of time**

Set the airplane in motion by continuous increasing power .
After reach out of speed 60 km/hour use the elevator for lift out of the airplane.
After attainment of speed 75 - 80 km/hour climb with speed 2 to 5 m/s (it depends on the weight of pilot, equipment and type of the engine).

N O T I C E :

TAKE - OFF IS P R O H I B I T !!!
- **If the engine operation is irregular**
- **If the wind speed exceed permit limits**

4.10 CIRCUIT FLIGHT

After attainment circuit height adjust the speed of horizontal flight on the value 80 - 90 km/hour by decrease of revolutions.

4.11 GLIDING FLIGHT

After attainment of suitable height for gliding flight or when an emergency situation arises, take over the airplane into the gliding flight with starting speed 75 km/hour.

By flight height and situation adjust the speed to the safety gliding speed 70 - 80 km/hour.
At this speed finish all phases of landing.

4.12 ELEMENTAL PROCEDURES ON THE LEVEL OF LANDING T

1. **Revolutions** - increased idling or engine idling
2. **Safety belts** - tightened
3. **Checking of circuit** - T space and runway
   - space between 3. and 4. turn
4. **Checking of fuel**

4.13 LANDING

Adjust angle of glide so that it corresponds with the safety gliding speed 70 - 80 km/hour.
After levelling out (cca height 3 m) in dwell, decrease flight speed by continuous pulling of the elevator, until the airplane lands with speed cca 55 km/hour at first on the main gear. After finishing elevator effect the airplane lands on the nose-wheel undercarriage.

4.14 ELEMENTAL PROCEDURES AFTER LANDING

1. **Revolutions** - according requirement
2. **Speed** - adjust on rolling speed maximum 12 km/hour

After landing run quickly leave runway usually in direction of the alignment of landing T axis.

5

OTHER INFORMATION FOR SAFETY OPERATION

5.1 GENERALLY

All given information and procedures with recommended piloting technique are valid for following flight cases. A pilot must not get into these flight cases when he observes normal and emergency procedures .

5.2 STALLS AND RECOVERY TO NORMAL FLIGHT

5.2.1 WING LEVEL STALL

Pull the elevator reasonably in successive steps, the airplane will has speed 48 km/hour. During this speed the altitude control bears on the stop, the airplane bow decreases and the airplane descends in successive steps.
Piloting technique for recovery to normal flight - reasonably push the elevator. Don't use the ailerons when the airplane is yawed along longitudinal axis during the stall. Level the directional control after descent and the restoration of rudder efficiency.

5.2.2 STALLING SPEED

WEIGHT OF AIRPLANE [kg]	RATE OF ENGINE	SPEED	
		IAS [km/hour]	IAS [mph]
250 ... standard	idling speed	**45**	
280 ... up-loaded	idling speed	**50**	

6
PERFORMANCE

6.1 GENERALLY

These performance are valid for the standard version of airplane with standard calculated maximum take-off weight 250 kg with usual pilotage without wind in ISA conditions.
Performances are showed with propeller blades adjusting for the best climbing

6.2 TAKE-OFF AND LANDING

These values are determined for take-off and landing from a grass airfield without slope of runway and without wind.

6.2.1 LENGTH OF TAKE-OFF RUN AND TAKE-OFF

Gryf	**447**		**503**	
Take-off run	**45 m**		**40 m**	
Take-off over 15 m	**128 m**		**115 m**	

6.2.2 LENGTH OF LANDING AND LANDING RUN

Gryf	**447**		**503**	
Landing over 15 m	**105 m**		**105 m**	
Run with braking	**35 m**		**35 m**	

6.3 CLIMB

6.3.1 MAXIMUM CLIMBING SPEED

	horizontal SPEED		FLIGHT ALTITUDE	**RATE OF CLIMB** 250 kg	
	IAS (km/hour)	mph	IAS [m]	**[m/s]**	
447	**70**		0 - 500	**3,5**	
503	**70**		0 - 500	**4,5**	

6.3.2 CEILING

Service (practical) ceiling 3 000 m

6.4 GLIDING FLIGHT WITH INOPERATIVE ENGINE

PERFORMANCE			SPEED IAS [km/hour]
The least descent	**3.0 m/s**	**feet/min**	**70**
The best gliding	**1 : 6,5**		**70**

6.5 HORIZONTAL FLIGHT

6.5.1 SPEEDS AND FUEL CONSUMPTIONS

TYPE	MODE	REVOLUTIONS [rpm]	SPEED [km/h]	CONSUMPTION [l/h]
447	MAX. CONTINUOUS POWER	**6 500**	**118**	**20**
	CRUISE POWER	**5 900**	**95**	**12**
	Long range power	**5 400**	**80**	**9**
503	MAX. CONTINUOUS POWER	**6 500**	**125**	**22**
	CRUISE POWER	**5 400**	**95**	**12**
	Long range power	**5 000**	**80**	**8**

6.5.2 FLIGHT RANGE AND ENDURANCE

TYPE	MODE	RANGE [km]	ENDURANCE [min]	[hour:min]
447	MAX. CONTINUOUS POWER	160	81	1 : 21
	CRUISE POWER	**214**	135	2 : 15
	Long range power	**240**	**180**	**3 : 00**
503	MAX. CONTINUOUS POWER	**153**	**74**	1 : 14
	CRUISE POWER	**214**	**135**	2 : 15
	Long range power	**270**	**202**	**3 : 22**

7
GROUND HANDLING

GROUND HANDLING - is described in the Operating - Technical Manual chapter 8. - from handling instructions for transfer of the airplane, parking and anchorage to assembling process of airplane for transport and hangaring .

8
SUPPLEMENTS

The Flight Manual includes filled and confirmed supplements for the concrete airplane :

8.1 MARKING AND LABELS

8.2 RECORD ABOUT THE WEIGHING AND LOCATION OF CENTERS OF RAVITY POSITIONS

8.3 RECORD ABOUT THE MEASURING OF DEFLECTIONS OF CONTROL SURFACES

8.4 RECORD ABOUT THE LEVELLING OF THE AIRPLANE