PILOT OPERATING HANDBOOK (P.O.H)

FAI UL / SSDR

SD-1 MINISPORT

Type: SD-1 Minisport TG, engine SE-33, propeller Helix H30F

Airplane must be operated in compliance with the information and limitations stated in this manual.

CONTENTS

1. General

The airplane SD-1 Minisport belongs to the FAI-UL category, according to the CAA UK as Single Seat Deregulated microlight (SSDR).

1.1.Important information

Attention!
This product is not liable to be approved by Civil Aviation Authority, and it is operated at someone's own risk. Intentional spins, stalls and aerobatic maneuvers are prohibited.

'Every damage of airplane must be reported to an approved inspector – technician. He will recommend the way how repair the damage and then he will provide the check and technical inspection. In the airplane documentation there must be made a report about the case'

1.2. Warnings, cautions, notes

The following information applies to warnings, cautions and notes used in the Flight manual:

WARNING

MEANS THAT NON-OBSERVATIONS OF THE CORRESPONDING PROCEDURE LEADS TO AN IMMEDIATE OR IMPORTANT DEGRADATION OF FLIGHT SAFETY.

CAUTION

MEANS THAT NON-OBSERVATIONS OF THE CORRESPONDING PROCEDURE LEADS TO A MINOR OR TO A MORE OR LESS LONG TERM DEGRADATION OF THE FLIGHT SAFETY.

NOTE

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

1.3 Description of airplane

The SD-1 Minisport is an ultra-light aerodynamically controlled, low-wing cantilever single seat monoplane of mixed wood-composite construction, equipped with front placed engine and fixed undercarriage of taildragger or tri-gear type. The airplane could be equipped with parachute emergency system.
The airplane is designed according to the LTF-UL and UL-2 regulations, and is intended for recreational flying in VFR.

1.4 Main technical data

Measurements

Wing span…..……...… ..5,98 m
Fuselage length..…….. ..4,35 m
Wing area ……..…6,1 m^2
Wing aspect ratio…..……..… ..5,85
MAC depth b_{mac}……1,05 m
Horizontal tail unit span……..……1,96 m
Elevator Area……0,95 m
Vertical tail Area……....0,44 m^2
Landing gear gauge……..2,78 m
Wheelbase……..1,08 m
Main landing gear wheel diameter….0,3 m
Diameter of tail wheel……...0,1 m
Propeller diameter……1,2 m

Weight

Empty weight……..(118-137) kg
Weight of a wing half ……..……12 kg
Elevator weight……...3 kg
Maximum take-off weight……..240 kg
Payload…….....110 kg
Fuel tank volume…….……..35 l
Unusable fuel volume……..0,5 l

1.5 Engine and propeller

Engine

SE-33, simple V-twin OHV 4-stroke, air-cooled, direct drive, magneto ignition

Max. continuous power……25kW@3600 rpm
Max. take off power……...22kW@3100 rpm
Min. CHT……60°C
Max. CHT…….....240 °C
Min. oil temp……...25 °C
Max. oil temp……..140 °C
Oil. pressure……...0,3-2,5 bar – indicated by red light
Oil. quantity……cca 1,4l
Operating outside air temperature……..-10°C / +40°C

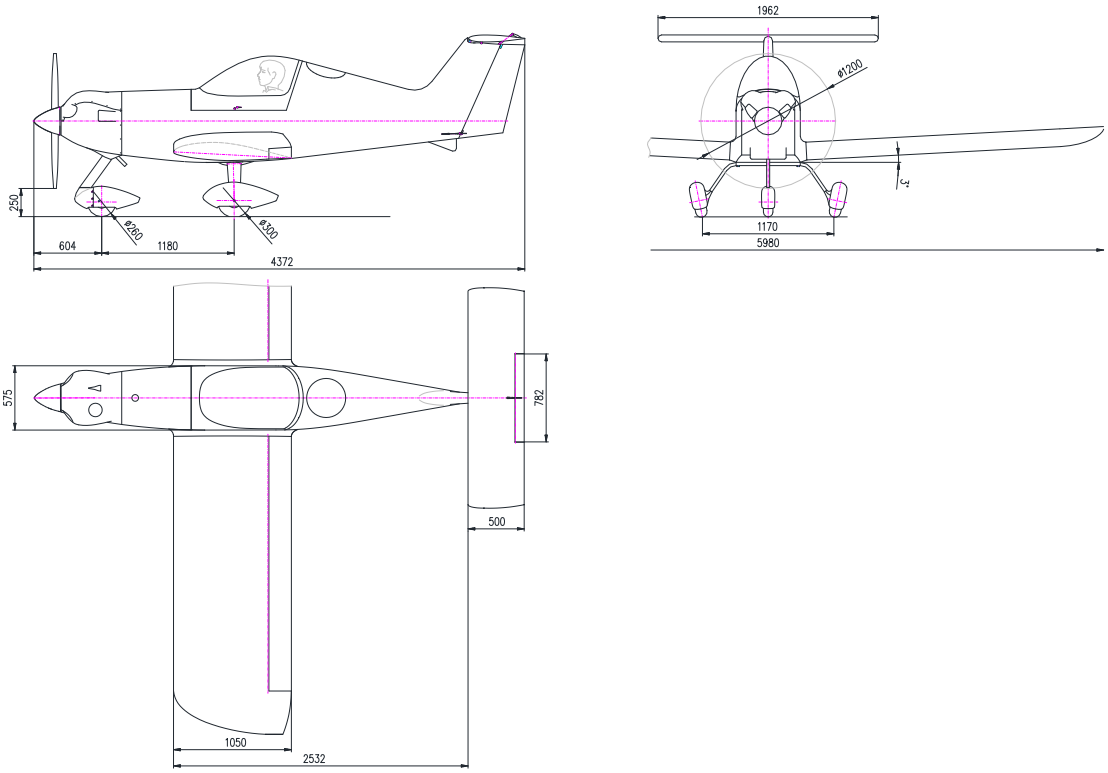
Fuel: MOGAS unleaded 98,95
Oil: API SG, SH, SJ, SAE 10W30

Propeller

Helix H30F 1,25 m L-ES-08-2
Typ: 2 blades composite, fixed pitch
Diameter: 1250 mm

Example for the engine monitor

1.6 Three-view airplane drawing



1. Operation Limitation

2.1 Airspeed limitation

	Speed	IAS (km/h)/(kt)	Meaning
V_{NE}	Never exceed speed	**220** / 119	Do not exceed this speed in any operation
V_A	Maximum maneuvering speed	**163** / 88	Do not make full or abrupt control movement above this speed, because under certain conditions the aircraft may be overstressed by full control movement.
V_{FE}	Maximum flap extended speed	**104** / 57	Do not exceed this speed with the given flap setting.

2.1.2 Airspeed indicator marking

Airspeed indicator markings and their color meanings are shown in the table below:

Marking	Value (IAS) Range (km/h)/(kt)	Meaning
White arc	**64 – 104** / 34 – 57	Operation range with extended flaps. (The lower limit is 1.1 V_{SO} in landing configuration and maximum weight. The upper limit is maximum permitted speed with extended flaps.)
Green arc	**78 – 163** / 46 – 88	Normal operation range. (The lower limit is 1.1 V_{S1} when maximum weight, maximum front position of C.G., and retracted flaps. The upper limit is maximum maneuvering speed V_A.)
Yellow arc	**163 – 220** / 88 – 119	Maneuvers must be conducted with caution and only in smooth air
Yellow line	**163** / 88	Maximum maneuvering speed Va
Red line	**220** / 119	Maximum airspeed Vne

2.1.3 Limitation of maximum acceptable wind speed

*The maximum acceptable wind speed for take-off and landing is **10 m/s (20kts).***

*The maximum acceptable perpendicular component of wind for take-off and landing is **5 m/s (10kts).***

2.1.4. Power plant limitation

Maximum allowable RPM 3600
Maximum continuous RPM 3600
Maximum CHT 220 ºC
Max. Oil Temp.: 140 °C

2.2. Weight

Maximum take-off weight..……..... 240 kg
Empty weight ……..…… 130 kg

Approved centre of gravity positions:
Empty airplane C.G. position……..... 13÷18% MAC
Operating C.G. range……... 22÷34% MAC

Minimum pilot weight…… 61 kg
Maximum pilot weight……..... 105 kg
Maximum fuel weight……..... 25 kg = 34 l
Maximum baggage weight…….. 10 kg

2.3. Load

Maximum allowed filling of the fuel tank in liters								
Weight of baggage (kg)	Pilot's weight (kg)							
	55	60	65	70	75	80	95	105
0	Full fuel tank							7
5	Full fuel tank						21	x
10	Full fuel tank					21	14	x

2.4. Approved maneuvers

SD-1 is approved as FAI UL. Following maneuvers are approved to be performed:

- ***Steep turns up to bank angle of 60°*** *- recommended entering airspeed is* ***130*** *km/h(71kt).*
- ***Horizontal eights*** *- recommended entering airspeed is* ***130*** *km/h (71 kt).*
- ***Climbing turns*** *- recommended entering airspeed is* ***160*** *km/h (87 kt).*

> ***Warning***
> *AEROBATICS AS WELL AS INTENTIONAL SPINS ARE PROHIBITED!*

2.5. Maneuvering load factors

Maneuvering speed	Airspeed km/h / kt	Load factor
V_A - maneuver with maximum deflection of a control surface	**163** / 88	**+ 4**
V_{NE} – maximum acceptable airspeed	**220** / 119	**+ 4**
V_A – maneuver with maximum deflection of a control surface	**163** / 88	**-2**
V_{NE} – maximum acceptable airspeed	**220** / 119	**-2**
V_{FE} – with extended flaps	**104** / 57	**+ 2**

2.6. Other limitations

***SMOKING IS PROHIBITED** on the airplane board!*

Heavy rain and very high humidity reduce aircraft performance!
In flight under these conditions is recommended to increase take-off and landing speed by 5 knots.

2.7. Limitation labels

Airspeed IAS		
Maximum airspeed	V_{NE}	***220 km/h / 119 kt***
Maximum maneuvering speed	V_A	***163 km/h / 88 kt***
Maximum flap extended speed	V_{FE}	***104 km/h / 57 kt***

AEROBATICS AS WELL AS INTENTIONAL SPINS ARE PROHIBITED!

Flights according to IFR and intentional flights under icing conditions are prohibited!

3. Operation data and procedures

3.1 Emergency procedures

3.1.2 Engine failure

Engine failure at take-off below 50 m (150ft)

1. Adopt the glide airspeed to 110 km/h (59kt)
2. Choose an area for landing straight ahead, only in a case to prevent from frontal crash change the direction
3. Ignition off
4. Fuel valve off

Engine failure during take-off when at least 50 m (150') above ground

1. Correct the airspeed to 110 km/h (59kt)
2. Choose an area for landing straight forward in a free space without obstacles
3. Ignition off
4. Fuel valve off
5. Flaps for lift increasing according to your need

3.1.3 Smoke and fire

1. Fuel selector OFF
2. Throttle lever FULL
3. When the engine stops master switch OFF
4. Extinguish fire by slip. Do not start the engine again
5. Make a safety landing

3.1.4 Emergency and precautionary landing

Emergency landing

1. Airspeed adjust to 110 km/h (59kt)
2. Choose landing area – free space without obstacles
2. Tighten up the safety harness
3. Flaps – according to your need
4. Fuel selector OFF
5. Ignition OFF
6. Master switch OFF

Precautionary landing

1. Choose an area for landing – against the wind direction
2. In the altitude 50 m (150ft) above ground make a fly-over with extended small flaps to check the chosen area for its surface and obstacles
3. In the altitude 150 m (500ft) above ground make circle with small flaps. Make downwind checklist.
4. When lower visibility do not lost the chosen landing area from your view.
5. Approach for landing make in landing configuration with higher engine power.

6. *Correct the glide path to be able to touch-down immediately after flying over the edge of chosen area.*
7. *After touch-down use brakes for prompt stop.*
8. *After stop shut off engine and master switch, close fuel valve and safe the airplane.*

3.1.5 Unintentional spin recovery

Warning
Intentional spins are prohibited!

Standard procedure of recovery from spin:

1. *Throttle lever - idle*
2. *Control stick - trim, ailerons – neutral position*
3. *Pedals - push down the pedal against the sense of rotation*
4. *Control stick - push forward and hold until rotation stops*
5. *Pedals - immediately after rotation stops return the pedal from deflection to the neutral position*
6. *Control stick - recover the diving by smooth pull back*

4. Normal procedures

4.1 Assembly and disassembly

Before mounting clean easy removable hinges and struts. Lubricate them using grease. Lubricate also hinges bushings placed in beams stubs and main horizontal tail unit bracket. Push out auxiliary wings hinges and push on the right wing into the fuselage tunnel. When the wing is enough close to the fuselage mount the linkage of flaperon control handle to the flaperon stone, and the control handle into the flaperon slot link. Fix up the auxiliary hinge and push on the main hinges into the stubs circa 1 cm deep using an extension stick. In the same way put the left wing on. Both wings are on, push the main hinges in and fix them up by pins. Secure the auxiliary hinges by binding wire.

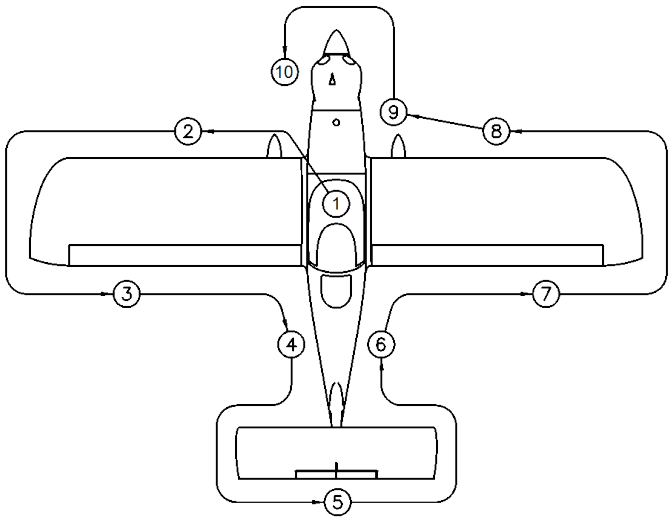
When mounting the horizontal tail units (HTU), push the control link of trim surface into the slot of HTU. Insert the hinge into the HTU bracket then insert the hinge thorough fin bushing to the opposite bracket. Push pin into the hole in bracket of HTU. Wrench a castle-nut on the pin and fix it up using a pin. Set the trim "heavy on head" and joint the control link together with HTU by a bolt. Wrench a castle-nut and secure it by a pin. Join the control link with the anti-servo trim lever and secure it by a cotter pin.

4.2 Pre-flight check

Make the pre-flight check every flight day or before every first flight when assembled. Incomplete or reckless check may cause an accident. Make the inspection in the way described in the check list.

NOTE

Word "condition" in the procedures means visual check of surface for damage, deformation, scratch, abrasion, corrosion or others events which lower the flight safety.



①	– *ignition - OFF* – *master switch - OFF* – *instrument equipment - check on condition* – *fuel indicator - check on fuel condition* – *controls -visual check, function, allowance, free movement to its stop - check of lift flaps run* – *canopy - attachment condition, cleanness* – *check, if there are free object in the cockpit*
②	– *condition of engine cowlings,* – *condition of propeller and spinner,* – *condition of engine bed and exhaust system,* – *visual check on fuel and electrical system condition,* – *other checks according to the engine manufacturer instructions.*
③	– *wing surface condition,* – *leading edge condition,* – *check Pitot tube condition.*
④	– *wing tip - surface condition, attachment check,* – *flaperon - surface condition, attachment, allowance, free movement.*
⑤	– *landing gear - check on wheels attachment, brakes, condition and inflation of tires* – *condition of fuselage and wing bottom surfaces*
⑥	– *vertical tail unit - condition of surface and attachment, free movement, stops* – *horizontal tail unit - condition of surface and attachment, free movement, stops*

4.3 Normal procedures and check list

4.3.1 Prior to engine starting

CHECK POSITION OF FRONT WHEEL BEFORE ENGINE STARTING!!! DANGER OF AIRPLANE DAMAGE.

1. Controls ..... free movement
2. Canopy ..... close and lock
3. Brakes ..... push on
4. Safety harness ..... fasten

4.3.2 Engine start

It is recommended to open fuel valve and turn propeller 2-3x while all switches OFF before first start in day to get fuel to carburettor.

1. Starting ..... Open fuel valve
   Master ON
   Ignition ON
   Throttle app. 20 % when cold or half when is engine warm.
   Push starter button
2. Choke ..... for cold engine open and after engine starting close slowly

4.3.2 Engine warming and run up

If airplane is not equipped with oil temperature gauge warm up engine at least 5 min. at 2000 RPM when is air temperature bellow 15 ºC. Prolong warm up time adequately at lower air temperatures. The CHT should not be below 120 ºC during run up. At least 3100 RPM static should be achieved at run up.

4.3.3 Taxying

Use the engine power and brakes according to your need. Do not use brakes continuously. The rudder is efficient from 20 knots speed. Taxi carefully in the strong wind. Hold the control stick in stick back position.

4.3.4 Before take-off

1. Altimeter ..... set (QNH)
2. Trim ..... set to neutral position
3. Controls ..... check on free movement
4. Canopy ..... check if closed properly
5. Safety harnesses ..... tighten up
6. Flaps ..... lever in 2nd notch (7°)

4.3.5 Take-off

Set airplane to runway centerline. Apply full throttle. Pull stick back during take-off run to enlighten front wheel, apply left rudder to compensate yaw effect. Move the stick to neutral position at rotation speed (app. 83 km/h).
Let build up speed to 110 km/h in ground effect after lift-off and start to climb thereafter. Check max. CHT during climbing.

4.3.6 Landing

On downwind leg maintain 110-130 km/h (59-70kt). On base leg slow down to 57 knots and set flaps to first stage. Slow down to 90-100 km/h (49-54kt) and set full flaps flaps on final. In case of wind from 45° and more to runway centerline or turbulence do not apply full flaps and land at 100 km/h (54kt). It is advised to apply some throttle before touch down to slow down speed.

5. Performance

Approved data for airspeed calibration, stall speeds, take-off performance and additional information useful for operation of the aeroplane.
The data in the charts has been computed from actual flight tests.
If not stated otherwise, the performances given in this section are valid for the max. take-off weight and flight under ISA conditions.

5.1 Take-off distance

Grass runway:

Take-off roll distance	Distance over 15ft screen hight
130 m	**300** m

Paved runway (concrete/asfalt):

Take-off roll distance	Distance over 15ft screen hight
120 m	**280** m

5.2 Landing distance

Grass runway:

Landing from 50ft screen height	Landing roll
260 m	**120** m

Paved runway (beton/asfalt):

Landing from 50ft screen height	Landing roll
250 m	**100** m

5.3 Climb performance

Altitude	Rate of climb	Best rate of climb speed (km/hod / kt IAS)
0 ft	**3,8** m/s **750** ft/min	120 / 65
3000 ft	**2,9** m/s **570** ft/min	120 / 65

5.4 Airspeed

Maximum horizontal speed is 180 km/h (100kt), optimal cruise 155 km/h (85kt).

Fuel consumption 4,7 l @ 155 km/h (85kt) / 3100rpm

5.5 Glide

Best glide speed	110 km/h / 59 kt
Glide ratio @ 110 km/h / 59 kt	1: 13

5.6 Stall Speeds

Stall speed are measured in MTOW and level flight.

	Position	Stall speed (km/hod / kt IAS)
Flaps retracted		**78** / 42
Flaps – 1. stage T/O (7°)	**I**	**70** / 38
Flaps – 2. stage L/D (20°)	**II**	**64** / 34

5.7 Airspeed Indicator Calibration System

IAS [km/h]	CAS [km/h]
60	61
70	70
80	80
90	89
100	98
110	107
120	116
130	126
140	135
150	144
160	153
170	163
180	172
190	181
200	190
210	200

6. Weight and balance

Empty weight measured *118-137 kg*
C.G. position movement *from 22 to 34% MAC*

Allowed centre of gravity position range

Front end point	*22 % MAC= 231 mm from leading edge*
Rear end point	*34 % MAC= 357 mm from leading edge*
MAC	*1050 mm*

WARNING

IT IS A PILOT RESPONSIBILITY TO OPERATE THE AIRPLANE IN ALLOWED RANGE OF WEIGHTS AND C.G. POSITIONS.

7. Aircraft description

7.1 FUSELAGE

Fuselage is of wood truss design with prevalent section 15x15 mm covered with plywood of 0,8-3 mm thickness. The pilot seat back is inclined under 40°. The inside with of cockpit in shoulder place is 54 cm (21,3"). The plywood tunel with wing and upper gear legs mounts is under pilot knees. The baggage compartment of 40 l (1,5 ft^3) is behind removable seatback. Composite cabin hood with polycarbonate windshield of 1,5 mm thickness opens to the side. The NACA inlet for ventilation is on the side of cabine hood.

7.2 WING

It consists of composite main spar with carbon caps on which are glued XPS ribs. The structure is covered with 1 mm plywood. Wingtips are made of sandwiched glass composite. Connection of wings to fuselage is made thru two main and two auxiliary pins. . The connection of flaperons to controls is performed by inserting of control pin into slot.

7.3 TAIL

The all movable horizontal tail (HT) has anti-servo tab and is statically balanced. Tails are of similar construction as wings- on composite spar are attached polystyrene ribs and plywood skin. Spring trimming is under pilot seat. Disassembly of HT is made thru disconnection of control and tab rods and pulling out of pin. The fin has main composite spar with carbon caps and HT hinge.

7.4 UNDERCARRIAGE

The legs of main gears are made of pultruded fiberglass rods. The wheels of 12x4 size are braked using mechanically actuated drum brakes. Tail wheel of 100 mm (4") diameter is controlled via ruder and is attached to the fiberglass spring.

7.5 CONTROLS

The horizontal tail and flaperons are controlled via pushrods and bellcranks. Flaps are controlled using mixer placed bellow seat. Rudder is controlled via cables.

7.6 ENGINE

The airplane is driven by SE-33 engine. Engine mount is made of CrMo tubing. Helix H30F fixed pitch propeller.

7.7 FUEL SYSTEM

The integral tank of 35 l capacity is placed behind fuselage firewall. It is made of fiberglass-PVC foam sandwich. The ball valve is connected to tank outlet. The Mikuni pump is connected to crankcase.

7.8 ELECTRICAL SYSTEM

The bus is powered by 12 V/9 Ah lead (lithium ion) battery and is charged by alternator integrated in stator.

7.9 INSTRUMENTS AND PITOT-STATIC SYSTEM

The airplane is fitted with basic flying instruments-speedmeter, altimeter, compass and vario. The RPM´s, total hours, head and exhaust gas temperatures are checked on the engine. The COM antenna is built in the airframe. The pitot tube is placed on the leading edge of right wing. The static ports are placed from bothe sides of fuselage in front of tails.*

7.10 RESCUE SYSTEM

The airplane is optionaly equipped with rescue system GRS 4/240. The container of system is attached behind pilot bulkhead.. The front ropes are attached on upper engine mount hinges. The auxiliary rope is attached to fuselage behind cabin.

7.11 RUDDER DEFLECTIONS

Rudder: Right/Left 30°, 172 mmm +/- 10 mm
Elevator: Up 11°, 74mm +/- 5 mm
Down 6°, 40mm +/- 5mm
Aileron (Flaps 0): Up 23,5°, 86 mm +/- 5 mm
Down 13,8°, 50 mm +/- 5 mm
Flaps 0: Down 0°,
Flaps 1: Down 7°, 26 mm +/- 5 mm
Flaps 2: Down 20°, 73 mm +/- 5 mm

* depends on builder choice

8. Handling, treatment and maintenance of the airplane

8.1. FOREWORD

This chapter contains procedures recommended by manufacturer for proper airplane operation.

8.2. PERIODICAL INSPECTION OF AIRPLANE

The time intervals in which is necessary to perform comprehensive inspections or maintenance depend on the service and whole airplane condition. Use only original parts if any exchange is necessary.

Periodical checkings must be performed at least in these intervals:

a) *After first 25 hours of sevice*

b) *After each 50 hours of service*

c) *After each 100 hours of service or annually.*

The engine maintenance system is defined by Engine service manual.
The propeller must be serviced in accordance to its manual.

8.3. The list of work at periodical inspections

8.3.1. Inspection after first 25 hours and after 50 hours

Action Nr.	Description	Performed by	Checked by
1	***Generaly*** *Wash whole airframe using wet sponge and suitable detergent. Remove cowling and covers and check fixing of all parts (fuel, oil and electrical installation). Check tightening and securing of all hardware.*		
2	***Controls*** *Check control cables on damage. Check metal parts for corrosion. Repair if necessary. Grease moving parts. Check movement smootheness and its assembly.*		
3	***Undercarriage*** *Remove covers and check free motion in the pins of lower main leg consoles. Check free motion in the tailwheel pin. Lubricate all pins usiing grease.*		
4	***Tyres*** *Check pressure in tyre, its wear, discs and brake system. Exchange tyre in case of excessive wear.*		
5	***Engine*** *Check engine installation, oil, cooling baffles and all hoses and controls on damage and wear. Check air filter and wash it in gasoline if necessary.*		
6	***Exhaust system*** *Check guskets, tubes and exhaust muffler for cracks, leaks and missing parts.*		

Action Nr.	Description	Performed by	Checked by
7	***Cowling*** *Check cowling for loosenes, cracks or any damage. Check completeness of hardware.*		
8	***Propeller*** *Check tips and leading edge on damage. Repair using epoxy or varnish..*		
9	***Fuel system*** *Check tighteness of whole system and condition of all hoses. Check smoothness of fuel valve run. Check fuel filter and exchange if necessary.*		
10	***Battery*** *Check voltage. Charge if necessary.*		
11	***Cockpit*** *Clean using wet towel. Remove dirty on floor using vacuum cleaner.*		
12	***Cabine hood*** *Use agent suitable for cleaning of polycarbonates. Do not use gasoline, alcohol etc.*		

7.3.2. Inspection after 100 hours or year examination

Action Nr.	Description	Performed by	Checked by
1	***Generaly*** *Clean all outside and inside skin of airplane. Check on damage, wear and corrosion.*		
2	***Front of the airplane*** *Check engine (see engine manual), hoses, engine mount, propeller, battery, exhaust, firewall and rescue system.* *Check tightening and securing of hardware.*		
3	***Fuel system*** *Check tube on cracks and valve function. Check fuel filter and exchange it if necessary.*		
4	***Fuselage*** *Check outside skin on cracks and inside structure on possible rust.*		
5	***Controls*** *Check free movement, wear of cable, tubing, bushes in stick, brackets, mixer and rod ends. Check end stops.*		
6	***Instruments*** *Check screws, fuses, placards, switches and pitot system. Assure that all instruments work fine.*		

Action Nr.	Description	Performed by	Checked by
7	***Wing*** *Check skin for cracks and possible bonding failure.* *Check possible free movement in main and auxiliary assembly pins.* *Check flaperon hinges and possible free movement in control connection pin.*		
8	***Tails*** *Check skin for cracks and possible bonding failure.* *Check possible free movement in all pins and their securing.*		
9	***Undercarriage*** *Check in accordance to 25 hours inspection.*		
10	*Lubricate all moving parts-see e plan*		
11	*Check all hinges of control surfaces and moving parts. Perform repair action if free movement in hinge exceed 0,4 mm. The free play in hinge of horizontal tail should not exceed 0,1 mm.*		

Assembly all dismantled parts after performed inspection and/or maintenance and perform engine test run.

8.3.3. Lubricating plan

a) Lubricant used

- *Use suitable lubricating grease. (Castrol grease LM, Mobil grease MP etc.)*

b) Lubricated places

- *All bearings*
- *Whole controls of flaperons and horizontal tail*
- *Main pin of HT at every disassembly*
- *Antiservo tab hinges*
- *Rudder hinges*
- *Stick bearings*
- *Pedals*
- *Throttle bowden*
- *Choke bowden*
- *Hinge and pins of cabine hood*