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ATEC 122 ZEPHYR

Flight and Operations Manual

Libice nad Cidlinou, September 2016

Type of aircraft **ATEC 122 ZEPHYR**

Serial number .....

Identification label .....

LAA CR type licence **ULL-05 / 2001** **issued** **12. 04. 2001**

This aircraft is not registered at the state office and is to be operated at operator's own responsibility.

The aircraft must be operated according to the information and limits of this flight manual. This manual must ever be on the board of aircraft.

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1.1. Introduction
1.2. Personal Data of the Owner
1.3. Aircraft Description
1.4. Completing of the Manual, Changes
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1.1. Introduction

The information provided within this manual is a necessary requirement for an effective and save operation of the **ATEC 122 ZEPHYR** aircraft. This information and documents are compiled around manufacturer's recommendations, and therefore should be given the utmost importance.

1.2. Personal Data of the Owner

Owner of aircraft:

Address:

Telephone No:

Date of ownership from - to:

Owner of aircraft:

Address:

Telephone No:

Date of ownership from - to:

Owner of aircraft:

Address:

Telephone No:

Date of ownership from - to:

1.3. Description of Airplane

The **ATEC 122 ZEPHYR** is an ultralight two-seater, cantilever, low-wing aircraft of mixed construction. The landing gear has a fixed tricycle undercarriage with a steerable front wheel. The power-plant is a pull arrangement and consists of a ROTAX 912 UL 80 HP or ROTAX 912 ULS 100 HP engine and a two bladed or three bladed fix or adjustable propeller FITI.

1.4. Modifications and Changes

If any changes or modifications to the aircraft are made, the owner of the said aircraft must notify the manufacturer and supply drawings and specifications of materials used. If the aircraft is sold, the manufacturer must be notified with address of the new owner.

1.5. Specification

Dimensions

Wing span		9,4 m	
Length of fuselage		6,2 m	
Total height		2,0 m	
Wing area		10,3 m	
Depth of mean aerodynamic chord		1,12 m	
Span of horizontal tail surface		2,4 m	
Flap position		I	15° 75 mm
		II	30° 140 mm
		III	45° 180 mm
Aileron deflection	up		95 mm
	down		60 mm
Elevator deflection	up		80 mm
	down		65 mm
Rudder deflection	L/R	+-20°	180 mm

Airfoil Section

Root section	UA 2
End section	UA 2

Landing Gear

Wheel spacing	1,9 m
Wheel base	1,4 m
Tire dimensions	380 * 100
Tire pressure	0,16 MPa / 1,6 atp
Spring system	
Main wheels	composite spring
Front wheel	rubber spring

Brakes Main wheels hydraulic disc brakes

Rescue System installed / not installed USH 52 S SOFT PACK, v_{MAX} = 293 km/h

Weights

Empty weight		kg
Maximum take-off weight	450	kg
Maximum take-off weight including rescue system installed	472,5	kg
Maximum weight of luggage in luggage space	5	kg

Power Plant and Engine Parameters

Propeller manufacturer	FITI design s.r.o.
Type of propeller	**FITI ECO COMPETITION 2 blade, 3 blade**
Engine manufacturer	Bombardier – ROTAX GmbH

Engine type	**ROTAX 912 UL 80 HP**	**ROTAX 912 ULS 100 HP**
Power		
Take-off power	59,6 kW/80 HP/5800 RPM	73,5 kW/100 HP/5800 RPM
Maximum continuous power	58,0 kW/78 HP/5500 RPM	69,0 kW/94 HP/5500 RPM
Cruising power	37,7 kW/51 HP/4800 RPM	44,6 kW/60 HP/4800 RPM

Engine Speed

Maximum take-off engine speed	5800 RPM / 5 minutes maximum
Max. continuous engine speed	5500 RPM
Cruising engine speed	4800 RPM
Engine idle speed	1400 RPM approximately

Oil Temperature

Minimum	50 °C		50 °C
Maximum	140 °C		130 °C
Operational optimum	90 °C-110 °C		90 °C-110 °C

Cylinder Head Temperature

Minimum	60 °C		60 °C
Maximum	150 °C		135 °C

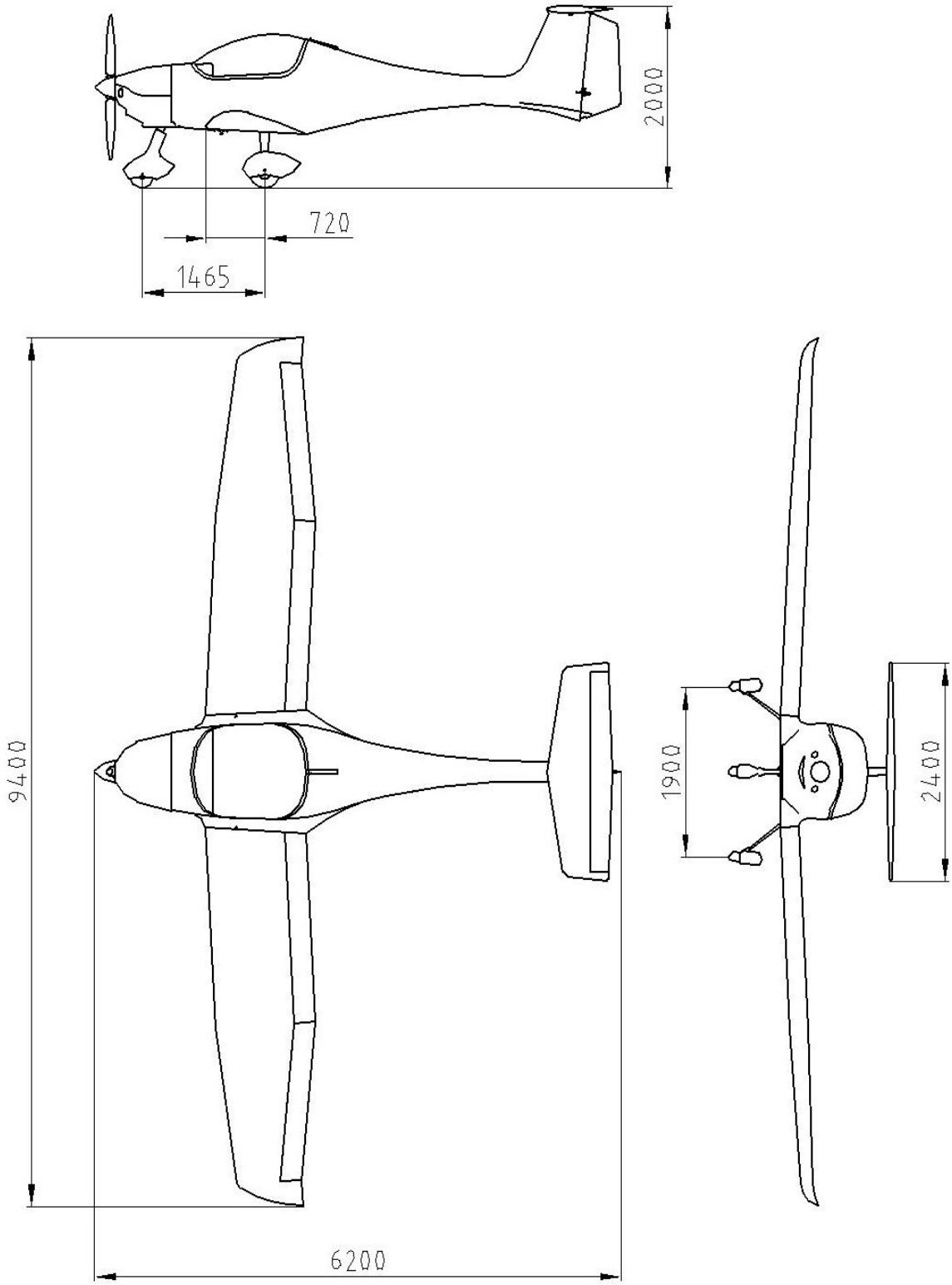
Oil Pressure

Maximum short time operated by cold start	7,0 bar
Minimum	0,8 bar (engine speed below 3500 1/min)
Operational	2,0 – 2,5 bar (over 3500 1/min)

Fuel Type	See Art. 2.10.
Oil Type	Any branded oil for 4 stroke motorcycle engines with gearbox additives. Power class API SF, SG + GL4 or GL5. AeroShell Sport Plus 4 10W-40 in preference recommended.

ROTAX 912 UL is not certified aeronautical engine. An engine failure may occur at any time. The pilot is fully responsible at all times for the operation of this engine and accepts all risk and consequences of an engine failure!
The correct operation of this aircraft is the sole responsibility of the pilot.

1.6. Three-View Sketch



Chapter 2

2. Operational Limits

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2.1. Introduction

The chapter 2 contents are operational limits necessary for a save operation of the aircraft

2.2. Air Speeds

Never exceed speed	v_{NE}	**265 km/h**	**143 kt**

Do not exceed this speed in any case

Design manoeuvre speed	v_A	**149 km/h**	**80 kt**

Do not use full deflection of the rudders and sudden control operations above this speed. Overload of the aircraft may occur

Maximum design cruising speed	v_C	**220 km/h**	**119 kt**

Operation over this speed must be conducted with caution in smooth air only

Max. cruising speed at severe turbulence	v_{RA}	**198 km/h**	**107 kt**

Never exceed this speed at severe turbulence

Maximum speed by full flaps deflection	v_{FE}	**130 km/h**	**70 kt**

Do not exceed this speed by flaps deflected

Stalling speed flaps retracted	v_{S1}	**76,5 km/h**	**41 kt**

The loss of uplift and fall of aircraft with flaps retracted happens at this speed

Stalling speed in landing configuration	v_{SO}	**64,9 km/h**	**35 kt**

The loss of uplift and fall of aircraft with flaps position III deflected happens at this speed

2.3. Weights

Empty weight .... kg

Maximum take-off weight .... kg

Useful load .... kg

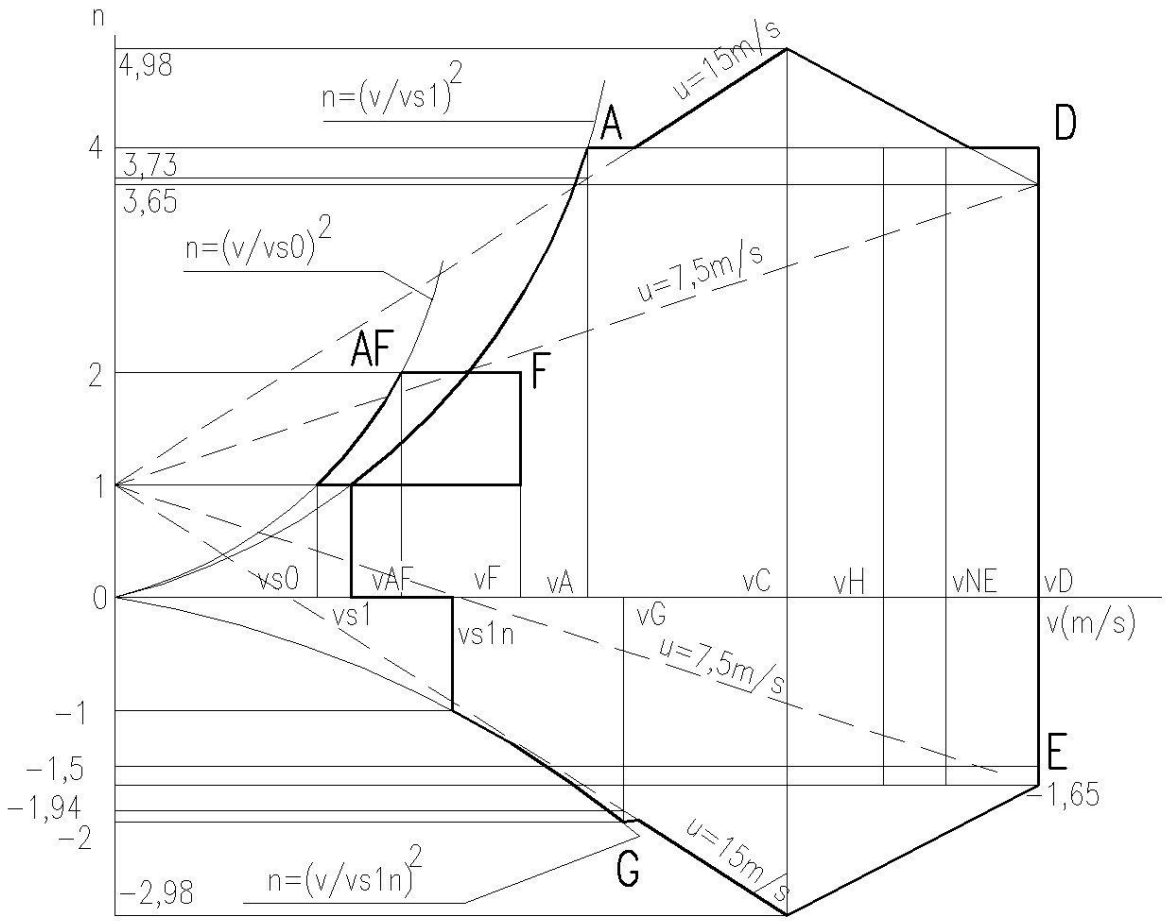
Never exceed the maximum take-off weight of the aircraft!

2.4. Centre of Gravity (CG)

CG of the empty aircraft .... % MAC

Flight range of CG, MTOW = 450 kg ..... 27–40 % MAC
Flight range of CG, MTOW = 472,5 kg ..... 32–40 % MAC

2.5. Manoeuvre and Gust Envelope



vS0 = 64,9 km/h = 18,0 m/s = 35 kt
vS1 = 76,5 km/h = 21,0 m/s = 41 kt
vAF = 91,1 km/h = 25,3 m/s = 49 kt
vS1n= 115 km/h = 31,9 m/s = 62 kt
vF = 130 km/h = 36,1 m/s = 70 kt
vA = 149 km/h = 41,4 m/s = 80 kt
vC = 220 km/h = 61,3 m/s = 119kt
vH = 245 km/h = 68,1 m/s = 132 kt
vNE = 265 km/h = 73,5 m/s = 143 kt
vD = 294 km/h = 81,7 m/s = 159 kt
vG = 163 km/h = 45,2 m/s = 88 kt

2.6. Permitted Manoeuvres

Category of the aircraft: Normal

Operations are limited to non-aerobatic manoeuvres that include:

- Any manoeuvres incident to normal flying
- Training of stalls
- Steep turns, in which the angle of bank is not more than 60°

Aerobatic operations are prohibited!

2.7. Operational Load Factors

Maximum positive load factor in CG ..... +4,0 g
Maximum negative load factor in CG ..... -2,0 g

2.8. Type of Operation

Permitted day flights VFR only (flights by unobstructed field of vision)

IFR flights (instrument flights) and flights by ice formation are prohibited!

2.9. Crew

Number of seats 2
Minimum weight of crew ..... 50 kg / 110 lb (see corrections Art. 9.4)
Maximum weight of crew ..... 180 kg / 397 lb (see corrections Art. 9.4)

2.10. Fuel

Recommended motor unleaded petrol of minimum octane number RON 90.
Fuel capacity ..... 60 l / 16 us gal (alternately 83 l / 22 us gal)
Not usable rest of fuel ..... 0,7 l / 0,18 us gal

2.11. Wind

The safe taking off and landing is possible if the following wind speed limits are not exceeded:

a) taking off or landing against wind ..... up to 12 m/s
b) taking off or landing tail wind ..... up to 3 m/s
c) taking off or landing cross wind ..... up to 6 m/s

2.12. Other Limits

Smoking and use of mobile phones is prohibited in aircraft.

2.13. Placards and Markings

The aircraft shall be equipped with mandatory placards placed on instrument panel containing following information:

- Identification of aircraft
  Identification number. Serial number. Designation. Empty weight. Maximum take off weight.

- Operating limitations
  Weight limits depending on weight of crew, fuel and luggage. Speed limits for standard flight configurations.

- Passenger warnings
  Definition of aircraft category, its airworthiness conditions and limitations. Intentional spins, stalls and aerobatics prohibition.

Chapter 3

3. Emergency Instructions

3.1. Engine Failure - Take Off
3.2. Engine Failure - in Flight
3.3. Rescue System Deployment
3.4. In Flight Fire
3.5. Engine Loss
3.6. Emergency Landings
3.7. Precautionary Landing
3.8. Aborted Landing
3.9. Vibration

3.1. Engine Failure – Take Off

1. **Push stick forward aircraft into gliding attitude and maintain airspeed of 100 km/h (54 kt).**
2. Determine the wind direction, adjust flaps for suitable position, turn off fuel valve, switch-off ignition, adjust safety belts and switch-off the master switch just before landing.

A. At a height up to 50 m get the aircraft into landing configuration and carry out a landing with respect for obstructions in take-off direction.

B. At a height above 50 m choose a suitable area for emergency landing.

3.2. Engine Failure - in Flight

1. Get the aircraft into gliding attitude and maintain airspeed of 100 km/h (54 kt).
2. Check a fuel level, switch on and make sure ignition is switched on.
3. If no problem found, try restarting the engine once more using additional fuel system.
4. If restarting impossible, use the instructions 3.1.

3.3. Rescue System Deployment

In distress by final loss of flight control do activate the rescue system

1. Switch off ignition
2. Adjust safety belts
3. Activate the rescue system

In case of landing on a limited area when collision is inevitable, use the rescue system as a braking device.

The aircraft can be damaged or the crew may be injured due to using a rescue system

3.4. In Flight Fire

1. Close the fuel valve
2. Open the throttle
3. Switch off the main switch and ignition
4. Do emergency landing
5. Get off the aircraft

3.5. Engine Loss

1. Speed ..... 100 km/h ..... 54 kt
2. Flaps retracted
3. Normal flight conditions

3.6. Emergency landing

1. Carried out in case of engine failure
2. Speed ..... 100 km/h ..... 54 kt
3. Adjust safety belts
4. Flaps according to situation
5. Announce the situation by the aircraft radio station
6. Close the fuel valve
7. Turn off ignition
8. Turn off the main switch

3.7. Precautionary Landing

Carry out in case of the loss of orientation, fuel exhaustion or for other reason if the aircraft is fully controllable.

1. Determine the wind direction
2. Choose a suitable landing area
3. Carry out a low pass into the wind along the right-hand side of landing area and inspect the area thoroughly.
4. Carry out a circuit flight
5. Calculate the landing plan
6. Land in the first third of the landing area using landing flaps

3.8. Aborted Landing

Carry out in case of wrong calculation of landing manoeuvre or after jump out by landing in case of pilot's consideration to abort landing manoeuvre and continue to fly.

1. Set up engine speed on maximum power
2. Set up take-off flaps position – I
3. Get level speed 110 km/h ..... 59 kt
4. Draw up control stick slowly to get aircraft into climbing by speed 110 – 120 km/h ..... 59 – 65 kt
5. Retract flaps

3.9. Vibrations

In case of unusual vibrations occurs.

1. Set the engine speed to where vibration is least
2. Carry out the safety landing checks for a possible emergency landing and head for the nearest airport

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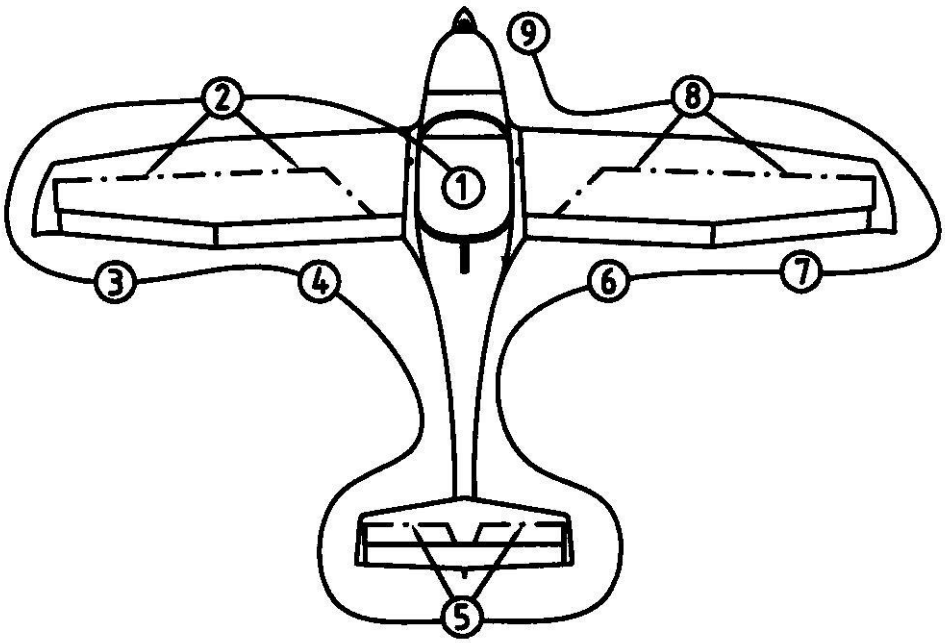
Chapter 4

4. Standard Procedures

4.1. Pre-Flight Inspection
4.1.1. Procedures Before Entering the Cockpit
4.1.2. Procedures After Entering the Cockpit
4.1.3. Procedures Before Engine Start, Starting the Engine
4.2. Engine Warm up, Engine Test
4.3. Taxiing
4.4. Engine Check
4.5. Procedures Before Take-Off
4.6. Take-Off and Climb Away
4.7. Cruising Flight
4.8. Descend and Landing
4.9. Flight in Rainy Conditions

4.1. Pre-Flight Inspection

It is important to carry out appropriate pre-flight inspection. To perform a negligent or incomplete inspection could be a cause of accident. The Manufacturer recommends to make following procedure:



1/ Cockpit – switches, seat belts, instruments, seats, controls, canopy locks, canopy condition check
2/ Left wing – coating and fabric bonding condition*, play, Pitot tube
3/ Left aileron – coating and fabric bonding condition*, free movement, attachments, controls
4/ Left flap – coating and fabric bonding condition*, attachments, controls, play
Left main gear leg – condition, brake fluid leak, wheel spat
5/ Tail – surface condition, coating and fabric bonding condition*
VT – surface, attachments, control
HT – coating, attachments, fitting covers
Rudder – surface, attachments, control
6/ Right flap - coating and fabric bonding condition*, attachments, controls, play
Right main gear leg - condition, brake fluid leak, wheel spat
7/ Right aileron - coating and fabric bonding condition*, free movement, attachments, controls
8/ Right wing – coating and fabric bonding condition*, play
9/ Nose wheel – condition, play, wheel
Engine – operation liquids amount, engine cowling
Propeller – condition, spinner tightness

* for detailed instructions see Art. 8, Par. 8.1., 8.1.1. and 8.1.2.

4.1.1. Procedures Before Entering the Cockpit

1. Check ignition – turned off
2. Check main switch – turned off
3. Check the wings, wing surfaces ailerons and flaps, clearances, hinges and connections of the controls, security of the wing pins, Pitot tube
4. Check the tail surfaces, elevator and rudder for secure connections, clearances and free movement
5. Check the fuselage, the surface and state
6. Check the landing gear, laminate springs, security of main and front wheels, their covers, screws and nuts, proper tire pressure, break function
7. Engine – the state of fastening of the engine covers, the state of the engine bed, intact fuel, oil and cooling system hoses, the fuel system drain
8. Propeller – the surface state, if it is intact, the state and fastening of the propeller cone
9. Cockpit – control of fastening and proper locking of the canopy, correct functioning and condition of the electrical installation of instruments, the state of the flight instruments, control of the fuel level, proper functioning of controls

4.1.2. Procedures After Entering the Cockpit

1. Check foot operated controls – function
2. Check brakes – function, brakes on
3. Check hand – operated controls – function
4. Check flaps – function, retract
5. Check engine controls – switched off, throttle idle
6. Check fuel valve – turned on
7. Check fuel level indicator – fuel volume
8. Check ignition – turned off
9. Check main switch – turned off
10. Check instruments – state, zero positions, adjust altimeter

4.1.3. Procedures Before Engine Start, Starting the Engine

1. Rescue system – unlock
2. Safety belts – fasten
3. Close the canopy and secure
4. Check fuel valve – turned on
5. Check throttle – idle
6. Open the choke if the engine is cold
7. Brakes on
8. Main switch on
9. Ignition on
10. Pull up the control stick
11. Start the engine
12. Oil pressure minimum within 10 seconds
13. Turn off the choke
14. Warm up the engine until the operating temperature

4.2. Engine Warm up

Start to warm up the engine at 2000 rpm, hold approx. 2 minutes, continue until 2500 rpm till the oil temperature reaches 50 ºC. Check both ignition circuits according to Art. 4.5.

4.3. Taxiing

Recommended speed of taxiing is 15 km/h ..... 8 kt max, direction is controlled by the front wheel.

4.4. Engine Ignition Check

1. Brakes on
2. Engine speed 4000 RPM
3. Switch off first ignition circuit – engine speed drop not over 300 RPM
4. Switch on – 4000 RPM
5. Switch off second ignition circuit – engine speed drop not over 300 RPM

Speed difference between circuits running separately not over 120 RPM

4.5. Pre Take-Off

Compulsory procedures prior take-off:

1.	Brakes	checked
2.	Foot-operated controls	checked
3.	Hand operated controls	checked
4.	Flap position I set and	checked
5.	Fuel valve on	checked
6.	Choke turned off	checked
7.	Throttle idle	checked
8.	Fuel gauge indicator	checked
9.	Instruments on and within limits	checked
10.	Safety belts secure	checked
11.	Cockpit secure and locked	checked

4.6. Take Off and Climbing

By accelerating until the maximum position of the throttle is reached, make the aircraft move. With the help of the front wheel and the rudder keep the aircraft in the axis of the runway. At speed of 70 km/h you make the aircraft fly off the earth by a light pull of the stick and continue the flight until 110 km/h. Then by gradual pull you make the aircraft start climbing at the optimum speed of 110 km/h. During the take-off, the marginal engine values must not be exceeded.

4.7. Cruising Flight

ATEC 122 ZEPHYR has good flight features in the whole range of permitted speeds and centre of gravity positions. The cruising speed is in the range **120 – 215 km/h ... 65 – 116 kt.**

4.8. Descending and Landing

Carry out descending with throttle idle at the speed of 100 km/h .. 54 kt
Flaps position limit according to Art. 2.2.

Procedures in the final:

1. Speed 100 km/h ..... 54 kt
2. Wing flaps in position III (at strong turbulence or headwind position II)
3. Throttle idle or corrected if necessary
4. Instruments in the permitted limits

Landing

The aircraft in the hold-up position decreases its speed by a gradual pull of the control stick until it touches down at speed of 70 km/h ... 38 kt. After the touch down of the front wheel, the landing run can be cut down by breaking.
Do not apply a maximum brake effect except of an extreme situation. An undue wear of tyres, brake lining and disc comes to and an over-stress of undercarriage and other parts may shorten durability of an aircraft rapidly.

4.9. Flight in Rainy Conditions

During the flight in the rain, the pilotage should be carried out with increased caution because of the decreased visibility and cockpit transparency. Furthermore, one should take into account a shortened hold-up position during the landing and extended take-off distance.

Maintain the following speeds during the flight in the rain:

1.	Climb away	110 km/h	59 kt
2.	Cruising flight	120 – 180 km/h	65 – 97 kt
3.	Descent at landing	115 km/h	62 kt

Chapter 5

5. Performances

5.1. Introduction
5.2. Air Speed Indicator Corrections
5.3. Stalling Speeds
5.4. Loss of Height by Stalling
5.5. Take off Distance at 15 m Height
5.6. Rate of Climb
5.7. Cruising Speeds
5.8. Range of Flight

5.1. Introduction

The information on speedometer calibration, stalling speed and other performances of the **ATEC 122 ZEPHYR** with ROTAX 912 UL 80 HP and ROTAX 912 ULS 100 HP engine is provided in this chapter.

5.2. Air Speed Indicator Corrections

Calibrated air speed CAS		Indicated air speed IAS		Deviation	
Km/h	Kt	Km/h	Kt	Km/h	Kt
65	35	59	32	-6	-3
80	43	77	42	-3	-1
100	54	98	53	-2	-1
120	65	122	66	2	1
140	76	143	77	3	1
160	86	166	90	6	4
180	97	190	103	10	6
200	108	212	114	12	6
220	119	235	127	15	8
240	130	258	139	18	9
260	140	282	152	22	12
265	143	289	156	24	13

5.3. Stalling Speeds

Engine idling	Flaps retracted	Flaps II	Flaps III
One pilot	65 km/h … 35 kt	62 km/h … 33 kt	62 km/h … 33 kt
Two pilots 450 kg	69 km/h … 37 kt	64 km/h … 35 kt	64 km/h … 35 kt

Engine stopped			
One pilot	66 km/h … 36 kt	62 km/h … 33 kt	62 km/h … 33 kt
Two pilots 450 kg	70 km/h … 38 kt	65 km/h … 35 kt	64 km/h … 35 kt

5.4. Loss of Height by Stalling

Level flight flap position	Flap deflection	Height loss m / feet
I	15°	30 / 100
II	30°	30 / 100
III	50°	30 / 100
0	-2,5°	30 / 100

5.5. Take off Distance at 15 m Height

Engine	80 HP	100 HP
Runway surface	Take off distance m feet	Take off distance m feet
Concrete	205 675	180 590
Turf	240 790	210 690

5.6. Rate of Climb

Engine	80 HP	100 HP
One pilot at 100 km/h 54 knot	6 m/s 1180 FPM	8 m/s 1570 FPM
Two pilots 472,5 kg	4,5 m/s 890 FPM	6,0 m/s 1180 FPM

5.7. Cruising Speeds

ROTAX 912 UL 80 HP

Air speed km/h knot	RPM	Consumption l/h
120 64,8	4000	5,8
140 75,6	4250	7,2
160 63,4	4600	9,5
180 97,2	4850	10,8
200 108	5200	13,1
215 116	5600	17,0

ROTAX 912 ULS 100 HP

120 64,8	3250	4,0
140 75,6	3700	5,5
160 63,4	4100	8,2
180 97,2	4500	10,8
200 108	4950	12,6
220 119	5500	18

5.8. Range of Flight

By maximum fuel capacity 60 l
ROTAX 912 UL 80 HP

Air speed km/h	kt	Range of fl. km	nm	Flight endurance h	15 l Flight reserve h
140	75,6	816	441	5,8	2
160	83,4	707	382	4,4	1,5
180	97,2	700	378	3,8	1,3
200	108	640	346	3,2	1,1

ROTAX 912 ULS 100 HP
By maximum fuel capacity 60 l

140	75,6	1070	578	7,6	2,7
160	83,4	820	443	5,1	1,8
180	97,2	700	378	3,8	1,3
200	108	666	360	3,3	1,2
220	119	515	278	2,3	0,8

ROTAX 912 ULS 100 HP
By maximum fuel capacity 83 l

140	75,6	1983	1071	14,16	2,7
160	83,4	1394	753	8,7	1,8
180	97,2	1112	600	6,18	1,3
200	108	894	483	4,47	1,2
220	119	748	404	3,4	0,8

Chapter 6

6. Assembly and Dismantling

6.1. Introduction
6.2. Dismantling the Horizontal Tail Surface
6.3. Dismantling the Rudder of the Vertical Tail Surface
6.4. Dismantling the Wings
6.5. Assembly

6.1. Introduction

The assembly of individual parts of the aircraft is described in this chapter. At least two persons are necessary for the assembly and dismantling.

6.2. Dismantling the Horizontal Tail Surface

Release and unbolt the bolt M6 adjusting the position of the horizontal tail surface. This bolt is situated at the upper side of the stabiliser. Take care that spacer do not fall into the stabiliser. For assembly, it is important to preserve this spacer. Release and remove the left and right screw of the main HT fittings. Tilt the HT so that it is possible to disconnect the pin of the control. Remove the HT and put it into a safe place to prevent its damage. Secure the ball bearing with a binding wire.

6.3. Dismantling the Rudder of the Vertical Tail Surface

Release and unbolt two M5 bolts connecting rudder with the cables. Release and lift up the upper pin. The rudder slips out by moving it backwards.

6.4. Dismantling the Wings

Disconnect the control of ailerons in the cabin space. Release and remove the lock nut of the bolt of the wing pins. Screw the bolt off by about 20 mm. The helper lifts the wing a bit by holding it at the end. By light taps on the head of the bolt the bottom pin is knocked-out. Unscrew the bolt and remove the pin. Then the upper pin is driven out with the help of a rod with 18 mm diameter. When pins removed, lift up the wing and disconnect the hoses of the static and total pressure. Those hoses must not be interchanged during assembly. Disconnect strobe-light or position light cables if the aircraft equipped with them.

6.5. Assembly

The assembly is carried out in the opposite way. All pins must be cleaned and greased and then secured. Max. tightening torque is 20 Nm (2 kpm). Take care about the proper adjustment of ailerons, which is done by shortening and extending the aileron connection struts.

Chapter 7

7. Aircraft and Its Systems Description

7.1. Wing
7.2. Fuselage
7.3. Tail Surface
7.4. Landing Gear
7.5. Controls
7.6. Engine
7.7. Fuel System
7.8. Instrument Equipment
7.9. Hand and Foot Controls
7.10. Cockpit Equipment

7.1. Wing

The cantilever wing of mixed construction has a laminar profile UA 2. The wing is rectangular in its central part, the ends are trapezoidal equipped with wingtips. The main spar of multilayer hard wood saturated with synthetic resin at a high temperature. It is placed in the 30% depth of wing. The wing flaps and ailerons are suspended on the rear auxiliary spar. Ribs in the leading wing edge are made of divinicell, the other ribs are the wood structure. From the leading wing edge, the wing torsion box covering is made of composite sandwich, the rest of wing is covered by PES fabric. The aileron and wing flaps are analogous construction. The centre-section is welded from high quality CrMo steel tubes.

7.2. Fuselage

The fuselage is an all-composite shell reinforced by bulkheads. The fuselage cross-section is elliptic, with wing fillets and spacious cockpit. The cockpit enclosure is from organic glass and it is lifted up and backwards. The engine space in the front part of the fuselage is separated by a firewall. The engine bed and the front wheel are fastened to a fire-proof engine bulkhead.

7.3. Tail Surfaces

The T-shaped tail surfaces are of a mixed construction. The horizontal tail surface has a trapezoidal shape formed by a rigid stabiliser and elevator. Covers of the torsion boxes of elevator are made of laminate, the spar and ribs are made of wood. The covering is made of the PES fabric. The vertical tail surface has a trapezoidal shape. The dorsal fin part is an integral part of the fuselage, the rudder is an all-laminate shell.

7.4. The Landing Gear

The landing gear is a fixed tricycle undercarriage with a controllable front wheel. The main landing gear is formed by a pair of composite flat springs. Main wheel dimensions are 380 x 100 mm, the front one 300 x 100 mm. The front wheel leg is made of duralumin tubes and composites equipped with a rubber spring. All wheels have an aerodynamic fairing, the main undercarriage wheels have disc brakes hydraulically controlled.

7.5. Controls

The steering of all rudders is duplicated. The ailerons, elevator and the flaps are controlled with the help of connection struts and levers, the rudder with the help of steel wire ropes. Important check points have inspection openings overlapped by organic glass.

7.6. Engine

Aircraft propulsion is provided by a ROTAX 912 UL or SUL and the owner’s choice of two or three bladed fix or ground adjustable propeller FITI.

7.7. Fuel System

The fuel system is formed by an integral fuselage tank with a fuel drain. Double fuel supply circuit with a spare electric pump. The pressure of supplied fuel is measured with a fuel-pressure gauge.

7.8. Instrument Equipment

The instrument equipment consists of basic instruments for flight control, engine control and navigation. The static and dynamic pressure is taken from the Pitot tube at the bottom of the port wing. Standard instrument panels layout on the picture 7.10.

7.9. Hand and Foot Controls

Foot-operated control
By pressing the left pedal 9, the aircraft turns left when mowing at sufficient speed on the ground or in the air, and vice versa.

Hand-operated control
By pulling the control stick 3 towards the pilot, the nose lifts up (the angle of incidence increases) and the aircraft climbs. By pushing the control stick, the aircraft descends. By deflecting the control stick to left, the aircraft banks to left, and vice versa.

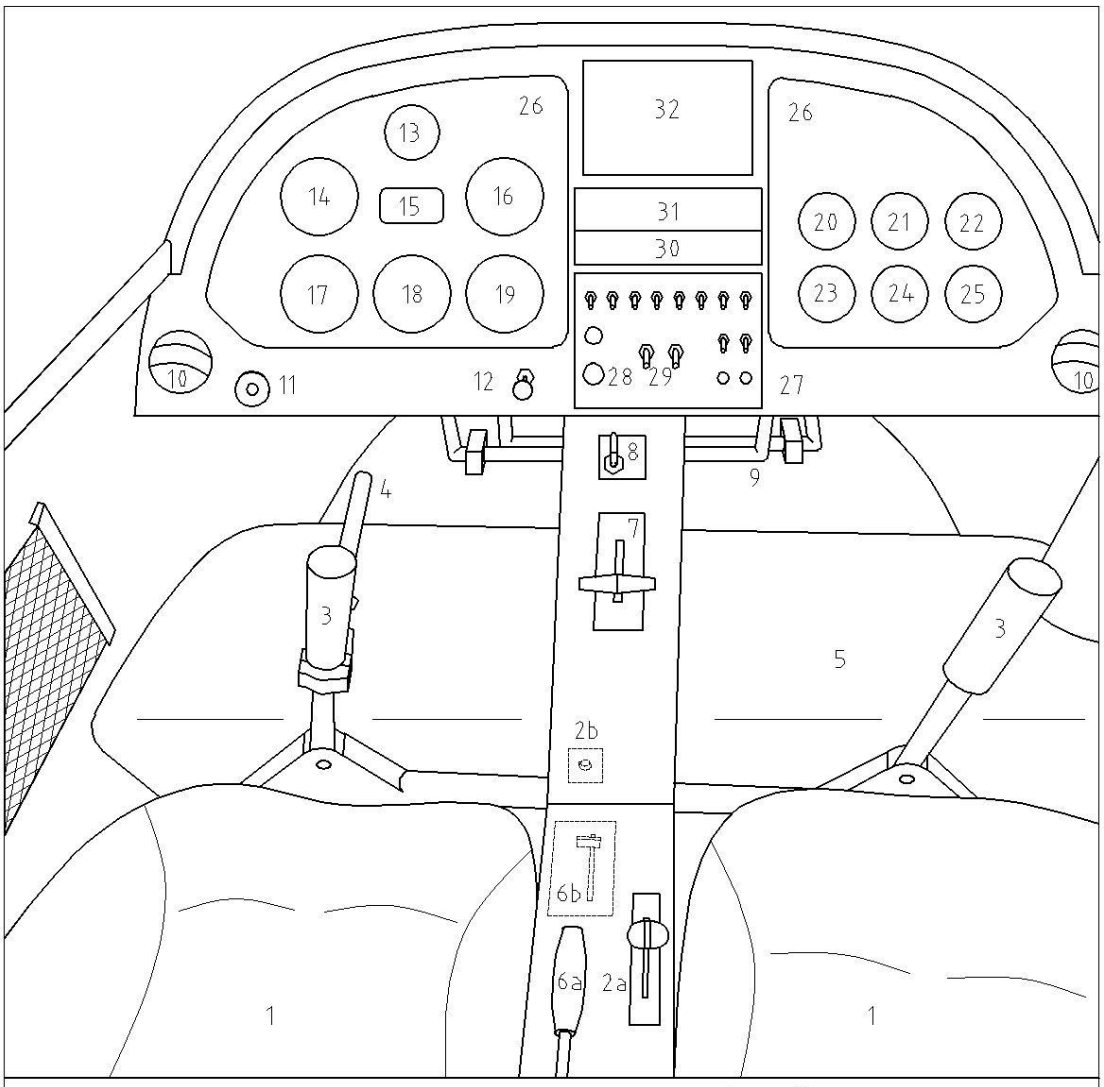
Wing flaps – mechanical option
By pressing the securing pin on the control lever 6a, the wing flaps are released and extend by an upwards motion, and vice versa.

Wing flaps – electric option
The flaps are actuated to the positions OFF, I, II, III by means of the linear potentiometer 6b. All flap positions are indicated by a control lamp.

The engine throttle
By moving the throttle 7 in the flight direction, the engine power increases, and vice versa.

Choke
Choke pushrod 11 pulled – the choke is turned on
Choke pushrod 11 pushed – the choke is turned off

7.10. Cockpit Equipment



1 – SEAT
2a – ELEVATOR TRIM
2b – ELECTRIC ELEVATOR TRIM (OPT.)
3 – CONTROL STICK
4 – WHEEL BRAKE
5 – FUEL TANK
6a – FLAP CONTROL
6b – ELECTRIC FLAP CONTROL (OPT.)
7 – THROTTLE
8 – FUEL COCK
9 – PEDALS
10 – VENTILATION
11 – CHOKE
12 – HEATING
13 – COMPASS
14 – AIRSPEED INDICATOR
15 – INCLINOMETER
16 – ALTIMETER
17 – OPTIONAL 80mm INSTRUMENT (E.G. VSI)
18 – OPTIONAL 80mm INSTRUMENT
19 – RPM INDICATOR + MOTOR HOURS
20 – OIL TEMP. INDICATOR
21 – CYL. HEAD TEMP. INDICATOR
22 – EXHAUST GAS TEMP. INDICATOR
23 – OIL PRESSURE INDICATOR
24 – FUEL PRESSURE INDICATOR
25 – FUEL QTY. INDICATOR
26 – DASHBOARD
27 – SWITCH PANEL
28 – MAIN SWITCH
29 – MAGNETO SWITCHES
30 – RADIO (OPT.)
31 – TRANSPONDER (OPT.)
32 – GPS GARMIN (OPT.)

Chapter 8

8. Care and Maintenance

8.1. Maintenance Schedule
8.2. Aircraft Repairs
8.3. Major Overhaul
8.4. Anchorage of the Aircraft
8.5. Cleaning and Care

8.1. Maintenance Schedule

Inspection, Mandatory Work	Inspection Period				
	10	25	50	100	200
Engine					
As per ROTAX Manual attached.					
Engine Compartment					
Engine Attachment Check integrity of construction with special care for welds, fixing points, silent blocks, bushings. Surface finish quality.				x	
Bolted Connections Check surface quality of bolted connections and bearing surfaces. Securing, tightening. Tighten and re-secure if necessary, Replace self locking nuts, split pins and securing wires.			x		
Silent Blocks Check elasticity of engine bearing, integrity of rubber blocks, degree of permanent deformation. Replace silent blocks if necessary, tighten, secure.				x	
Oil, Water and Fuel Hoses Check surface integrity, liquid leakage, quality of connections, protection against oscillating parts and exhausts. Replace if necessary.		x			
Working Liquids Check level, refill keeping instruction of engine manufacturer.	x				
Coolers Check integrity, sealing, purity.				x	
Controls Check control forces, free play, hinges, end stops adjustment, self-locking. Adjust, secure.			x		
Exhausts Check integrity, sealing, corrosion degree, springs quality and prestress. Grease ball connections.				x	
Carburetters Check surface quality, controls adjustment, quality of elastic connection flange – integrity, sealing. Replace flange if material degradations or surface cracks appear.		x			
Electric Installations Check quality, integrity and purity if cables, contacts, welds, bunched cable supports and bushings. Check gauges and senders connections.					x
Propeller Attachment Check quality of bolts, tightening moments, securing.				x	
Cockpit					
Control Sticks Check free movement in longitudinal and cross direction, clearance fits, end stops adjustment, securing. Replace pins or bolts if worn-out, grease, secure.				x	
Rudder Control Check integrity of pedals with special care for surface cracks near welds. Full and free movement right and left (raise nose wheel off ground), end stops adjustment, rudder cable tensioning, clearance fits, securing. Adjust, replace worn-out parts, grease, secure.				x	
Flap Control Check free movement of flap control lever, stable bearing in every flap position, interlock pin wear. Replace worn-out parts, grease, secure.			x		
Canopy – Open / Close Check quality and function of locks and hinges, canopy bearing. Adjust, replace worn-out parts, grease, secure.					x

Flight Control Instruments Check legibility, markings, attachment instruments in panel, installations, wiring.					**x**
Electric Installations Check quality, integrity and purity of cables, insulations, contacts and welds. Battery attachment, working condition.					**x**
Safety Belts Check fixing points rigidity, belt surface quality, adjustment.				**x**	
Fuel System Check leak-proof condition, fuel supply quality, fuel pumps and valve function, tank deaeration. Replace fuel filters.		**x**			
Parachute Rescue System Check general condition, attachment. Do mandatory work as per instructions of rescue system manufacturer.					**x**
Landing Gear					
Main Gear Check attachment rigidity, surface quality, degree of permanent deformation.			**x**		
Wheels Check attachment, brakes condition, brake pads, disc quality, leak-proof condition. Attachment and purity of wheel spats.		**x**			
Front Gear Check general condition, integrity, rubber damper, clearance, springing deflection, steering quality. Grease sliding bearings, replace rubber springs if worn-out.		**x**			
Fuselage Check general condition, integrity. Antennas, lights and coverings attachment.					**x**
Wing Check general condition, surface quality, integrity, attachment, fittings, play. Ailerons and flaps condition, surface quality, hinges, play, securing. Controls condition, free movement, end positions, clearance. Pitot tube condition and attachment. Check the condition of the coating and fabric bonding (see the Par. 8.1.1.).	**x**				
Tail Surfaces					
Rudder, Elevator Check general condition, hinges, movement, clearance, securing. Check the condition of the coating and fabric bonding (see the Par. 8.1.1.).					**X**
HT Stabilizer Check general condition, attachment, fittings, securing.				**x**	
	10	**25**	**50**	**100**	**200**

8.1.1. Inspection of the condition of the coating and fabric bonding

There can not be any visible crack between the fabric coating and hard surface of the wings/ elevator/rudder. If even limited detachment of the coating is observed, try to input any sharp tool (e.g. knife) into that slit and gently pass the tool through it to check its depth. If the tool is able to easily intrude between the coating and wing structure, it is necessary to remove the aircraft from operation and to make its complete re-coating. If the tool is not able to intrude into the slit, bond the slit by contact glue to avoid water intrusion between the fabric coating and wing structure and so to avoid further degradation of bonding.

We recommend to cover all bonded connections situated on torsion box of wings and horizontal tail by white plastic tape of 25mm width. The tape shall be placed in a position to cover the connection of torsion box and coating by its middle part.

8.1.2. Report about the condition of the coating and fabric bonding

The owner of the airplane shall periodically report the information about the condition of the coating on his airplane via Report Form in the Enclosure 2. The Report Form is also available to download from producer´s websites: www.atecaircraft.eu. Such form shall be transmitted to the producer once in 2-years period.

8.2. Aircraft Repairs

Minor repairs are the repairs of those parts, which do not participate substantially in the aircraft function and stiffness.
Among the permitted repairs are:

- the lacquer repair
- replacing worn-out parts
- repairing the tyres of the landing wheels

These repairs can be carried out by the owner itself. Repairs of the torsion box, spars, wings or tail surfaces must be carried out in a special workshop.

8.3. Major Overhaul

The major overhaul is carried out after 1500 flight hours but not later than 10 years after putting the aircraft into operation, unless decided otherwise during regular technical inspections or by producer´s bulletin. The overhaul will be carried out in the ATEC factory or in a professional workshop authorized by the ATEC. The engine overhaul and maintenance are carried out according to the instructions of the engine producer.

The time between overhauls (TBO) is the period approved to operate the airplane under normal operational conditions before the obligation to deliver the airplane for major overhaul arises. After the TBO is expired, the next operation of the airplane can not be considered as safe and due to this reason it is not allowed to exceed the TBO limit. Normal operational conditions are such conditions which are in compliance with the requirements of the manufacturer and appropriate aviation authority.

The TBO limit assessed by the manufacturer and by appropriate authority is based on airplane performance tests and operation experience necessary to reach the airworthiness approval. The TBO limit can be changed by the producer based on production progress intended for TBO extension.

The TBO limit is always directed by flight hours or flight records. The number of flight hours shall be recorded in the logbook. The entry about the execution of the major overhaul shall be recorded in the logbook by the manufacturer or by his authorized service centre by which the major overhaul was carried out.

Except other worn-out parts and other components subjected to maintenance instructions according to their appropriate manual, the following works are being performed during the major overhaul:

- Re-coating of fabric on wings, ailerons, flaps and horizontal tail
- New impregnation of the wooden frame of wings and horizontal tail
- Conservation of internal tubes of the centre wing
- Engine mount replacement
- Wings attachments inspection
- Undercarriage inspection, rubber springs exchange
- Electrical installation and battery inspection
- Replacement of all engine hoses
- Back-up fuel pump inspection
- Fuel tank leak inspection, pressure test
- Steering inspection and parts replacement, plays correction
- Inspection of rescue system attachments
- Exhaust system inspection

8.4. Anchorage of the Aircraft

The anchorage of the aircraft is necessary in order to protect the aircraft against eventual damage caused by the wind or wind blasts during parking outside the hangar. For the purpose, the aircraft is equipped with parking grips at the bottom side of the wing and at the tail skid.

8.5. Cleaning and Care

The aircraft surface should always be treated by using suitable cleaning agents. The oil and grease rests can be removed from the aircraft surface by suitable surface active substances or eventually by petrol. The cockpit enclosure should be cleaned only by washing using a sufficient water flow with an addition of suitable surface active substances. Never use petrol or chemical solvents.

Chapter 9

9. Weights and Balance

9.1. Introduction
9.2. Empty Weight
9.3. Maximum Take-Off Weight
9.4. CG Range
9.5. CG Determination
9.6. Useful Load, Weight Table

9.1. Introduction

The weight, useful weight and centre of gravity information is described in this chapter.

9.2. Empty Weight

The weight of aircraft full equipped, without fuel and crew. It is weighed as a total weight of all wheels weights.
The **empty weight** of the **ATEC 122 ZEPHYR** including ROTAX 912 ULS and standard equipment with / without rescue system is

..... kg

9.3. Maximum Take-Off Weight

..... kg

Never exceed the maximum take-off weight!

9.4. Centre of Gravity Range

CG of empty aircraft is ..... % of MAC

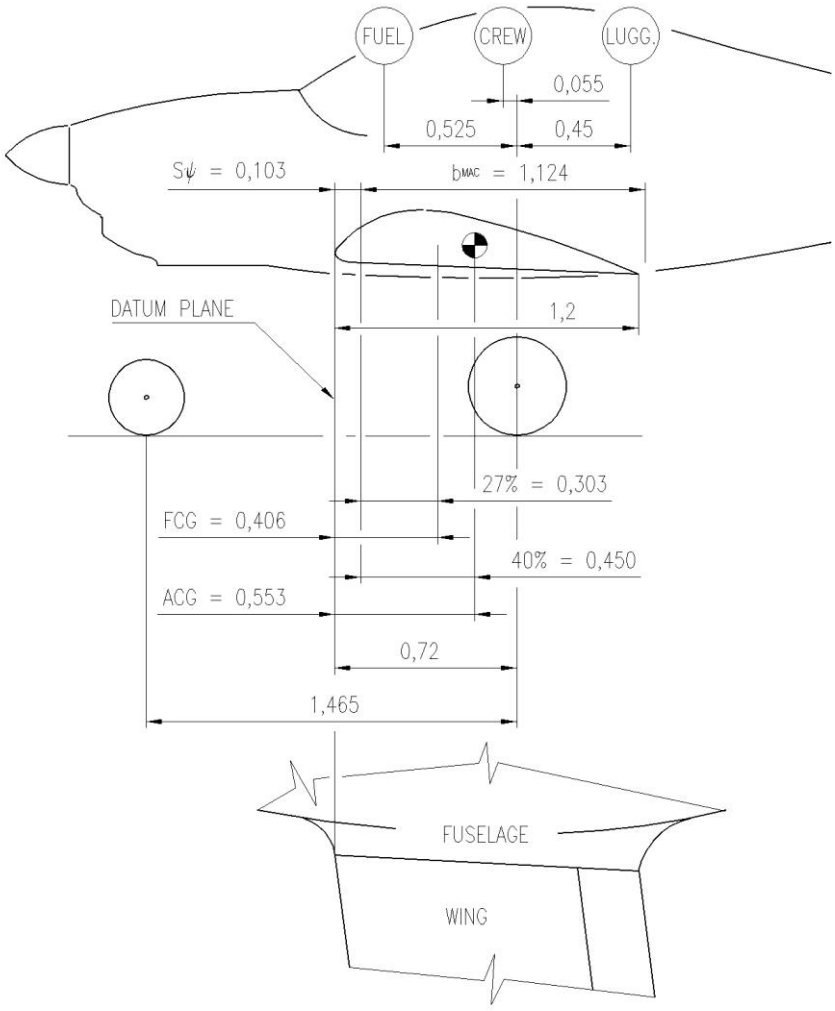
The flight range of CG, MTOW = 450 kg ..... 27-40 % of MAC
The flight range of CG, MTOW = 472,5 kg ..... 32-40 % of MAC

Operation over this range is prohibited

9.5. Centre of Gravity Determination

The aircraft has to be weighed in flight position including crew and fuel.

Weight on main wheels	G_1	(kg)
Weight on front wheel	G_2	(kg)
Total weight	$G = G_1 + G_2$	(kg)
Distance from main wheel to front wheel centre	$x_{MW-FW} = 1,465$	(m)
Distance from main wheel centre to leading edge of wing in root point	$x_{MW-LE} = 0,72$	(m)
CG distance from main wheel centre	$x_{MW-CG} = G_2 * x_{MW-FW} / G$	(m)
Length of MAC	$b_{MAC} = 1,124$	(m)
Length of wing chord in the root area	$b = 1,202$	(m)
Back-swept MAC displacement	$s_y = 0,103$	(m)
Distance from CG to leading edge	$x_{CG} = x_{MW-LE} - x_{MW-CG}$	(m)
Distance from CG to leading edge of MAC	$x_{CG-MAC} = x_{MW-LE} - x_{MW-CG} - s_y = 0,617 - 1,465 * G_2 / G$	(m)
	$x_{CG-MAC\%} = x_{CG-MAC} * 100 / 1,124 = 54,9 - 130,3 * G_2 / G$	(%)



9.6. Useful Weight, Weight Table

Useful weight is a difference between maximum take-off weight and the weight of empty aircraft.

The useful weight by empty weight ..... kg is ..... kg.

The aircraft weight and CG table, fuel tank 60 L

Fuel in tank 1L = 0,775 kg	Crew weight kg	Luggage weight kg	Aircraft CG % MAC	Total aircraft weight kg
0	MAX	5		
0	MAX	0		
¼ ... 15 L	MAX	5		
½ ... 30 L	MAX	5		
¾ ... 45 L	MAX	5		
1 ... 60 L	MAX	5		
1 ... 60 L	MAX	0		
1 ... 60 L	MIN	0		
0	0	0		

The aircraft weight and CG table, fuel tank 80 L

Fuel in tank 1L = 0,775 kg	Crew weight kg	Luggage weight kg	Aircraft CG % MAC	Total aircraft weight kg
0	MAX	5		
0	MAX	0		
¼ ... 20 L	MAX	5		
½ ... 40 L	MAX	5		
¾ ... 60 L	MAX	5		
1 ... 80 L	MAX	5		
1 ... 80 L	MAX	0		
1 ... 80 L	MIN	0		
0	0	0		

The aircraft CG is located in allowed range if kept the weight limits above

Enclosure 1: **RECORDS OF REVISIONS**

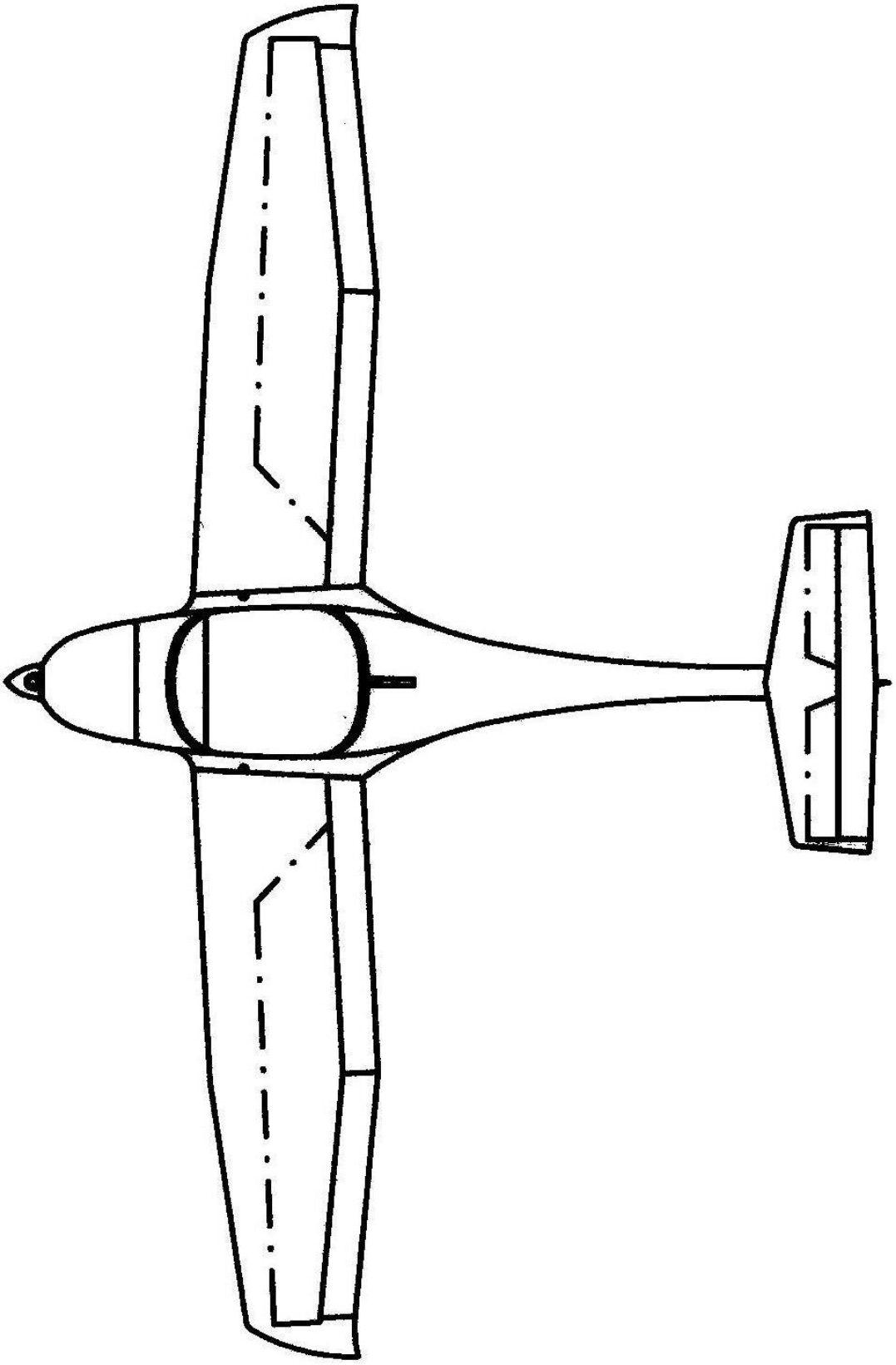
Any revision of the present manual, except actual weighing data, must be recorded in the following sheet according to information from the Manufacturer.
New or amended text in the revised pages shall be indicated by a black vertical line on the left hand margin,and the Revision No and the date shall be shown on the bottom left hand side of the page.

Revision Number	Affected Section	Affected Pages	Date Approved	Approved by	Date Inserted	Signature
1	4.1	21	1.9.2016	Petr Volejnik	1.9.2016	
1	8.1.	36-38	1.9.2016	Petr Volejnik	1.9.2016	
1	8.3.	38-39	1.9.2016	Petr Volejnik	1.9.2016	

Enclosure 2: **REPORT FORM - ZEPHYR AIRCRAFT**

WINGS AND HORIZONTAL TAIL COATING CONDITION		
Producer: ATEC, v.o.s., Czech Republic		
This form and the photo shall be submitted to: **sales@atecaircraft.eu**		
This form serves to report the condition of your aircraft to its producer based on findings from your regular inspections and shall be submitted to the producer once in 2-years period or immediatelly after some findings or anomalies are detected on horizontal tail or wings coating. At least visual inspection of horizontal tail and wings coating condition shall be performed before each flight according to Par. 4.1. of the Flight and Operations Manual. Please fill-out this form and describe the findings from your regular inspection of the aircraft. **Mark affected areas on the drawing on the next page 2 and 3 as most exactly as possible.** **Send the photo of your findings as the attachment to this form.** Correct and exact description of your findings will help us to identify the problem and suggest its appropriate solution as soon as possible. Non-authorized repairs or modifications are not allowed.		
Aircraft s/n:	Registration sign:	
Owner´s name:		
Contact (address, tel., e-mail):		
Description of the horizontal tail and wings coating condition:		
Anomalies founded (mark the option):	**NO**	**YES** – see the desription below:
Other findings:		
I send the photo of my findings attached.		
Inspection date:	Owner´s signature:	

View from above:



Bottom view: