The Sole Manufacturer and Distributor in Czech Republic:
ATEC v.o.s.

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Czech Republic

ATEC 321 FAETA NG with ROTAX 912 UL/ULS

Flight and Operations Manual

Libice nad Cidlinou, Czech Republic, November 2016

Type of aircraft: **ATEC 321 FAETA NG**

Serial number:

Registration/call sign:

Type Certificate: **ULL-04 / 2005** **Date of issue: 19. 10. 2005**

The UL aircraft (Sport Flying Device) is not a subject of CAA authorisation and is to be operated at own risk of the user.

The aircraft must be operated according to informations and limits listed in this manual.

Contents Chapter

Enclosures:

1. Log Book (example)

2. Records of Revisions

3. Service and Maintenance Book

Chapter 1

1. General

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1.1. Introduction

Information provided within this manual is a necessary requirement for an effective and save operation of the **ATEC 321 FAETA NG** aircraft. The manual contents information which Manufacturer considers as important.

1.2. Personal Data of the Owner

Owner of aircraft:.....

Address:.....

Telephone No:.....

E-mail:.....

Date of ownership from: to:.....

Owner of aircraft:.....

Address:.....

Telephone No:.....

E-mail:.....

Date of ownership from:..... to:.....

Owner of aircraft:.....

Address:.....

Telephone No:.....

E-mail:.....

Date of ownership from:..... to:.....

1.3. Aircraft Description

ATEC 321 FAETA NG is an ultralight, two-seater, cantilever, low-wing aircraft of all carbon composite construction. The landing gear has a fixed tricycle gear with a steerable nose wheel. The propulsion unit is in pulling configuration and consists of ROTAX 912 UL or ROTAX 912 ULS engine and two or three-blade fix or ground adjustable FITI propeller.

1.4. Modifications and Changes

If the Manufacturer makes any structural or operation changes necessary to be advised to the owner, the related documentation will be delivered to the owner, who is obliged to record them into this Manual. These documents will be published in ascending numerical series.

If the aircraft is sold to another person, the Manufacturer shall be announced about the name and contact information of the new owner.

1.5. Aircraft Technical Data

Dimensions

Wing span			9,6 m
Length of fuselage			6,2 m
Total height			2,0 m
Wing area			10,1 m^2
Depth of mean aerodynamic chord			1,11 m
Span of horizontal tailplane			2,6 m
Flap position	I	10 °	45 mm
	II	20 °	90 mm
	III	35 °	150 mm
Aileron deflection	up	20 °	80 mm
	down	12 °	58 mm
Elevator deflection	up	22 °	80 mm
	down	18 °	60 mm
Rudder deflection	L/R	+-20°	140 mm

Wing profile

Root area	SM 701
End area	SM 701

Landing Gear (tricycle with nose wheel)

Wheel spacing	1,9 m
Wheel base	1,4 m
Tyre dimensions (main gear)	350 x 120 mm
Tyre dimensions (nose wheel)	300 x 100 mm
Tyre pressure	0,16 MPa / 1,6 atp

Suspension

Main gear	composite springs
Nose wheel	rubber suspension

Brakes	hydraulic disc brakes on the main gear (brake fluid DOT 4 or DOT 5)
Rescue System	USH 52 S SOFT PACK / v_{MAX} = 293 km/h

Weight

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

Propulsion Unit and Engine Parameters

Propeller producer	FITI design s.r.o., Řevnice, Czech Republic
Type of propeller	**FITI ECO COMPETITION 2 blades or 3 blades**
Engine producer	BRP - ROTAX GmbH, Austria
Engine type	**ROTAX 912 UL / ROTAX 912 ULS**
Noise level	65 dB(A) in the altitude of 160 m (2 blades propeller, full power)

Engine Performance

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 max.
Max. continuous engine speed	5500 RPM
Cruising engine speed	4800 RPM
Engine idle speed	1400 RPM approx.

Cylinder Head Temperature

Minimum	60°C	60°C
Maximum	150°C	135°C

Oil Temperature

Minimum	50°C	50°C
Maximum	140°C	130°C
Operating	90°C-110°C	90°C - 110°C

Oil Pressure

Maximum (short-term operated when cold start-up)	7,0 bar
Minimum	0,8 bar (below 3500 RPM)
Operating	2,0 – 5,0 bar (over 3500 RPM)

Fuel Type	912 UL/80HP	MOGAS EN228	Normal, Super or Super Plus / min. RON 90
	912 ULS/100HP	MOGAS EN228	Super or Super Plus/ min. RON 95

Oil Type ..... Use only oil with **RON 424** classification or **AeroShell Sport Plus 4 10W-40** as an option.

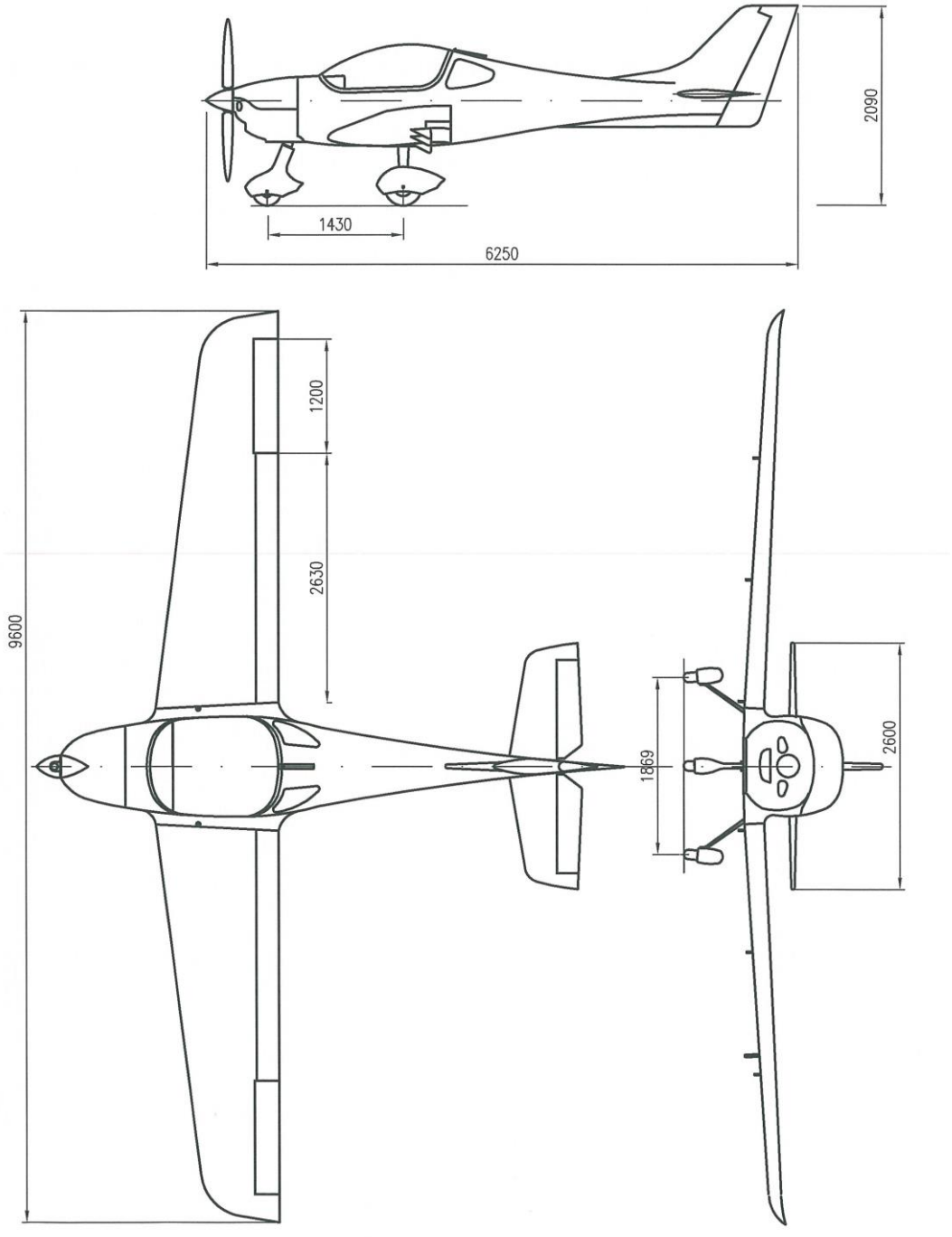
Coolant..... conventional (mix ratio 1:1) or Evans (see the Rotax Manual)

The engine characteristics, operation and maintenance are preferentially directed by appropriate Rotax Manual).

ROTAX 912 UL or ULS is not certified aviation engine. Any engine failure may occur at any time.
The pilot is fully responsible for operation of this engine and accepts all risks and consequences of an engine failure.
The correct operation of this aircraft is the sole responsibility of the pilot.
The pilot of sport flying device is obliged to consider the flight altitude and flight track so that to be able to make safety landing in case of engine failure.

1.6. Three-View Sketch

(mm)



Chapter 2

2. Operating Limits

2.1. Introduction
2.2. Air Speed
2.3. Weight
2.4. Centre of Gravity
2.5. Manoeuvre and Gust Envelope
2.6. Permitted Manoeuvres
2.7. Load Factors
2.8. Type of Operation
2.9. Crew
2.10. Fuel tank
2.11. Wind
2.12. Other Restrictions
2.13. Labels and Markings

2.1. Introduction

The Chapter 2 contains operating limits necessary for safe operation of the aircraft.

2.2. Air Speed(IAS)

Never exceed speed	v_{NE}	**290 km/h**	**157 kt**

Do not exceed this speed in any case!

Design manoeuvre speed	v_A	**167 km/h**	**90 kt**

After exceeding this speed, do not use full deflection of any control surface and do not make any sudden control operations. An overload of the aircraft may occure!

Maximum design cruising speed	v_C	**248 km/h**	**134 kt**

Do not exceed this speed except the flight in smooth air, but with caution!

Max. cruising speed at severe turbulence	v_{RA}	**240 km/h**	**130kt**

Do not exceed this speed at severe turbulence!

Max. speed, flaps extended I. (10 °)	$V_{FE,I}$	**130 km/h**	**70 kt**
Max. speed, flaps extended II. (20 °)	$V_{FE,II}$	**120 km/h**	**65 kt**
Max. speed, flaps extended III. (35 °)	$V_{FE,III}$	**110 km/h**	**59 kt**
Recommended speed, flaps extended III.	V_{FE}	**90 km/h**	**49 kt**

Do not exceed these speed limits when flaps extended!

Stall speed, flaps retracted	v_{S1}	**73 km/h**	**39 kt**

Flying this speed with flaps retracted results in loss of lift force and stall!

Stall speed in landing configuration	v_{S0}	**54 km/h**	**29 kt**

Flying this speed with flaps extended in position III. results in loss of lift force and stall!

2.3. Weight

Empty weight ..... kg

Maximum take-off weight ..... 472,5 kg

Useful load ..... kg

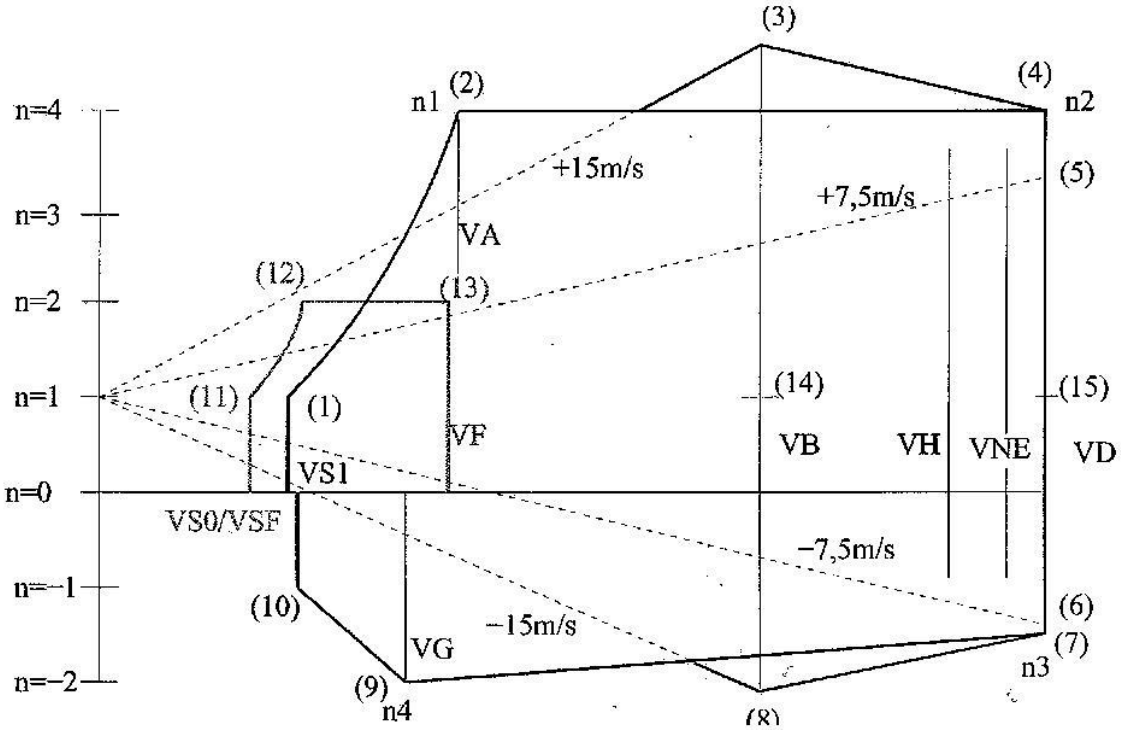
Never exceed maximum take-off weight of the aircraft!

2.4. Centre of Gravity (CG)

CG of the empty aircraft ..... % MAC

CG range allowance ..... 25-35 % MAC

2.5. Manoeuvre and Gust Envelope (CAS)



	CAS (km/h)	CAS (kt)	IAS (km/h)	IAS (kt)
V_{s0}	60	32,4	54	29,2
V_{s1}	78,4	42,3	73	39,4
V_{AF}	86,2	46,5	83	44,8
V_{S1N}	111,9	60,4	111	60,0
V_F	110	59,4	110	59,4
V_A	159	85,9	167	90,2
V_G	158	85,3	166	89,6
V_C	230	124,2	248	133,9
V_H	249	134,5	269	145,3
V_{NE}	268	144,7	290	156,6
V_D	298,8	161,3	324	175,0

2.6. Permitted Manoeuvres

Category of the aircraft: Normal

Operations are limited to non-aerobatic manoeuvres that include:

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

Aerobatic manoeuvres are prohibited!

2.7. Load Factors (when 472,5 kg MTOW)

Maximum positive load factor in CG	+ 5,05G
Maximum negative load factor in CG	- 3,05G

2.8. Type of Operation

Only VFR day flights are permitted (flight by visual reference to the ground during the daytime)

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

2.9. Crew

Number of seats	2
Minimum weight of crew	60 kg
Maximum weight of crew	180kg
Maximum load of the seat	90 kg

2.10. Fuel tank

Fuel capacity	2 x 50 L
Non-usable rest of fuel	1,2 L

2.11. Wind

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

a) take-off or landing headwind	up to 12 m/s
b) take-off or landing tailwind	up to 3 m/s
c) take-off or landing crosswind	up to 6 m/s

Never operate the aircraft when above listed wind range limits are exceeded!

2.12. Other Restrictions

Smoking, using of mobile phones, explosives and combustible materials and transport of movable objects are prohibited on board of the aircraft.

2.13. Labels and Markings

The aircraft shall be equipped with mandatory labels and markings. These must be placed on instrumental board in a visual field of pilot and must contain following information:

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

- Operating limits
  - Load and weight limits depending on the weight of crew, fuel and luggage
  - Speed limits for standard flight configurations

- Passenger Warnings
  - Definition of aircraft category, its airworthiness conditions and restrictions
  - Prohibition of intentional spins, stalls and aerobatics

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Chapter 3

3. Emergency Procedures

3.1. Engine Failure on Take-off
3.2. Engine Failure in Flight
3.3. Rescue System Activation
3.4. Fire on Board
3.5. Engine Loss
3.6. Emergency Landing
3.7. Safety Landing
3.8. Aborted Landing
3.9. Vibrations

3.1. Engine Failure on Take-off

1. Get the aircraft to gliding flight by pushing the stick forward maintaining the airspeed of 100 km/h (54 kt).
2. Determine the wind direction, adjust flaps to appropriate position, close the fuel valve, switch-off the ignition, adjust safety belts and switch off the main switch just before landing. *Note: Electric flaps actuation is only possible when the main switch is switched-on.*
   A) If altitude is below 50m (160ft), get the aircraft to landing configuration and make a landing in take-off direction with respect to eventual obstacles.
   B) If altitude is higher than 50m (160ft), choose a suitable area for emergency landing.

3.2. Engine Failure in Flight

1. Get the aircraft to gliding flight maintaining the airspeed of 100 km/h (54 kt).
2. Check the fuel level and make sure ignition is switched on.
3. If no significant failure on engine or its installation found, try again to start up the engine using the back-up fuel circuit. The engine can be started by electric starter even though the propeller turns in flight because of windmilling and its speed is not sufficient. It is not necessary to wait for the standstill of the propeller.
4. If the engine start-up is not successful, carry out emergency landing similar way as described in the Art.3.1.

3.3. Rescue System Activation

In case of distress, when definitively losing control of flight, activate the rescue system.

1. Switch off the ignition
2. Fasten the seatbelts
3. Remove the securing pin from activation handle
4. Fire the rescue system

In case of landing on limited space, when collision with an obstacle is inevitable, use the balistic rescue system as a braking device of the aircraft.

Note: the activation of the rescue system is only available from pilot´s seat

The aircraft may be damaged or the crew may be injured when using the rescue system!

3.4. Fire on Board

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

3.5. Engine Loss

1. Speed ..... 100 km/h (54 kt)
2. Flaps retracted
3. Instruments within tolerated values

3.6. Emergency Landing

Carried out in case of engine failure:

1. Speed ..... 100 km/h(54 kt)
2. Fasten seatbelts
3. Flaps position according to situation
4. Report the situation by radio
5. Close the fuel valve
6. Switch off the ignition
7. Switch off the main switch

In case of emergency landing on terrain, a surface not approved for take-off/landing of sport flying device, the aircraft may be damaged or the crew may be injured!

3.7. Safety Landing

Carried out in case of orientation loss, fuel exhaustion or any other reason when the aircraft is fully controllable.

1. Determine the wind direction
2. Choose any suitable landing surface
3. Make a low pass headwind along the right-hand side of the landing surface and inspect the terrain thoroughly
4. Make a pattern flight
5. Calculate the landing plan
6. Land in the first third of the landing area by using flaps in landing position

3.8. Aborted Landing

Carried out in case of wrong calculation of landing manoeuvre or bounce during landing and when the pilot considers aborted landing manoeuvre as more safe and decides to proceed the flight.

1. Set the engine run up to maximum power
2. Fluently set up flaps to take-off position – I
3. Reach the level speed of 110 km/h (59 kt)
4. Pull the control stick slowly to make the aircraft climbing by speed 110 – 120 km/h (59 – 65 kt)
5. Retract flaps

Maintain the aircraft in take-off axis by using rudder control throughout the flight.

3.9. Vibrations

In case of unusual vibrations occurance, it is necessary to:

1. Set the engine run up to appropriate RPM on which the vibrations are the lowest
2. Carry out safety landing, eventually find the nearest airfield to land

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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-up; Engine Start-up

4.2. Engine Warming-up

4.3. Taxiing

4.4. Engine Check

4.5. Procedures Before Take-off

4.6. Take-off and Climbing

4.7. Cruising Flight

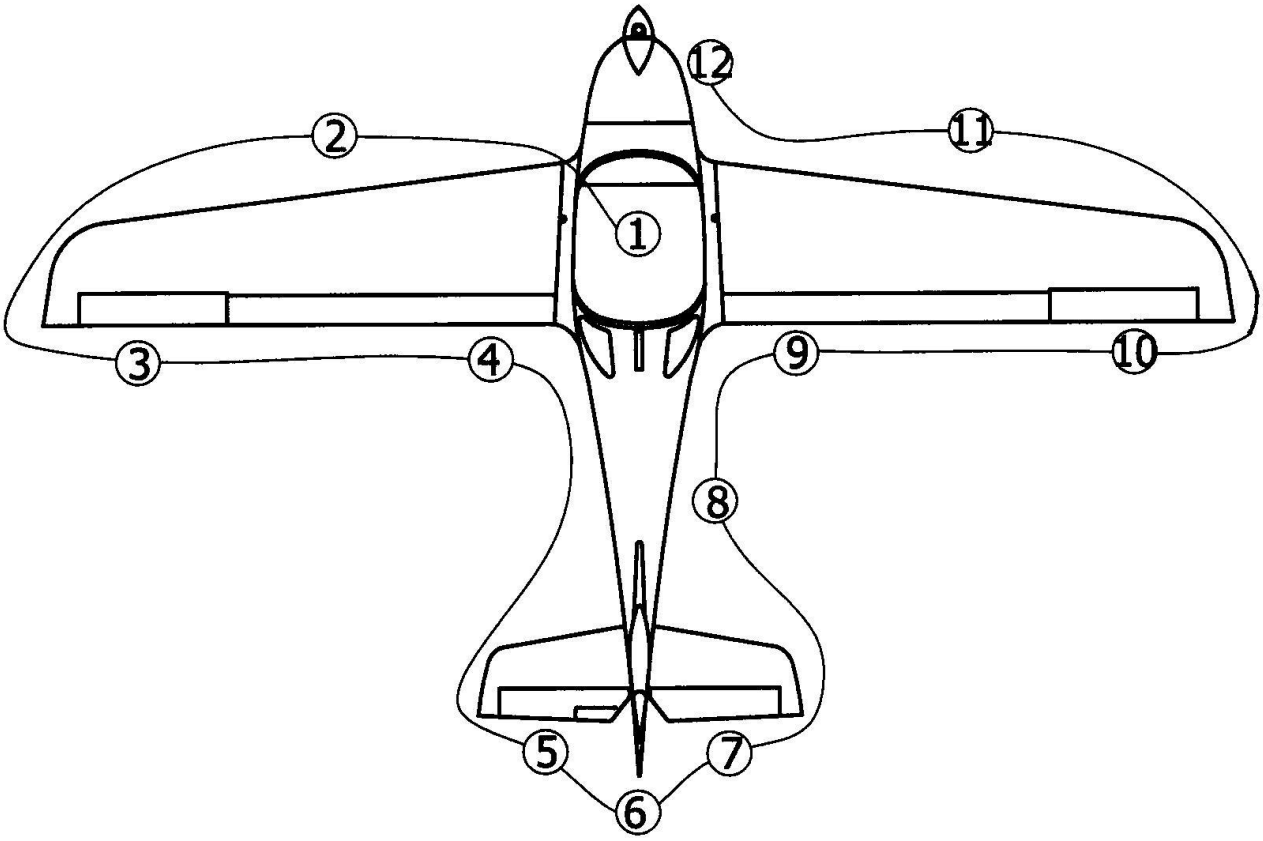
4.8. Descending and Landing

4.9. Flight in Rainy Conditions

4.10. Engine Shut-off

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 an accident. The Manufacturer recommends to do the following procedure:



1/ Cockpit – switches, seat belts, instruments, seats, controls, canopy locks, canopy condition check
2/ Left wing – coating, condition, plays, Pitot tube, fuel tank cap, drain valve, fuel tank ventilation
3/ Left aileron – coating, free movement, attachments, controls
4/ Left flap – coating, attachments, controls, play
Left gear leg – condition, brake fluid leak, wheel, tyre condition and inflation, wheel and spat attachment
5/ Left horizontal tail and elevator – surface condition, attachment, elevator free movement, plays, trimming tab
6/ Vertical tail and rudder – surface condition, rudder attachment, plays, ropes tension
7/ Right horizontal tail and elevator – surface condition, attachment, elevator free movement, plays, check the securing of the pin of the HT control
8/ Tailplane – surface condition, radio antenna check
9/ Right flap - coating, attachments, controls, play
Right gear leg - condition, brake fluid leak, wheel, tyre condition and inflation, wheel and spat attachment
10/ Right aileron - coating, free movement, attachments, controls
11/ Right wing – coating, condition, plays, fuel tank cap, drain valve, fuel tank ventilation
12/ Nose wheel – condition, play, wheel, tyre condition and inflation

Engine - condition and fastening of engine cowling, engine bed, hoses intactness (fuel, oil, cooling system), screws and nuts security, exhaust pipe and carburettors attachment, drain plug, oil and coolant level

a) Oil level –Open the cover of the inspection hole on the engine cowling and unscrew the cap of the oil tank. Manually turn the propeller few times in its rotating direction to press the oil from the engine into the oil tank. Stop turning the propeller when you hear the „bubbling sound" signalizing that only air starts flowing from the engine into the oil tank. Check the oil level with the dipstick in the oil tank and refill up to the maximum level if needed. Pay attention not to stain surrounding engine parts or its compartment by oil, otherwise remove oil spots properly. Cover the oil tank with the cap. Install the cover of inspection hole and secure by screws. Keep the oil level within the range marked on the dipstick. Always use the same type of the oil which is already used in the engine. Cover the oil tank with the cap. Never open the oil tank when the oil is hot!
b) Coolant level – Remove the upper cowling of the engine. The engine must always be cool when checking the coolant amount. Do not open the expansion tank when the coolant is hot! Loosen the cap of the expansion tank and check the coolant level. The maximum level allowance is about 2 cm below the rim of the expansion tank. If the level is low, refill appropriate amount of the coolant. Cover the engine by upper cowling and fix it by screws. Keep the coolant level in the overflow bottle within the marked range „MIN-MAX".
13/ Propeller check– surface condition, blades and spinner tightness

4.1.1. Procedures Before Entering the Cockpit

1.	Canopy	⇨	open
2.	Ignition	⇨	switched off
3.	Main switch	⇨	switched off
4.	Rescue system	⇨	secured
5.	Pedals position	⇨	adjust to appropriate position (if equipped with adjustable pedals)
6.	Seats position	⇨	adjust to appropriate position (if equipped with adjustable seats)

4.1.2. Procedures After Entering the Cockpit

1.	Cockpit	⇨	check canopy fastening and locking, proper function and condition of electric installation of instruments, condition of flight instruments, fuel level check, proper function of controls, rescue system securing against unintended activation
2.	Foot-operated steering	⇨	check function, proper adjustment of pedals
3.	Brakes	⇨	check function, brakes on
4.	Hand–operated steering	⇨	check function, free movement, stops
5.	Flaps	⇨	check function, retract
6.	Fuel valve	⇨	open for appropriate tank in use
7.	Throttle	⇨	idle
8.	Fuel level indicator	⇨	check fuel amount
9.	Main switch	⇨	switched off
10.	Ignition	⇨	switched off
11.	Instruments	⇨	check condition, zero values, altimeter setting

4.1.3. Procedures Before Engine Start-up; Engine Start-up

Do not start-up the engine if there is a person in vicinity of the aircraft!

1. Rescue system ⇨ unlock (if equipped with)
2. Safety belts ⇨ fasten
3. Canopy ⇨ close and lock
4. Parking brake ⇨ on
5. Fuel valve ⇨ turn on (open/select for appropriate tank intended to use)
6. Choke ⇨ turn on - in case the engine is cold
7. Throttle ⇨ idle
8. Main switch ⇨ switch on
9. Ignition ⇨ both circuits switched on
10. Brakes ⇨ on

Do not press the starter as long as the engine is running. Wait until complete stop of the engine.

11. Starter button ⇨ press and hold (without interruption) for max. 10 sec.; adjust throttle to reach a smooth run at approx. 2500 RPM
12. Oil pressure ⇨ minimum 0,8 bar within 10 seconds; Monitor oil pressure. Increase engine speed when oil pressure remains steady above 2 bar.
13. Choke ⇨ turn off
14. Warm the engine up to the operating temperature

Never unlock neither open the canopy when engine is running!

4.2. Engine Warming up

Start warming up the engine when 2000 RPM, after approx. 2 min. continue warming up to 2500 RPM until reaching the oil temperature of 50°C. After the engine is warmed up to the operating temperature, start taxiing and prepare to take-off without undue delay to avoid overheating of the engine.

4.3. Taxiing

Maximum recommended speed of taxiing is 15km/h (8kt). The direction is controlled by the nose wheel. Braking is carried out with the brake lever on the left control stick. Control stick is in neutral position.
- in case of strong headwind, push the control stick forward
- in case of crosswind, hold the control stick position opposite to wind direction

4.4. Engine Check

1. Brakes ⇨ on
2. Throttle ⇨ 4000 RPM
3. Switch off 1st ignition circuit ⇨ max. RPM drop after stabilization must not exceed 300 RPM
4. Switch on both ignition circuits ⇨ 4000 RPM
5. Switch off 2nd ignition circuit ⇨ max. RPM drop after stabilization must not exceed 300 RPM
   Note: The RPM speed difference between ignition circuits running separately must not be more than 115 RPM.
6. Throttle ⇨ reduce to idle run

7. Left and right fuel tank check ⇨ during engine run, the fuel pressure must not drop below tolerated value in either of fuel tanks in use. During the change-over of fuel tanks in use, a short-term pressure drop may occur. After the appropriate fuel tank is selected, the fuel pressure must return to appropriate values.

After the engine check is finished and operating temperature is reached, carry on take-off within max. 5 min. If the aircraft is grounded when engine is running for a long period, the engine and its compartment are not sufficiently cooled by the airflow. This may cause overheating and damage of the engine and composite structure of its compartment.

4.5. Procedures Before Take-off

1.	Brakes	⇨	on
2.	Rescue system	⇨	unlock (if equipped with)
3.	Foot-operated steering	⇨	free travel
4.	Hand-operated steering	⇨	free travel
5.	Flaps	⇨	position I.
6.	Fuel valve	⇨	open (left/right) for appropriate fuel tank intended to use
7.	Choke	⇨	turned off
8.	Throttle	⇨	idle
9.	Fuel indicator	⇨	fuel amount check
10.	Instruments	⇨	switched on, values within operating limits
11.	Safety belts	⇨	adjusted, fastened, secured
12.	Canopy	⇨	closed and locked

4.6. Take-off and Climbing

Release the brakes. Make the aircraft move by accelerating until the maximum throttle position is reached. Control stick in neutral position. Control the nose wheel and the rudder to keep the aircraft within the runway axis.

When reaching the speed of 75km/h (45kt), gently pull the control stick to lift up the aircraft and continue take-off up to the speed of 110km/h (59kt). Then, gently pull the control stick to start climbing by optimum speed of 110km/h (59kt). After reaching the stable climbing speed of 110-120km/h (59-65kt) and altitude over 50m (160ft), fluently retract the flaps.

Limit values of the engine must not be exceeded during the take-off. Climbing at full take-off power is only allowed for a period of max. 5 minutes. When requested flight level is reached, adjust the propeller to “cruise” position *(if equipped with in-flight adjustable propeller)*.

4.7. Cruising Flight

ATEC 321 FAETA NG has good flight characteristics within the whole range of permitted speeds and position of the centre of gravity. The cruising speed range is **120 – 248km/h (65 – 134kt)**.
Pay attention to values displayed on flight and engine instruments. The values must not be exceeded throughout the flight. Optimum operating oil temperature shall be within a range of 90-110°C.

4.8. Descending and Landing

Descending

Descend with throttle on idle when speed of 100km/h (55 kt).
Flaps position limits according to Art. 2.2. Propeller in "take off" position *(if equipped with in-flight adjustable propeller)*.

Procedures on final:

1. Propeller in "take-off" position *(if equipped with in-flight adjustable propeller)*
2. Speed of 90km/h (49kt)
3. Flaps position III (position II. in case of strong turbulence or strong headwind)
4. Throttle idle or corrected if necessary
5. Instruments within permitted limits

Landing

The speed of the aircraft in hold-up position decreases by soft pulling of the control stick until touch down at the speed of 70km/h (38kt). After touch-down of the nose wheel, the landing distance can be shortened by braking.

Do not apply maximum braking power except an extreme situation occures. A frequent use of brakes results in undue wear of tyres, brake pads and discs. A frequent intensive braking may cause a mechanical over-stress of undercarriage and other load bearing structure. This may shorten the life-time of the airframe.

4.9. Flight in Rainy Conditions

During the flight in the rain, it is necessary to pay close attention to the aircraft control because of poor visibility and limited transparency of the canopy. Furthermore, shorter hold-up position when landing and extended take-off distance must be taken into account.

Maintain the following speeds during the flight in the rain:

1.	Climbing	120 km/h (65kt)
2.	Cruising flight	120 – 180 km/h (65 – 97kt)
3.	Descending to land	110 km/h (59kt), flaps positions I and II as by Art. 2.2.

4.10. Engine Shut-off

After landing and taxiing to the parking place, keep the engine running by approx. 2000 RPM for a period at least 2 min. to cool it down. If the engine was cooled down enough by descending flight and taxiing, it can be shut-off as soon as the aircraft is stopped. Always keep the fuel valve open for appropriate fuel tank in use.

Chapter 5

5. Performances

5.1. Introduction
5.2. Air Speed Indicator Corrections
5.3. Stall Speed
5.4. Altitude Loss by Stalling
5.5. Take-off Distance up to 15m / 50ft
5.6. Rate of Climb
5.7. Cruising Speed
5.8. Flight Range

5.1. Introduction

The Chapter contents information on speed indicator calibration, stalling speed and other performances of the aircraft equipped with ROTAX 912 UL or ULS engine and propeller FITI ECO COMPETITION 2L/160 with the pitch adjusted to 21° / 85% for climbing.

5.2. Air Speed Indicator Corrections

IAS (km/h)	*CAS (km/h)*	*IAS (kt)*	*CAS (kt)*	*Deviation (km/h / kt)*	*Note*
54	*60*	*29,2*	*32,4*	*-6/-3,2*	V_{so}
75	*78,4*	*40,5*	*42,3*	*-3,4/-1,8*	V_{s1}
100	*102*	*54*	*55,1*	*-2/-1,2*	
120	*120*	*64,8*	*64,8*	*0/0*	
140	*138*	*75,6*	*74,5*	*+2/+1,2*	
160	*154*	*86,4*	*82,1*	*+6/+3,7*	
167	*159*	*90,2*	*85,9*	*+8/+5*	V_A
180	*171*	*97,2*	*92,3*	*+9/+5,6*	
200	*190*	*108*	*102,6*	*+10/+6,2*	
220	*205*	*118,8*	*110,7*	*+15/+9,3*	
240	*223*	*129,6*	*120,4*	*+17/+10,5*	
248	*230*	*133,9*	*124,2*	*+18/+11,2*	V_C
260	*241*	*140,4*	*130,1*	*+19/+11,8*	
280	*259*	*151,2*	*139,9*	*+21/+13*	
290	*268*	*156,6*	*144,7*	*+22/+13,7*	V_{NE}

5.3. Stall Speed (CAS)

Engine idle	*Flaps retracted*	*Flaps I (10°)*	*Flaps II (20°)*	*Flaps III (35°)*
Solo flight	69,5 km/h 37,5 kt	64 km/h 34,5 kt	58km/h 31,3 kt	52 km/h 28 kt
472,5 kg	79,5 km/h 43 kt	72,0 km/h 38,9 kt	67 km/h 36,2 kt	60 km/h 32,4 kt

Engine off	*Flaps retracted*	*Flaps I (10°)*	*Flaps II (20°)*	*Flaps III (35°)*
Solo flight	69,5 km/h 37,5 kt	64 km/h 34,5 kt	58 km/h 31,3 kt	52 km/h 28 kt
472,5 kg	79,5 km/h 43 kt	72,0 km/h 38,9 kt	67 km/h 36,2 kt	60 km/h 32,4 kt

5.4. Altitude Loss by Stalling

Flap position (level flight)	*Flap deflection*	*Altitude loss*	
I	10°	30 m	100 ft
II	20°	30 m	100 ft
III	35°	30 m	100 ft
0	0	30 m	100 ft

5.5. Take-off Distance up to 15m / 50ft

Engine	*80 HP*		*100 HP*	
Runway surface	*Take-off distance*		*Take-off distance*	
Asphalt	270 m	880 ft	245 m	800 ft
Grass	290 m	950 ft	265 m	870 ft

5.6. Rate of Climb (when speed of 110 km/h (59 kt))

Engine	*80 HP*		*100 HP*	
Solo flight	6,0 m/s	1182 ft/min	7,5 m/s	1476 ft/min
472,5 kg	4,5 m/s	886 ft/min	6,0 m/s	1182 ft/min

5.7. Cruising Speed

ROTAX 912 UL 80 HP

Air speed		*RPM*	*Fuel consumption*
km/h	*kt*		*l/h*
120	65	4000	5,8
140	76	4250	7,2
160	86	4400	9,5
180	97	4700	10,8
200	108	5000	13,1
220	119	5300	17,0

ROTAX 912 ULS 100 HP

Air speed		*RPM*	*Fuel consumption*
km/h	*kt*		*l/h*
120	65	3500	7,5
140	76	3700	8
160	86	4100	10,1
180	97	4500	13,2
200	108	4800	14,7
220	119	5200	17,5
240	130	5500	20

5.8. Flight Range

When maximum fuel amount of 100 L

ROTAX 912 UL 80 HP

Air speed		*Flight range*		*Flight endurance*	*Flight reserve (10 L)*
km/h	*kt*	*km*	*n.m.*	*h*	*h*
140	76	1750	945	12:30	1:23
160	86	1515	818	9:28	1:23
180	97	1500	810	8:20	0:55
200	108	1374	742	6:52	0:45
220	119	1164	628	5:17	0:35

ROTAX 912 ULS 100 HP

Air speed		*Flight range*		*Flight endurance*	*Flight reserve (10 L)*
km/h	*kt*	*km*	*n.m.*	*h*	*h*
140	76	1575	850	11:15	1:15
160	86	1425	769	8:54	1:00
180	97	1227	662	6:48	0:45
200	108	1224	661	6:06	0:40
220	119	1131	610	5:06	0:34
240	130	1080	583	4:30	0:30

Information on engine RPM, consumption, flight endurance and flight range are of informative character only. Listed values are dependent on propeller type and pitch, flight altitude, temperature, air pressure and aircraft load. The flight range is considered as theoretic, when windless conditions. When planning the flight track, do consider these factors and safe amount of fuel reserve!

Chapter 6

6. Aircraft Assembly/Disassembly

6.1. Introduction
6.2. Horizontal Tail Assembly/Disassembly
6.3. Wings Assembly/Disassembly

6.1. Introduction

The assembly of individual parts of the aircraft is described in this chapter. At least two persons are needed for assembly/disassembly. All parts necessary for assembly are delivered with the aircraft.

Before assembly, clean, grease and then secure all pins. Pay attention to correct adjustment of ailerons and flaps, which is carried out by shortening and prolonging of connecting pushrods.

With each next assembly, it is necessary to replace locking nuts and split pins with new pieces.

After the aircraft is assembled, make deflections adjustment according to levelling record and carry out engine check with a focus on both fuel tanks function. Check the correct values on the fuel indicators.

6.2. Horizontal Tail (HT) Assembly / Disassembly

At least two people are needed for HT assembly/disassembly. Pay attention to avoid a fall of small parts into the inner space of the tail during manipulation!!

Horizontal tail assembly

To reach better access to the attachment points of the HT, it is recommended to remove the vertical tail rudder. Unscrew two M5 screws fixing the rudder in the carrier. Then, deflect the rudder fully either to the right or to the left. Pull the rudder rearwards out of the lower carrier, then remove the rudder upwards out of the upper hinge.

- **Horizontal tail attachment to the fuselage**

Remove the cover of the mounting hole under the right half of the HT on the left side of the fuselage. Connect the right half of the HT with the elevator first and insert the cross-beam into the hole in the fuselage. Simultaneously insert the elevator into pins in the steering lever. Connect the left half of the HT same way.

It is necessary to simultaneously put the wire of the trim servo through the hole into the fuselage. Then, put two M8 screws into holes connecting both halves of the HT and screw them into the bulkhead in the fuselage. The screws must be fitted with a locking washer to avoid their self-loosening and must be properly tightened.

Finally, screw M5 screws (in the front root area of the HT stabilizer), which connect both HT halves by the connecting tube, into both HT halves. The screws are necessary to secure by Loctite glue.

Install the cover of the mounting hole on the left side of the fuselage under the HT. Finally, cover the gap between the fuselage and HT stabilizer by any suitable white plastic tape which avoids water intrusion into the fuselage.

• Vertical tail rudder installation
Adjust the foot-operated steering either to left or right deflection. In such position then install the upper bolt of the HT rudder into the upper hinge and simultaneously install the lower carrier. Adjust the steering to neutral position and install two M5 screws securing the HT rudder in the lower carrier.

HT disassembly

Disassembly of the HT is carried out in reverse order than assembly. First, pull out the vertical tail rudder, then unscrew the front M5 screws from the upper part of the HT. Finally, unscrew both M8 screws connecting the HT with the fuselage. Remove both HT halves out of the fuselage.

6.3. Wings Assembly/Disassembly

At least two people are needed for wings assembly/disassembly. One for assembly and one (or better two) assistant(s) to hold and support the wing to avoid its fall and damage.

Do not push on the wing surface to avoid cracks in the gel-coat especially in the area of material connections.

Your assistant holds the wing on the wingtip and you hold it on the root. (The second assistant which can hold the wing by the flap would be helpful).

Disconnected wing shall be placed on any smooth soft pad (e.g.mattress) to avoid its damage.

Wings assembly
(same for both left and right wing)

•Flap pushrod preparation - connection into the wing
Put the wing into the position by its leading edge down (on the soft pad). Hold the wing together with your assistant, who deflect the flap and so the rod lever will protrude out. This enables you better access to connect the flap pushrod with the flap lever.

Pay attention to install the correct pushrod (LEFT („L“) or RIGHT („R“)) to appropriate wing. Pay attention to correct pushrod position (its non-adjustable end leads into the wing and the adjustable one towards the fuselage (the sticker with letters L/R will be on upper side). Fix the connection by the pin of Ø5mm and spacer + split pin (all such parts delivered attached on the pushrod).

•Aileron pushrod preparation - connection into the wing
Screw the aileron pushrod to the adjustable end protruding from the wing. Pay attention to install the correct pushrod (LEFT or RIGHT) to appropriate aileron. Exact tuning will be adjusted later.

•Wing Connection to the fuselage
Prepare two of main wing pins. Lubricate them with an appropriate quantinty of vaseline. Pay attention to their correct position - UPPER wing pin is WITHOUT thread, LOWER wing pin is WITH thread.

Your assistant holds the wing by the wingtip and you hold it by the root. (The second assistant who can hold the wing by the flap would be helpful).

Pick the wing up and attach it close to the fuselage so that pushrods (aileron and flap) enter the fuselage through the appropriate holes, but keep the space between the wing and fuselage yet to reach enough access to connect the rest of the equipment. All of you are still holding and supporting the wing to avoid its fall. Then you support the wing by your knees (at the area of wing root) and connect (or you just hold the wing and another assistant can help you to connect):

- static and dynamic pressure hoses of Pitot tube (just on the left wing)
  Note: Pay attention not to interchange the hoses of Pitot tube during assembly.
- quick couplings of fuel hoses
- cable connector of the fuel gauge
- cable connector of the strobes/position lights *(if equipped with)*

Push the wing towards the fuselage to attach it completely without any play between the wing and fuselage. Insert the main wing pins into the hole with fittings (wing attachment) inside. Insert the upper pin (without thread) first and then insert the bottom pin (with thread). This operation requires careful use of the hammer and auxiliary metal rod (Ø 18mm) to beat the pin into the hole. During this operation, the assistant (holding the wing on the wing tip) pays attention to keep the correct dihedral angle. If needed, he can slightly lift the wing up to fit the fittings exactly with the hole in correct position and so to enable pins easily pass through the fittings. Both pins must be inserted to their fully beaten position. Then the assistant can leave the wing.

Secure the pin from upper side by the bolt – torque is approx. 25 Nm. Install the M10 self-locking nut from the bottom side, so that the wing connection is properly secured.

Cover the holes with any plastic white sticker (to avoid water intrusion).

•Flaps pushrods connection inside the cockpit

Take the seats out of the cockpit to have a better access to the flap steering lever situated in the central tunnel. Connect pushrods to the flap lever using the pin Ø5mm and spacer + split pin (all parts delivered attached to the pushrod). You can insert the pin Ø 5mm from the bottom side (better accessibility for the spacer and split pin assembly). Install seats back.

•Aileron pushrods connection inside the cockpit

Screw the pushrods to the control stick to fully tightened position. Then loosen it again by a number of turns indicated on the pushrod. This ensures correct neutral position of ailerons. Secure the connection with the pin Ø5mm and spacer + split pin (all parts delivered attached to the pushrod).

Wings disassembly

First of all, drain off the fuel from both wing tanks.

Disconnect ailerons pushrods (from the control stick) and flaps pushrods (in the central tunnel) inside the cockpit.

Release and remove the locking nuts of wing pins bolts. Screw the bolts out by approx. 2cm.

Beat out the bottom pin by light tapping on the head of the bolt by the hammer. Unscrew the bolt and remove the bottom pin.

The assistant (holding the wing by the wing tip) can slightly lift the wing if needed to enable pins to be pulled-off more easily.

Beat out the upper pin by the hammer with a help of any metal rod of Ø 18mm.

After pins removal, your assistant holds the wing by the wingtip and you hold it by the root. (The second assistant which can hold the wing by the flap would be helpful).

Partially pull the wing out of the fuselage, so that you reach the space between the wing and fuselage to have enough access to disconnect the equipment. All of you are still holding and supporting the wing to avoid its fall.
Then you support the wing by your knees (at the area of wing root) and disconnect (or you just hold the wing and another assistant can help you to disconnect):
- static and dynamic pressure hoses of Pitot tube (just on the left wing)
  Note: Pay attention not to interchange the hoses of Pitot tube during their next re-assembly.
- quick couplings of fuel hoses
- cable connector of the fuel gauge
- cable connector of the strobes/position lights (if equipped with)

Store the wings on safe and dry place with stable temperature. Wings need to be properly secured and prevented from structural and surface damage.

Chapter 7

7. Aircraft and System Description

7.1. Wing
7.2. Fuselage
7.3. Tailplane
7.4. Landing Gear
7.5. Steering
7.6. Propulsion
7.7. Fuel System
7.8. Instruments
7.9. Controlling Elements
7.10. Canopy
7.11. Cockpit Equipment

7.1. Wing

The cantilever tapered backswept wing of an angle of 5,5° with SM 701 airfoil along the whole span is a reinforced shell of carbon composite sandwich with carbon composite coating. The wing spar is made of laminated hard beech wood saturated with synthetic resin and is situated in 30% of the wing depth. The ailerons are hinged on the rear spar and slotted flaps are hinged on composite hinges with turning point under the outline profile. Ailerons and flaps are of all-composite structure. Wing root ribs are made of carbon sandwich, other ribs are made of plastic foam. The main spar is welded of high quality CrMo steel tubes.

7.2. Fuselage

The fuselage is all-composite carbon-fibre shell braced with carbon sandwich bulkheads, NOMEX honeycomb and hardened foam. The fuselage cross section has elliptic shape with aerodynamic wing base and spacious cockpit covered by the perspex canopy. The luggage compartment with two small side-windows behind the seats are the part of the cockpit. The engine is in the front part of the fuselage. It is separated from the cockpit by the firewall to which the engine mount and the steerable nose wheel are attached.

7.3. Tailplane

The tailplane is of all-composite structure designed in classical crosstail arrangement. The horizontal tail of trapezoidal shape consists of fixed stabilizer and elevator. The vertical tail is of trapezoidal shape. The rudder is of all-composite structure.The tail fin is an integral part of the fuselage. The elevator trim can be mechanical or electrical (optional equipment).

7.4. The Landing Gear

The landing gear is a fixed tricycle undercarriage with a steerable nose wheel. The main gear is designed as a pair of composite leaf springs. The integral nose leg with aerodynamic fairing made of composites and metal tube is suspended with rubber springs. Main wheels size is 350x120 mm, nose wheel size is 300x100 mm. The main wheels are fitted with hydraulic disc brakes. All wheels are covered by wheel spats.

7.5. Steering

The steering of all control surfaces is doubled. The ailerons, flaps and elevator are controlled by control rods and levers, the rudder is controlled by steel wire ropes. Lift flaps are optionally equipped with electrical control. All controls attachments are installed the way so that not to interfere the airframe contour. The important checking points in wings are equipped with inspection holes with perspex covers. The control is possible to balance longitudinally.

7.6. Propulsion

The propulsion unit is ROTAX 912 UL or ROTAX 912 ULS engine and three or two blade FITI ECO COMPETITION propeller, which can be fix, ground or in-flight adjustable.

7.7. Fuel System

The fuel system consists of two fuel tanks inbuilt in wings with a total fuel capacity of up to 100 litres (2 x max. 50L). The piping connection is equipped with a sediment bowl and a drain plug. The fuel supply is assured by two independent circuits with back-up electrical fuel pump. Unused fuel returns back to the fuel tank. The fuel pressure is measured by the pressure gauge. When the fuel indicator light turns on, the fuel reserve is 5L.

7.8. Instruments

The instrumental equipment consists of basic flight and engine instruments and navigation system. The static and dynamic pressure value is taken from the Pitot tube installed on the underside of the left wing. Instruments layout on the dashboard is shown on the picture in the Art. 7.11.

If the aircraft is equipped with SSR transponder, this must be switched-on during the flight. The installation of SSR transponder must be provided by appropriate authorized person.

Basic transponder squawks:
- 2000 - controlled flight
- 7000 - uncontrolled flight
- 7500 - unlawful interference (hijack)
- 7600 - communication failure / radio contact loss
- 7700 - emergency

When setting up the new squawk, the transponder must be in “STAND-BY” mode.

7.9. Controlling Elements

Foot-operated control
By pushing the left pedal when appropriate speed is reached, the aircraft turns left when moving on the ground or in the air, and vice versa. Pedals can be adjustable in three positions (optional equipment).

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

Wing flaps – mechanical option
The flaps are released to move when the release button on the control lever is pushed. By pulling the lever upward, flaps are extending step by step to positions I, II, III, and vice versa. After the release button is released, the flaps stay in appropriate stabilized position.

Wing flaps – electric option
The flaps are actuated by linear potentiometer adjusting positions I, II, III or OFF with help of servo engine. Each flap position is indicated by indicator light.

Engine throttle
By pushing the throttle lever forward, the engine power increases and vice versa.

Choke
By pushing the choke lever forward, the choke opens and vice versa.

7.10. Canopy

The cockpit is covered with hinged perspex canopy with two small sliding windows. The canopy opens up and backwards. Electrical blocking system on canopy locks disables to start-up the engine in case the canopy is not properly closed. Mechanical blocking system (the lever to open/close canopy) prevents the canopy from self-opening during the flight. Small dismisting fan installed on the top of the dashboard avoids canopy fogging (optional equipment).

7.11. Cockpit Equipment

(picture and description as by individual configuration)

Chapter 8

8. Care and Maintenance

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

8.1. Maintenance Schedule

Inspection, Mandatory Work	Inspection Period (hours)				
	10	**25**	**50**	**100**	**200**
Engine					
As per ROTAX Manual attached.					
Engine Compartment					
Engine Bed Check integrity of construction with a special focus on welds, fixing points, silent blocks, bushings. Check surface condition.				**x**	
Bolted Connections Check surface condition of bolted connections, bearing surfaces. Check securing and tightening. Tighten and re-secure if necessary. Replace locking nuts, split pins and securing wires.			**x**		
Silentblocks Check elasticity of engine bearing, integrity of rubber blocks, degree of permanent deformation. Replace silent blocks if necessary, tighten, secure.				**x**	
Oil, Coolant and Fuel Hoses Check surface integrity, leakage, condition of connections, protection avoiding touching with oscillating parts and exhaust system. Replace if necessary.		**x**			
Operating Liquids Check level, refill according to instructions of the engine producer.	**x**				
Coolers Check integrity, sealing, purity.				**x**	
Controls Check forces, end stops adjustment, plays, hinges, self-locking. Adjust, secure.			**x**		
Exhaust piping Check attachment, integrity, sealing, surface condition, corrosion degree, springs condition and prestress. Grease ball connections by a special lubricant.				**x**	
Carburettors Check attachment, surface condition, controls adjustment, condition of elastic connection flange – integrity, sealing. Replace flange if material degradations or surface cracks appear.			**x**		
Electric Installation Check integrity, purity and general condition of cables, insulation, contacts, soldered joints, wiring harness attachment to the airframe and bushings. Check probes and indicators interconnections.					**x**
Propeller Attachment Check condition of bolts, torques, securing.				**x**	

	10	25	50	100	200
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 a special focus on surface cracks near welds. Full and free movement right and left (raise nose wheel off the ground), end stops adjustment, rudder cables tension, clearance fits, securing. Adjust, replace worn-out parts, grease, secure.				**x**	
Flap Control Check free movement of flaps and control lever, stable bearing in each flap position, interlock pin wear. Replace worn-out parts, grease, secure.			**x**		
Canopy – Open / Close Check condition and function of locks and hinges, canopy bearing. Adjust, replace worn-out parts, grease, secure.					**x**
Flight and Engine Instruments Check legibility, markings, mounting in the panel board, air-operated and electric installations, wiring.					**x**
Electric Installations Check condition, integrity and purity of cables, insulations, contacts and welds. Battery attachment, operating condition.					**x**
Safety Belts Check fixing points rigidity, belt surface condition, adjustment.				**x**	
Fuel System Check leakage, fuel supply, pumps, gauge and valve function, drain plug, tank ventilation and deterioration. Replace fuel filters.		**x**			
Ballistic Rescue System Visual check of general condition, rocket, lines, attachment to bulkhead. Maintenance according to the manual of the rescue system producer.					**x**
Landing Gear					
Main Gear Check attachment, rigidity, surface condition, clearance, degree of permanent deformation.			**x**		
Wheels Check attachment, brakes condition, brake pads and disc condition, brake circuit leakage. Attachment and purity of wheel spats.		**x**			
Nose Gear Check general condition, surface, integrity, rubber springs condition and deflection when loaded, steering condition. Grease slide bearings, replace rubber springs if worn-out.		**x**			
Fuselage Check general condition, integrity, purity. Antennas, lights, covers and cowlings attachment.					**x**

	10	25	50	100	200
Wings Check general condition, surface condition, integrity, attachment, fittings, bolts, clearance. Ailerons and flaps condition, surface condition, hinges, clearance, securing. Controls condition, free movement, end positions, clearance. Pitot tube condition and attachment.			**x**		
Tailplanes					
Rudder, Elevator Check general condition, hinges, movement, clearance, securing.					**x**
HT Stabilizer Check general condition, attachment, fittings, securing.				**x**	

8.2. Aircraft Repairs

Each damage, which may have an influence on airframe strength or flight characteristics must be reported to the Manufacturer. The Manufacturer determines a way of repair.
Minor repairs mean the repairs of those parts, which substantially do not take a part in the aircraft function and stiffness. Among permitted repairs belongs:

- paint repairs
- worn-out parts exchange
- repairs of wheel tyres

Above mentioned minor repairs can be carried out by the owner himself. Repairs of torsion box, spars, wings and tailplane, landing gear and fuselage load-bearing structure must be carried out by authorized or specialized workshop. If any surface repairs or changes, a white tone colour must be kept on upper side exposed to sunshine.

8.3. Engine Major Overhaul

The major overhaul is carried out after 2000 flight hours but not later than 10 years after putting the aircraft into operation, unless decided otherwise during regular technical inspections or by the Manufacturer bulletin. The overhaul is performed by authorized or special workshop. The overhaul and maintenance are carried out according to manual of the engine producer.

8.4. Anchorage of the Aircraft

Anchorage of the aircraft is necessary in order to avoid eventual damage caused by wind or wind blasts during parking outside the hangar. For this purpose, the aircraft is equipped with screw mounting points for eyelets on the underside of the wingtips.

8.5. Cleaning and Care

The aircraft surface should always be treated with suitable cleaning agents. Oil and grease remnants can be removed from the aircraft surface by suitable surface active substances or alcohol. The canopy should be only cleaned with a sufficient tepid water flow with addition of suitable surface active substances. Never use petrol or chemical solvents. Do not use water jet stream for airframe cleaning and avoid water inlet into Pitot-static system, engine compartment, ventilation holes and other open areas on the airframe.

8.6. Storage

The aircraft shall be stored covered on a dry place or facility to be prevented from structural or surface damage which can be caused by weather influence e.g. high humidity, high sunshine or temperature changes.

A stored aircraft shall be properly fixed to avoid self-movement. All instruments, switches, magnetos and ignition shall be switched off. Rescue system shall be properly secured to avoid its activation. Pitot tube shall be covered with an appropriate cover to avoid internal pollution of the Pitot system. Any cloth cover of the canopy is recommended to avoid risk of scratches.

If the aircraft is supposed to not to be operated for longer than one month period, it is recommended to remove back-up batteries from instruments (GPS, EFIS...) and to maintain them charged. The main battery shall be maintained charged.

The tyres inflation pressure shall be periodically checked.

For engine maintenance during the aircraft storage, follow the instructions of the engine producer.

Chapter 9

9. Weight 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 Sheet

9.1. Introduction

Weight, useful load and centre of gravity data are described in this chapter.

9.2. Empty Weight

The empty weight is the weight of fully equipped, ready to operate aircraft, excluding fuel and crew. Empty weight is a total sum of all weight values measured under all undercarriage wheels simultaneously.

The **empty weight** of the aircraft is

..... kg

9.3. Maximum Take-off Weight

The maximum take-off weight defined by the Manufacturer and Czech UL 2 regulation is

472,5 kg

Never exceed the maximum take-off weight!

9.4. Centre of Gravity Range

Centre of gravity of empty aircraft is ..... % MAC

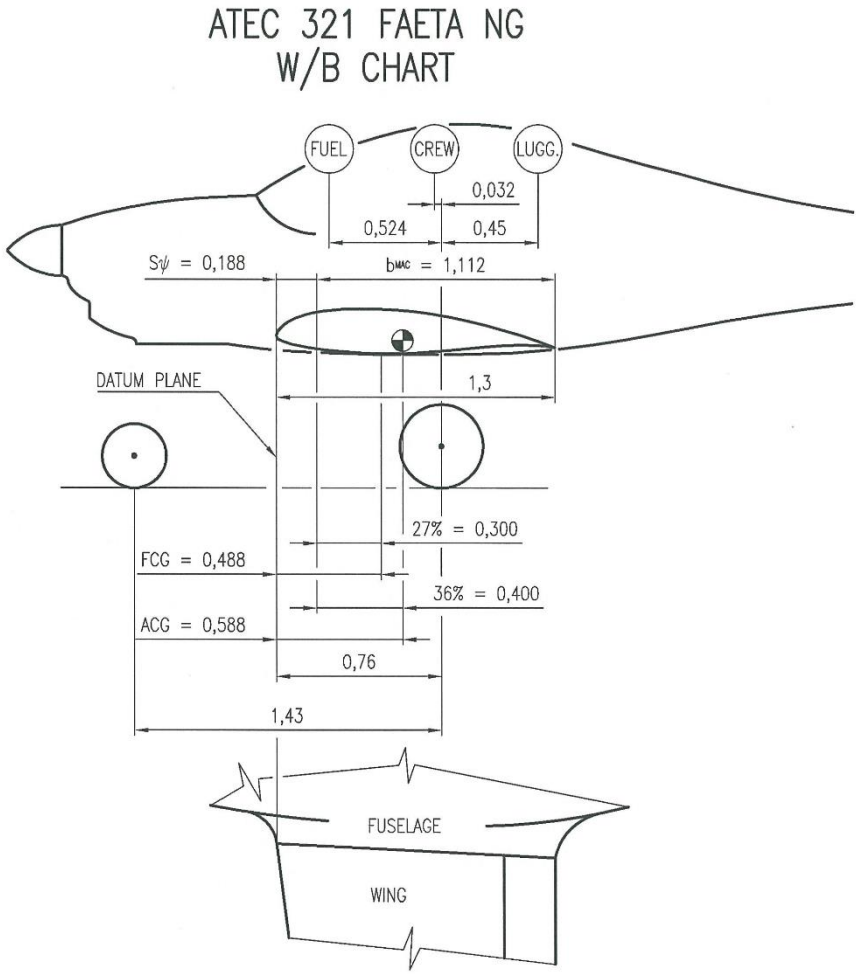
Range of centre of gravity in flight 25 - 35 % MAC

Operation over this range is prohibited!

9.5. Centre of gravity determination

The aircraft has to be balanced in “flight position” including crew and fuel.

Weight on main wheels	G_1	(kg)
Weight on nose wheel	G_2	(kg)
Total weight $G_1 + G_2$	$G = G_1 + G_2$	(kg)
Distance from main wheel axis to nose wheel axis	$x_{MW-FW} = 1,43$	(m)
Distance from main wheel axis to wing leading edge in wing root area	$x_{MW-LE} = 0,76$	(m)
CG distance from main wheel axis	$x_{MW-CG} = G_2 * x_{MW-FW} / G$	(m)
Length of MAC	$b_{MAC} = 1,112$	(m)
Length of wing chord in the root area	$b = 1,300$	(m)
Back-swept MAC displacement	$s_y = 0,19$	(m)
Distance from CG to leading edge	$x_{CG} = x_{MW-LE} - x_{MW-CG}$	(m)
Distance from CG to leading edge of MAC	$x_{CG-MAC} = x_{MW-LE} - x_{MW-CG} - s_y = 0,57 - 1,43 * G_2 / G$	(m)
	$x_{CG-MAC\%} = x_{CG-MAC} * 100 / 1,112 = 51,26 - 129,5 * G_2 / G$	(%)



9.6. Useful load, weight sheet

Useful load is the weight difference between the maximum take-off weight and the empty weight determined by scalling.

When the aircraft empty weight is of ..... kg, the useful load is ..... kg.

Aircraft weight and centre of gravity sheet, fuel tanks of 2 x 50 L, take-off weight of 472,5 kg

Fuel amount (1 L = 0,775 kg)	**100 L**	**75 L**	**50 L**	**25 L**	**10 L**
Useful load					
CG position in % b_{MAC}					
Luggage weight	**5 kg**	**5 kg**	**5 kg**	**5 kg**	**5 kg**
Crew weight					
CG position in % b_{MAC}					

If above listed limits are kept, the centre of gravity is situated in permitted position range.

Enclosure 1

Log Book

Each aircraft must be equipped with the log book where flight informations are noted just after each flight track performed.

OK-ABC						
Date	**Pilot name**	**Track**	**Flight Time /day**	**Total Flight Time**	**Take-off (number)**	**Fuel (filled up/L)**

Enclosure 2

Records of Revisions

Any revisions of the present manual, except actual weight data, must be recorded into following sheet according to information received from the Manufacturer. New or amended text on the revised pages shall be indicated by black vertical line on the left margin, along the section affected. The revision number and date shall be shown on the bottom left side of the page.

Revision Number	Affected Section	Affected Pages	Approval Date	Approved by	Insertion Date	Signature

Service and Maintenace Book

Any mandatory inspection works, works as by Manufacturer bulletins, reparations, changes,modifications, replacements, inspection reports or important notes must be recorded into following sheet.

Date	**Works performed / reason** (mandatory inspection works, bulletins, reparations, modifications, replacements, inspection reports, notes)	**Signature**

Service and Maintenace Book

Any mandatory inspection works, works as by Manufacturer bulletins, reparations, changes, modifications, replacements, inspection reports or important notes must be recorded into following sheet.

Date	**Works performed / reason** (mandatory inspection works, bulletins, reparations, modifications, replacements, inspection reports, notes)	**Signature**

Service and Maintenace Book

Any mandatory inspection works, works as by Manufacturer bulletins, reparations, changes, modifications, replacements, inspection reports or important notes must be recorded into following sheet.

Date	**Works performed / reason** (mandatory inspection works, bulletins, reparations, modifications, replacements, inspection reports, notes)	**Signature**

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Issued by the Manufacturer:

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