Flight Design

AIRCRAFT OPERATING INSTRUCTIONS

CTSW

(CTSW / CTSW-2006 / CTSW Classic / CTSW Advanced)

FLIGHT DESIGN

SERIAL NUMBER: _____

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1 Table of Contents

Note: In accordance FAR 21.190 Flight Design has established Aircraft Operating Instructions for the CTSW. The content and format is defined by ASTM standard F2245 and supplemented as deemed necessary by the manufacturer.

2 General Information

Read this before your first flight!

Each pilot must be familiar with the contents of the Aircraft Operating Instructions Manual and abide by all placards, limitations and checklists. Additionally, all Service Directives must be complied with and the Maintenance and Inspections Procedures manual must be used for all maintenance. For maintenance of the Rotax® engine, the BRS emergency parachute system and other installed equipment refer to the original manufacturers' manuals.

Flight Design CTSWs are delivered worldwide, and comply with a variety of Light Sport airworthiness standards. All configurations are equipped with non-certified engines that meet ASTM standard F2339. Unless otherwise specified, the information given is common to all configurations. Where different, the information is given in the appropriate appendices and supplements.

The Flight Design CTSWs delivered in the U.S.A. are built to conform to the U.S. Light Sport Pilot rules and are intended for Day/VFR use.

This manual is for guidance when operating a CTSW aircraft and is not intended to substitute for any required training received from an appropriately rated flight instructor.

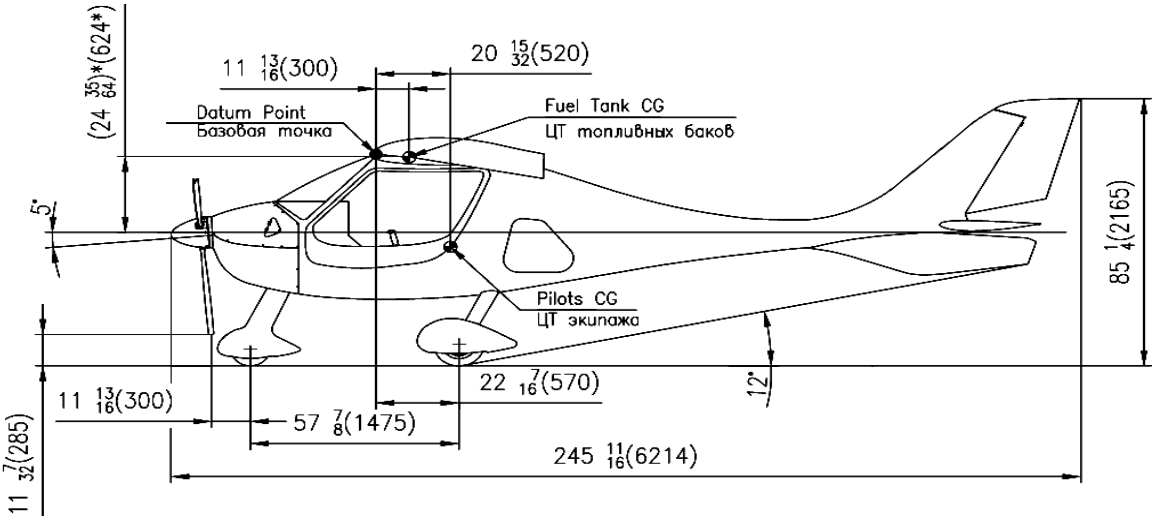
Manufacturer

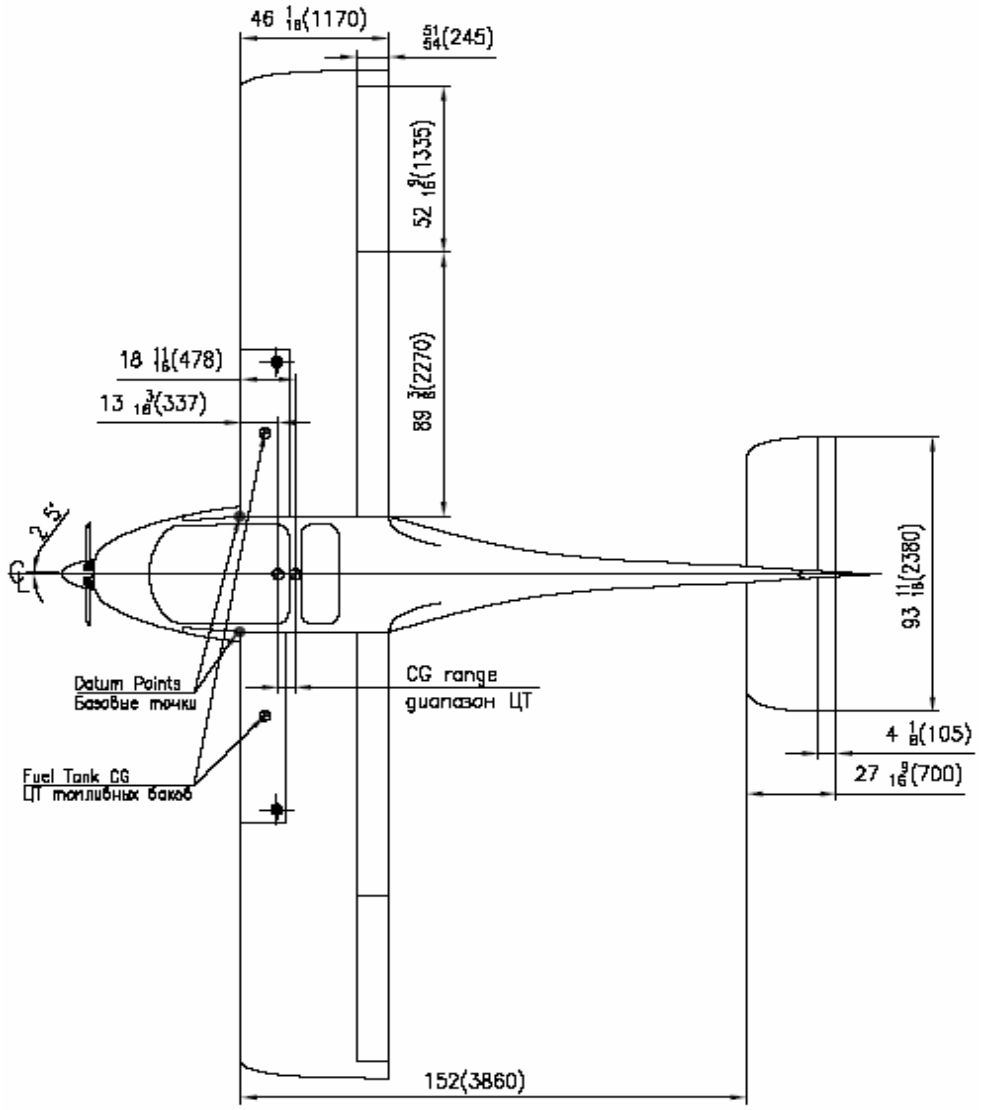
Flight Design GmbH
Sielminger Str. 65
D – 70771 L.-Echterdingen

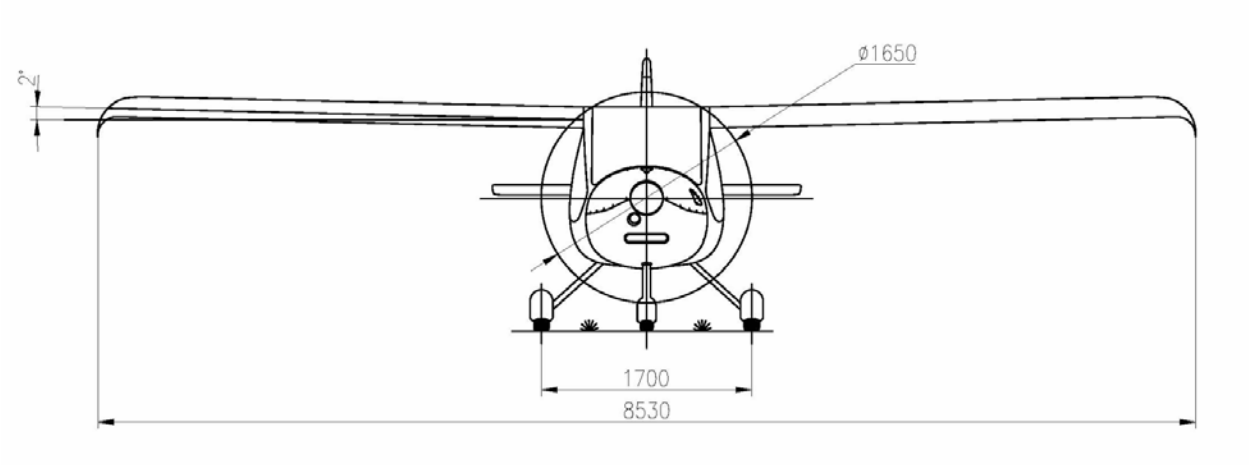
Basic description

The CTSW is a conventional two seat high-wing aircraft with three-axis controls.
The wings are fully cantilevered, incorporate integral fuel tanks, pushrod actuated ailerons and slotted type flaps that extend downwards for slow speed flight, and reflex upwards for cruise flight.
The aircraft is equipped with an all-moving stabilator with a trim tab and tricycle landing gear with a steerable nose-wheel.
The primary structures are made of carbon fiber reinforced plastic.

Views and dimensions, inches (mm)







Geometrical parameters

Geometry, mm / inch		
Max. length	6214	244.6
Max. height	2165	85.3
Areas, m^2 / ft^2		
Wing	9.98	107.4
Stabilator	1.65	17.75
Vertical tail	1.32	14.20
Wing span, m / inch	8.53	335.8
Aspect ratios		
Wing	7,29	
Stabilator	3,40	

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3 Airplane and Systems Descriptions

3.1 Engine: Rotax® 912 Series

Description

The standard engine is a Rotax 912 UL2, a four cylinder, horizontally opposed, normally aspirated four stroke engine that incorporates air cooled cylinders with liquid cooled heads.

Limitations

	ROTAX 912 UL2	ROTAX 912 ULS
Take-off performance: (at 5.800 RPM, max 5 min)	59.6 KW / 81 HP	73.5 KW / 100 HP
Max. continuous performance (at 5.500 RPM)	58 KW / 79 HP	69 KW / 95 HP
Min RPM before take-off, RPM	4.400	4.500
Max RPM before take-off, RPM	5.500	
Max cylinder head temperature	120 ºC 248 F	

For a complete description of the engine and limitations see the Rotax 912 Operator's Manual

3.2 Propeller

For a complete description of the propeller see Operator's Manual for appropriate propeller

Applicability

	CTSW Classic Light	CTSW Classic	CTSW Advanced
Neuform TXR-65, 2-blade	●		
Neuform CR3-65, 3-blade		●	●
Kaspar, 3-blade in-flight adjustable		●*	●*

* - available as an option

3.3 Fuel and fuel capacity

The fuel valve is purely on/off and has to be in the appropriate maximum position. This engine does not have a mixture valve or require leaning.

Fuel specification: Premium Automotive Unleaded per ASTM D 4814, minimum AKI 91 for Rotax 912ULS.
SUPER leaded, DIN 51600, ONORM C 1103
EURO-SUPER ROZ 95 unleaded, DIN 51603, ONORM 1101
SUPER PLUS ROZ 98 unleaded, DIN 51607, ONORM 1100
AVGAS 100 LL.

ATTENTION! AVGAS loads the valve seats with high lead content and forms more combustion chamber deposits and should be used only in case of vapor lock or insufficient octane on auto fuel.

Each wing has an integral fuel tank with a capacity of 65l / 17 U.S. gallons of which 62l / 16.5 gallons are usable.

The total fuel capacity is 130l / 34 U.S. gallons of which 124l / 33 gallons are usable.

For complete fuel specifications see the Rotax 912 Operator's Manual

3.4 Oil

Only brand-name semi-synthetic or full synthetic 4-stroke motorcycle oil should be used.

	ROTAX 912 UL2	ROTAX 912 ULS
Oil, normal operating pressure (below 3.500 RPM)	2.0 – 5.0 bar 29 – 73 psi	
Oil, min operating pressure (above 3.500 RPM)	0.8 bar 12 psi	
	on very cold start momentarily 7 bar allowed	
Min/max temperature measured at the oil inlet of the engine	50 / 130 ºC 120 / 266 ºF	
Optimum operating temperature	90-110 ºC 190-230 ºF	
Oil capacity	3.0 l, min 2.0 l 6.4 liq pt, min 4.2 liq pt	
Max oil consumption, L per hour / liq pt per hour	0.06 / 0.13	

The engine is equipped with a friction clutch to guard against sudden propeller stoppage: for this reason, oils with friction modifiers or additives that favor clutch slippage should not be used.

Diesel engine oils are unsuitable because of their lower temperature tolerances.

For oil change intervals see the Maintenance and Inspection Procedures Manual.

Note: If the engine is primarily run on AVGAS, more frequent oil changes will be required because of possible lead build-up.

For complete oil specifications see the Rotax 912 Operator's Manual

3.5 Operating weights and loading (occupants, baggage, fuel, ballast)

Operating weights

	LSA registration			
	USA		Australia	
	kg	lbs	kg	lbs
Max. take-off weight	600	1323	544 / 600	1199 / 1323
Empty plane	314*	693*	303	668
Typical payload	297	654	241 / 297	531 / 654

* - with BRS 1350 HS

	BFU / LTF-UL registration	
	kg	lbs
Max. take-off weight	472.5	1042
Empty plane	268	590
Typical payload	180 / 114.5*	396 / 252*

* - with full tanks

	BCAR Section S registration	
	kg	lbs
Max. take-off weight	450	922
Empty plane	265	584
Typical payload	185	407

Loading

	LSA registration	BFU / LTF-UL registration	BCAR(S) registration
Maximum weight per seat	118 kg 260 lbs	100 kg 220 lbs	100 kg 220 lbs
Maximum baggage weight per side	25 kg 55 lbs		
Minimum single pilot weight	54 kg 120 lbs	70 kg 155 lbs	55 kg 122 lbs
Maximum fuel weight	93 kg 205 lbs		
Minimum fuel weight	9 kg 20 lbs	8 kg 18 lbs	13 kg 29 lbs

3.6 Structures and Systems Description

Fuselage
The fuselage of the CTSW is made of multiple layers of carbon fiber and aramid (Kevlar®) laminated over a dense foam core creating a sandwich structure. The cabin can resist loads from all sides. This provides superior pilot and passenger crash protection and low structural weight.

Wings
The cantilevered wing of the CTSW plugs into 4 hard points at the top of the cabin for attachment to the fuselage. The overlapping spars resist lift loads. The main spar caps are solid carbon fiber wrapped with S glass fibers over a dense Rohacell core. The wing "skin" is a carbon fiber sandwich. The ribs are molded carbon fiber and bonded into place.

Wingtips
The wingtips of the CTSW are highly developed drooped type. They reduce stall speed, improve stability and low speed control of the CTSW.

Fuel system
Fuel is gravity fed to the engine from two integral wing tanks. The total capacity is 130l / 34 U.S. gallons. The usable fuel quantity is 124l / 33 U.S. gallons.
The operation of the fuel valve does not allow the ignition key to be inserted unless the fuel valve is in the "ON" position.

Electric system
The Rotax 912 series of engines are equipped with a "Lighting Coil" type alternator and a rectifier-regulator that converts and regulates the output of the alternator to a nominal 13.5V – 14.2V 250W (roughly 18A).
The battery for the electric starting system is 12V sealed, AGM type.
The dual ignition system is a CDI (capacitive discharge).

Landing gear
The landing gear of the CTSW is of the tricycle type. The nose wheel is steerable through a direct link to the rudder pedals. The main gear legs are heavy duty machined aluminum rods.

Brakes
Hydraulic disk type, actuated through a handbrake lever. Parking brake is set by simultaneous use of the brake lever and parking brake valve.

Control surfaces

The movable surfaces of the CTSW are of aramid-foam-aramid, carbon-foam-aramid, carbon-foam-carbon sandwiches with carbon fiber spars and attachment points.

Rudder
The rudder is of a conventional type and it is aerodynamically balanced and is operated through foot pedals and cables.

Stabilator
The stabilator is an all-moving type stabilizer with a counter-weight and anti servo/trim tab. It is actuated through a flexible push pull cable connected to the dual control sticks.

Ailerons
The Frise type ailerons are controlled with push pull tubes and rod bearings and droop automatically with selection of the flaps.

Flaps
The flaps are of the slotted type, and a pre-selector switch is used to position the flaps from -6° (or -12° for CT-LSA Australia) to +40º. The position of the flaps is indicated on the control panel. The flaps are protected by limit switches at the end limits.

Pitch Trim
Pitch trim is activated through a control wheel located adjacent to throttle quadrant, and acts upon trim tab on the stabilator.

Aileron Trim
Aileron trim is activated trough a control wheel located on the console between the pilot seats.

Rudder Trim System
Rudder trim is activated through a control wheel located on the cabin bulkhead above the console and between the pilot seats.

BRS Parachute system

Rocket deployed emergency parachute system. The system is actuated through the red “T” handle located on the cabin bulkhead between the pilot seats. The T handle is secured on the ground with a tagged safety pin. The pin is removed for flight operations. To deploy the parachute, the T handle is pulled out fully to the stop.

Autopilot

Autopilot is an optional equipment. The available autopilots are Digiflight II Series.

- CT Pilot 1 Axis, Digiflight II FP basis (Aileron, later upgrade possible);
- CT Pilot 2 Axis, Digiflight II FP basis (Aileron & Stabilizer, later upgrade possible);
- CT Pilot 2 Axis + vertical speed, Digiflight II FP VS basis (Aileron & Stabilizer with vertical steering).

For a complete description and operating information of the autopilot see Operating Handbook for Digiflight II Series autopilots, TruTrak Flight Systems.

CTSW Classic Light Standard Instrument Panel*

Symbolic notations

1 Ignition lock / start
2 Fuel valve
3 12V outlet
4 Switch panel
5 Flap position indicator
6 Flap circuit breaker
7 Flap switch
8 Main circuit breaker 30A
9 Main circuit breaker 25A
10 Air speed indicator
11 Three pointer altimeter
12 Circuit breakers
13 Slip & bank indicator
14 Cabin heating
15 Carburettor heating
16 Cockpit light
17 Instrument light

*** - instrument panels can be chosen from the list (please see Appendix 2) with accordance to the list of the instruments from the Customer Order**

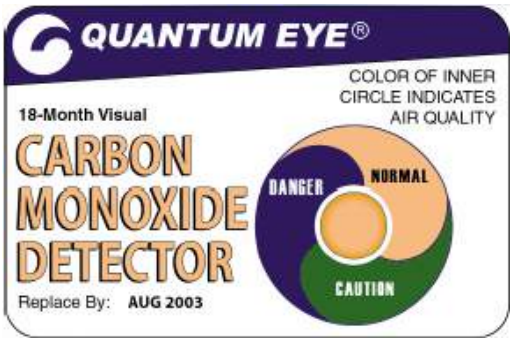
Control Quadrant

Flap position indicator

Ignition switch and starter

3.7 Carbon monoxide detector

Every CTSW aircraft (starting S/N: 07-11-21) is equipped with Carbon Monoxide (CO) Detector.
The owner (pilot) is responsible to watch the date on the detector and when necessary – replace it. The owner (pilot) is also responsible to mark the date when install the new one.



Condition – Color: Normal – Yellow, Caution – Green, Danger – Dark Blue.
The Quantum Eye is a multi-level Carbon Monoxide Detector. It provides a visual indication of carbon monoxide contamination. Each detector is packaged in a protective bag that when opened activates it. Once activated the minimum product lifetime is 18 months.
Adhesive backing allows it to be easily mounted in the cockpit or any clearly visible surface.

Operating temperature range is from 41° to 100 ° F (5° C to 38° C), relative humidity (RH) range from 25 to 90% RH.
Sensor Regeneration: from caution – 2 hours, from danger – 6 hours.

Note: This information is for examination only. For details please refer to the manufacturer website www.QGinc.com.

4 Operating Limitations

4.1 Stalling speeds at maximum takeoff weight (V_{S1} and V_{S0})

V_{S0}: Stalling speed or the minimum steady flight speed in the landing configuration.
V_{S1}: Stalling speed or the minimum steady flight speed obtained in a specific configuration.

V_S	Flaps	-6° (-12°)	44 KCAS (49 KCAS)	81 km/h CAS (90 km/h CAS)
V_{S1}	Flaps	0°	42 KCAS	77 km/h CAS
V_{S0}	Flaps	40°	39 KCAS	72 km/h CAS

4.2 Flap extended speed range (V_{S0} to V_{FE})

The White arc on the airspeed indicator is from V_{S0} to V_{FE}, flaps 15°.
V_{FE}: Maximum flap extended speed.

V_{FE}:	Flaps	0°	100 KCAS	185 km/h CAS
		15°	80 KCAS	148 km/h CAS
		30°	62 KCAS	115 km/h CAS
		40°	62 KCAS	115 km/h CAS

4.3 Maximum maneuvering speed (V_A)

V_A: Design maneuvering speed (above this speed only 1/3 of max. deflection may be given, full or abrupt deflection of the control surfaces may cause structural failure).

	LSA registration				**BFU / LTF-UL registration**		**BCAR Section S registration**	
	USA		**Australia**					
	km/h	**kts**	**km/h**	**kts**	**km/h**	**kts**	**km/h**	**kts**
V_A, CAS	182	98	193	104	193	104	164	89

4.4 Never exceed speed (V_{NE})

V_{NE}: Never-exceed speed.

	LSA registration			
	USA		Australia	
	km/h	kts	km/h	kts
V_{NE}, CAS	268[2]	145[2]	301[1]/296[2]	163[1]/159[2]

	BFU / LTF-UL registration	
	km/h	kts
V_{NE}, CAS	276[3]	150[3]

	BCAR Section S registration	
	km/h	kts
V_{NE}, CAS	280	151

1 - Without rescue system;
2 - With BRS 1350 HS.
3 - With BRS 1050.

4.5 Crosswind and wind limitations

The maximum demonstrated crosswind is 30 km/h / 16 knots.

CAUTION! Due to the light operating weights and low minimum flight speeds of Light Sport Aircraft, operations with surface winds in excess of 46 km/h / 25 kts should not be attempted.

4.6 Service Ceiling

The Service Ceiling is the maximum altitude at which a climb rate of 100 ft/min / 30 m/min can be achieved. For the CTSW it is 4,250 m / 14,000 feet.

Note: An aircraft must be properly equipped and the pilot appropriately certificated for operations above 10,000 feet / 3,000 m.

4.7 Load factors

The maximum maneuvering limit load factor is: + 4 g / -2 g Flaps up
+ 2 g / -0 g Flaps down

4.8 Maneuvers

Aerobatics, including intentional spins are prohibited.

4.9 Other limitations

Flight in to known icing is prohibited.

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5 Weight and Balance Information

5.1 Installed equipment list

Please see the Appendix 1.

5.2 Center of gravity (CG) range and determination

Method for determining the Basic Empty Weight

Place the aircraft level on three suitable scales. (If only one scale is available, use leveling blocks and make separate measurements at each gear location).
The aircraft leveling reference is the top of the console (tunnel) that runs between the pilot seats.

Note the following measurements:

G1: The weight found at the nose wheel location
G2: The combined weight found at the main wheel locations.
a: 35.63 in. / 905 mm - the distance from the leading edge of the wing to the nose wheel.
b: 58.07 in. / 1475 mm - the distance from the main gear location to the nose wheel location.

The Basic empty weight is the total of weights found at G1 and G2

$$G1 + G2 = G$$

Using the following formula, find the Empty Center of Gravity location of the aircraft.

$$((G2 \times b): G) - a = X$$

X - The distance from the leading edge of the wing to the Cg location

Using the weights found on the scales and the weight and balance sheet determine the Basic Empty Weight.

Complete the Weight & Balance and Equipment List.

Determining the Weight and Balance

Using examples (see Appendix 3), find the loaded center of gravity location.
Using the center of gravity envelope, plot the loaded center of gravity.

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6 Performance

The performance figures are based on sea level, standard atmospheric conditions and a gross weight that depends on your local certification rules.

6.1 Takeoff distance

	600 kg	472,5 kg
Take-off distance over a 15 m / 50ft obstacle	232 m / 760 ft	186 m / 610 ft

6.2 Best rate of climb

At weight 600 kg and flaps 0°: $\mathbf{V}_Y$ = 154 km/h / 78kts

6.3 Best angle of climb

At weight 600 kg and flaps 0°: $\mathbf{V}_X$ = 122 km/h / 66 kts

6.4 Cruise speed

Propeller type: Neuform, 2 blade, 1650 mm dia.
Propeller blade incidence at 3/4*r: 27 deg

Cruise speed at 75% power		
600 kg	-6° (-12°)	205 km/h / 112 kts
472,5 kg	-12°	205 km/h / 112 kts

6.5 RPM

Minimum Idle: 1400
Static: 4700
Normal climb: 4800
Maximum: 5800 (5 min)
Max. continuous: 5500
Normal cruise: 4200 – 5200
Cruise @ 75%: 5200

6.6 Fuel consumption

Fuel consumption in l/h / U.S. gal/h	Rotax 912 UL2	Rotax 912 ULS
at take-off performance	24,0 / 6,3	27,0 / 7,1
at max. continuous performance	22,6 / 5,6	25,0 / 6,6
at 75% continuous performance	16,2 / 4,3	18,5 / 4,9

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7 Emergency Procedures

Engine failure

The first action in case of engine failure is to lower the nose and to establish best glide speed: 115 km/h / 63 kts. If the failure occurs during takeoff, it is often best to attempt a landing straight ahead and under control rather than try to turn and return to the runway. The next action should be to identify a field for landing, taking in to consideration obstacles, field length, and wind direction.
Maintain a minimum speed of 115 km/h / 63 kts at 15° flaps until final approach.
Before touchdown, select flaps 40°.
If there is sufficient time and the failure can be identified, an engine restart while in safe flight altitude may be attempted.
If the restart is successful it may be possible to proceed to a suitable landing area and perform a precautionary landing.

In case of fire shut off the engine:

- Shut off the fuel valve;
- Turn off the ignition;
- Slip away from the fire if possible;
- Land as soon as possible.

The Emergency Parachute System (BRS)

The BRS system may be used at a variety of altitudes and airspeeds. Situations that might warrant its use may include:

- A loss of control in Instrument Meteorological Conditions
- A structural failure
- A collision in flight
- An irrecoverable spin
- Pilot incapacitation
- Jammed flight controls
- Engine failure over hostile terrain

If possible, before activating the BRS shut off the engine and tighten the seatbelts.
To activate the system, pull the T handle all the way to the stop.

CAUTION! The operator of a CTSW must be thoroughly familiar with the contents of the BRS Manual and abide by all instructions and limitations within.

Overturn on land

- Carefully unfasten the seat belts and lower yourself first, then your passenger.
- Be careful of any spilled fuel – there may be a fire hazard!
- Leave the airplane immediately.

Failure of the Dynon EMS

Failure of the Dynon EMS (if equipped) does not directly endanger continuation of flight. With a completely failed EMS system the engine data can no more be surveyed by the pilot. To avoid damages to the engine the flight can be continued, but operation should be limited to moderate RPMs (equalling maximum 185 km/h / 100 kts cruise speed at flaps fully negative). Aerotow or banner tow shall not be done with this failure. Ongoing flights to a qualified service station are allowed with the limitations named before. Before such a flight due care has to be given to oil and coolant quantity checks before the flight.

Flap control failure

If failure of the flap control occurred, proceed a suitable landing area and perform a precautionary landing. Use instruction for the flap manual operation.

Instruction for the flap manual operation

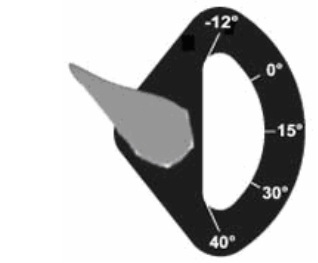
1) To activate the manual operation of the flap control printed circuit board (PCB), do as follows.

   a) Turn the flap control switch by 180° with reference to 15° position to illuminate the LED display VD1 and central segments of the automatic operation indicator (provided the processor is in proper working condition).

   This is to notify that the manual operation is switched on and the automatic operation is switched off. The control system is in the stand-by mode.

VD1

   b) When the flap control switch is turned by 180° with reference to 30° position, the flaps start to retract (flaps move up)



VD2

Located on the plate of the electric mechanism MT-10 is the limit switch which has the function to limit the movement of flaps. This corresponds to the maximum up deflection. When the flaps move, the LED display VD2 illuminates.

c) When the movement of flaps has been accomplished, the control switch should be reset to a neutral position (see item 1, a).

d) When the flap control switch is turned by 180° with reference to 0° position, the flaps start to extend (flaps move down).
At this point, the LED display VD3 illuminates. The limit switch located on the MT-10 has the function to limit the movement of flaps.

VD3

e) Intermediate flap position (for instance 0°, 15°, 30°) is to be selected by sight according to the position of flaps with respect to the wing.
To set the flaps in intermediate positions, if necessary, ensure that flaps move up or down as far as the required position. After that, stop the movement of flaps by setting the flap control switch in a neutral position (item 1, a).

2) To activate the automatic operation, set the switch in one of the designated positions (-6° (-12°), 0°, 15°, 30°, 40°), accompanied by an indication at the display corresponding to the selected position. The movement of flaps in these positions is to be stopped automatically.
To change the settings of the automatic operation, if necessary, comply with the instructions “Setting-up of flap positions”.

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8 Normal Procedures

8.1 Preflight

A. Cabin

1.	Aircraft documents	Check
2.	Flight controls	Free and correct
3.	Spar Bolts	Installed and secure
4.	Ignition	Off, key out
5.	Electrical equipment	Off
6.	Radio master	Off
7.	Master Switch	On
8.	Flaps	Down
9.	Master switch	Off
10.	Fuel Valve	On

B. Left side

1.	Main gear and tire	Check
2.	Baggage compartment	Secure
3.	Antenna	Check
4.	Aft fuselage condition	Check
5.	Tie down	Remove
6.	Vertical Stabilizer	Check
7.	Stabilator	Check
8.	Servo tab	Check
9.	Tie-down	Remove
10.	Rudder	Check

C. Right Side

1.	Vertical Stabilizer	Check
2.	Aft fuselage condition	Check
3.	Baggage compartment	Secure
4.	Main gear and tire	Check

D. Left wing

1.	Flap	Check
2.	Aileron	Check
3.	Wing tip	Check
4.	Wing leading edge	Check
5.	Pitot tube	Check
6.	Tie down	Remove
7.	Fuel cap	Secure

8. Fuel tank vent	Aligned
9. Vent manifold	Check

E. Nose

1. Cowling	Secure
2. Exhaust stack	Secure
3. Nose gear	Check
4. Engine intakes	Clear
5. Landing Light	Check
6. Spinner	Secure
7. Propeller	Check
8. Cowling	Secure
9. Oil quantity	Check (follow the Rotax Manual)
10. Fuel	Drain and Check
11. Static port	Clear

F. Right Wing

1. Leading edge	Check
2. Tie down	Remove
3. Wing tip	Check
4. Aileron	Check
5. Flap	Check
6. Fuel cap	Secure
7. Fuel tank vent	Aligned
8. Vent manifold	Check

8.2 Engine start

1. Preflight	Complete
2. Parking Brake	Set
3. Carburetor heat	Off
4. Circuit breakers	In
5. Radios and Electrical equipment	Off
6. Master Switch	On
7. Anti-collision lights	On
8. Fuel Valve	Open
9. Ignition key	In
10. Choke	As required
11. Throttle	Closed
12. Ignition Switch	Start and release
13. Choke	Adjust
14. Oil pressure	Check
15. Radios	Set
16. Flaps	Up

8.3 Taxiing

1. Brakes and Steering	Check

Before takeoff

1. Parking Brake	Set
2. Seat belts	Secure
3. Doors	Closed
4. Flight Controls	Free and correct
5. Flight Instruments	Set
6. Choke	Off
7. Carburetor heat	Off
8. Throttle	3200 RPM
9. Engine Indications	Check
10. Ignition	Check Left, Right, & Both (max. drop 300 RPM/max diff. 120 RPM)
11. Oil temperature	Min 51°C / 124°F
12. Throttle	Idle
13. Flaps	Set for takeoff
14. Trim	Set for takeoff
15. Radios	Set
16. Parking Brake	Release

8.4 Normal takeoff

1. Flaps	0° to 15°	
2. Throttle	Full	
3. Carburetor heat	Off	
4. Climb at MTOW:		
600 kg	95 km/h / 51 kts	flaps 15°
472,5 kg	78 km/h / 42 kts	flaps 15°

8.5 Climb

1. Power	5500 RPM (max. continuous)
2. Best angle of climb speed	Vx = 66 kts flaps 0°
3. Best rate of climb speed	Vy = 78 kts flaps 0°

8.6 Cruise

1. Power	Set
2. Engine Instruments	Check

8.7 Descent

1. Carburetor heat	As required
2. Altimeter	Set

8.8 Before landing

1. Seatbelts	Secure
2. Airspeed	100 km/h / 54 kts
3. Flaps	15° to 40°
4. Carburetor heat	Off

8.9 Normal landing

Flaps as desired, 40° for short field

Airspeed (V_{FE}):

Flaps 0°	100 KCAS	185 km/h CAS
15°	80 KCAS	148 km/h CAS
30°	62 KCAS	115 km/h CAS
40°	62 KCAS	115 km/h CAS

8.10 After landing

1. Landing light	Off
2. Flaps	Retract

8.11 Shut down

1. Parking brake	Set
2. Radios	Off
3. Electrical equipment	Off
4. Ignition	Off
5. Master switch	Off

8.12 Short field takeoff procedure

Flaps	15°
Parking brake	Set
Power	Full
Brakes	Release
Rotate	80 km/h / 44 kts

8.13 Balked landing procedure

Power	Full
Flaps	15°
Airspeed	110 km/h / 59 kts

8.14 Information on stalls, spins and other useful pilot information

Stalls
The CTSW exhibits conventional characteristics with a slight buffet at the onset of the stall. There is no tendency to roll in a coordinated stall. Directional control should be maintained through use of the rudder.
Recovery is also conventional: release pressure on the control stick to reduce the angle of attack. Apply full power, and slowly recover.

Spins
The CTSW is not certified for spins.

In the event of an unintentional spin:
1. Reduce power to idle
2. Center the ailerons
3. Apply rudder in the opposite direction of rotation
4. When the rotation stops, smoothly recover from the resultant dive.

If an unintentional spin is entered and the altitude is such that a safe recovery cannot be made, the ballistic parachute system should be deployed.

Steep turns
Enter with coordinated use of rudder and ailerons. Increase pitch and power as necessary to maintain altitude and airspeed. Do not exceed 60° of bank angle.

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9 Aircraft Ground Handling and Servicing

9.1 Servicing fuel, oil and coolant

Fuel
The fuel tanks are equipped with vented fuel caps that are located on the upper surface of the wing. The fuel caps must be in place for flight, with the vents facing forward. A calibrated dip stick, with left tank and right tank indications, is supplied to check the fuel quantity. The aircraft must be grounded during refueling and secured from open flame.

Note: The aircraft finish may be damaged by exposure to fuel; any spills should be immediately cleaned up.

Oil
For an accurate oil measurement:
1. Set the Parking brake.
2. Check the Master switch is off, and the Ignition key is out.
3. Open the top cowling hatch.
4. Open the Oil tank.
5. Turn the propeller in the direction of rotation until you hear a pronounced gurgling sound from the oil tank. This the oil returning from the engine back to the oil tank. If you do not complete this procedure your oil level will read low.
6. Check the oil level. If it is not sufficient, remove the top cowling and add more oil to the tank. Be careful to not overfill.

Coolant
To check the coolant level:
1. Set the Parking brake
2. Check the Master switch is off, and the Ignition key is out.
3. Open the top cowling hatch.
4. Check the coolant level. It should be between min. and max. marks.
5. If it is not sufficient, remove the top cowling, open the cap of the coolant tank and add coolant to fill up the tank.
6. Make sure that no air is inside the cooling system.
7. Close the coolant tank cap.
8. If necessary, add coolant to the expansion tank.

9.2 Ground handling and tie-down instructions

Moving the CTSW

The aircraft can be moved by one person.
1. Check that the parking brake is off.
2. Check that the area around the aircraft is clear of obstacles and people.
3. Push down on the tail boom of the aircraft to lift the nose gear off the ground.

Be careful not to damage antennas mounted on the fuselage' bottom.

4. Push the aircraft in needed direction.

Tie down instructions

1. Attach tie down lines from the ground to the tie-down rings on the undersurface of the wings.
2. Place the tail boom tie-down strap around the tail boom and secure to the ground with mooring lines.
3. Stop wheels with a wheel chocks.

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10 Required Placards and Markings

10.1 Airspeed indicator range markings

Aircrafts with LSA registration

Marking	Speed Range	
White range (flap operating range)	72 … 115 km/h	39 ... 62 kts
Green range (normal operating range)	81 [91*]..222 km/h	44 [49*]... 120 kts
Yellow range (caution range)	222 … 269 km/h	120 ... 145 kts
Red line (never exceed speed)	269 km/h	145 kts

* - with flaps in (-12º) position

Aircrafts with LTF registration

Marking	Speed Range	
White range (flap operating range)	72 … 115 km/h	39 ... 62 kts
Green range (normal operating range)	94 … 245 km/h	51 ... 132 kts
Yellow range (caution range)	245 … 260 km/h	132 ... 140 kts
Red line (never exceed speed)	301 km/h	163 kts

Aircrafts with BCAR Section S registration

Marking	Speed Range	
White range (flap operating range)	61 … 122 km/h	33 … 66 kts
Green range (normal operating range)	74 … 219 km/h	40 … 118 kts
Yellow range (caution range)	219 … 278 km/h	118 … 150 kts
Red line (never exceed speed)	278 km/h	150 kts

10.2 Operating limitations on instrument panel

MAX: RPM 5800, EGT 1616F, CHT 248F, Oil Temp. 266F, Oil Press. 102 psi

or

MAX: RPM 5800, EGT 880ºC, CHT 120ºC, Oil Temp. 130ºC, Oil Press. 7 bar

10.3 Passenger Warning

The warning* “This aircraft was manufactured in accordance with Light Sport Aircraft airworthiness standards and does not conform to standard category airworthiness requirements” is placed on the instrument panel or in a place where a passenger will see it.

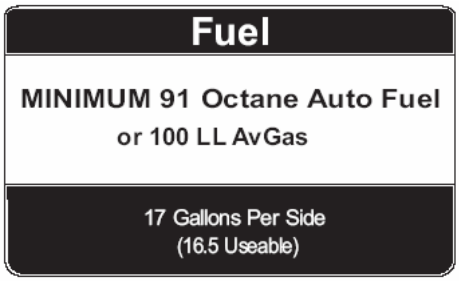
* - actual for aircrafts with LSA registration only

10.4 "NO INTENTIONAL SPINS"

The placard "NO INTENTIONAL SPINS" is placed close to the airspeed indicator.

10.5 Miscellaneous placards and markings

Type of Fuel — 2 x beside filling cap



Red marking	5800 RPM	Tachometer
Red marking	5 bar	oil pressure gauge
Red marking	130ºC	oil temperature gauge
Red marking	120ºC	water temp gauge (cylinder head)

Oil pressure gauge	max 102 psi 7 bar min 12 psi 0,8 bar	

Throttle — lever box

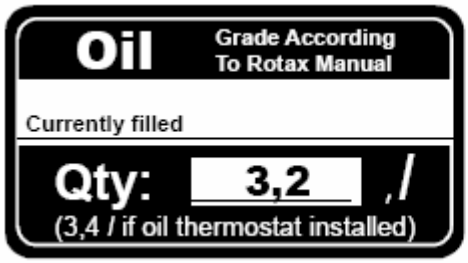
Choke — lever box

Stabilator Trim — lever box

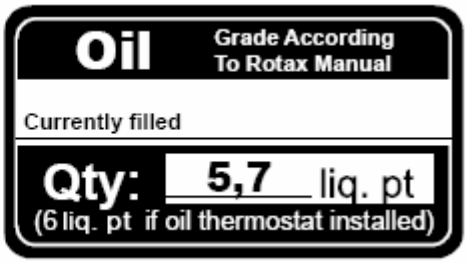
Brakes — lever box

Flaps	-6° (-12°), 0°, 15°, 30°, 40°	flap indicator

Oil quality



Cowling hatch backside



Circuit Breakers — right side of the central console

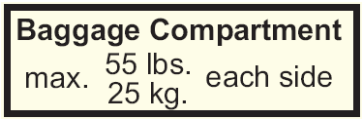
Main Circuit Breakers — right side of the Central console

Fuses — Switch panel (Middle Console, depends on panel type)

Main fuses — Instrument panel

Maintenance/packing interval — BRS Manual & Chute placard

Baggage Compartment — Baggage area



Doors — External door side, under the window

Internal door side, under the window

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11 Supplementary Information

11.1 Familiarization flight procedures

See the Pilot Training Supplement for familiarization procedures*.

* - actual for aircrafts with LSA registration only

11.2 Pilot operating advisories

None at this time.

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12 List of amendments

Revision No.	Date released	Affected chapters	Affected pages	Approved by
Original Issue	28-Feb-2005	N/A	N/A	
1	20-Jun-2005	2 General Information	6; 8	
		3 Airplane and Systems Descriptions	13; 14	
		4 Operating Limitations	15; 17; 19	
		10 Required Placards and Markings	36	
2	05-Oct-2005	4.5 Crosswind and wind limitations	15	
		6 Performance	27	
		8.2 Engine starting	31	
		8.4 Normal takeoff	32	
		8.5 Best angle of climb speed (V_X); 8.6 Cruise	33	
		10.5 Miscellaneous placards and markings	36	
3	05-Apr-2006	Total revised; Name of document changed; insert part 12, Appendix 1, Appendix 2, Appendix 3, Appendix 4	1-62	
4	05-Dec-06	Added “Failure of the Dynon EMS” paragraph	29	
5	30-Dec-06	Document fully revised	1 -APP3-3	
5a	16-Apr-07	Oil characteristics updated	3-3	
		Point 3.5 carried to page 3-4	3-4	
		Never exceed speed values updated	4-2	
		Green range for LSA airplanes updated	10-1	
5b	13-Jul-07	Corrected airspeed for US-LSA version from 113 kts to 98 kts	4-2	
		List of amendments added	12-1, 12-2	
6	01-Apr-08	Name of document changed	i	
		App. 1 changed	1	
		App. 2 changed	2	

		3.1: "*For the optional engines please see Appendix 1 (Equipment List)* " deleted	3-1	
		3.2: "*For the optional propellers please see Appendix 1 (Equipment List)"* deleted	3-2	
		3.3: "steam blast problems or MOGAS failing" changed to "vapor lock or insufficient octane on auto fuel"	3-2	
		3.7 Carbon monoxide detector added	3-9	
		9.1: "3 to 4 times in the direction of rotation, while you hear the air gurgling in the oil tank" changed to "in the direction of rotation until you hear a pronounced gurgling sound from the oil tank. This the oil returning from the engine back to the oil tank. If you do not complete this procedure your oil level will read low."; "refill the oil tank" changed to "add more oil to the tank. Be careful to not overfill." 9.2: Title "Towing (moving)" changed to "Ground handling"; "Install mooring" changed to "Attach tie down";	9-1	
		"blocks" changed to "chocks"	9-2	
7	29-Apr -08	8.4 corrected	8-4	

Appendix 1. Current equipment List

The current equipment list should be inserted here. Old equipment lists should be kept so that the history of the aircraft is properly documented. They should be marked by hand with the word “INVALID”. The owner of the aircraft is responsible for ensuring that a valid equipment list is available.

Appendix 2. Variants of instrument panels

Symbolic notations

1 Dynon EFIS 100 Flight information system
2 Dynon EMS 120 Engine monitoring system
3 Autopilot CT Pilot 2 Axis (Digiflight II)
4 Air Speed Indicator
5 Altimeter
6 Radio Garmin SL series & Transponder GTX series
7 Radio King KY series & Transponder KT series
8 GPS Garmin 496
9 -
10 Air speed indicator D 80mm
11 Three pointer altimeter D 80mm
12 Variometer D 57mm
13 Slip & bank indicator
14 UMA analogs (RPM meter, Oil pressure, Oil temperature, Cylinder head water temperature, Volt meter*)
15 Hobbs hour counter
16 Trutrack ADI

* - Volt meter excluded on CTSW Classic Light ready to fly modification.

CTSW Classic Light

CTSW Classic Light base instrument panel

CTSW Classic Light additionally equipped with Honeywell Radio and Transponder

CTSW Classic Light additionally equipped with Garmin Radio and Transponder

CTSW Classic

CTSW Classic base instrument panel

CTSW Classic additionally equipped with Autopilot, Nightflight package with TruTrack ADI, Garmin GPS, Radio and Transponder

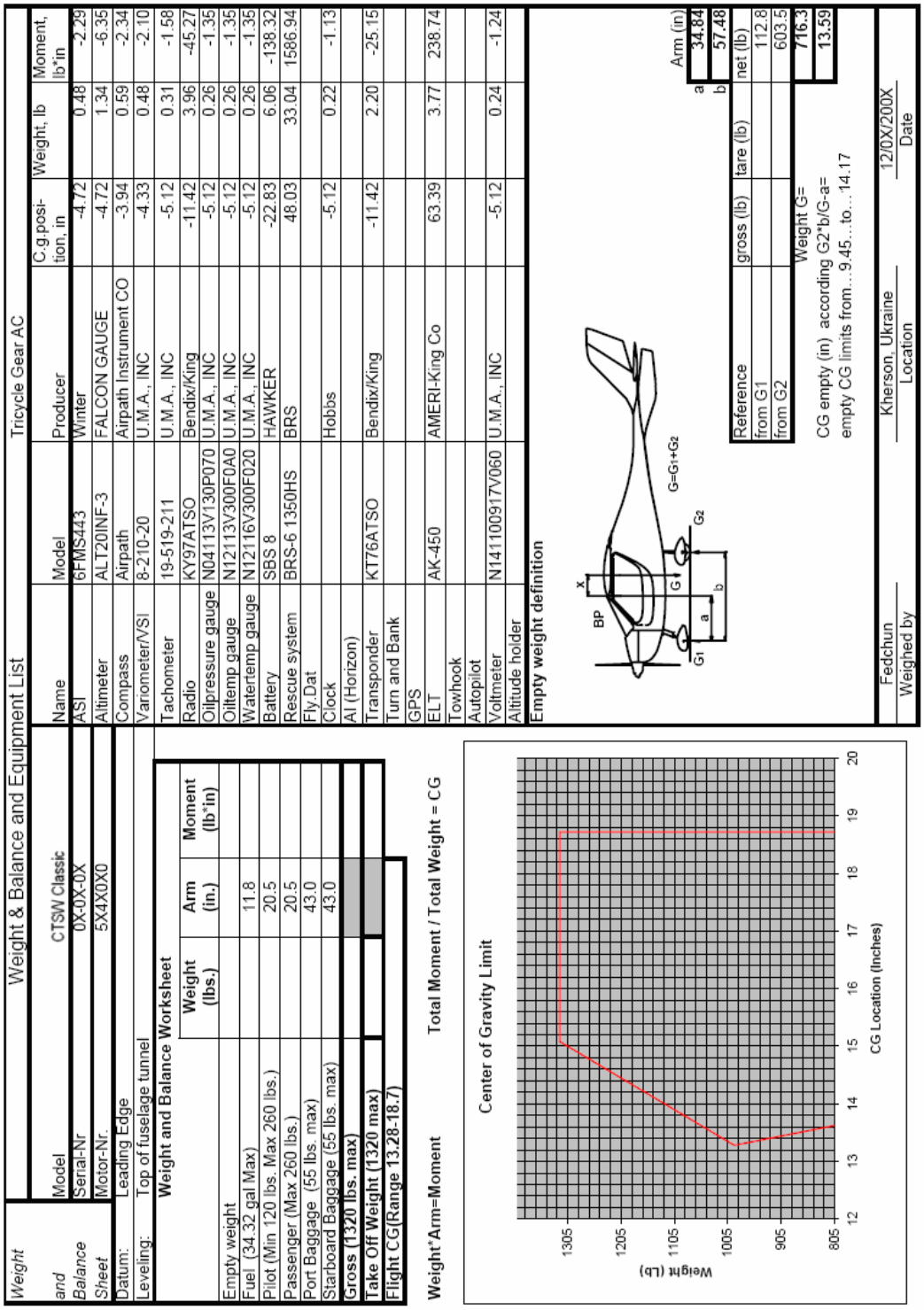
CTSW Advanced

CTSW Advanced (Dynon) instrument panel

CTSW Advanced additionally equipped with Autopilot, Nightflight package, Garmin GPS, Radio and Transponder

Appendix 3. Samples of the Weight & Balance and Equipment List

Sample of the Weight & Balance and Equipment List for aircrafts with LSA registration



Weight & Balance and Equipment List — Tricycle Gear AC

Weight and Balance Sheet	Model	CTSW Classic
	Serial-Nr	0X-0X-0X
	Motor-Nr.	5X4X0X0
Datum:	Leading Edge	
Leveling:	Top of fuselage tunnel	

Weight and Balance Worksheet

	Weight (lbs.)	Arm (in.)	Moment (lb*in)
Empty weight			
Fuel (34.32 gal Max)		11.8	
Pilot (Min 120 lbs. Max 260 lbs.)		20.5	
Passenger (Max 260 lbs.)		20.5	
Port Baggage (55 lbs. max)		43.0	
Starboard Baggage (55 lbs. max)		43.0	
Gross (1320 lbs. max)			
Take Off Weight (1320 max)			
Flight CG(Range 13.28-18.7)			

Weight*Arm=Moment **Total Moment / Total Weight = CG**

Name	Model	Producer	C.g.position, in	Weight, lb	Moment, lb*in
ASI	6FMS443	Winter	-4.72	0.48	-2.29
Altimeter	ALT20INF-3	FALCON GAUGE	-4.72	1.34	-6.35
Compass	Airpath	Airpath Instrument CO	-3.94	0.59	-2.34
Variometer/VSI	8-210-20	U.M.A., INC	-4.33	0.48	-2.10
Tachometer	19-519-211	U.M.A., INC	-5.12	0.31	-1.58
Radio	KY97ATSO	Bendix/King	-11.42	3.96	-45.27
Oilpressure gauge	N04113V130P070	U.M.A., INC	-5.12	0.26	-1.35
Oiltemp gauge	N12113V300F0A0	U.M.A., INC	-5.12	0.26	-1.35
Watertemp gauge	N12116V300F020	U.M.A., INC	-5.12	0.26	-1.35
Battery	SBS 8	HAWKER	-22.83	6.06	-138.32
Rescue system	BRS-6 1350HS	BRS	48.03	33.04	1586.94
Fly.Dat					
Clock		Hobbs	-5.12	0.22	-1.13
AI (Horizon)					
Transponder	KT76ATSO	Bendix/King	-11.42	2.20	-25.15
Turn and Bank					
GPS					
ELT	AK-450	AMERI-King Co	63.39	3.77	238.74
Towhook					
Autopilot					
Voltmeter	N141100917V060	U.M.A., INC	-5.12	0.24	-1.24
Altitude holder					

Empty weight definition

BP, x, G1, a, b, G2, G=G1+G2

	Arm (in)
a	34.84
b	57.48

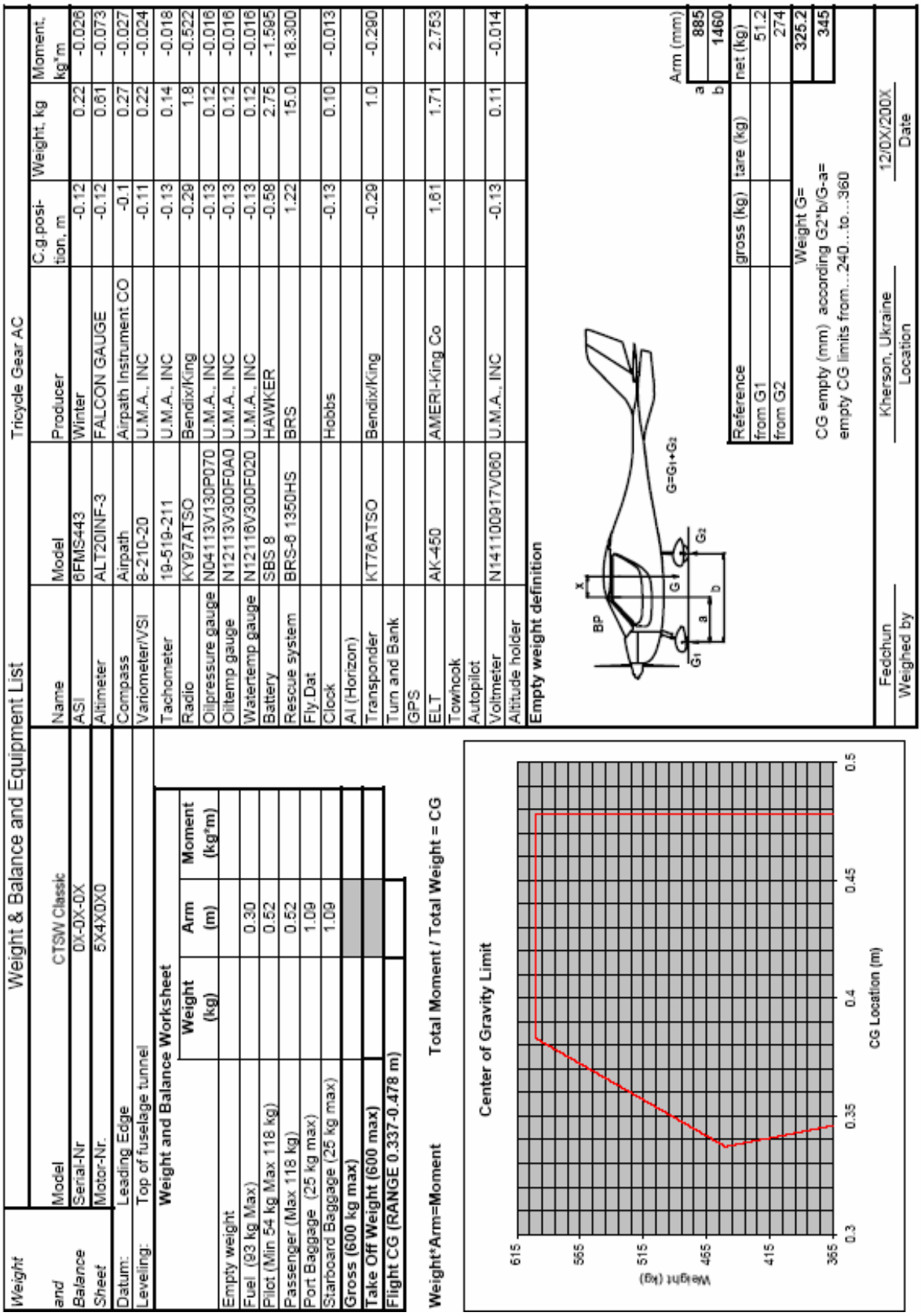
Reference	gross (lb)	tare (lb)	net (lb)
from G1			112.8
from G2			603.5
		Weight G=	716.3
CG empty (in) according G2*b/G-a=			13.59
empty CG limits from...9.45...to...14.17			

Fedchun — Kherson, Ukraine — 12/0X/200X
Weighed by — Location — Date

Center of Gravity Limit

Weight (Lb): 805, 905, 1005, 1105, 1205, 1305
CG Location (Inches): 12, 13, 14, 15, 16, 17, 18, 19, 20

The acceptable empty Cg range is 9.45 to 14.17 inches.



Weight & Balance and Equipment List — Tricycle Gear AC

Weight and Balance		CTSW Classic
	Model	
	Serial-Nr	0X-0X-0X
Sheet	Motor-Nr.	5X4X0X0
Datum:	Leading Edge	
Leveling:	Top of fuselage tunnel	

Weight and Balance Worksheet

	Weight (kg)	Arm (m)	Moment (kg*m)
Empty weight			
Fuel (93 kg Max)		0.30	
Pilot (Min 54 kg Max 118 kg)		0.52	
Passenger (Max 118 kg)		0.52	
Port Baggage (25 kg max)		1.09	
Starboard Baggage (25 kg max)		1.09	
Gross (600 kg max)			
Take Off Weight (600 max)			
Flight CG (RANGE 0.337-0.478 m)			

Weight*Arm=Moment **Total Moment / Total Weight = CG**

Name	Model	Producer	C.g.position, m	Weight, kg	Moment, kg*m
ASI	6FMS443	Winter	-0.12	0.22	-0.026
Altimeter	ALT20INF-3	FALCON GAUGE	-0.12	0.61	-0.073
Compass	Airpath	Airpath Instrument CO	-0.1	0.27	-0.027
Variometer/VSI	8-210-20	U.M.A., INC	-0.11	0.22	-0.024
Tachometer	19-519-211	U.M.A., INC	-0.13	0.14	-0.018
Radio	KY97ATSO	Bendix/King	-0.29	1.8	-0.522
Oilpressure gauge	N04113V130P070	U.M.A., INC	-0.13	0.12	-0.016
Oiltemp gauge	N12113V300F0A0	U.M.A., INC	-0.13	0.12	-0.016
Watertemp gauge	N12116V300F020	U.M.A., INC	-0.13	0.12	-0.016
Battery	SBS 8	HAWKER	-0.58	2.75	-1.595
Rescue system	BRS-8 1350HS	BRS	1.22	15.0	18.300
Fly Dat		Hobbs	-0.13	0.10	-0.013
Clock					
AI (Horizon)	KT76ATSO	Bendix/King	-0.29	1.0	-0.290
Transponder					
Turn and Bank					
GPS					
ELT	AK-450	AMERI-King Co	1.61	1.71	2.753
Towhook					
Autopilot					
Voltmeter	N14110091 7V060	U.M.A., INC	-0.13	0.11	-0.014
Altitude holder					

Empty weight definition

	Arm (mm)
a	885
b	1460

Reference	gross (kg)	tare (kg)	net (kg)
from G1			51.2
from G2			274
		Weight G=	325.2

CG empty (mm) according G2*b/G-a= 345

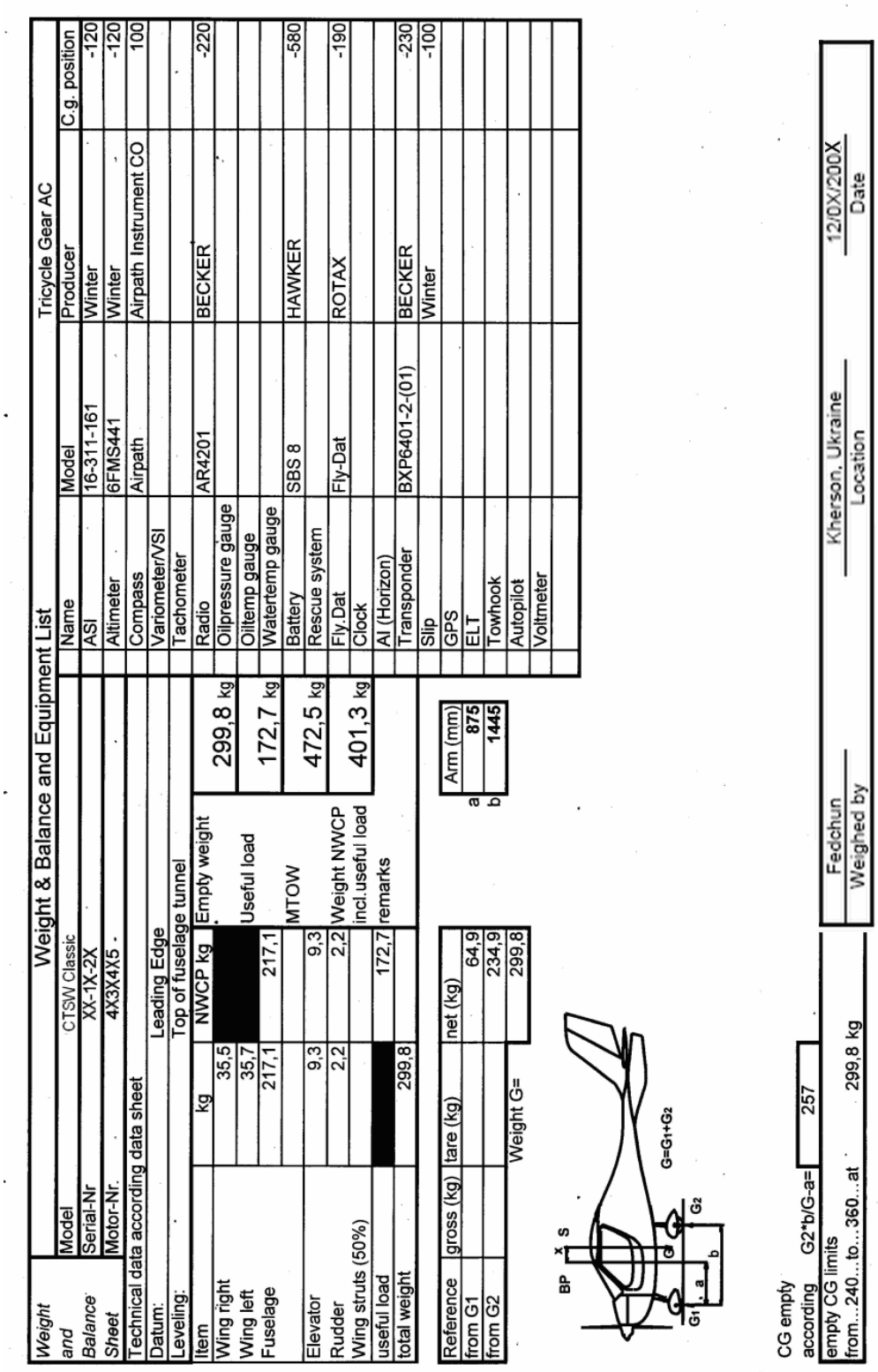
empty CG limits from....240...to....360

Fedchun — Kherson, Ukraine — 12/0X/200X

Weighed by — Location — Date

The acceptable empty Cg range is 240 to 360 mm.

Sample of the Weight & Balance and Equipment List for aircrafts with BFU / LTF-UL registration



Weight & Balance and Equipment List — Tricycle Gear AC

Weight and Balance		
Model	CTSW Classic	
Serial-Nr	XX-1X-2X	
Motor-Nr.	4X3X4X5 -	

Technical data according data sheet

Datum: Leading Edge

Leveling: Top of fuselage tunnel

Item	kg	NWCP kg	Empty weight	
Wing right		35,5		299,8 kg
Wing left		35,7	Useful load	
Fuselage		217,1		172,7 kg
		217,1	MTOW	
Elevator	9,3	9,3		472,5 kg
Rudder	2,2	2,2	Weight NWCP	
Wing struts (50%)			incl.useful load	401,3 kg
useful load		172,7	remarks	
total weight		299,8		

Reference	gross (kg)	tare (kg)	net (kg)
from G1			64,9
from G2			234,9
		Weight G=	299,8

	Arm (mm)
a	875
b	1445

	Name	Model	Producer	C.g. position
	ASI	16-311-161	Winter	-120
	Altimeter	6FMS441	Winter	-120
	Compass	Airpath	Airpath Instrument CO	100
	Variometer/VSI			
	Tachometer			
	Radio	AR4201	BECKER	-220
	Oilpressure gauge			
	Oiltemp gauge			
	Watertemp gauge			
	Battery	SBS 8	HAWKER	-580
	Rescue system			
	Fly.Dat	Fly-Dat	ROTAX	-190
	Clock			
	AI (Horizon)			
	Transponder	BXP6401-2-(01)	BECKER	-230
	Slip		Winter	-100
	GPS			
	ELT			
	Towhook			
	Autopilot			
	Voltmeter			

CG empty according G2*b/G-a= 257

empty CG limits from...240...to...360...at 299,8 kg

Fedchun — Weighed by

Kherson, Ukraine — Location

12/0X/200X — Date

The acceptable empty Cg range is 240 to 360 mm.