Section 7 – Airplane and System Description

IMPORTANT NOTE

The Pilot's Operating Handbook for SE-MMJ has several supplements that add to or modify the Airplane and System Description. In order to help the pilot to find the correct and complete descriptions, the aircraft owner has compiled this consolidated Airplane and System Description using the basic POH and the POH supplements..

Only the original POH text is official

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7.1 Introduction

This section describes systems of the airplane and its operation. Information on optional systems and equipment is available in section 9, Supplements.

7.2 Airframe

The airframe of SportStar RTC airplane is of semimonocoque, metal -composite structure consisting of metal reinforcement, frames and duralumin sheet skin.

7.2.1 Fuselage

The fuselage is of semimonocoque structure consisting of reinforcements and duralumin skin. Fuselage section is rectangular in the lower part and elliptic in the upper part. The fin is an integral part of fuselage. Top part of the fuselage including canopy frame is made of composite. The cockpit for two-member crew is located in the middle part of the fuselage that is accessible after uncovering the single-piece organic glass canopy. The engine compartment in the front part of the fuselage is separated from the cockpit by the steel fire wall to which the engine bed is attached.

7.2.2 Wing

The wing is of rectangular shape, single-spar structure with the auxiliary spar with suspended ailerons and split wing flaps. Riveting is used for connecting individual structural elements. Fiber-glass wing tips are riveted on the wing ends.

7.2.3 Horizontal Tail Unit (HTU)

The HTU of conventional type consists of the stabilizer and elevator with the trim tab. Single-spar structure of HTU consists of duralumin ribs, spar and skin. Top view of HTU is of rectangular shape.

7.2.4 Vertical Tail Unit

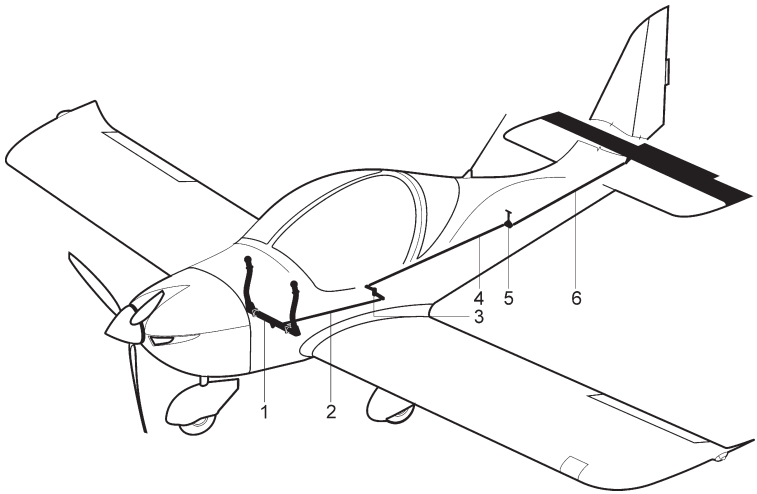
VTU is of trapezoidal shape. Its fin is an integral part of the fuselage. The rudder is suspended on the fin by means of two hinges. The VTU structure consists of the duralumin spar and skin.

7.3 Control

Airplane control consists of ailerons, elevator and rudder. Directional control is connected by means of pull rods with nose landing gear control. Main landing gear brakes are controlled by pedals of directional control.
Airplane is equipped with dual control enabling flight with two-member crew.

7.3.1 Longitudinal Control

The longitudinal control is operated by the left control stick or the right control stick that are attached to the countershaft of manual control (1, Figure 7-1). The movement of the control stick is transferred from the countershaft by the pull-rod (2), led via the central channel (between the seats) in the cockpit, to the deflection of the two-armed lever (3) located under the floor in the baggage compartment. An angular deflection of the two-armed lever is transferred to a longitudinal movement of two pull-rods (4; 6) connected with the rocker arm (5) in the middle of the rear part of the fuselage. The rear pull-rod (6) is attached to the elevator lever.



Legend to Figure 7-1:

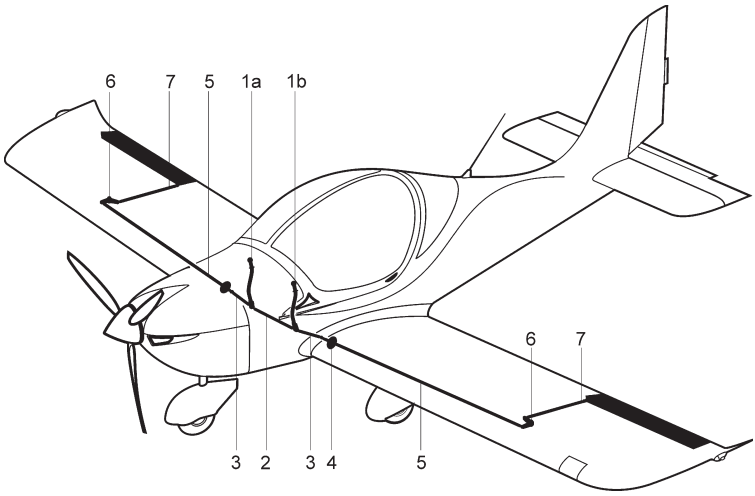
1	Countershaft of manual control	4	Pull-rod
2	Pull-rod	5	Rocker arm
3	Two-armed lever	6	Pull-rod

Figure 7-1 Longitudial control

7.3.2 Lateral Control

The lateral control is controlled by the left control stick (1b, Figure 7-2) or by the right control stick (1a) attached to the countershaft of manual control. The size of lever swing to the left or to the right from the vertical position determines the size of the aileron deflection. The movement of the control stick is transferred by the system of pull-rods and by the angular lever to the pull-rod of aileron.

The control elements are located on the main spar brackets. The control sticks (1a; 1b) are mutually connected by the pull-rod (2). The pull-rods (3) connected with the pull-rods (5) are attached to the control sticks. The pull-rods (5) pass through the grommets in ribs No. 1 and are connected with the angular levers (6). The angular levers (6) transfer the movement to the pull-rods (7) connected with the levers on the ailerons. The bellcrancs (6) are pivoted in the brackets in the wing.



Legend to Figure 7-2:

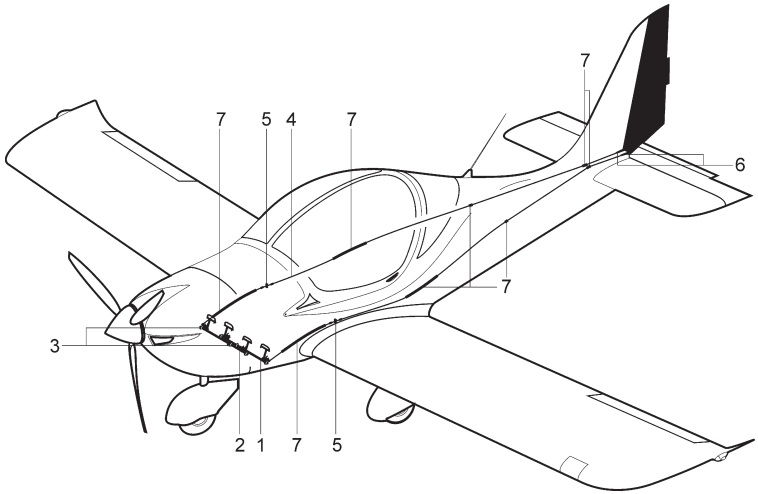
1a	Control stick – right	4	Grommet
1b	Control stick – left	5	Pull-rod
2	Connecting pull-rod	6	Bellcrank
3	Pull-rod	7	Pull-rod

Figure 7-2 Lateral control

7.3.3 Rudder Control

Rudder control is controlled by pedals of foot control. The movement of the pedals is transferred to the rudder by the steel cables (4, Figure 7-3). The cables are attached to the left pedal of left foot control, to the right pedal of right foot control and to the attachments on the rudder. The route of cables of rudder control is led along the sides of the fuselage. The cables are led in the plastic guiding tubes (7) in the exposed places. The stops of cables are located in the area of fuselage frame No. 3.

The pedals of rudder control are connected with the nose landing gear by means of the adjustable pull-rods. The rudder deflecting and the nose landing gear steering are controlled via the movement of foot control pedals. The hydraulic pumps of brakes are also controlled by the foot control pedals.



Legend to Figure 7-3:

1	Rear countershaft	5	Grommet
2	Front countershaft	6	End piece
3	Bearing	7	Tube
4	Cable		

Figure 7-3 Rudder control

The foot control pedals can be set in three positions

Adjustable foot control pedals equipped with the remote position control

The steps to adjust the rudder pedals position:

WARNING

THE RUDDER MUST BE IN NEUTRAL POSITION BEFORE PEDALS ARE ADJUSTED! CHECK THAT THE RUDDER IS CENTERRED BEFORE ADJUSTING!

DO NOT ADJUST FOOT CONTROL PEDALS POSITION IN FLIGHT OR WITH ENGINE RUNNING!

1. Check the engine is shut down.
2. Set the rudder in the neutral position (centered).
3. Assure the space aft of the rudder pedals (where your feet are positioned in flight) is clear, and no pressure is applied to the rudder pedals.
4. Pull the lever marked **ADJUSTABLE PEDALS LEVER** (located below the instrument panel on the RH and LH cocpit side), pedals will automatically move fully aft. Then release the lever.
5. Place feet on the pedals, apply light even pressure on pedals while slightly engaging the lever. The pedals will start to move forward.
6. Release lever and continue to push pedals forward using light even pressure. The pedals will automatically lock in the nearest position.
7. Repeat steps 4 and 5 to move pedals to the desired position.

7.3.4 Elevator Trim Tab Control

The elevator trim tab is located on the elevator trailing edge. It is controlled by the electromechanical strut connected with the angular lever on the trim tab via the pull-rod. In the upper part of both control sticks, there is a head with control buttons that serve for setting the trim tab deflections. The sense of control is: forwards (heavy on nose) or backwards (heavy on tail).

The electromechanical strut is mounted inside the elevator; the connector is attached to the bracket on the pull-rod of elevator control. The relative position of the trim tab is indicated by the PFD.

7.3.5 Wing Flaps Control

The wing flaps can be set to four positions.

RETRACTED ..... 0°
TAKEOFF ..... 15°
LANDING (1st position) ..... 30°
LANDING (2nd position)..... 50°

Detailed description of the electrical wing flaps control.
is currently missing from the Pilot's Operating Handbook

(Currently missing)

Figure 7-4 Wing flaps control

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7.4 Controls in the Cockpit and Instrument Panel

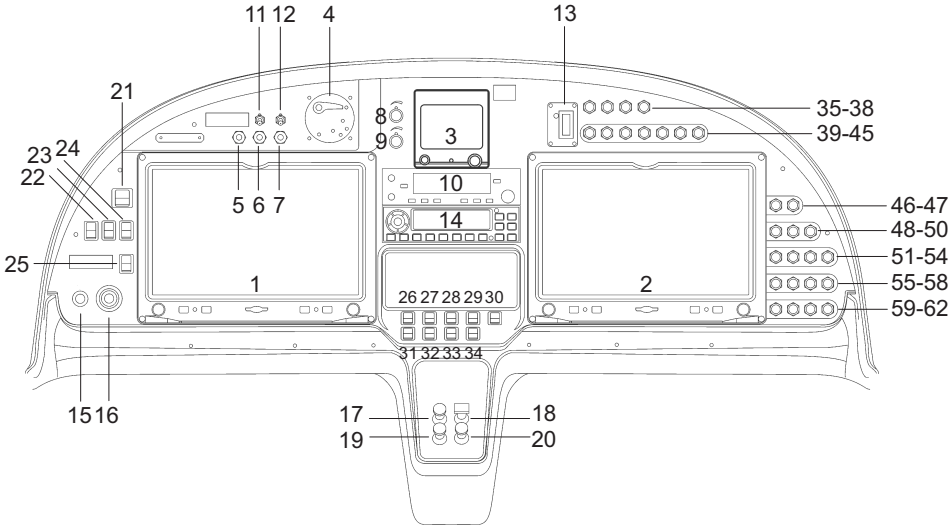


Figure 7–5 Instrument panel and center panel (page 1 of 2)

Legend to Figure 7–5

1 Primary Flight Display GDU 460
2 Multifunction Display GDU 460
3 Backup Flight Instrument G5
4 Flaps control
5 **EMS** signaling light
6 **AUX. GEN** signaling light
7 **GEN** signaling light
8 **INSTR. PANEL DIM** knob
9 **INSTR. LIGHT DIM** knob
10 GTR 255A COMM unit
11 **TAS AUDIO** switch
12 **DAY-NIGHT** switch
13 ELT remote control
14 GTX 335 transponder
15 Choke control
16 Ignition switch
17 Cold air control knob
18 Carburetor preheating control knob
19 Hot air control knob
20 Windshield / feet heating control knob
21 **MASTER SWITCH**
22 **AVIONICS SWITCH**
23 **GEN** switch
24 **AUX GEN** switch
25 **FUEL PUMP** switch
26 **BEACONS** switch
27 **POS. LIGHTS** switch
28 **LDG LIGHT** switch
29 **TAXI LIGHT** switch
30 **COCKPIT LIGHTS** switch
31 **BATTERY G3X** switch
32 **PITOT HEAT** switch
33 **IC (Intercom)** switch
34 **SOCKET** switch
35 **G5** circuit breaker
36 **FLAPS** circuit breaker
37 **PITOT HEAT** circuit breaker
38 **FUEL PUMP** circuit breaker
39 **ACCU** (Battery) circuit breaker
40 **GEN-REF** circuit breaker
41 **GEN** circuit breaker
42 **AUX. GEN** circuit breaker
43 **GEN FIELD** circuit breaker
44 **BATTERY G3X** circuit breaker
45 **SIGNAL** circuit breaker
46 **PFD** circuit breaker
47 **MFD** circuit breaker
48 **AHAHRS 1** circuit breaker
49 **ADAHRS 2** circuit breaker
50 **EMS** circuit breaker
51 **BEACONS** circuit breaker
52 **POS.LIGHTS** circuit breaker
53 **LDG LIGHT** circuit breaker
54 **TAXI LIGHT** circuit breaker
55 **COCKPIT LIGHTS** circuit breaker
56 **INSTR. LIGHTS** circuit breaker
57 **ACI** circuit breaker
58 **TRIM** circuit breaker
59 **COMM** circuit breaker
60 **XPDR** circuit breaker
61 **ALT ENCOD.** circuit breaker
62 **TAS** circuit breaker

Figure 7–5 Instrument panel and center panel (page 2 of 2)

7.4.1 Garmin G3X System Description

The G3X is an advanced technology avionics suite designed to integrate pilot/airplane interaction into one central system. The system combines primary flight instrumentation, airplane systems instrumentation, and navigational information, all displayed on two color screens. The G3X system is composed of several sub-units or Line Replaceable Units (LRUs). LRUs have a modular design. This design greatly eases troubleshooting and maintenance of the G3X system. Each LRU has a particular function, or set of functions, that contributes to the system's operation (see Fig. 7-5a).

GDU 460 display unit

Featuring big, bright, high-resolution touchscreens, these easy-to-read, easy-to-use flight displays provide a whole new perspective on situational awareness with standard GPS navigation, ADAHRS, terrain/obstacles alerting, wireless connectivity, video input and more. G3X Touch even comes preloaded with Garmin FliteCharts, for terminal procedures for airports throughout the U.S., Canada and Europe, plus an option for Jeppesen charts for complete worldwide database coverage. And Garmin SafeTaxi diagrams identify runways, taxiways, FBOs and hangars as well as your airplane's exact location on the field for airports throughout the U.S., Canada and Europe.
Navigation function:

- Display of position and ground speed
- Display of stored navigation and map databases
- Area navigation functions using the determined position/velocity and stored navigation data
- Advisory approach navigation functions and associated databases
- Display of flight plan and navigation from an external GPS navigator
- Display of navigation data from an external VOR/ILS NAV radio

GSU 25 ADAHRS

The GPS-aided, digital GSU 25 ADAHRS provides highly accurate and reliable referencing of airplane position, rate, vector and acceleration data. The GSU 25 provides AHRS and Air Data information in a single mechanical package. The GSU 25 interfaces to a remote mounted GMU magnetometer for heading information and also computes OAT from inputs provided by the GTP 59.

GMU 22 Magnetometer

GMU series remote-mount, solid-state, tri-axial magnetometers use magnetic field measurements to create electronically stabilized heading references.

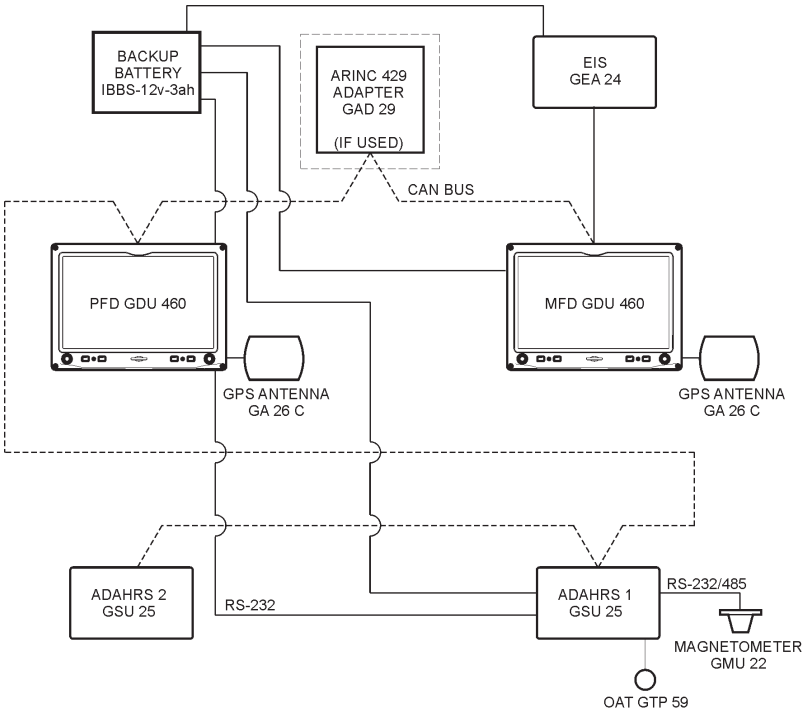


Figure 7–5a Scheme of G3X System

GEA 24 EIS

This EIS unit can measure a variety of engine parameters such as RPM, manifold pressure, oil temperature and pressure, exhaust gas temperature, coolant temperature, fuel level, voltage, current, fuel pressure, fuel flow, trim tab potentiometers, external contacts, and general purpose temperature sensors.

GTP 59 OAT Probe

GTP 59 is an outside air temperature (OAT) probe that provides data to the G3X Touch air data computer for true airspeed, density altitude and other essential flight calculations.

ARINC 429 Adapter GAD 29

The GAD 29 allows the G3X system to interface to IFR navigators such as the GNS and GTN series.

Backup Battery IBBS-12v-3ah

The Integrated Back-up Battery System, IBBS, is an electronic system that combines a Lithium-Iron-Phosphate (Li-Fe-PO4) battery pack, a charger and switching logic in one convenient package.

NOTE

Detailed description and operation of the Garmin G3X system is described in G3X Touch Pilot´s Guide – Doc. No. 190-01754-00 Rev. H, dated December 2016 or latest valid issue.

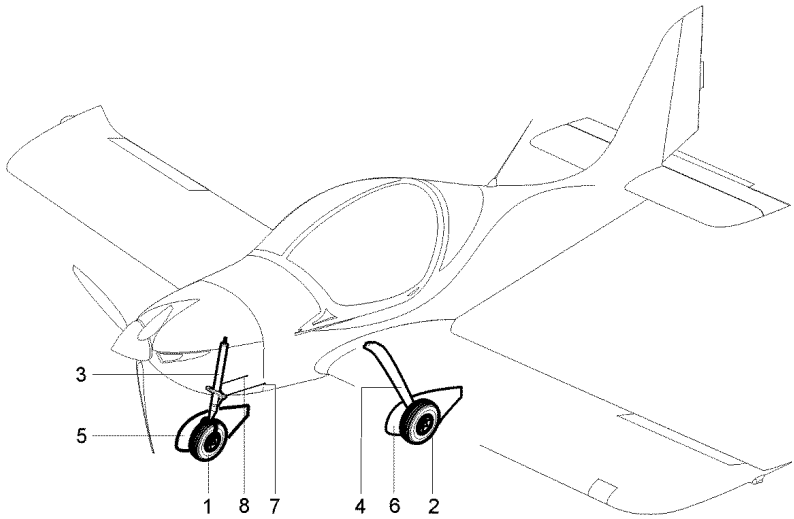
7.5 Inside and Outside Marking and Placards

Placard list and markings are mentioned in the Airplane Maintenance Manual for SportStar RTC airplane.

7.6 Landing Gear and Brakes

7.6.1 Landing Gear

The airplane is equipped with a sort of fixed nose landing gear. Main landing gear legs (4, Figure 7-6) are produced from composite spring. Nose landing gear leg (1) is welded from two pieces - the tube and the yoke- in which the nose wheel is mounted. The nose landing gear is spring-loaded by rubber blocks. The nose wheel is controllable, wheel control is coupled with rudder control by means of two pull rods (7, 8). Wheels can be fitted with fiber-glass aerodynamic pants (5, 6).



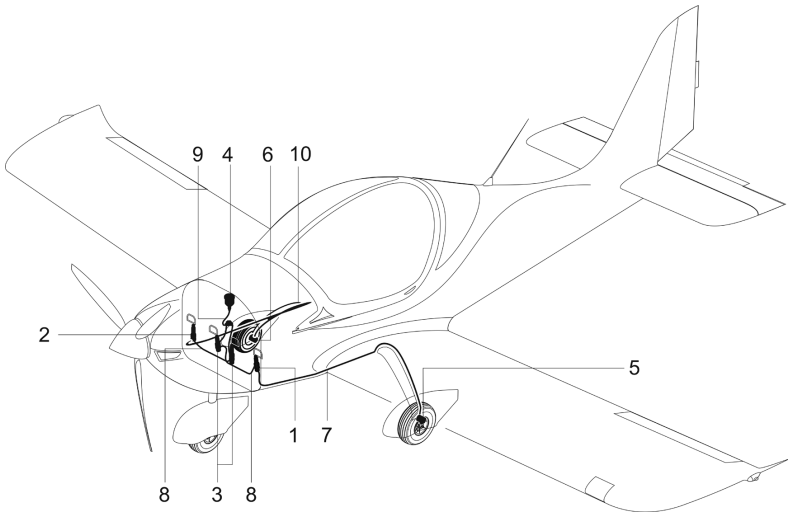
Legend to Figure 7-6:

1	Nose wheel	5	Nose wheel pant
2	Main wheel with brake	6	Main wheel pant
3	Nose landing gear leg	7, 8	Nose wheel control rods
4	Main landing gear leg		

Figure 7-6 Landing gear

7.6.2 Brakes

The SportStar RTC airplane is equipped with disk hydraulic brakes on main landing gear wheels (Figure 7-7). Brake system is composed of brake pedals (these are a part of rudder control pedals), brake pumps (1, 2, 3), hoses for leading brake liquid (7, 9, 9, 10), brake yokes with wheel cylinders and brake pads. By depressing the brake pedals compression of brake pumps occurs, which generates pressure in brake circuit and hydraulic cylinders press the brake pads onto the brake disks. Braking pressure can be regulated only by force of brake pedals depressing.



Legend to Figure 7-7:

1	Brake pump	6	Right wheel brake
2	Brake pump	7	Hose to left wheel brake
3	Brake pump	8	Brake liquid hose
4	Barake fluid reservoir	9	Brake liquid hose
5	Left wheel brake	10	Hose to right wheel brake

Figure 7-7 Braking system

The mechanical manually controlled parking brake is installed in the airplane. **PARKING BRAKE** handle is located below the left pilot seat.

Applying parking brake

1. Brake pedals ..... press and hold
2. **PARKING BRAKE** handle ..... pull to brake
3. Brake pedals ..... release

Releasing parking brake

1. Brake pedals ..... press and hold
2. **PARKING BRAKE** handle ..... push to release
3. Brake pedals ..... release

7.7 Seat and Safety Harnesses

SportStar RTC airplane is a two-seat airplane with side-by-side seats. Seats are fixed, non-adjustable and fitted with light upholstery.

Each of seats is fitted with four-point safety harness which is composed of safety belts, shoulder straps and lock. The safety harness is anchored in the fuselage sides behind the seats and on the seat sides.

7.8 Baggage Compartment

Baggage compartment is positioned behind seat rests.
Maximum weight of baggage is 55 lbs (25 kg) and is stated on the placard in the baggage compartment. The baggage compartment is fitted with rubber net for baggage fixation.

7.9 Canopy

The cockpit canopy is of a semi drop shape. The framework is made of composite. The organic glass is glued to the canopy composite frame.

The canopy is attached to the fuselage in the front part by two swivel pins by means of which it can be folded up forwards. In order to make opening easier, the actual weight of canopy is balanced by two gas struts, besides the canopy is provided with holders on the lower framework for easier handling. The canopy is provided with the lock in the rear upper part of framework for locking.

7.10 Power Unit

7.10.1 General

The engine ROTAX 912 S2 (100 hp) is used to power SportStar RTC airplane. ROTAX 912 S2 is a four-cylinder, four-stroke engine with opposite cylinders, central cam shaft, OHV valve mechanism and maximum take-off power of 100 hp (73.5 kW) at 5800 RPM.

The on-ground adjustable, composite, 3-blade propeller WOODCOMP KLASSIC 170/3/R is standard mounted on the engine ROTAX 912 S2.

The airplane can be optionally equipped with the 3-blade, composite, in-flight adjustable KW-31-033 propeller.

The airplane can be optionally equipped with the 3-blade, composite, on ground adjustable DUC SWIRL-3 L propeller.

7.10.2 Engine Control

Engine power is controlled by means of **THROTTLE** lever, which is located in the central console which controls engine power range from idle up to maximum take-off. Engine power controller S7610001S is mechanically interconnected with the flap on carburetors. Engine power controller S7610002S is mechanically interconnected with fuel injection control.

If the throttle lever is fully pushed forward, then this position corresponds to maximum engine power. If the throttle lever is fully pulled back, then this position corresponds to idle (1600 – 1700 RPM set by airplane manufacturer).

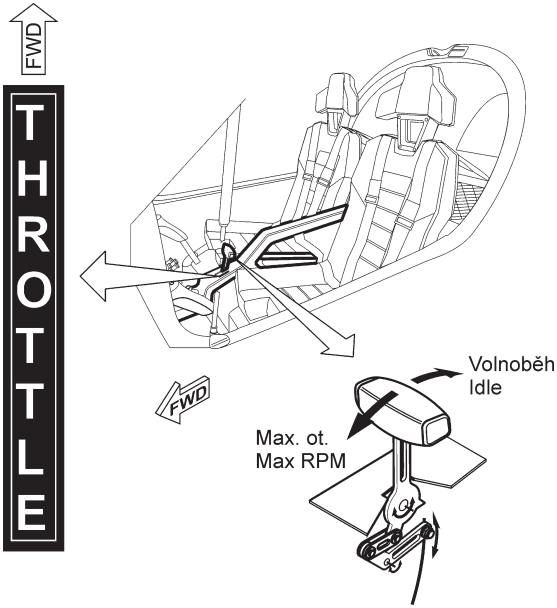


Figure 7–7a Throttle control

7.10.3 Engine Instruments

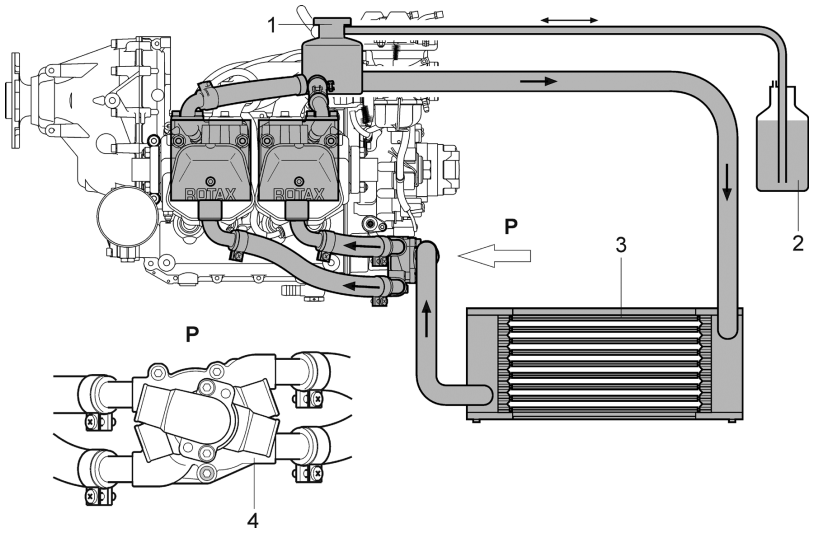
Engine parameters (RPM, CT, EGT, oil pressure and temperature) are displayed on the MFD (see par. 7.4.1). Exceeding of engine parameters is signalized with the **EMS** signaling light.

7.10.4 Engine Cooling System

Engine cooling is combined, cylinder heads are cooled by water, and cylinders are cooled by air.

Cooling circuit of cylinder heads is designed as a closed system containing pump, expansion tank (1) with pressure closure, cooling liquid cooler (3) and overflow bottle (3). Scheme of cylinder head cooling system is shown in Fig. 7–8.

When changing, the cooling liquid is filled up through the cap of expansion tank (1), during airplane operation it is replenished into overflow bottle (3) between the lines of maximum and minimum level.



Legend to Figure 7-8:

1	Expansion tank	3	Cooling liquid cooler
2	Overflow bottle	4	Pump

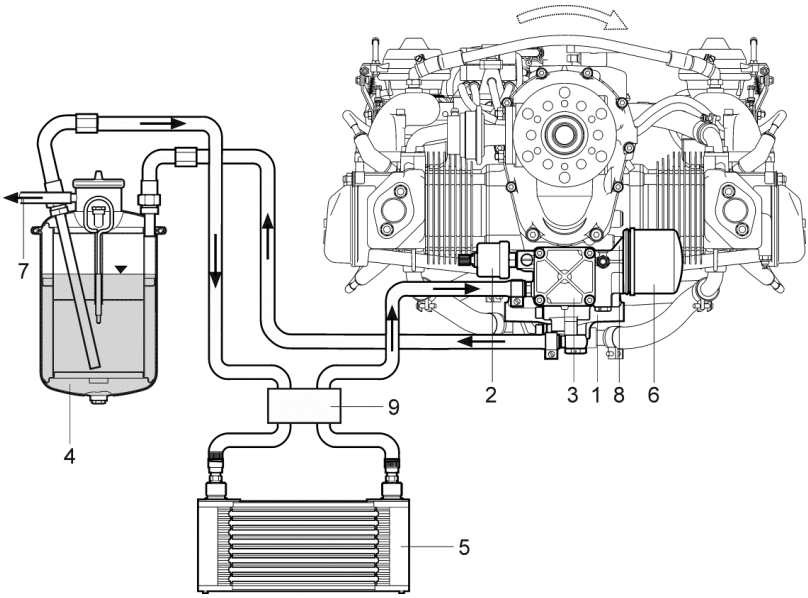
Figure 7-8 Scheme of cylinder head cooling system

7.10.5 Engine Lubrication System

The engine is equipped with the lubrication system with the dry sump and the oil pump that has a built-in pressure reducing valve (1, Figure 7-9) and a sensor of oil pressure (2). The oil pump (3), that is driven by the camshaft, takes the engine oil from the tank (4) through the thermostat (9), oil cooler (5) and the oil is forced through the oil filter (6) to the individual lubrication points in the engine. The oil flows down from the lubrication points to the bottom of the crankcase, and from there it is forced to the oil tank by means of the pressure shocks from the pistons. The venting of the system is realized by the outlet (7) on the oil tank.

The sensor of oil temperature (8) is located on the pump body and it measures the oil temperature on the inlet; the sensor of oil pressure (2) is installed along with the pressure reducing valve in the oil pump.

Oil pressure and temperature are indicated on instruments in right side of the instrument panel. Oil is replenished through the lid in the upper part of the oil tank (4).



Legend to Figure 7-9

1	Reduction valve	6	Oil filter
2	Sensor of oil pressure	7	Venting of oil system
3	Oil pump	8	Sensor of oil temperature
4	Oil tank	9	Thermostat
5	Oil cooler		

Figure 7-9 Scheme of engine lubrication system

7.10.6 Engine Intake System

Engine intake system ensures delivery of sufficient air into engine. Air is taken into the engine through openings on the engine covers through the air filters. The intake system can be equipped with carburetor heating system. Hot air from the heat exchanger (located on the exhaust collector) is taken to the mixing chamber. Amount of in-taken hot air is regulated by flaps in mixing chamber inlets. Flaps are controlled by the **CARBURET. PREHEAT.** knob on the instrument panel.

7.10.7 Ignition System

The engine is equipped with the double contactless ignition system. Each ignition circuit has own source of energy, control unit, 2 ignition coils and 4 spark plugs. It is fully autonomous on the other circuit of accumulator. High voltage current is distributed to the spark plugs through high-voltage cables. Ignition sequence of individual engine cylinders: 1-4-2-3.

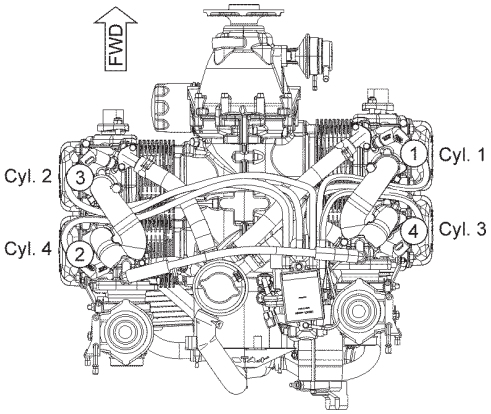


Figure 7-10 Ignition sequence

Ignition circuits are controlled by the ignition switch on the instrument panel.
Positions of ignition switch:

OFF	engine ignition is off
R	only ignition circuit B is on
L	only ignition circuit A is on
BOTH	both circuits are on
START	both circuits are on and starter is cranking the engine

7.10.8 Propeller

The on-ground adjustable, composite, 3-blade propeller DUC SWIRL-3-L is installed on the airplane.

7.11 Fuel System

Fuel system serves for keeping fuel in the airplane and it's feeding to the engine. Fuel system of SportStar RTC airplane is composed of integral fuel tanks (1, 2 Figure 7–12), fuel line, fuel selector (4), check valve (5), fuel filter (5), mechanical fuel pump - located on the engine (11),electrical fuel pump (6), distributors (9, 10), distribution pipes of fuel with return branch and fuel tanks draining valves (12). Overflow fuel from engine fuel pump (11) is led via hose under the airplane. Fuel pressure and manifold pressure are displayed on the MFD (14) (see par. 7.4.1).

7.11.1 Fuel Tanks

Fuel is contained in the wing integral tanks (1, 2) having volume 60 l each. Each tank is fitted with air venting (output is under the wing tip) and draining valve (15) on the bottom side of the wing.

Fuel is led from the tanks through the hoses to the fuel selector (4) located on a central console under the instrument panel and then through a fuel filter (5), the fuel pumps (6, 11), distributors (9, 10) to the carburetors (7, 8). Fuel return hose goes from the fuel distributor (9) into the fuel selector (4) and from there to fuel tanks (1, 2) which the fuel is drawing off. See figure 7-11 for Scheme of fuel system.

7.11.2 Fuel Selector

The fuel selector (4) serves for tank selection and fuel delivery interruption in case of engine fire or long parking of airplane.

To move selector from **OFF** (closed) position it necessary pull the safety button on the fuel selector, turn the handle from the **OFF** position to the left and then release safety button. Now the handle can be freely moved between **LEFT** and **RIGHT** position. Safety button prevents unintentionally switch the selector to **OFF** position.

To move selector to **OFF** (closed) position it is necessary pull the safety button on the fuel selector, turn the handle to the **OFF** position and then release safety button. Now the handle is blocked in the **OFF** position. Safety button prevents unintentionally switch the selector from the **OFF** position during parking.

7.11.3 Fuel Filter

The fuel filter (5) separates all mechanical impurities from fuel. The fuel filter is located in the cockpit on the left airframe panel.

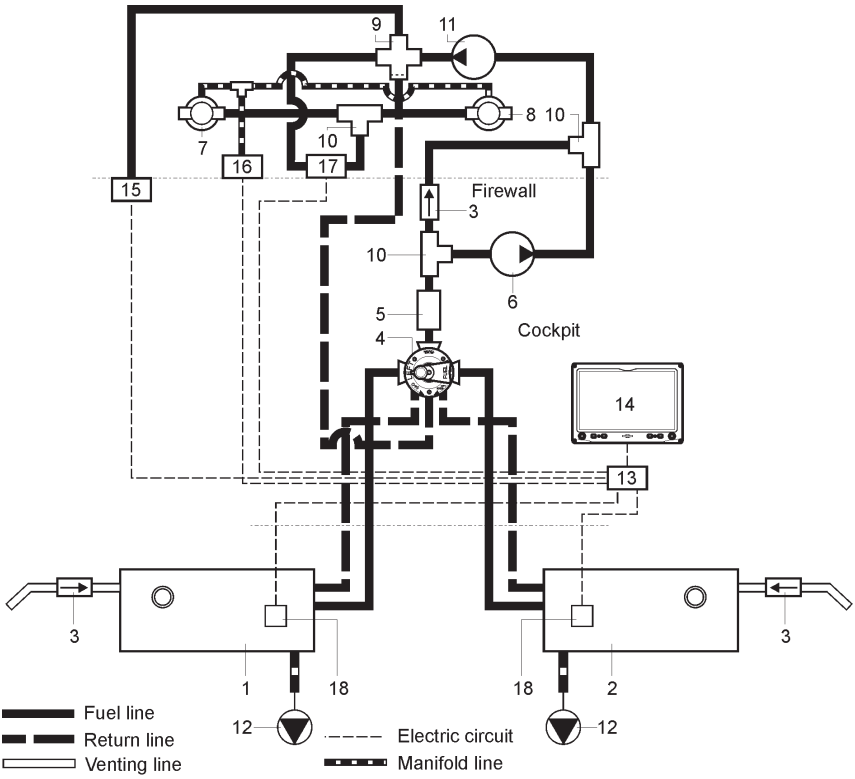
7.11.4 Indication of Fuel Quantity and Fuel Flow

Fuel quantity is measured by a float fuel sensor (18, Figure 7–12) in each tank. The signal from the fuel sensor is led to the EIS GEA 24 (13) and the value are displayed on the MFD (14) (see par. 7.4.1). True fuel quantity is indicated only on ground and in level flight and it takes approx. 2 minutes to level fuel after transition from climb/descent.

The fuel flow meter (17) is installed on the firewall in the engine compartment. The flow meter is inserted between the pump (11) and the three-way distributor (10) ensuring the fuel supply to the carburetors. The signal from the flow meter is led to the EIS GEA 24 (13) and the value are displayed on the MFD (14).

7.11.5 Fuel Tank Draining

Draining of the fuel tank is specified in Section 8 para 8.5.2.



Legend to Figure 7–11

1	Left fuel tank	10	Three-way distributor
2	Right fuel tank	11	Engine fuel pump
3	Check valve	12	Drain valve
4	Fuel cock	13	EIS GEA 24
5	Fuel filter	14	MFD GDU 460
6	Electric fuel pump	15	Fuel pressure sensor
7	Left carburetor	16	Manifold pressure sensor
8	Right carburetor	17	Fuel flow meter
9	Four-way distributor	18	Fuel level sensor in tank

Figure 7–11 Diagram of fuel system

7.12 Electrical System

The airplane is equipped with 14 V DC electrical installation (see Figure 7–12). A main generator with power of 250 W is the primary source of electrical energy.

A 600 W alternator is mounted on the forward left side of the engine. It is mounted via brackets on the propeller gear case and is belt driven from the propeller hub. The alternator supplies power to the airplane. The power supplied by the alternator is controlled by the integrated voltage regulator. It combines three essential devices in one physical container:

1. It functions as a linear regulator.
2. It provides a vital safeguard for electrical system with a solid-state, over voltage protection system.
3. It contains a low-voltage detection circuit that illuminates a red warning light **AUX. CHARG.** Whenever bus voltage drops below 12.5 V.

The external alternator is switched on/off by **AUX. GEN** switch located on the lower left part of the instrument panel. There is also **AUX. GEN** circuit breaker located below the left part of the instrument panel.

In case of external alternator installation in the airplane there is also a **GEN** switch installed on the lower left part of the instrument panel. The **GEN** switch switches off and on the main generator.

DC voltage is distributed to individual systems by main bus bar. Each system is protected by circuit breaker. If overloading of any of the circuits occurs, then the circuit breaker is pulled out. Circuit breakers are listed in the Aircraft Maintenance .

CAUTION

DO NOT USE CIRCUIT BREAKERS FOR NORMAL SWITCHING OFF OF THE SYSTEMS.

After switching **MASTER SWITCH** on and by turning the ignition key to **START** position the starter is activated. The starter is power supplied from the accumulator before engine start. After engine has been started and idle RPM reached, generator starts supplying current into electrical network.

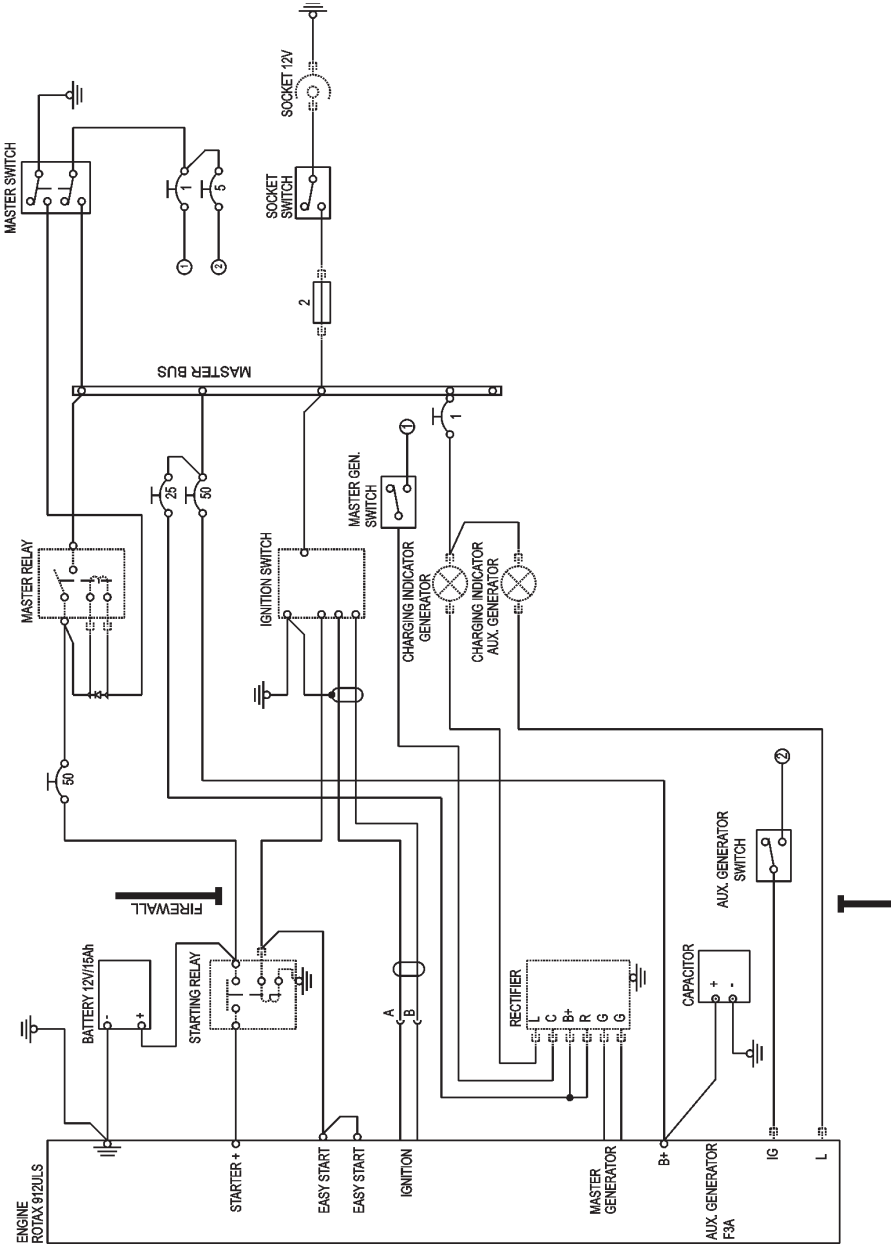


Figure 7–12 Scheme of electrical system

7.12.1 Lighting

Airplane is equipped with an internal and external lighting.

Internal lighting is composed of adjustable lamp which is located on the canopy frame, instrument panel lighting which is located on the bottom part of the glareshield and instrument lighting. Canopy lamp is switched by **COCKPIT LIGHT** switch. The instrument panel lighting and the instrument lighting is switched on by the **DAY-NIGHT** switch to **NIGHT** position. The intensity of the lighting can be adjusted by the **INSTR PANEL DIM** and **INSTR LIGHT DIM** knobs.

External lighting is composed of position lights and anti-collision beacons which are located in wing tip and taxi / landing headlight which is located in right / left wing leading edge. Position lights are switched by **POS. LIGHTS** switch and anti-collision beacon by **BEACON** switch. Landing headlight is switched by **LDG LIGHT** switch; taxi headlight is switched by **TAXI LIGHT** switch.

7.13 Pitot-static System

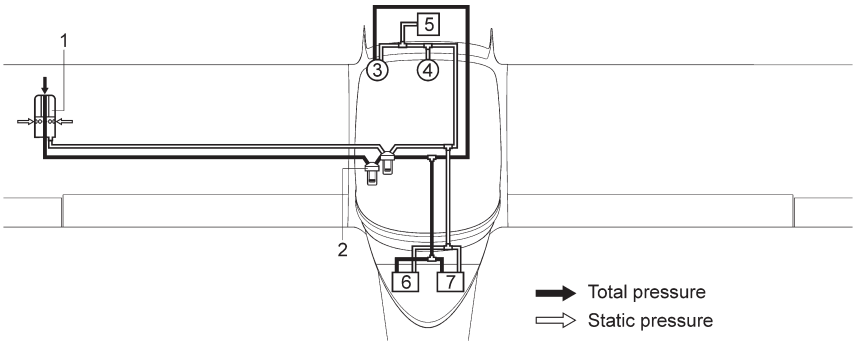
Pitot-static tube (1, Figure 7–13) for sensing static and total pressure is located under the left half of the wing. Total pressure is sensed through the opening in the Pitot-static tube face. Static pressure is sensed through openings on the tube circumference. System of pressure distribution to individual instruments is made by means of flexible plastic hoses.

Static pressure is led to main (6) and standby ADAHRS unit GSU 25 (7), standby altimeter (4), backup airspeed indicator (3) (if installed) and altitude encoder (5). Total pressure is led to the main (6) and standby ADAHRS unit GSU 25 (7) and backup airspeed indicator (3) (if installed).

Pitot-static tube is electrically heated. The heating is activated by **PITOT HEATING** switch, located in the left lower part of the instrument panel. Activation of the system is signalized by illuminating of the **PITOT HEAT.** marking on MFD of the G3X system.

CAUTION

AVOID BLOWING INTO THE PITOT-STATIC SYSTEM WITH THE CONDENSATE RESERVOIR COVER IS CLOSED - IT MAY CAUSE AN INSTRUMENT MALFUNCTION.



Legend to Figure 7–13

1	Pitot-static tube	5	Altitude encoder
2	Drain sump	6	Main ADAHRS unit GSU 25
3	Standby airspeed indicator	7	Standby ADAHRS unit GSU 25
4	Standby altimeter		

Figure 7–13 Scheme of pitot-static system

7.14 Supplementary Equipment

7.14.1 Stall Speed Warning System

The sensor of stall speed warning is located on the left wing leading edge. When approaching the critical angle of attack (stall speed proximity) the flap is reset and electrical circuit connected as a result of pressure differences acting on the front and the rear part of the flap. During stall speed warning the acoustic signaling is activated which lasts throughout the time of occurrence.

7.14.2 Ventilation and Heating System

Cockpit ventilation is ensured by 2 eye–ball vents (14, Figure 7-14) located on the left and right of the tip-up canopy frame. Vents are connected to the NACA inlets (14) through tip-up canopy frame front flaps.

Cockpit heating is ensured by hot air from the heat exchanger (2). The heat exchanger is located on the exhaust collector (18). Air from ambient atmosphere is warmed up in the exhaust collector and then led through the mixing chamber (6) on the firewall and hoses to the cockpit floor or to the hot air outputs through the instrument panel cover as well as into the hollow spaces in the canopy frame for canopy glass defrosting.

Hot air quantity is regulated by the **HOT AIR** knob, cold air quantity is regulated by the **COLD AIR** knob on the instrument panel. Proportion of the cold and hot air in the heating system can be set continuously. Other knob on the right of the **HOT AIR** knob serves for air routing to the cockpit floor or on the canopy glass.

Legend to Figure 7-14

1	Air inlet	11	Hose
2	Heat exchanger	12	Hose
3	NACA inlet	13	Hose
4	Hot air chamber	14	NACA inlet
5	Cold air chamber	15	Eye-ball vent
6	Mixing chamber	16	Air outlets
7	Hose	17	Controls
8	Hose		For information:
9	Hose	18	Exhaust collector
10	Hose	19	Cooling liquid cooler

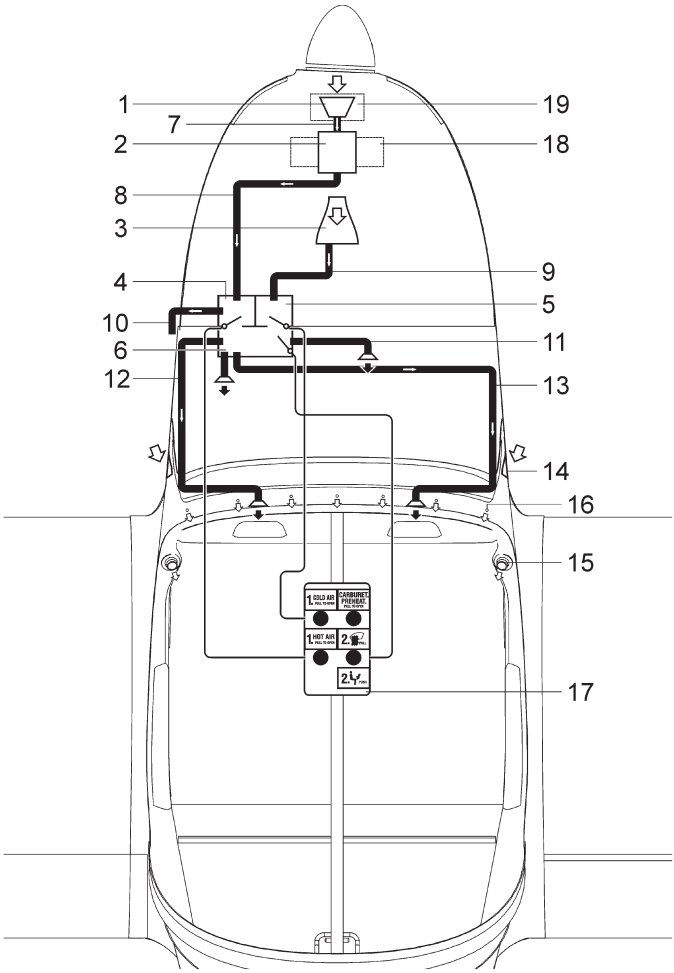


Figure 7-14 Scheme of ventilation and heating system

7.15 Navigation and Communication Equipment

7.15.1 AIR Traffic AT-1

AT-1 is a small, lightweight traffic / electronic conspicuity system based on FLARM and ADS-B technology. It detects the position of surrounding air traffic and transmits the own position to other airplanes that are equipped with compatible systems. It transfers traffic data and warning messages to the compactible cockpit display systems (Garmin Aera 660 GPS or GDU 460 Displays of G3X system, depending on airplane equipment).

The TAS system consist of AT-1 unit and antennas. AT-1 unit is installed on the right side of the avionics rack. FLARM antenna lower is installed on the left lower side of the fuselage, FLARM antenna upper is installed on the cover of the fuselage upper part. ADS-B antenna is installed on the right lower side of the fuselage. GPS antenna is installed under the cover of the fuselage upper part.

The AIR Traffic AT-1 is connected to the power supply through the avionics bus. The system is protected by a circuit breaker **AT-1**. The avionics bus is operated by **AVIONICS SWITCH** circuit breaker.

The AT-1 audio output provides an audio signal to an intercom. The audio signal can be turned off by **TAS AUDIO** switch .

For some of its functions, AT-1 measures the barometric altitude. The static port is connected to the hose from the altitude encoder.

NOTE

Detailed operating instructions are stated in the Pilot's Manual, doc. No. MAN0070A0002, Version 4.0, date 2020/01/09 or later valid version.

7.15.2 Garmin GTR 255A COMM

The Garmin GTR 225A is a VHF communication transceiver. The GTR 225A COMM operates in the band from 118.000 to 136.975 MHZ in 25 kHz steps. For European operations, a Com radio configuration of 8.33 kHz steps 118.000 to 136.992 MHz is also available. The transmit power of the GTR 225A is 10W.

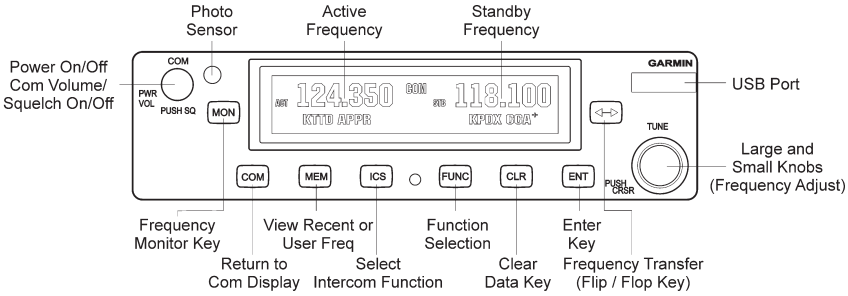


Figure 7-15 – GTR 225A COMM display and description

GTR 225A Controls

Power/Com Volume/Squelch Knob

The Power/Com Volume/Squelch knob located in the top left corner of the bezel controls audio volume for the Com radio. Rotating the knob clockwise past the detent turns power on and counter-clockwise turns power off. When the Com radio is active, press the Power/Com Volume/Squelch knob to toggle automatic squelch control On/Off for the Com radio.

The Com radio features an automatic squelch to reject many localized noise sources. You may override the squelch function by pressing the Power/Com Volume/Squelch knob. This facilitates listening to a distant station or setting the desired volume level.

To override the automatic squelch, press the Power/Com Volume/Squelch knob momentarily. Press the Power/Com Volume/Squelch knob again to return to automatic squelch operation. A “SQ” indication appears to the left of the active Com frequency window in the upper left corner of the display when automatic squelch is overridden.

Large/Small Concentric Knobs

The Large right and Small right knobs are used for tuning frequencies and data entry.

Flip/Flop Key

Press and release the Flip/Flop key to switch between the active (left-most) and standby (right-most) frequency. Switching between Com frequencies is disabled while you are transmitting.

COM Key

Press the COM key to return to the Com radio mode.

MEM Key

Press the MEM key to recall and toggle between the Com Recent and User Frequency Lists.

ICS Key

Press the ICS key to toggle display of the ICS settings for Intercom On / Off, AUX Audio, or the Intercom settings.

FUNC (Function) Key

The FUNC (Function) key accesses function categories for the following: the Com Radio, ICS Configuration, System Configuration, and Timer. Pressing the FUNC key once displays the Function mode. Pressing the FUNC key a second time exits the Function mode.

T/F (To/From) Key

Press the T/F key to toggle between the bearing TO or radial FROM the active VOR. The T/F page also shows Distance/Speed/ Time information. The T/F key does not operate for Localizer frequencies.

CLR Key

Pressing the CLR key erases information, cancels entries, and resets timers.

ENT Key

Press the ENT key to save selected values, to confirm a prompt, or to save the Standby frequency.

MON (Monitor) Key

The MON (Monitor) key will engage the monitor function where the Standby frequency may be monitored while still listening to the Active frequency.

USB Port

The USB port is used to update the frequency database in the GTR 225.

Photo Sensor

Used for the automatic adjustment of the display brightness.

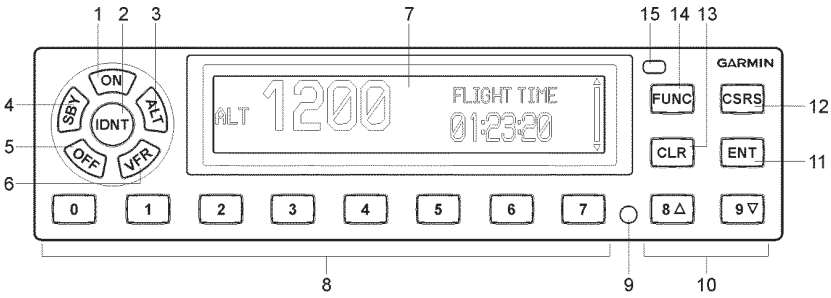
7.15.3 Garmin GTX 335 Transponder

The GTX 335 is panel mounted mode S transponder with ADS-B Out functionality. It receives interrogations from ground stations with secondary radar or from TCAS/TAS/TCAD systems on board other airplanes with a frequency of 1030 MHz and transmits a coded response back on a frequency of 1090 MHz.

GTX 335 features:

- ADS-B Out
- TIS traffic display output and aural alerting
- Altitude deviation alerting
- Timers: count up, count down, flight, trip
- Static (Outside) air temperature display
- Density and pressure altitude display
- Internal GPS

The transponder system consist of transponder unit, antenna and altitude encoder.



Legend to Figure 7-16:

1	Key for switching the XPDR on and mode selecting	9	Photocell
2	Key for activation of the special position identification code	10	Code selection keys, count up / down, flight timers
3	Key for mode selecting	11	Key for acknowledge
4	Key for mode selecting	12	Cursor key
5	Key for switching the XPDR off	13	Key for clear selected entry and exits the menus
6	Key for change to the pre-programmed VFR squawk code	14	Key for cycles through menu
7	Display	15	
8	Code selection keys		

Figure 1 – Front panel of Garmin GTX 335

The Garmin GTX 335 transponder has the following controls:

Mode Selection Keys

Mode selection keys are located on the left next to the display.

ON Sets the transponder to MODE A operation. In this mode, the transponder replies to interrogations, as indicated by the reply symbol ('R'). Replies do not include altitude information.

ALT Sets the transponder to operate in MODE A and MODE C. In ALT mode, the transponder replies to identification and altitude interrogations, as indicated by the reply symbol ('R'). Replies to altitude interrogations always are referenced to standard pressure altitude 1013 hPa.

VFR Sets the transponder code to the VFR code programmed in the configuration mode. Pressing the VFR key again will restore the previous identification code.

OFF Switches the GTX 335 off.

SBY Selects the standby mode. When in standby mode, the transponder does not reply to any interrogations.

IDNT Pressing the **IDNT** key activates the special position identification (SPI) pulse for 18 seconds, identifying the transponder return from others on the air traffic controller's screen. The word 'IDENT' will appear in the upper left corner of the display while the IDENT mode is active.

Code Selection Keys

Code selection is done via eight numeric keys (**0** - **7**) providing 4096 active identification codes. Pushing one of these keys begins the code selection sequence. The new code will not be activated until the fourth digit is entered. Pressing the **CLR** key will move the cursor back to the previous digit. Pressing the **CLR** key when the cursor is on the first digit of the code or pressing the **CRSR** key during code entry removes the cursor and cancels data entry, restoring the previous code.

The numbers **8** and **9** are not used for code entry, only for entering a count-down time, adjusting contrast and display brightness, and for data selection in the configuration mode.

NOTE

The identification code should be entered with care, regardless if the code was assigned by ATC or if a standard transponder code is being used.

Important Codes

NOTE

During regular operation avoid an accidental selection of the codes intended for emergency: 7500, 7600 and 7700.

1200 – VFR code in North America (refer to ICAO Standards)
7000 – VFR code commonly used in Europe (refer to ICAO Standards)
7500 – Hijack code (airplane is subject to unlawful interference)
7600 – Loss of communications
7700 – Emergency
7777 – Military interceptor operations
0000 – Military use

FUNC Changes the page shown on the right side of the display. The data displayed includes Transponder (XPDR) - Timer (TMR) - Altitude (ALT) - System (SYS).

CSRS The **CRSR** key activates the cursor for selection in menus and on pages.

CLR The **CLR** key deletes selected inputs and leaves a menu.

ENT The **ENT** key acknowledges menu selections and inputs by the pilot into the corresponding data fields.

Function Display

Scrolling through the menu groups XPDR - TMR - ALT - SYS is done by pressing the **FUNC** key. Within a menu group keys **8** (up) and **9** (down) are used for scrolling through the submenus.

Timer Menu:

Count-up timer:
Controlled by **ENT** and **CLR** keys.

Count-down timer:
Controlled by **ENT** and **CLR** keys. The count-down time is set with the **0** - **9** keys.

Flight Timer:
This Timer measures time since the last take-off of the airplane. It starts automatically when the transponder detects a take-off. With the **ENT** and **CLR** keys start, stop and reset is possible manually.

Trip Timer:
This Timer measures time since the last manual reset of the timer. It starts automatically when the transponder detects a take-off. With the **ENT** and **CLR** keys start, stop and reset is possible manually.

Altitude Menu:

Pressure Alt:
Displays the flight altitude provided from the Altitude Encoder as configured in feet, hundred feet (FL) or in meters.

Altitude Monitor:
Is selected / deselected by **CRSR** and **ENT** keys. If the altitude limit is exceeded a warning will be annunciated acoustically via sound and / or voice.

SAT / DALT:
Display of Static Air Temperature and pressure altitude, if available.

System Menu:

Backlight:
By pressing **CRSR** and **8** (up) respectively **9** (down) the backlight offset is adjusted.

Contrast:
By pressing **CRSR** and **8** (up) respectively **9** (down) contrast is adjusted.

Messages:
This page displays the number of active system messages. Viewing active system messages can be displayed by pressing the **CRSR** key.

GPS Status:
Shows the status of all configured GPS sources within the GTX 335. Details to the GPS fixes can be displayed by pressing the **CRSR** key.

Failure Annunciation

If the transponder unit detects an internal failure, the screen will display a corresponding failure message. For details see the Garmin GTX 335 Pilot's Guide.

NOTE

Detailed operating instructions are stated in the Garmin GTX 335/345 All-In-One ADS-B Transponder Pilot’s Guide, P/N 190-01499-00 (revision F or later).

7.15.4 Kannad AF Integra ELT

Description

The emergency location radio transmitter KANNAD AF INTEGRA consists of the unit which is installed in the baggage compartment and the control panel which is installed in the instrument panel. The external antenna is installed under the composite upper part of the fuselage aft of the baggage compartment.

The KANNAD AF INTEGRA transmits emergency signals on two frequencies:

406 MHz (Cospas-Sarsat frequency) for precise pinpointing and identification of the aircraft,

121.5 MHz used for homing in the final stages of the rescue operations.

The unit has the built-in GPS receiver and therefore the aircraft position (accuracy typically about 60 meters) will be transmitted by the ELT within minutes following the distress.

The energy to the units is provided by a battery pack composed of a $LiMnO_2$ two-element battery. Until the battery expiry date, the duration of the 121.5 MHz transmission is over 48 hours at -20°C. As it is therefore preferable to keep the battery power for 121.5 MHz homing frequency transmission for the rescue operations, in compliance with Cospas-Sarsat specifications, the 406 MHz transmission is deliberately stopped after 24 hours to extend the 121.5 MHz transmission for as long as possible.

Operation

The ELT operates automatically if the switch on the unit in **ARM** position. The ELT is activated by switch which reads aircraft acceleration in longitudinal direction. When the value of 3.5 ft/sec of airplane longitudinal acceleration is exceeded, the ELT unit is automatically activated and starts continuously transmitting emergency radio signal at frequency of 121.5 MHz. Every 50 seconds the units transmits a 406 MHz signal.

Manual activation of the ELT is possible either by setting the switch on the remote control unit to **ON** position or by setting the switch on the unit to **ON** position.

The activated ELT can be switched off by setting the switch on the remote control unit to **RESET** position panel or by setting the switch on the unit to **OFF** position.

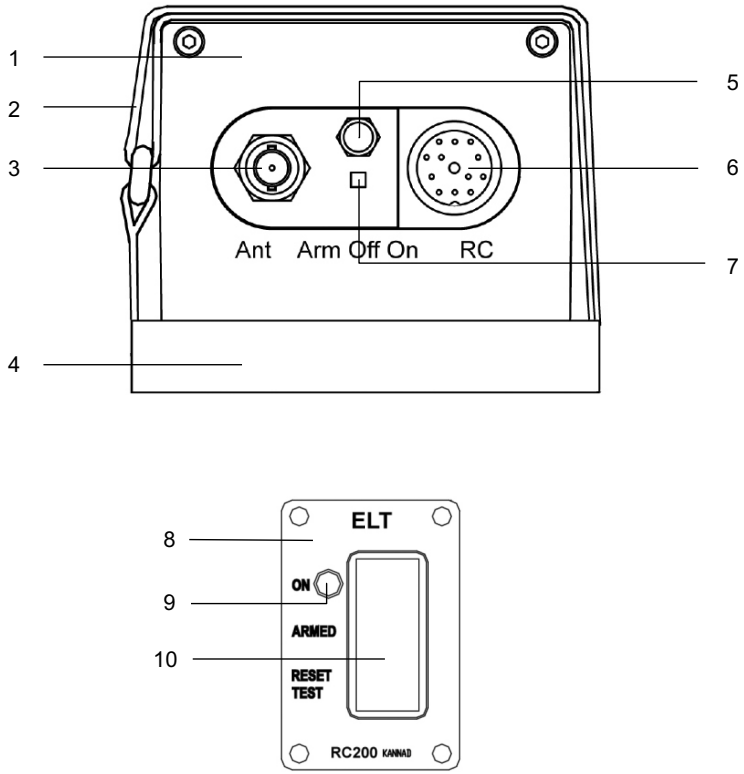
The ELT has 4 different modes of operation:

Off

Self-test (temporary mode)

Armed (standby mode to enable automatic activation by the shock sensor or by an optional remote control panel).

On (transmission).



1 ELT unit

2 Attaching strap

3 BNC connector for the external antenna

4 Bracket

5 3-position switch **ARM-OFF-ON**

6 Socket connection to remote control panel

7 Red visual indicator

8 Remote control panel

9 Red visual indicator

10 3-position switch **ON-ARMED-RESET/TEST**

Fig. 7-17 – ELT unit and Remote Control panel

Off Mode

The ELT is off when the switch is in the **OFF** position, no part of the ELT is energized. This mode must **only** be selected when the ELT is removed from the aircraft or when the aircraft is parked for a long period or for maintenance.

Self-Test Mode

The self-test mode is a temporary mode (max duration 15 seconds) in which the ELT checks the main characteristics of the transmitter (Battery voltage, Programming...) and enables digital communication with programming and test equipment. This mode is selected:

When switching from **OFF** to **ARM** on ELT;

When switching to **RESET/TEST** on the remote control panel (provided that the switch of the ELT is in the **ARM** position);

When switching to **ON** prior to transmission.

The buzzer operates during the self-test procedure

After about 10 seconds, the test result is displayed on the red visual indicator as follows:

One long flash, duration 1 s, indicates a proper functioning.

A series of short flashes, 200 ms, indicates a faulty functioning.

The number of flashes indicates the type of failure:

3+1	LOW BATTERY VOLTAGE
3+2	LOW RF POWER
3+3	FAULTY VCO LOCKING (FAULTY FREQUENCY)
3+4	NO IDENTIFICATION PROGRAMMED
3+5	FAULTY VSWR (LINK TO EXTERNAL ANTENNA)
3 + 6	INTERNAL GPS SERIAL LINK

Armed Mode

In order to enable activation by the G-Switch or with the remote control panel, the ELT must be in standby mode with the switch in the **ARM** position. **This mode is mandatory during flight**. The ELT should remain in the "ARM" position except when the aircraft is parked for a long period or for maintenance.

On Mode

This mode is selected:

Manually by switching the ELT to **ON**;

By switching the remote control panel switch to **ON** (provided that the ELT switch is in the **ARM** position);

Automatically when a crash occurs (provided that the ELT switch is in the **ARM** position).

When the ON Mode selected, the ELT starts transmitting:

After 50 seconds on 406 MHz (one 406 MHz burst every 50 sec.) to the external antenna;

After the GPS lock on 121.5 MHz (continuous transmission between each 406 MHz burst). If GPS lock does not occur within 5 minutes, the 121.5 MHz will be activated.

The red visual indicator on the ELT and on the remote control panel flashes and the buzzer operates:

- Red visual indicator:
  1 short flash during ELT transmission on 121.5 MHz (every 0.7 seconds);
  1 long flash during ELT transmission on 406 MHz (every 50 seconds).
- Buzzer:
  1.5 Hz pulse signal (recurrence 0.7s) during ELT transmission on 121.5 MHz

In case of accidental activation, the ELT can be reset either by switching it to **OFF** or by switching to **RESET** on the remote control panel.

The number of 406 MHz bursts transmitted is recorded. This information is available when the ELT is connected to a programming and test equipment (PR600).

7.15.5 Garmin G5 Flight Instrument

Refer to Pilot’s Operating Handbook Supplement 41.