Samara VVV-Avia
Russia, 443046, Samara, Airport Smyshliaevka, A4,+ 7 846 226 1787, www.vvv-avia.ru
E-Mail: elitar-avia@mail.ru

MAINTENANCE MANUAL
LSA ELITAR-SIGMA

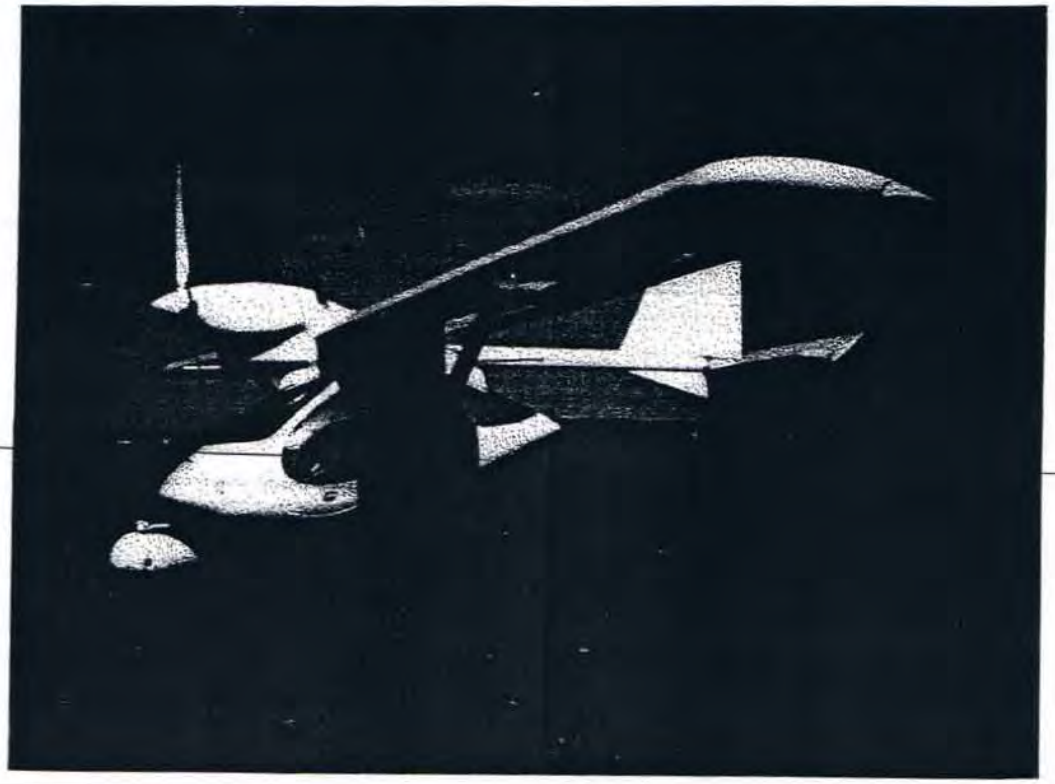
Aircraft design is patent-protected
Patent № 57927

First edition
2007

The present Maintenance Manual (MM) belongs to LSA Elitar – Sigma

Serial number	
Power plant	ROTAX-912ULS
Number of seats	Two
Aircraft owner	
Aircraft base	
Address of the aircraft owner	Russia, 443046, Samara, Airport Smyshliaevka, «A4» Tel. +7 846 226 1787, www.vvv-avia.ru E-mail: elitar-avia@mail.ru

PICTURE OF LSA Elitar-Sigma



CONTENTS

REVISION SHEET

No	Page number	Modification (Description)	Date	Executor

ABBREVIATIONS

CB	Circuit breaker
AE	Aviation equipment
PI	Pressure instruments
AL	Aircraft lights
FOS	Flight operating safety
Prop	Propeller
IS	Ignition switch
RWY	Runway
TOM	Take-off mode
A/C	Aircraft
POL	Petroleum, oil, lubricants
CE	Calibration equipment
CS	Engine crankshaft
VFR	Visual Flight Rules
EI	Engine instrument
TWY	Taxiway
Elev	Elevator
Rud	Rudder
TCL	Throttle control lever
CECL	Carburetor enrichment control lever
ACS	Aircraft control stick
FIC	Flight intercom
MNTN	Maintenance
IM	Instruction manuals
MRD	Maintenance and repair documentation

1.GENERAL INFORMATION

It is very important that this Maintenance Manual (MM) is read together with Flight Operating Manual (FOM) which contains all the corresponding data on working weights and operating limitations for this particular aircraft.

The present Manual covers maintenance, repairs and other important issues of aircraft operation.

Before starting operation of the aircraft it is necessary to study this Manual in full.

All defective structural elements must be replaced by the new ones received only from the manufacturer or dealer. Do not use parts which are not original. All operating difficulties and equipment failures should be reported to the manufacturer by filling in the form (see Chapter 13).

Improper usage of this Maintenance Manual information can inflict serious injury or death.

AIRCRAFT PROJECTIONS

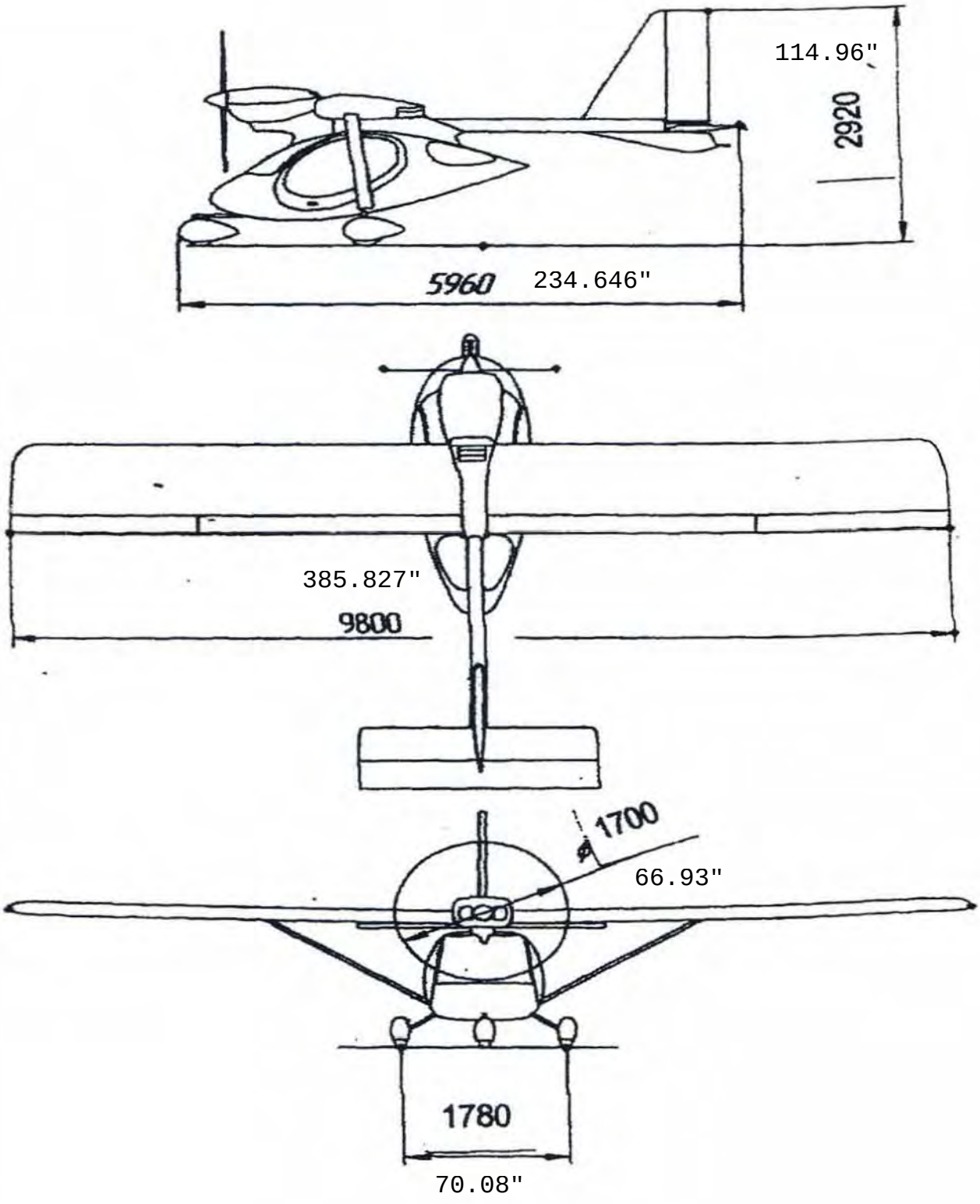


Fig. 1

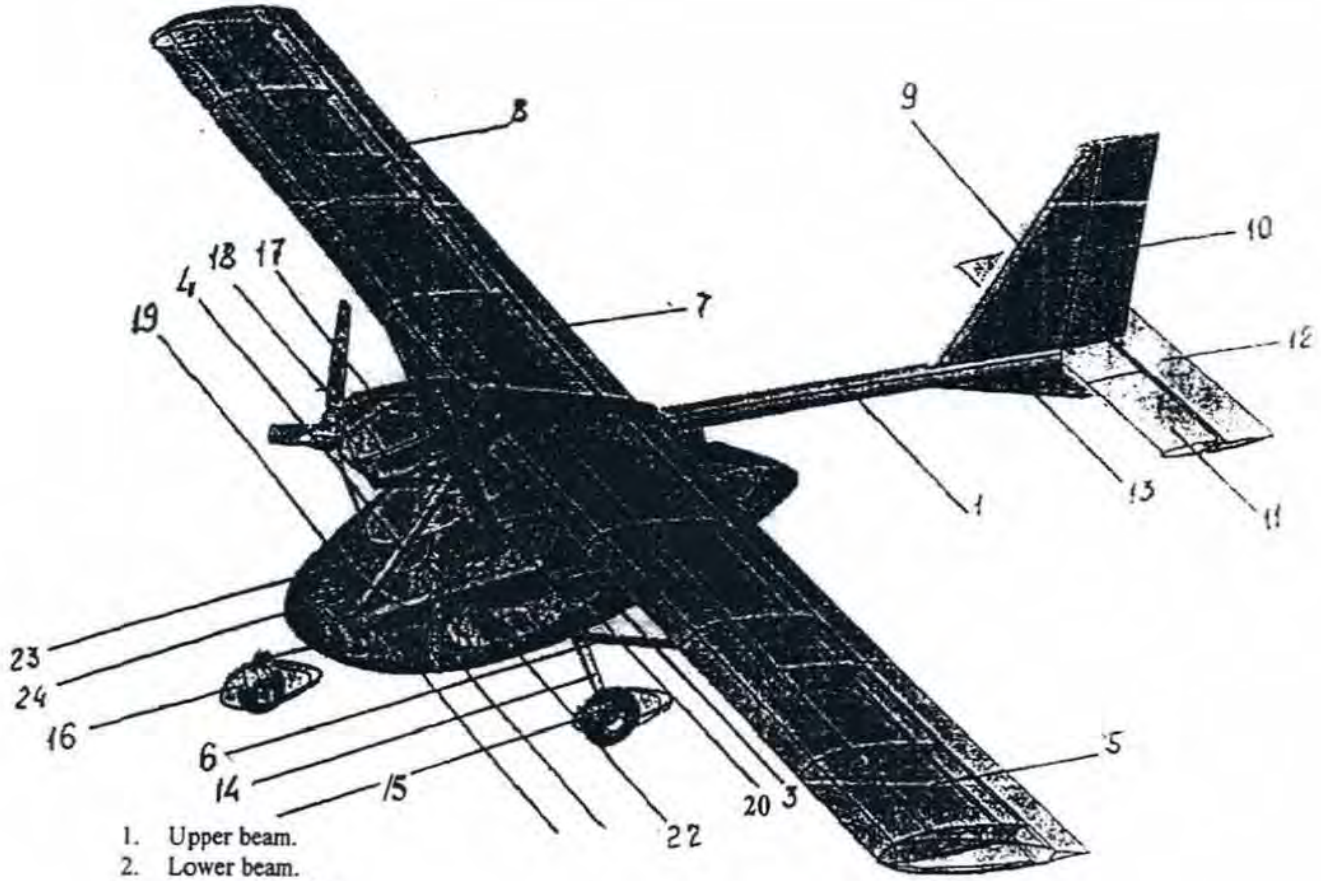
1.1 EQUIPMENT LIST

Design. The aircraft is a semi-cantilever high-wing monoplane with a conventional design and a front top-mounted power plant. Fig. 2.

Design feature of this aircraft is its airframe structure consisting of upper and lower beams, braced to each other by a pylon and a forward strut. Outer wings, empennage and engine are attached to the upper beam. Landing gear legs, wing bracing struts, aircraft operating controls, engine controls, pilots' seats and fuel tank are attached to the lower beam.

The closed two-seat cockpit has a tear-drop shape. It is attached to both upper and lower beams. . It is made of three-layered composite materials with plastic foam filler. In the front part of the cockpit a non-bound windshield glazing is mounted. The cockpit has two oval doors located on the left and on the right side. Cockpit doors are fitted with big oval-shaped non-bound windows providing with very good vision range. The doors open outside up. Two oval-shaped windows are fixed in the rear left and right top part of the cockpit to improve the view.

Wing platform is rectangular. The wing is single-spar. Wing frame is made of metal. It is equipped with slotted flaps and drooped ailerons. Every outer wing panel is removable, this allows for quick wing de-rigging for aircraft transportation. To increase structural stiffness every outer wing panel is additionally secured to fuselage by struts.



1. Upper beam.
2. Lower beam.
3. Center-line pylon.
4. Forward strat.
5. Left wing plane.
6. Wing bracing strut.
7. Flap.
8. Aileron.
9. Fin.
10. Rudder.
11. Stabilizer.
12. Elevator.
13. False keel.

15. Main landing gear wheel with fairing.
16. Front landing gear with steerable wheel and fairing.
17. Engine mount with engine cowls.
18. Propeller.
19. Cockpit.
20. Cockpit doors.
21. Luggage hold.
22. Left pilot's seat.
23. Aircraft control stick.
24. Aircraft control pedals.

Fig. 2 Aircraft structure.

Aircraft empennage is cantilever with conventional design. Stabilizer and fin are of all-metal structure. Elevator and rudder frames are metal, riveted, the skin is made of lacquer treated fabric. A false keel with emergency bumper skid is mounted on the bottom side of the upper beam under the fin.

The landing gear is tricycle with non-retractable nose wheel. Main landing gear legs are made of composite material. Nose landing gear is steel, round in section. To increase the wheel base it is mounted longitudinally along the lower beam axis and it projects forward beyond the cockpit size. Pneumatic-tired wheels are mounted on landing gear legs. The nose wheel is steerable, pedal-controlled. To improve airplane aerodynamics the landing gear wheels are covered with fairings made of composite materials.

Main wheels are equipped with mechanical drum brakes or hydraulic brakes. Wheel breaking is performed by pushing the aircraft control stick forward.

Power plant. A 100 h.p. gasoline-powered piston engine ROTAX 912ULS with opposed cylinders and combined air-fluidized cooling system is used as a power plant. It is manufactured by BOMBARDIER – ROTAX GMBH MOTOREN FABRIK, Austria.

Propeller. The engine is equipped with three-blade propeller with variable pitch VN 31 – 120 "Donchak-SM". Propeller consists of a metal boss and three composite blades.

Equipment. The aircraft control is dual. Two aircraft control sticks (ACS) and two sets of pedals are installed in the cockpit. Elevator and ailerons are controlled with ACS, rudder is controlled by pedals. Position of pedals in relation to pilots' seats can be regulated with a special mechanism. Elevator and ailerons control system linkage is made of rigid metal pull rods. Rudder is controlled by means of cable runs.

Flaps are controlled manually by a flap control handle. Flaps can be controlled from both the left and the right pilot seats. Wing flaps linkage consists of rigid metal pull rods. Flaps can be extended into two positions: landing position and takeoff position.

Carburetor throttle plates are controlled by a throttle control lever (TCL) mounted on a central control pedestal. An additional throttle control lever is mounted on the left side of the left pilot seat. It can be folded down along the seat. Throttle plates control run is made of cables with "bouden" braiding.

Carburetor enriching unit is controlled by an enrichment control lever (ECL) mounted on the central control pedestal. Carburetor enriching unit control linkage is made of cables with "bouden" braiding.

Radiator cooling folds control is made of braided steel wire with "bouden" braiding.

Aircraft cockpit is equipped with ventilation and heating system. Cockpit is ventilated with ram air coming in through two ram intakes on the sides of the bottom engine cowls. Cockpit is heated by hot air fed from engine into the cockpit.

In the front part of the cockpit there is a console made of composite materials. Two panel casings and three instrument/control panels are attached to it (left, central and right panels).

In the left (right) casing there is a metal instrument panel installed where the following flight equipment is mounted: altimeter, air speed indicator, vertical speed indicator and slip indicator. Integrated engine control instrument «FLYdat» and fuel gage indicator are installed on the left (right) dashboard. Radio IC-A200 and fuse block are mounted on the right (left) dashboard. Circuit breakers, engine starter button and indicating lamps are on the central control panel.

In the cockpit pilots' seats are placed side-by-side. Seat back tilt can be adjusted, also backs of seats can be folded forward or easily removed. In front of pilot seats there are fiber glass plastic floors mounted. They are made of composite materials.

Between pilot seats there is a central control pedestal with throttle control lever (throttle control lever of left pilot is located to his left), enrichment control lever and trimming effect regulator.

Central control pedestal and the upper part of the lower beam from the central instrument panel up to the pylon are covered with central casing made of composite materials.

A fuel tank with 60L capacity is installed behind pilots' seats and separated from the cockpit by a special metal case. The upper part of the case is a floor of the cockpit luggage hold. In the rear part of the cockpit a 12V accumulator battery is mounted on the pylon wall and on the cockpit ceiling there is a radio station antenna installed.

External lighting equipment. Taxiing-landing light, aircraft lights and oscillating beacons mounted on the fin, left and right wing tips.

1.2 SOURCES TO PURCHASE PARTS

Spare parts can be purchased from the following sources:

Manufacturer:

Russia, 443046, Samara, Airport Smyshliaevka, «A4»
Tel. +7 846 226 1787, www.vvv-avia.ru
E-mail: elitar-avia@mail.ru

Dealer:

1.3 LIST OF REPLACEMENT PARTS/CONSUMABLES

Propeller, main gear springs, aircraft lights, oscillating beacons, tires, oil, lubricants/coolants, spark plugs, oil filter, fuel strainer, air filter, fuses, (brake pads?).

1.4 ENGINE SPECIFICATIONS.

ROTAX–912ULS is a four-cycle engine with four opposed cylinders, with liquid cooling system for cylinder heads and air-oil cooling system for cylinders. Engine volume is 1352 cm^3. It can develop power up to 100 hp at engine speed 5800 rpm. Engine torque is transferred to the three-blade fixed-pitch propeller via gearbox with reduction ratio 2.43 : 1.

For complete engine description, performance characteristics and maintenance requirements refer to Maintenance guide for «Rotax - 912ULS». Study engine limitations in the corresponding section of the guide closely.

Engine is equipped with exhaust system and engine muffler. Elements of this system are made of stainless steel.

1.5 WEIGHT AND BALANCE INFORMATION

1.5.1 Weight and balance calculation

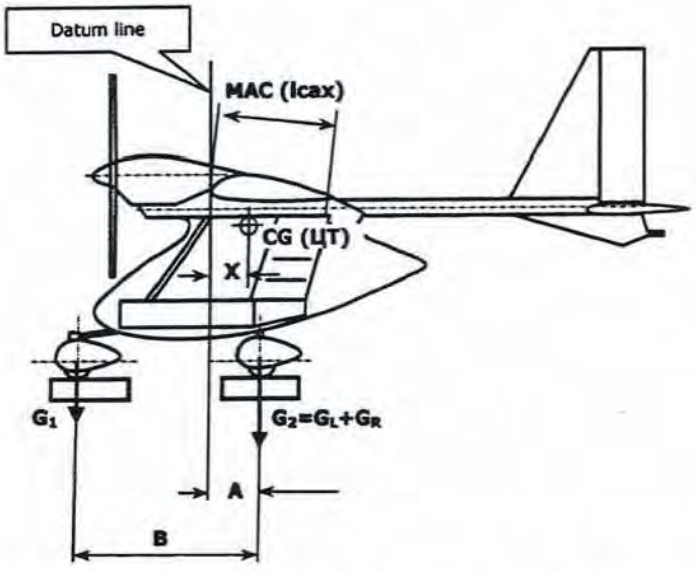
The center-of-gravity position is measured in inches (mm) aft of zero datum line. Datum line goes through the wing leading edge root.

At first we should determine aircraft empty weight and center-of-gravity position for a corresponding landing gear configuration. Place the aircraft in a level position on three scales in such a way that upper beam axis is horizontal. Record the readings of scales.

Calculate the center-of-gravity position of the empty aircraft from the following formula:

$$X = A - B \times \frac{G_1}{G_1+G_2}$$

where: A and B = distances that should be measured for the particular aircraft;
G_1 = weight load on the nose landing gear;
G_2 = weight load on the main landing gear;
G_1+G_2 = empty aircraft weight.



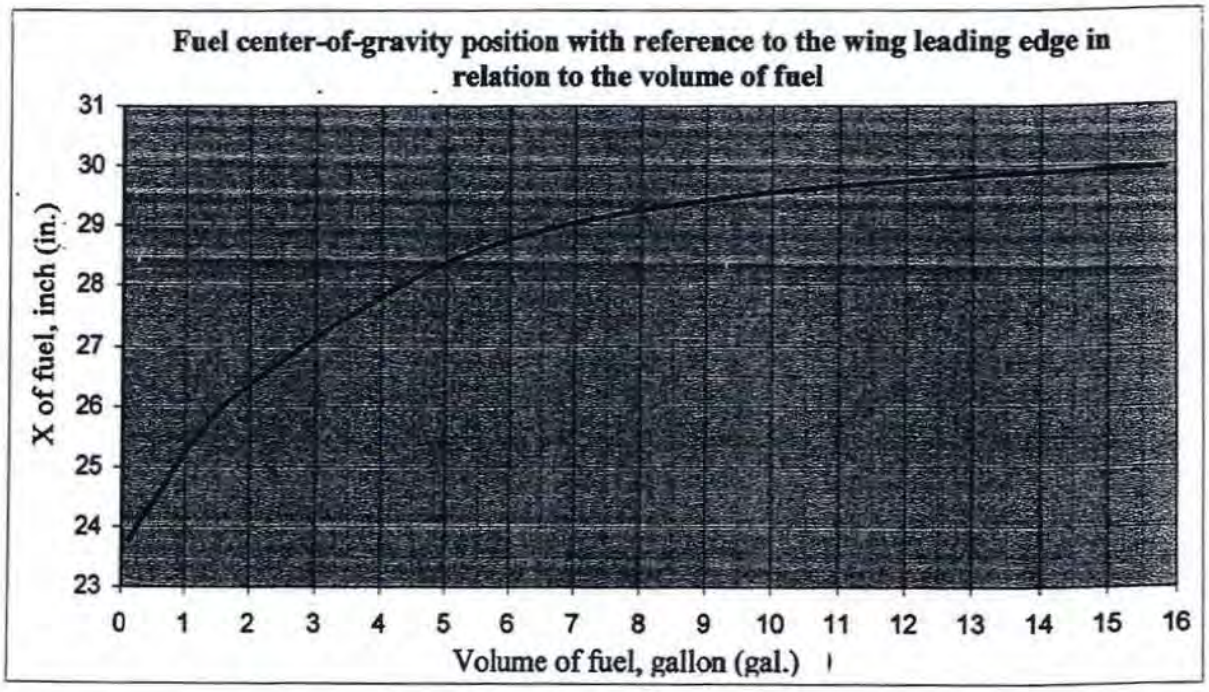
Enter respective weight values (column 2) and distances from the center of gravity to the datum point X (column 3) for the empty aircraft, pilot + passenger, luggage and fuel into the table below.

Static moment values in the last column are calculated as a product of weight in pounds (kg) by CG position in inches (mm) respectively for each element (multiply values from columns 2 and 3 in each line).

Loading plan

Description	Weight, lb (kg)	X, inches (mm)	Static moment, Lb × inch (kg × mm)
1	2	3	4
Empty aircraft			
Pilot + passenger		6.10 (155)	
Luggage		28.74 (730)	
Fuel		X = *f*(V)	
Aircraft calculated			

Fuel center-of-gravity position is determined in relation to volume of fuel in the fuel tank.



Define the total weight and total static moment of the aircraft by summing up weights of all elements (column 2 of the table) and moments (column 4 of the table) respectively.

Determine the balance of the aircraft (center-of-gravity position aft of the datum line) dividing total static moment by total weight. Enter calculated values into corresponding columns of the table bottom line.

Permissible CG range is 11.1 – 15.9 in. (281 - 405 mm) behind zero datum point (wing leading edge).

Make sure that the center-of-gravity position lies within the permissible range aft of datum.

1.5.2 Conditions of weighing.

Aircraft empty weight is defined under the following conditions:

- All equipment installed on the aircraft corresponds to the standard configuration.
- The engine is filled with liquid coolant and oil in accordance with set standards.
- There is no usable fuel.

Note:

Operating the aircraft with maximum takeoff weight is the pilot's responsibility.

1.6 TIRE INFLATION PRESSURES.

Main landing gear	1.8 – 2.0 bar	0.18 – 0.2 MPa
Nose landing gear	1.8 – 2.0 bar	0.18 – 0.2 MPa

1.7 APPROVED OILS / LUBRICANTS-COOLANTS.

See Maintenance Guide of ROTAX–912ULS engine.

1.8 RECOMMENDED TIGHTENING TORQUE VALUES.

See Maintenance Guide of ROTAX–912ULS engine.
Tightening torque of mounting bolts for propeller VN 31-120 Donchak SM:
2.5 – 3.0 kg/m (18.08 – 21.7 lb/ft).

1.9 GENERAL SAFETY INFORMATION.

Any defects detected during inspections, routine maintenance or any other time must be fixed before the flight. All failures should be reported to the manufacturer by filling in the form provided in Chapter 13 (FEEDBACK FORM).

Only people familiar with the aircraft design, instruction manuals and safety measures during aircraft operation and who passed knowledge test with appropriate authorization can be allowed to operate the aircraft.

When performing any works on the aircraft it necessary to follow all safety precautions set forth in the aircraft maintenance manual, engine operation manual and in appropriate instructions.

After taxiing to parking area and engine cut-off the aircraft must be grounded and chocks have to be put under the main landing gear wheels. It is PROHIBITED to approach the aircraft until it stops moving and its propeller stops rotating completely.

Before any works on the aircraft it is necessary to take measures eliminating

- spontaneous engine start,
- systems switching on,
- injury of people or damage to the aircraft;
- ignition switches and circuit breakers must be off.

During fueling the aircraft must be de-energized and grounded. It is prohibited to perform any works or to turn on and off switches and CBs. Fuel gauge calibration test with power on is allowed.

Any maintenance of high-set parts of the aircraft must be performed using appropriate step ladders. It is PROHIBITED to start the works before making sure that the step ladder is serviceable and steady.

Before engine start for functional check it is necessary to make sure:

- that efficient fire extinguishing means are available in the parking area;
- that chocks under landing gear wheels and additional tie-down of the plane at its main gear legs are secure;
- that there is no ice or snow under landing gear wheels and chocks;
- that there are no people and foreign objects in dangerous areas close to the aircraft;
- that cockpit doors are locked securely.

Engine start and ground run-up must be performed by two people, one person should be in the cockpit and another one should stand in front of the aircraft at a safe distance. The latter repeats instructions of the specialist sitting in the cockpit, gives a permission for engine start-up, monitors safety when the

engine is running, gives a command on emergency engine cutoff if noticing signs of possible engine damage or threat of accidents with people .

It is PROHIBITED to start the engine for ground run-up for a person acting alone.

When engine is running it is PROHIBITED:

- To open doors;
- To leave the cockpit of an aircraft;
- To be in the plane of propeller rotation and to come close to it;
- To perform any activities on the aircraft except for functional checkout of its engine, equipment and systems, and also except for adjustment of the engine IDLE mode.

In case of any signs of fire (smoke, flame) during engine work on the ground it is necessary to immediately switch the engine off, close fire cock and take measures for fire extinguishing. Next start of engine is possible only after detection and elimination of a fault.

IT IS PROHIBITED:

- to turn propeller without making sure that ignition is switched off and temperature of cylinder heads does not exceed 120°F;
- to unscrew spark plugs on hot engine;
- to start the engine without removing covers and tie-down appliances from the aircraft;
- to use leaded gasoline.

During maintenance works it is PROHIBITED to smoke and use open fire at a distance less than 25 m (82 ft) from the aircraft.

Only fault-free stamped tools, serviceable tested devices and calibration equipment are to be used during works.

Flight in hydroplane configuration. Engine start and run-up must be done only on shore. Engine start on water can be performed only by a pilot of the aircraft. Mechanic is allowed to start and run-up the engine if the plane is located with nose to the shore, nose sections of the floats should rest upon the shore line.

2. INSPECTION PROCEDURE

MM article	Action	Type of maintenance			
		25 - hours	50- hours	100- hours	Annual
1.	2.	3.	4.	5.	6.
	2.1 PREPARATION				
2.1.01	Prepare tools, devices, calibration equipment, and consumables.	+	+	+	+
2.1.02	Remove propeller hub spinner	+	+	+	+
2.1.03	Remove engine cowls and center wing fairings.	+	+	+	+
2.1.04	Open structural access doors in the bottom part of the left and right outer wing panels.	+	+	+	+
2.1.05	Open front top and rear bottom hatches of the cockpit. Remove fairings from main landing gear wheels.	-	+	+	+
2.1.06	Dismount in the cockpit the following items:	-	+	+	+
2.1.07	- accumulator battery;	-	+	+	+
	- pilot seats;	-	+	+	+
	- center casing;	-	+	+	+
	- left and right floors.	-	+	+	+
2.1.08	Make an inspection and troubleshooting of the aircraft and engine.	+	+	+	+
	2.2 ENGINE.				
2.2.01	Inspect engine cowls. Inspect engine and engine mount.	+	+	+	+
2.2.02	Clean the engine and its components from dust and	+	+	+	+
2.2.03	dirt. On the reduction gear check the following:	+	+	+	+
2.2.04	- propeller shaft axial displacement; - axial runout of a propeller shaft flange; - radial runout of a propeller shaft flange .	+	+	+	+
2.2.05	Change oil and oil filter. Wash the cooling system and change liquid	+	-	+	+
2.2.06	coolant. Service the air filters.	-	-	-	+
2.2.07	Check carburetors adjustment.	-	+	+	+
2.2.08	Service the engine control system.	+	+	+	+
2.2.09		+	+	+	+

1.	2.	3.	4.	5.	6.
2.2.10	Check carburetor flanges condition.	+	+	+	+
2.2.11	Change carburetor flanges.	-	-	-	+
2.2.12	Check spark plugs.	+	+	+	-
2.2.13	Change spark plugs.	-	-	-	+
2.2.14	Check metal segments of spark plugs, file the contact assembly.	+	+	+	+
2.2.15	Apply lubricant to hinged connections of the exhaust system.	-	-	+	+
2.2.16	Check fuel filter.	+	+	+	+
2.2.17	Change fuel filter.	-	-	-	+
2.2.18	Check compression.	+	+	+	+
2.2.19	Change critical (limited-life) parts.	-	+	+	+
2.2.20	Perform the service bulletins received.	-	+	+	+
2.2.21	Check condition of hoses	+	+	+	+
2.2.22	Perform reduced engine run-up with propeller thrust measurement.	+	+	+	+
	2.3 PROPELLER				
2.3.01	Check residual life.	-	+	+	+
2.3.02	Inspect propeller.	+	+	+	+
2.3.03	Clean propeller blades.	+	+	+	+
2.3.04	Dismantle propeller hub, inspect the root of blades.	+	+	+	+
2.3.05	Check propeller balance and airscrew knock.	-	-	+	+
	2.4 AIRFRAME.				
2.4.01	Inspect upper beam, check external condition of the following elements:				
	- outer wing panels attachment brackets;	+	+	+	+
	- brackets and emergency parachute system cable attachment assemblies;	+	+	+	+
	- engine mount attachment bracket;	+	+	+	+
	- forward strut attachment assembly;	+	+	+	+
	- stabilizer attachment brackets;	+	+	+	+
	- fin attachment brackets.	-	-	-	+
2.4.02	Inspect lower beam, check external condition of the following elements :				
	- main landing gear legs attachment assemblies;	+	+	+	+
	- nose landing gear leg attachment assembly;	+	+	+	+
	- attachment assemblies of wing struts;	+	+	+	+
	- forward strut attachment assembly.	+	+	+	+

1.	2.	3.	4.	5.	6.
2.4.03	Inspect forward strut, check security of attachment.	+	+	+	+
2.4.04	Inspect center-line pylon, check its external condition, mounting bolts tightening security.	+	+	+	+
2.4.05	Inspect the aircraft cockpit from outside. Check the external condition of glazing and fiber-glass plastic surface.	+	+	+	+
2.4.06	Clean external surface of the cockpit from dirt. Service the cockpit doors.	+	+	+	+
2.4.07	Check security of doors locking, working efficiency	-	-	+	+
2.4.08	of shock absorbers.	+	+	+	+
2.4.09	Inspect outer wing panels skin, check its external condition.	+	+	+	+
2.4.10	Check locking of wing attachment bolts. Inspect spar and ribs of the outer wing panels where	+	+	+	+
2.4.11	they are accessible.	-	-	+	+
2.4.12	Inspect outer wing bracing struts and their attachment assemblies.	+	+	+	+
2.4.13	Dismantle outer wing panels and check condition of the attachment fittings.	-	-	-	+
2.4.14	Inspect hinge fittings of flaps and ailerons, check their external condition and security of attachment.	+	+	+	+
2.4.15	Apply lubricant to hinged fittings of flaps and ailerons.	-	+	+	+
2.4.16	Inspect ailerons, check condition of their skin.	+	+	+	+
2.4.17	Inspect flaps, check condition of their skin, security of brackets and control rods attachment, cleanness of drain vents.	+	+	+	+
2.4.18	Inspect empennage, check condition of its skin, security of attachment of stabilizer, fin and false keel.	+	+	+	+
2.4.19	Inspect rudder and elevator, check condition of their skin. Inspect hinge fittings of rudder and elevator, check their external condition and security of attachment.	+	+	+	+
2.4.20	Apply lubricant to hinged fittings of rudder and elevator.	+	+	+	+
2.4.21	Inspect flutter-preventive weights on the elevator, check security of attachment.	-	+	+	+
2.4.22	Inspect center wing fillets.	+	+	+	+
2.4.23	Dismantle the fin and check condition of its attachment fittings.	+	+	+	+
2.4.24		-	-	-	+

1.	2.	3.	4.	5.	6.
2.4.25	Dismantle stabilizer and check condition of its attachment fittings.	-	-	-	+
	2.5. LANDING GEAR AND WHEEL BRAKING SYSTEM				
2.5.01	Inspect spring-type front landing gear leg, check its external condition, security of attachment.	+	+	+	+
2.5.02	Inspect nose wheel fairing.	+	+	+	+
2.5.03	Apply lubricant to flexible connection of a front wheel fork with spring bracket.	-	+	+	+
2.5.04	Check tire pressure.	+	+	+	+
2.5.05	Remove nose wheel and its fairing and service it.	-	-	+	+
2.5.06	Inspect front wheel fork.	-	-	+	+
2.5.07	Reinstall the nose wheel. Check easiness of wheel rotation.	-	-	+	+
2.5.08	Inspect nose wheel control cable linkage.	+	+	+	+
2.5.09	Check tension of nose wheel control cables.	-	-	+	+
2.5.10	Apply lubricant to nose wheel control cables.	-	+	+	+
2.5.11	Inspect spring-type main landing gear legs, check their external condition, security of attachment.	+	+	+	+
2.5.12	Inspect wheels attachment fittings.	+	+	+	+
2.5.13	Inspect fairings of main landing gear wheels.	+	+	+	+
2.5.14	Inspect main landing gear wheels, check tire inflation.	+	+	+	+
2.5.15	Inspect brake shoes control levers.	+	+	+	+
2.5.16	Inspect brake shoes control cable linkage.	+	+	+	+
2.5.17	Remove main landing gear wheels. Inspect their axles, bearings and refresh their oil lubricant. Change brake shoe linings if necessary.	-	-	+	+
2.5.18	Reinstall wheels on landing gear legs. Check easiness of wheel rotation and performance of the wheel braking system.	-	-	+	+
2.5.19	Inspect wheel braking mechanism and braking differential gear lever.	+	+	+	+

2.5.20	Service the wheel braking system.	-	+	+	+
2.5.21	Dismantle nose and main landing gear legs and check condition of attachment fittings.	-	-	-	+
2.5.22	Inspect float-type landing gear, check its external condition and security of attachment.	+*	+*	+*	+*
2.5.23	Inspect water propeller shrouding and its control system. Apply lubricant to its cables and hinge joints.	+*	+*	+*	+*
2.5.24	Inspect ski-type landing gear * To be done when flying on float-type or ski-type landing gear.	+*	+*	+*	+*
	2.6 CONTROL SYSTEM				
2.6.01	Inspect aircraft control sticks (ACS). Check external condition, security of attachment.	+	+	+	+
2.6.02	Inspect the root of aircraft control sticks. Check security of their attachment and of control rods connection.	+	+	+	+
2.6.03	Inspect trimming mechanism. Check external condition.	+	+	+	+
2.6.04	Inspect elevator control rods and control bell cranks. Inspect ailerons control rods and control bell cranks	+	+	+	+
2.6.05	in the aircraft cockpit and also inside of left and right outer wing panels.	+	+	+	+
2.6.06	Apply lubricant to hinged nodes of elevator and ailerons control systems. Check efficiency of the aircraft roll and pitch control.	-	+	+	+
2.6.07	Check elevator deflection angles, adjust them if necessary.	+	+	+	+
2.6.08	Check aileron angles, adjust them if necessary. Inspect flaps control mechanism.	-	-	-	+
2.6.09	Inspect flaps control rods and bell cranks. Apply lubricant to hinge joints and to flaps control	-	-	-	+
2.6.10	mechanism.	+	+	+	+
2.6.11	Check flaps control performance.	+	+	+	+
2.6.12		-	+	+	+
2.6.13	Inspect the block of rudder control pedals.	+	+	+	+
2.6.14	Inspect pedals adjustment mechanism, check its performance.	+	+	+	+
2.6.15		+	+	+	+

1.	2.	3.	4.	5.	6.

2.6.16	Apply lubricant to hinge joints of rudder pedals block.	-	+	+	+
2.6.17	Apply lubricant to the mechanism of pedals adjustment.	-	+	+	+
2.6.18	Inspect rollers of rudder control system cable linkage and nose wheel control linkage.	+	+	+	+
2.6.19	Inspect rudder control system cable linkage.	+	+	+	+
2.6.20	Check tension of rudder control cables.	-	-	+	+
2.6.21	Apply a coat of lubricant to rudder control cables.	-	+	+	+
2.6.22	Check efficiency of rudder control.	+	+	+	+
	2.7 FUEL SYSTEM				
2.7.01	Inspect fuel lines. Check external condition and tightness.	+	+	+	+
2.7.02	Inspect fuel tank and filler. Check their external condition and tightness.	+	+	+	+
2.7.03	Drain and check fuel sediment.	+	+	+	+
2.7.04	Check drain system cleanliness.	+	+	+	+
2.7.05	Blow the drain line with compressed air.	-	-	+	+
2.7.06	Inspect fuel shut-off and drain valves, check external condition and tightness .	+	+	+	+
	2.8 AIRCRAFT COCKPIT				
2.8.01	Clean cockpit from dust and dirt.	+	+	+	+
2.8.02	Inspect cockpit inside surfaces.	+	+	+	+
2.8.03	Inspect instrument subpanel, console casings, console, instrument panels.	+	+	+	+
2.8.04	Inspect master control board.	+	+	+	+
2.8.05	Inspect central casing.	+	+	+	+
2.8.06	Inspect pilot seats mounting locations.	+	+	+	+
2.8.07	Inspect pilot seats, check their external condition.	+	+	+	+
2.8.08	Inspect and service the mechanism of seat backs adjustment.	-	+	+	+

1.	2.	3.	4.	5.	6.
2.8.09	Inspect safety harness and their mountings. Check security of locks fixation.	+	+	+	+
2.8.10	Inspect cockpit floors.	+	+	+	+
2.8.11	Inspect luggage hold.	+	+	+	+
	2.9 COCKPIT HEATING/VENTILATION SYSTEM				
2.9.01.	Inspect cockpit heating/ventilation control panel. Check if shutters open readily.	+	+	+	+
2.9.02	Inspect cockpit ventilation system air inlets, clean them of dust.	+	+	+	+
2.9.03	Inspect ventilation/heat register hot air supply sleeve with engine cowls open.	-	+	+	+
2.9.04	Check during engine run-up if hot and cold air is supplied to cockpit.	+	+	+	+
	2.10 EMERGENCY RECOVERY SYSTEM*				
2.10.01	Routine maintenance of ERS shall be done by the manufacturer in 36 months after parachute packing.	+	+	+	+
2.10.02	Check maintenance period left.	+	+	+	+
2.10.03	Inspect ERS within preflight preparation scope.	+	+	+	+
2.10.04	Inspect suspension system cables, check their external condition.	+	+	+	+
2.10.05	Inspect suspension system cable mounting units. Check cables' external condition and if they are mounted securely. Lubricate suspension system cables.	-	-	+	+
	* If emergency parachute system is available				

2.11.03	Inspect electronic ignition units, igniter coils, spark plug high voltage wires, and negative terminals.	+	+	+	+
	Engine Start System				
2.11.04	Inspect the starter, check its external condition. Make sure the wire is securely connected and fixed.	+	+	+	+
2.11.05	Check external condition of: a) start relay; b) ignition button.	+	+	+	+
	Power-Supply System				
2.11.06	Inspect power-supply devices: - battery; - rectifier-regulator; - capacitor; - automatic circuit breakers (ACB); - switches.	+	+	+	+
2.11.07	Inspect terminal blocks behind the flight deck and in rear of the cockpit. Make sure the wire lugs are securely connected.	-	-	-	+
2.11.08	Inspect the battery compartment. Check electric harness condition everywhere on the aircraft.	+	+	+	+
2.11.09	Inspect fuse panel. Make sure the fuse ratings comply with specification.	-	-	-	+
2.11.10	Check the battery and alternator are connected to the onboard electric circuitry.	-	+	+	+
2.11.11		+	+	+	+
	Fuel System Electric Equipment				
2.11.12	Inspect fuel pump. Make sure it is clean, securely fixed, and the body is sealed. Check the fuel pump operation.	+	+	+	+
2.11.13		+	+	+	+
	Alarm System				
2.11.14	Inspect all alarm displays, check their external condition and if they are securely fixed.	+	+	+	+

2.11.15	Check ALTERNATOR FAILURE and ENGINE PARAMETERS alarm operation;	+	+	+	+
	2.12 INSTRUMENTAL EQUIPMENT				
	<u>Pressure Instruments</u>				
2.12.01	Inspect PVD-6 pitot probe. Check its external condition. Make sure it is securely fixed and inlet and drainage openings are clean.	+	+	+	+
2.12.02	Inspect pressure instrument supply lines. Check external condition and labeling.	+	+	+	+
2.12.03	Inspect water traps, remove dust and condensate.	+	+	+	+
2.12.04	Blow the pressure instrument supply lines with pressurized air.	-	-	+	+
2.12.05	Inspect following pressure instruments: - VD-10 altimeter; - US-350 speedometer; - VR-10 climbing-speed indicator.	+	+	+	+
2.12.06	Check altimeter error at a test point corresponding to barometric pressure at time of checkup.	+	+	+	+
2.12.07	Check pressure instrument supply lines for leaks. Check pressure instruments operation.	+	+	+	+
	<u>Engine Operation Monitoring Instruments (EOMI)</u>				
2.12.08	Inspect EOMI sensors.	+	+	+	+
2.12.09	Inspect FLYdat integrated data instrument. Check its internal condition. Disconnect FLYdat connector. Inspect and clean the contacts with alcohol.	+ -	+ -	+ +	+ +

	Flight Control and Navigation Equipment				
2.12.10	Inspect the compass and slip indicator. Check external condition.	+	+	+	+
2.12.11	Compass checkup: - check compass adjustment date; - check compass lag error.	-	-	+	+
	Fuel Level Gauge				
2.12.12	Inspect fuel level gauge sensor and its wiring.	+	+	+	+
2.12.13	Inspect fuel level gauge indicator.	+	+	+	+
2.12.14	Disconnect the connector from indicator and sensor. Clean the contacts with alcohol. Reconnect the connector.	-	-	+	+
2.12.15	Check fuel level gauge operation.	+	+	+	+
	2.13 RADIO EQUIPMENT				
2.13.01	Inspect radio station. Check if it is mounted securely.	+	+	+	+
2.13.02	Inspect the flight intercom.	+	+	+	+
2.13.03	Inspect the antenna. Check its external condition.	+	+	+	+
2.13.04	Perform the pilot headsets maintenance.	-	+	+	+
2.13.05	Inspect the antenna cable. Check the external condition and if securely fixed.	-	+	+	+
2.13.06	Inspect and clean the contacts of radio station and intercom plug-and-jack connectors.	-	-	-	+
2.13.07	Check radio station and headsets operation.	+	+	+	+
2.13.08	Remove the radio station and send to a metrological laboratory for checkup.	-	-	+	+
	2.14 FINAL PROCEDURES				
2.14.01	Install on the aircraft all equipment demounted in the course of maintenance.	+	+	+	+
2.14.02	Inspect the aircraft. Make sure all demounted equipment has been reinstalled and all locks are as assigned.	+	+	+	+

1.	2.	3.	4.	5.	6.
2.14.03	Check if all tools, instruments, accessories, service plugs, and consumables are in place. Make sure no	+	+	+	+

	foreign objects are left in aircraft and engine.				
2.14.04	Install engine cowls, centerwing fairings, close all access doors.	+	+	+	+
2.14.05	Perform engine run-up as per reduced procedure.	+	+	+	+
2.14.06	Fill out aircraft log-book and technical documentation.	+	+	+	+

Line maintenance is a system of preparation procedures, visual inspections, and checkups performed between periodic maintenance procedures to make sure the aircraft is technically sound and ready to operate. This is major aircraft flight preparation maintenance type and includes:

- preflight maintenance;
- turnaround maintenance;
- postflight maintenance.

2.15 AIRCRAFT LINE MAINTENANCE

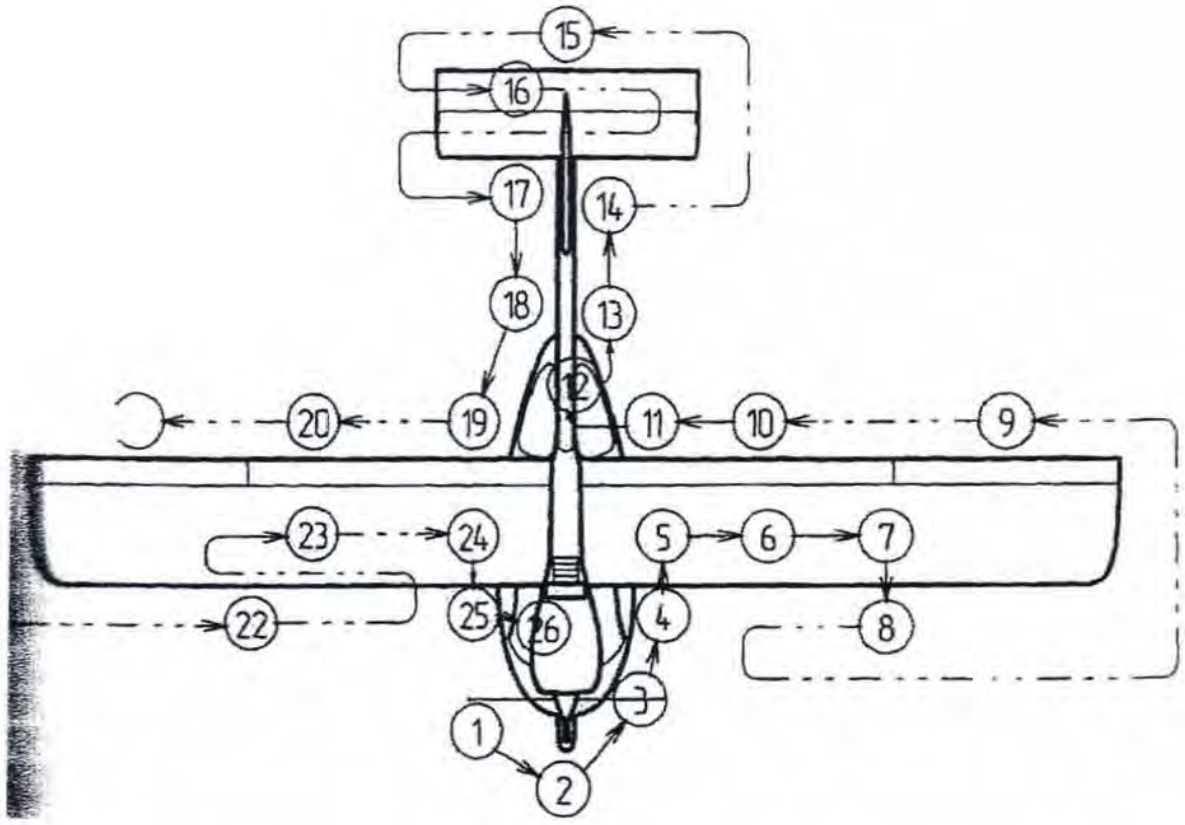
2.15.1 *PREFLIGHT MAINTENANCE*

Preflight maintenance is to be conducted immediately before the first flight of the day and reflects the tasks set for that day. It includes:

- engine and propeller preflight inspection;
- aircraft preflight inspection;
- aircraft engine, equipment, and systems operational capability checkup;
- troubleshooting of detected malfunction;
- checkup of fuel and lubricants to ensure sufficient levels for given flight mission, and fill up if necessary;
- aircraft flight readiness verification.

Preliminary procedures:

1. Make sure automatic circuit breakers and air intake are in "off" position.
2. Uncover aircraft, engine, propeller blades, and airspeed head.
3. Disconnect tiedown riggings from the outer wings and NLG.
4. Remove control surface locks and air inlet covers.



1. Inspect propeller, air intake.
2. Inspect nose landing gear leg.
3. Inspect windscreen, front hatch and headlights.
4. Inspect the door and cowls.
5. Inspect landing gear leg and cockpit board.
6. Inspect wing bracing strut.
7. Check airspeed head.
8. Inspect outer wing panel and aircraft lights.
9. Inspect aileron and actuating rod.
10. Inspect the flap.
11. Inspect windows, center-wing fairings, and flap control.
12. Inspect bottom hatch and radio antenna.
13. Inspect upper beam and rudder control cable.
14. Inspect fin and rudder.
15. Inspect stabilizer.
16. Inspect elevator and control rod.
17. Inspect fin and rudder.
18. Inspect upper beam and rudder control cable.
19. Inspect windows, center-wing fairings, filler and flap control.
20. Inspect the flap.
21. Inspect aileron and control rod.
22. Inspect outer wing panel and aircraft lights.
23. Inspect wing strut.
24. Inspect landing gear leg and cockpit board.
25. Inspect the door and cowls.
26. Inspect cockpit from the inside.

Aircraft Walk-Around.

2.15.1.1 *Preflight Engine Inspection*

Preflight engine inspection should be performed in compliance with *Rotax-912ULS Operations Manual*.

2.15.1.2 *Aircraft Preflight Inspection*

API is conducted in accordance with walk-around sequence.

1. Inspect propeller.

2. Inspect NGL. Inspect external condition, wheels and fork securing nuts' torque, and threaded connection locks. Check external condition and fairing mounting. Check tire pressure visually.
3. Inspect wind screen, make sure that there are no damages and that glass is clean. Make sure the forward hatch of the cockpit is locked securely.
4. Inspect engine cowls, make sure that they are locked securely and that there is no fuel leak signs. Inspect left door, check external condition of hitch assemblies, condition and cleanness of glass.
5. Inspect cockpit side wall, lower fairing of center-section, and left gear leg. Check external condition, wheel mounting nut's torque and locking, and threaded connection locks. Check fairing external condition and mounting. Check tire pressure. Make sure that gear leg and left strut are fixed securely to fuselage. Check external condition of pressure instruments supply pipelines at the strut to cockpit transition area.
6. Inspect the left strut of the wing and check its external condition.
7. Inspect the strut to left hand wing mounting unit, check if threaded connection locks are secure. Check external condition and mounting security of airspeed head and pressure instruments supply pipelines.
8. Inspect left hand wing, make sure it is not damaged and all surfaces are clean.
9. Inspect left aileron. Check aileron and its mounting external condition, mounting of control rod, and threaded connection locks.
10. Inspect flap. Check flap and its mounting external condition, and threaded connection locks.
11. Inspect flap control assembly. Make sure all rods and levers are well secured and all threaded connections properly locked. Check the cockpit's external condition and make sure the windows are clean.
12. Inspect the cockpit's lower surface, make sure there is no fuel leakage signs. Check if bottom hatch is closed securely. Inspect radio station antenna.
13. Inspect upper beam. Make sure that there are no damages present. Inspect rudder control cable, check its external condition, security of sealing into the tip, and threaded connection locks.
14. Check if rudder control cable is fixed securely. Inspect the left side of the fin and rudder. Make sure the mounting is secure.
    Inspect the stabilizer front and rear mounting units.
15. Inspect stabilizer, check its external condition, make sure the surfaces are clean, mountings are secure, and threaded connections are properly locked.

16. Inspect elevator. Check its external condition, if all surfaces are clean, and if mountings are secure. Inspect elevator control rod, check its external condition, whether it is securely mounted to the elevator. Make sure threaded connections are properly locked.
17. Check if rudder control cable is fixed securely. Inspect the lift side of the fin and rudder. Make sure the mounting is secure and threaded connections are reliably locked. Inspect the stabilizer's front mounting unit.
18. Inspect upper beam, make sure there is no damage. Inspect rudder control cable, check its tension by hand, its external condition, and if it is securely sealed into the tip. Check threaded connection locks.
19. Inspect flap control assembly. Make sure all rods and levers are securely connected, and threaded connections are properly locked. Inspect external condition and cleanness of cockpit windowing. Inspect the filler well, make sure there is no fuel leak signs and that the cap is tightly closed and locked.
20. Inspect the right flap. Inspect the flap and its mountings external condition. Make sure all threaded connections are reliably locked.
21. Inspect the right aileron. Check aileron and its mountings external condition, and if the rod is connected securely. Make sure all screw mountings are properly locked.
22. Inspect the right hand wing. Make sure there is no damage present and all surfaces are clean.
23. Inspect the strut to right hand wing mounting. Make sure all screw mountings are properly locked.
24. Inspect the cockpit's side, lower fairing, center wing section's lower fairing, and right gear leg. Check external condition, the wheel mounting nut torque and lock, and if all threaded

connections are securely locked. Check the fairing's external condition and mounting. Visually check tire pressure. Make sure the gear leg and left strut are securely mounted to the fuselage.

25. Inspect engine cowling, make sure they are securely locked, and there are no fuel leak signs. Inspect the right door, check the hitch mountings external condition as well as windowing condition and cleanness.
26. Inspect the cockpit from inside.

2.15.1.3 *Boarding the Cockpit*

1. Remove all foreign objects from the pockets and clean the footwear.
2. Smooth out safety belts.
3. Holding the upper edge of the door opening by hand set the left foot (if boarding the right seat) or the right foot (if boarding the left seat) on the cockpit floor behind the control lever.
4. Sit down into the pilot seat.

2.15.1.4 *Door Lock Checkup*

1. Close the right door and lock it by pulling the handle. Make sure the lock works smoothly and easily.
2. Secure the lock by retainer by pressing it down to the stop. Push the lock handle and make sure it doesn't move.
3. Pull out the retainer. Open the door lock, and open the door. Make sure the shock strut holds it in opened position. If the shock strut does not provide sufficient support it should be unmounted and repaired (refilled) or replaced.

2.15.1.5 *Preflight Cockpit Inspection*

1. Inspect the flight decks, dashboards, and main control panel. Make sure all instruments, radio station, switches, and automatic circuit breakers are securely mounted.
2. Inspect cockpit ventilation/heating board, make sure ventilation/heating shutters open easily.
3. Inspect central control panel.
4. Inspect control pedals and pedal adjustment mechanism.
5. Inspect aircraft control knobs.
6. Inspect aileron/flap rod actuators on the pylon, make sure quick release locks work properly.
7. Inspect flap control handle, flap position retention assembly.
8. Inspect central pylon, check its external condition.
9. Inspect the battery and check if it is securely mounted. Check if battery cables are reliably connected.
10. Check the fuel pump body's external condition and leak integrity.
11. Inspect the fuel filter, make sure it is clean.
12. Inspect fuel quantity gage, make sure the electric wires are reliably connected.
13. Inspec pilot seats, check safety harness and backrest position lock mechanism condition.

2.15.1.6 *Preflight Steering System Checkup*

A. Aircraft Steering System Operation Checkup

1. Move the control stick (CS) alternatively left-right and forward-backwards. Make sure CS moves smoothly without any drag.

2. Lift the front gear leg so that it does not prevent footplate operation, press alternatively left and right control pedals. Make sure the footplates move smoothly without any drag.
3. Check the deflection of the aircraft's steering surfaces. It must comply with following Table:

Right foot pedal:	**forward**	Rudder, front wheel to the right
	backward	Rudder, front wheel to the left
Control Stick:	**pull**	Elevator up
	push	Elevator down
Control Stick:	**to the right**	Right aileron up
		Left aileron down
	to the left	Left aileron up
		Right aileron down

4. Turn the right pilot's pedal position adjustment knob counterclockwise and, pressing the pedals, make sure they move without seizure.
5. Release the right pilot's pedal position adjustment knob and make sure the pedals are securely fixed in the position chosen.
6. Turn the left pilot's pedal position adjustment knob clockwise and check pedal adjustment similarly.
7. Press the key of flap control handle retainer and move it up and down. Make sure the handle moves without seizure.
8. Position the flaps alternatively into take-off and landing position. Make sure the flaps detent securely.
9. Undeflect the flaps and make sure they detent securely.
10. Rotate the CS in-flight unloading wheel forward and backward, and make sure the CS moves forward and backward.

B. Wheel Braking System Control Checkup

1. Push the control handle by approximately 2/3 of the range.
2. Try rotate the wheels by hand. make sure the wheel does not rotate and braking pads completely press against the drums. Adjust if necessary.
3. Position the control handle in neutral. Check if the wheels rotate freely and braking pads completely release the drums.
4. The pilot should check the braking system operation when leading the aircraft out.

2.15.1.7 *Cockpit Ventilation and Heating Checkup*

1. The check is performed during the engine run-up.
2. Alternatively open the cold and hot air inlet shutters.
3. Make sure the air is supplied to the cockpit.

2.15.1.8 *Pilot Seat Backrest Adjustment Gear Checkup*

1. Press the backrest adjustment button of the right pilot seat.
2. Make sure the seat backrest tilt back and forth without seizure.
3. Release the push-button and make sure the seat backrest is securely locked in the selected position.
4. Check the left pilot seat backrest adjustment gear in the same way.

2.15.1.9 *Safety Harness Checkup*

1. Alternatively engage the safety harness buckle into the lock on the left and right pilot seats.
2. Pull the belt to make sure the buckle is securely locked.
3. Press the button and make sure the belt buckle can be easily disengaged from the lock.

2.15.1.10 *Fuel System Electrical Equipment Checkup*

1. Turn on the "BATTERY" CB.
2. Turn on the "PUMP" CB.
3. Aurally and visually make sure the pump is running.
4. Turn off "Battery" and "Pump" circuit breakers.

2.15.1.11 *Alarm System Checkup*

The alarm system is checked during the engine start-up and run-up.

1. Turn on the "BATTERY" CB.
2. Switch on the "GENERATOR" CB. The red "GENERATOR" alarm display shall light up.
3. Start the engine.
4. Make sure the red "GENERATOR" alarm indicator goes off. The illuminated display with the engine running shows there is a malfunction in the power supply system. The display can illuminate when the engine crankshaft speed is below 1400 rpm.
5. The "FLYdat" display shall momentary light up and go out 40 seconds after the engine start-up upon execution of the utility program of "FLYdat" integrated engine parameters monitor. Illuminated "FLYdat" display with the engine running shows that one of the controlled engine parameters limit value is exceeded.

2.15.1.12 *Pressurization and Functional Checkups of Pressure Instruments and Airspeed Head*

The airspeed head pressure check and pressure instrument power supply check, and pressure instruments functional check are performed with KPU-3 checkout device

1. Connect the KPU-3 heads to the airspeed head to check "dynamic" and "static" conditions.

WARNING: The dynamic check head shall be connected only with the rubber sleeve removed to avoid the airspeed indicator damage due to differential pressure.

2. Connect the rubber sleeve from the KPU-3 outlet to the head nipple to check the "dynamic" condition.
3. Make sure the second rubber sleeve of KPU-3 is connected to nipple "D" of the airspeed indicator installed on the KPU-3, and "Pressure"-"Vacuum" switch is in the "Pressure" position.
4. Close the pressure feed and pressure relief valve on the KPU-3.
5. Rotate the knob 5-6 turns to create pressure in the KPU-3.
6. Gradually open the pressure feed valve. Close the pressure feed valve when 250 km/h (155.28 mph) is reached on the KPU-3 air speed indicator.

WARNING: Do not exceed the speed value of 250 km/h (155.28 mph) to avoid the instrument damage.

7. Compare the aircraft and KPU-3 airspeed indicator readings to check the aircraft airspeed indicator accuracy. The difference between readings should not exceed 5 km/h (3.11 mph).
8. Check the tightness of the pressure instrument full pressure feed system by keeping it under pressure for 1 minute. The pressure drop on the airspeed indicator shall not be allowed.
9. Open the pressure relief valve and relieve the pressure down to 0 reading on the airspeed indicator, then close the pressure relief valve.
10. Connect the rubber sleeve from the KPU-3 outlet to the head nipple to check the "static" condition.
11. Make sure the second rubber sleeve of KPU-3 is connected to nipple "C" of the airspeed indicator installed on the KPU-3, and "Pressure"-"Vacuum" switch is in the "Vacuum" position.
12. Close the KPU-3 pressure feed valve.
13. Rotate the knob 8...10 turns to create negative pressure in the KPU-3.
14. Gradually open the pressure feed valve. Close the pressure feed valve when 250 km/h (155.28 mph) is reached on the KPU-3 air speed indicator.

WARNING: 1. When creating negative pressure in the system monitor the altitude-rate indicator readings. To avoid instrument damage the climb speed shall not exceed 10 m/sec (32.8 fps).

2. Do not exceed the speed value of 250 km/h (155.28 mph) to avoid the instrument damage.

15. Compare the aircraft and KPU-3 airspeed indicator readings to check the aircraft airspeed indicator accuracy. The readings variance shall not exceed 5 km/h (3.11 mph).
16. 16. Let the pressure instrument static pressure feed system stay under negative pressure for 1 minute to check its tightness. The negative pressure drop in the system shall not exceed 10 km/h (6.22 mph) as per the airspeed indicator.
17. Carefully open the pressure relief valve and relieve the negative pressure down to 0 reading on the airspeed indicator, then close the pressure relief valve.

WARNING: Monitor the altitude-rate indicator reading when the negative pressure is relieved from the system. To avoid instrument damage the descent speed shall not exceed 10 m/sec (32.8 fps).

18. Remove the KPU-3 "dynamic" and "static" check heads from the airspeed head.

19. Check the accuracy of the altimeter barometric pressure dial reading:

a) Prior to the check, verify the atmospheric pressure value for the area (airfield, site, etc.) and reduce it to the aircraft parking location.

b) Rotate the altimeter knob to set the altimeter hands to "0".

c) Compare the atmospheric pressure readings of altimeter to the atmospheric pressure value reduced to the aircraft stand location.

d) The reading variance shall not exceed ±1.5 Mmhg (± 0.002 bar) at the air temperature from +15 °C (59°F) to +25°C (77°F), and ± 2.0 Mmhg (±0.0027 bar) at all other air temperature values.

20. Tap the instrument face glass with a finger to check the altitude-rate indicator reading accuracy at the "zero" mark. The error shall not exceed ± 0.5 m/sec (1.64 fps). Adjust with the knob if the error exceeds the allowable value.

2.15.1.13 *Functional Checkup of the FLYdat Integrated Engine Control Unit*

1. Turn on "BATTERY" CB. 40 seconds after the FLYdat unit utility program execution is completed check the LCD display indications:

- the exhaust gas temperature, engine head and oil temperature displays shall show the ambient air temperature;
- the oil pressure and crankshaft rpm shall show "zeros", the oil pressure display may show "1";
- the engine hours display shall show the digits corresponding to the engine operating time in hours;

the "FLYdat" red alarm panel shall not light up

2.15.1.14 *Fuel Level Gauge and Fuel Load Checkup*

1. Turn on the "BATTERY" CB.
2. Check the fuel level gauge reading. It shall show the fuel load. The calibration table shall be used to identify the fuel load.
3. In case the fuel load is above the emergency level the fuel emergency level indicator light should not flash. When the fuel load below the emergency level, the emergency level indicator light should flash.
4. When fuelling the aircraft make sure the emergency fuel level indicator light goes out when the fuel level in the tank reaches 7 liters.

2.15.1.15 *Radio Equipment Check*

1. Turn on the "BATTERY" CB.
2. Switch on the radio station.
3. Set the radio to the frequency of the departure airfield flight operations director or the flight control tower.
4. Establish communication and check its quality.

2.15.1.16 *Aircraft Fuelling*

1. The aircraft must be fuelled only with unleaded motor gasoline min. RON 95, EN 228 Super, EN 228 Super plus, see sec. 6 Fuel system
2. The aircraft must be fuelled with carefully filtered gasoline through a filler neck using a special-purpose filling system with a cleaner filter and water separator.
In case the filling system is not available, the aircraft can be fuelled from the can using 2-3 filter layers to be installed on the filler neck.

WARNING: 1. Never empty the gasoline to the bottom of the can since water and mechanical contaminants settle at the can bottom.
3. Let the fuel settle for at least 10 minutes before filling from the can.

4. In order to prevent the water in the gasoline purchased at a gas station from entering the system it is recommended prior to filling the aircraft to settle the gasoline in a special container with dump valve and to drain the residue.
5. Within 10 minutes after each aircraft fueling drain the fuel sediment to check for water and foreign articles.
6. The aircraft must not be fuelled under rainy, snowy conditions or in case of the high air dust content unless the measures to prevent the precipitation and dust ingress into the filler neck.
7. Aircraft fuelling under lightning conditions is **PROHIBITED**.
8. The following shall be PROHIBITED during the aircraft fueling and fuel draining:
   - engine start-up;
   - turn the "Battery" switch on and off;
   - perform assembly and disassembly works.
9. Tightly close the filler neck cap after fuelling.

2.15.1.17 *Discharging Fuel and Checking Fuel Sediment Sample*

1. Open the drain cock access door on the cockpit floor.
2. Place clear transparent fuel drain glass container under the valve and push and turn the drain valve handle.
3. Drain 200-250 g (0.44-0.55 pounds) of fuel into the container and close the drain valve.
4. Check the drained fuel sediment. It shall be free from mechanical contaminants and water. In case the fuel sediment test results are unsatisfactory repeat the operations specified in p.p. 2 and 3 several times. In case the repeated fuel sediment test results are unsatisfactory drain the fuel from the tank, washout the tank and replace fuel.

WARNING: Accidental fuel spills should be immediately removed. Any works on the engine and aircraft should be PROHIBITED until the spilled fuel is completely removed.

2.15.1.18 *Start-up and Run-up the Engine*

Engine start-up and run-up should be done as described in *Rotax-912ULS Operations Manual*.

2.15.1.19 *Aircraft Flight Readiness Verification*

1. Report maintenance procedure completion to the person who supervises the aircraft flight readiness

2. Supervisor should verify the aircraft flight readiness as follows:
- check maintenance scope and quality;
- make sure all found malfunctions and failures have been fixed;
- check the fuel/ oil and lubricants load;
- check proper documentation fill-out.
3. Make appropriate entries into the aircraft preflight preparation log (flight log).

2.15.2 *TURNAROUND MAINTENANCE*

Turnaround maintenance is conducted after each lead-in of the aircraft as initial maintenance during aircraft preparation for the next flight. It includes:

- engine and propeller inspection;
- aircraft inspection;
- fuel sediment test if refueling took place;
- fuel, oil, and coolant level checkup;
- found problems clearing;
- aircraft flight readiness verification

Make sure BATTERY CB and IGNITION switches are in OFF position before any maintenance work.

2.15.3 *POST-FLIGHT MAINTENANCE*

The post-flight maintenance is performed at the end of the flight day after flights have been completed. The maintenance includes:

- engine and engine systems inspection;
- propeller inspection;
- aircraft fueling, fuel sediment testing;
- fuel, oil and coolant level checkup;
- found malfunctions elimination;
- cockpit clean-up;
- dust, dirt, snow removal from the aircraft surfaces;
- air-intakes capping, airspeed head covering;
- rudder and ailerons clamping;
- engine, propeller, and aircraft covering;
- aircraft tiedown.

2.15.4 *WINTER OPERATION SPECIFICS*

Perform the following actions before operating the aircraft in winter season:
- remove any snow or ice from the aircraft surfaces;
- deicing and desnowing should be done using warm air with timely removal of melt water;
- install ski landing gear if necessary;
- thoroughly cover the engine, fuselage, wing planes, and tail upon completion of the flights.
It is PROHIBITED to issue the flight clearance if the aircraft is covered with ice and/or snow.

2.15.5 WATER SURFACE TAKE-OFF OPERATION SPECIFICS

Before flying the aircraft from water it is required to perform the maintenance of lifting devices and towing platform. Thoroughly inspect the aircraft and flotation landing gear, remove any rust, restore paint coating, lubricate all the bolt mountings and control cables with TsIATIM-201 lube oil.

Install flotation landing gear.

After the flotation landing gear has been installed thoroughly check all bolt joints and adjust the water rudder. Using the wire line turnbuckles and stoppers of control cable cover adjust the water rudder so that it is in neutral position when the air rudder is in neutral position.

During preflight maintenance inspect the flotation landing gear, check bolt joints, check for cracks in the body, and make sure there is no water inside the floats.

Preflight and post-flight maintenance should be done ashore with the aircraft set on the towing platform. Choose flat waterside, the water reservoir should preferably have sandy bottom without rocks. The rocks can damage the floats.

The aircraft should be stored ashore on the towing platform and tied down. Aircraft launching and lifting should be done only by using towing platform.

Timely remove rust, restore paint coating of the aircraft, flotation landing gear and towing platform in the course of maintenance.

Make sure the sand and water do not get to the filler necks during the aircraft fuelling by oil and lubricants.

When the flights from the water surface are over, thoroughly inspect the aircraft ant its systems, change the lube oil in steering system, remove rust, and restore paint coating.

3. AIRCRAFT STRUCTURES

3.1 FUSELAGE

Aircraft FUSELAGE is load carrying structure shown in the figure.

UPPER BEAM is of cylinder shape. The beam structure consists of the four riveted segments. Primary structure consists of eight frames. Materials used: D16T aluminum alloy and 30HGSA steel. Engine bed mounting units are installed on the frame 1. Outer wing and safety parachute system mounting cables are riveted to frames 2 and 3. Vertical and horizontal stabilizers are mounted on frames 7 and 8. False keel is riveted from below to the tail section of the beam.

LOWER BEAM is of box-like section. It is made of riveted together D16T aluminum alloy plates. Pilot seat cups and duct, separating the cockpit from the fuel tank, are riveted to the lower beam. Aircraft and engine control system mounting units as well as gear and wing strut mounting units are also installed on the lower beam.

PYLON is made of riveted together D16T aluminum alloy plates and is of slant parallelepiped shape. Flap control assembly mountings are installed on the front panel of the pylon. Rear panel carries SPS mountings and battery support frame. Upper and lower beams are attached to the pylon with bolts. Spring retainers of pilot seat backrests are mounted on the pylon's right and left side panels.

FORWARD STRUT is made of aluminum channel bar. Fairing and two strut mounting units are riveted to the channel bar. The fairing of semi-oval cross-section is made of D16T aluminum alloy plate. The strut is fixed by two bolts to upper and lower beams. The elevator control rod runs inside the strut.

ENGINE BED is designed to carry the ROTAX 912ULS engine and its systems. Engine bed lower section consists of riveted together parts made of D16T aluminum alloy. It is a duct through which the radiator cooling air is supplied. Atop the duct, closer to its front end, the upper section of the engine bed consisting of two side metal panels rigidly joined together is installed on rubber cushions. The panels have weight saving apertures. Oil system and engine cooling system lines run through the apertures in the panels.

The oil tank casing designed to accommodate the oil tank and engine liquid cooling system radiator is installed in the rear upper part of the engine bed. The casing is equipped with controlled shutters to adjust the coolant temperature. Oil cooler casing designed to accommodate oil system radiator is installed in the rear part of the engine bed. Controlled cowl shutters for oil temperature adjustment are located above the casing.

Closed 2-SEAT COCKPIT is drop-shaped. It is made of 3-layer composite material with plastic foam filling. The cockpit is made of: EZ-200 glass cloth, PS-4-40 plastic foam, ED-20 epoxy resin with PEPA hardening compound and dibutyl phthalate as a plastifier.

PILOT SEATS are mounted side by side in the cockpit. Backrests have adjustable tilt, fold forward, and can be easily removed. Backrest spring retainers are installed behind the seats on the central pylon side panels. The retainers are controlled by two press-buttons located on the lower beam between pilot seats. There are two doors of oval shape located on the right and left side of the cockpit.

COCKPIT DOORS are equipped with large convex oval casement-free windows which provide perfect field of view. The door open outwards upwards.

Each door is locked by locking mechanism consisting of rods and levers which control the liner motion of two locking pins, front and rear ones. Locking pins move into rebates in cockpit doorways ensuring reliable locking of the doors. Locking assembly has two twist knobs, one of which is located on the outside of the door, and the other is built into the door casement from inside. Locking mechanism is retained in locked position from inside by a pin retainer.

Casement free windshield is installed in the front of the cockpit. Two oval windows in cockpit rear section on the right and left side help to provide the best possible field of view.

Fuselage maintenance intervals should be as specified in *Airframe*, Sec. 2, Paragraph 2.4; *Cockpit*, Sec. 2, Paragraph 2.8, *Cockpit Ventilation and Heating System*, Sec. 2, Paragraph 2.9.

3.1.1. **Fuselage Maintenance**

A. External Condition Checkup.

1. The aircraft can be equipped with special covers for all main aircraft's elements: propeller, engine, cockpit, wings, stabilizer, and keel. Never keep the aircraft uncovered during long idle periods and when in storage. It is recommended to use light color covers in summer to avoid composite parts overheating.
2. Fuselage maintenance boils down to regular inspection and external condition checkup of upper and lower beams, central pylon, and front strut. Particular attention should be paid to possible damage and cracks, the condition of mounting units, bolt joints, paint coating, and corrosion presence.
3. Inspect the cockpit and centerwing fairing surfaces. Make sure they are clean, there is no skin damage and delamination. Cracks, delamination, and blistering in the skin are not allowed. In case of any defects of the composite skin make sure to contact the manufacturer of your aircraft. All damaged area repairs must be done only with manufacturer representative (dealer) present. Use car paint cosmetics to clean any dirt from the aircraft skin.
4. Use only chamois, flannel, or cotton napkins to wipe the cockpit windows. DO NOT use organic solvents to clean the windows!
5. Use special polishing liquids to remove small scratches from the windows.
6. Window separation from the cockpit walls and butt joint seal failure ARE NOT ALLOWED. If found, such failures should be reported to the manufacturer. The repairs can be done only with manufacturer representative (dealer) present.
   Unauthorized repair is PROHIBITED!
7. Occasional cracks with length not exceeding 10 mm in the glassing in the areas where securing bolts are installed are not regarded to be manufacturer's fault. If found, terminate a crack at the end with a hole 1 mm in diameter.
8. Window silver-plating area should not take more than 25% of windshield surface area, and more than 35-40% of side windows.

B. Cockpit Doors Checkup

1. Inspect cockpit doors. Inspect external condition of the door bodies and windows. Make sure they are clean. Skin cracks, delamination, and blistering are not allowed. Window separation from the cockpit walls and butt joint seal failure are not allowed. If found, such defects should be reported to the manufacturer. All damage repairs can be done only with manufacturer representative present.
2. Inspect the door hinge fittings. Make sure there are no cracks and that doors are securely mounted.
3. Open door in full and make sure they are retained in open position by shock struts. If the door shuts down remove the shock strut and replace.

4. Close the door and lock it by pushing the lock knob. Make sure the knob moves with little force applied and reaches the end stop position.
5. Insert lock retainer to end stop position and make sure it is retained in retained by the spring in recess and the lock does not open.
6. Lightly pull by the retainer to move it out, and open the door lock. Make sure the knob moves easily and without scuffing.

C. Door Lock Inspection and Lubrication

1. Remove decorative panel from the door body internal surface.
2. Inspect lock's rods and levers.
3. Apply TsIATIM-201 grease to the lock's swivel joints and retainer pins.
4. Check if the lock knob moves easily.
5. Replace decorative panel.

D. Door Dismounting and Mounting

1. Remove the shock strut.
2. Remove the splint from the mobile part of the door axis and push the mobile part aside.
3. Remove both axis halves from the front and rear door mounting units.
4. Dismount the door carefully.
5. Mount the door in reverse order after applying the grease to the axis swivel and both axis halves.

E. Cockpit External Condition Checkup

1. Check the external condition and mounting security of the flight deck and instrument board cases, instrument boards and instrument panels, heating and ventilation panels, and central casing. The requirements to fiberglass panels' external condition are similar to that of any fiberglass parts. Instrument boards and panels should be securely mounted. The labeling should be clearly visible.
2. Check the external condition and mounting security of the cockpit floors. Floors external condition should comply with requirements common for all fiberglass parts.
3. Check external condition of cockpit lining. Glue down any unstuck areas.
4. Inspect the luggage hold and rear portion of the cockpit. Check the external condition, remove any litter.

F. Pilot Seats Inspection, Adjustment, Demounting, and Installation

1. Remove the seat cushion from the left pilot seat cup, inspect it, repair upholstery if necessary and glue down any torn off Velcro strips.
2. Press the backrest adjustment key and remove the backrest mounting strip from central pylon's mounting unit. Make sure the backrest can be folded along the seat.
3. Remove backrest rubber shock absorbers from the mounting unit hooks. Lift the backrest vertically up until its pins move out from the cup's mounting unit cutouts, and remove the backrest.
4. Inspect the backrest. Check condition of pins, backrest mounting strip, and rubber shock absorbers. Replace damaged rubber shock absorbers. Repair backrest upholstery if necessary.
5. Inspect the left pilot's seat cup, make sure there are no cracks and deformations in primary structure and backrest mounting units. Velcro strips should be glued down to the cup to hold the seat cushions. Glue down torn off Velcro strips with glue.
6. Inspect backrest mounting unit on central pylon. Check retainer condition.
7. Inspect backrest adjustment key. Make sure keys and control cables are mounted securely, and there is no mechanism jam-up when the key is pressed.
8. Apply TsIATIM-201 grease to key pivot pins and backrest retainers.
9. Hook up backrest rubber shock absorbers and insert the backrest pins in one of three cutouts in mounting units depending on the pilot's height.
10. Press the backrest adjustment key and install the backrest mounting strip onto the central pylon's mounting unit.

11. Adjust backrest tilt angle and release the key. Make sure the retainer is fully set into one of the holes in the strip.
12. Install the seat cushion in such a way that Velcro strips on the cushion match the ones on the seat cup. Check if the cushion is securely mounted.
13. Sit down in a seat and, if necessary, adjust the backrest tilt angle.
14. Check the right pilot seat in similar way.

3.2 Wing

Aircraft's WING is rectangular in shape in plan view and equipped with slot flaps and drooped ailerons.

Wing's composite structure is a design feature. Конструктивной особенностью является смешанная конструкция крыла. Each outer wing primary structure is made of metal and assembled with rivets. It consists of the spar and six ribs. Primary structure elements are made of D16T aluminum alloy with additional spar reinforcement by mending plates and angle bars of 30HGSA steel. Wing skin is composite. It features 3-layer fiberglass structure with plastic foam filler. EZ-200 glass cloth, PS-4-40 plastic foam, ED-20 epoxy resin with PEPA hardening compound and dibutyl phthalate as a plastifier are the materials the skin is made of. The skin is mounted to the wing's primary structure with epoxy glue and rivets.

Flap mounting brackets are riveted to ribs 1, 2, and 3, and aileron mounting brackets are riveted to ribs 4, 5, and 6. Aileron control assembly is located inside the outer wing. The pipe with a rear outer wing to upper beam mounting eye is installed in rear part of the outer wing between ribs 1 and 2. Front outer wing to upper beam mounting eye is installed on the spar and mounted with bolts. Outer wing mountings are made of 30HGSA steel. The mounting bracket for the wing strut is riveted to the spar from below. Lower surface of each outer wing is equipped with five access doors.

FLAPS are entirely made of composite material. Each flap has one spar made of composite material, and one rib glued in where the flap starts. The same materials as for wing skin are used in flap manufacture. Flap mounting bracket and control lever are mounted on the flap rib. Another two flap mounting brackets are mounted on its spar.

WING STRUTS are made of aluminum alloy. Each strut is a pipe oval in cross-section with strut mounting eyes riveted to it. The struts are covered with fiberglass fairings on the outside. Pressure instrument supply lines run inside the left strut. The lower and upper space between the fairing and the pipe is filled with sealing foam.

Please refer to *Airframe*, Sec. 2, Paragraph 2.4, for wing maintenance intervals.

3.2.1 **Wing Maintenance.**

1. Inspect outer wing surfaces and mounting units. Check if skin is clean and solid. Check mounting units and bolt joints. Cracks, delamination, and blistering in the skin are not allowed. In case of any defects of the fiberglass skin make sure to contact the manufacturer (dealer). All damaged area repairs must be done only if authorized by the manufacturer representative (dealer). Use only car paint cleaners to clean any dirt from the aircraft skin.
2. Inspect external condition of wing struts, check mounting units, and bolt joints. Cracks, delamination, and blistering in the skin are not allowed.
3. Inspect external condition of ailerons. Make sure the skin is clean and solid. Tears in the skin are not allowed.
4. Inspect external condition of flaps. In case of cracks, delamination, and blistering in the skin make sure to contact the manufacturer of your aircraft.
5. Check the control levers to flap mountings. Make sure there are no cracks and deformations. Check bolt joints.
6. Inspect flap and aileron hinge fittings. Check bolt joints. Wash swivel joints with kerosene and apply TsIATIM-201 grease.

WARNING! 1 DO NOT heat wing skin above 70°C (158°F) using any heating devices. It is recommended to use covers of light color in summer to avoid excessive heating of composite elements of the structure.
2. DO NOT place tools, parts, and assemblies on the wing and tail skin.

3.3 Empennage

Aircraft's EMPENNAGE is of classic design, cantilevered.

STABILIZER is solid-metal riveted structure consisting of spar and 12 ribs. Stabilizer edges are made of composite material. Three elevator mounting units are installed on stabilizer terminal ribs and in the middle of the spar. Rear mounting unit is installed on the spar from below on the centerline. Front mounting unit is mounted between two central ribs. Stabilizer is mounted to upper beam by two threaded studs installed in the front mounting, and by one bolt to false keel bracket.

ELEVATOR primary structure is made of D16T aluminum alloy, riveted. It consists of a spar and 10 ribs. The skin is made of cloth soaked in NTs 551 varnish. Elevator has two mass-balance weights, three hinge fittings, and control lever.

FIN is all-metal riveted structure consisting of a spar and six ribs. Upper edge of the fin is made of composite material. Upper and lower mounting units of the rudder as well as fin to lower beam rear mounting unit bracket are fixed to the spar. Front mounting units are riveted to ribs 1 and 2 at the front portion of the fin. The fin is secured to upper beam by four bolts.

FALSE KEEL with tail protecting support is riveted to upper beam. Rear portion of false keel is covered by composite fairing.

Please refer to *Aircraft*, Sec. 2, Paragraph 2.4, for empennage maintenance intervals.

3.3.1 Empennage Maintenance

1. Check external condition of keel skin, make sure there is no damage present. Check fin's mounting units and bolt joints.
2. Check rudder's external condition, make sure the skin is clean and not damaged. Ruptured skin is not allowed.
3. Inspect rudder mounting units. Check bolt joints. Wash swivel joints with kerosene and apply TsIATIM-201 grease to them.
4. Check external condition of stabilizer skin. Make sure it is not damaged. Check mounting units and bolt joints. Slack in mounting units is not allowed. Make sure to contact the manufacturer (dealer) if slack is found.
5. Check elevator's external condition. Make sure the skin is clean and not damaged. Ruptured skin is not allowed. Check if flutter-preventive weights are well secured.
6. Inspect elevator's hinge fittings. Check bolt joints. Wash swivel joints with kerosene and apply TsIATIM-201 grease to them.
7. Inspect false keel and tail stopper. Check external condition, make sure there is no damage and composite edge trim is securely fixed.

3.4 Wheel Landing Devices

Aircraft's LANDING GEAR has three wheels with front leg. Gear legs are nonretractable. ШАССИ самолёта трёхколёсное с передней стойкой. Стойки шасси не убираются в полёте. Dampening is provided by resilient properties of leg material.

MAIN GEAR LEGS are made of composite material. The structure has 3-layer design made of plywood and fiberglass glued together. There is fork with shaft located in upper portion of the leg, Wheel mounting bracket is located in leg's lower portion. Leg mounting is performed as follows: fork's shaft is inserted into upper mounting socket located on the lower beam, and additionally secured with one bolt to the lower mounting.

FRONT GEAR LEG is made of 30HGSA steel. It is shaped as cone frustum of big extension. Wheel mounting unit is installed in the front portion of the leg, and leg to lower beam mounting - in its

rear portion. To increase the wheel base the front leg is located on the lower beam centerline and protrudes beyond the cockpit's clearance. The leg is secured to lower beam by four bolts.

Wheels with tires of 350 mm in diameter are installed on the main gear legs. The front steering wheel is installed in steering fork and has tires of 300 mm in diameter. Steering fork has shaft and walking beam. The front wheel steering is controlled by pedals via cable.

To improve the aircraft's aerodynamics, the wheels are covered with fairings made of composite material.

Main wheels are equipped with drum type brakes with mechanical drive. Brakes are operated by control handle by moving it forward. To improve the aircraft's steering maneuverability, the BRAKE SYSTEM is equipped with differential brake operated by pedals. Differential brake control lever is connected to rudder control cable. When the aircraft makes a turn, the wheel going along the curve of smaller radius is slowed down.

Please refer to *Landing Gear and Wheel Brake System*, Sec. 2, Paragraph 2.5, for wheel landing devices maintenance intervals.

3.4.1 LANDING GEAR MAINTENANCE

3.4.1.1 External Condition Checkup

1. Inspect the legs, make sure they are not damaged. Check if gear legs are securely fixed to the fuselage. Check the mounting of wheel brackets. Cracks and delamination of composite material are not allowed. If found make sure to contact the manufacturer (dealer).
2. Inspect wheel fairings. External condition requirements are similar to all parts made of composite material. Make sure to check if the locks are securely mounted on fairings.
3. Inspect the wheels, make sure they are securely mounted. Make sure control cables are securely connected. Check tires condition. Deep cuts and wear are not allowed. Replace the tires with cuts deeper than the first cord layer and if the first cord layer has been worn off.

3.4.1.2 Tire Pressure Checkup

1. Connect pressure gage or a pump equipped with pressure gage to the tire valve.
2. Check the pressure gage reading. The pressure should be 2 kg/cm^2 (28.4 PSI).
3. Pump up the tire if the reading is below 2 kg/cm^2(28.4 PSI).

WARNING! Tire pressure should NOT be above 2 kg/cm^2(28.4 PSI).

3.4.1.3 Brake System Adjustment

1. Install jacks under wing planes and raise the wheel off the ground. If no jacks available, set main legs on supports. Abut the supports against the wheel brackets.
2. Put the control lever and pedals in neutral position.
3. Check the wheels free rotation by rotating them manually. If rotation is hampered, decrease the cable tension by Bowden stoppers located in lower portion of gear leg.
4. Push control lever by approximately ¼ of its travel.
5. Rotate the wheels manually. Make sure the rotation is difficult meaning that braking pads press against the drums. Adjust cable tension by Bowden stoppers located in lower portion of gear leg if necessary. Check if brake torques are the same on the left and right wheels.
6. Push the control lever by approximately 2/3 of its travel.
7. Try to rotate the wheels manually. The wheels should not rotate meaning that braking pads entirely press against the drums. Adjust cable tension by Bowden stoppers located in lower portion of gear leg if necessary.
8. Push the control lever as far as possible. Make sure it meets the end stop. Slack the cables if necessary.
9. Put the control lever in neutral position. Rotating the wheels manually make sure they rotate freely. Repeat adjustment if rotation is hindered.

10. If adjustment failed, increase or decrease cables tension by Bowden stoppers located in differential brake area. Repeat the adjustment procedure.
11. By alternatively pressing left and right pedals, and pulling the CS by 2/3 of its travel, check differential brake operation. Pressing the right pedal should slow down the right wheel, pressing the left pedal should slow down the left wheel.
12. Rotate the wheels manually. The rotation should be difficult meaning that braking pads press against the drums.

3.4.1.4 Differential Brake Adjustment

1. Put the pedals in neutral position.
2. Check the position of differential brake control lever on the left elevator control cable.
3. Loosen the nut on differential brake control lever and move it along the cable into neutral position. Tighten the nut.
4. Make checkup as described in paragraph 3.4.1.3. Repeat the adjustment if necessary.

3.4.1.5 Main Wheel Removal and Installation

1. Remove the wheel fairing, disconnect the cable from the brake lever, and lift the wheel off the ground.
2. Remove the locking pin and unscrew the wheel mounting nut.
3. Carefully rocking, remove the wheel from shaft.
4. Clean the shaft and apply some grease. Install the wheel in reverse order.
5. Check and adjust the brakes after the installation (see paragraph 3.4.1.3).

3.4.1.6 Front Wheel Removal and Installation

1. Disconnect control cables and lift the wheel off the ground.
2. Unlock and unscrew the wheel fork mounting nut.
3. Remove the wheel together with fork and fairing.
4. Remove wheel fairing.
5. Remove the locking pin and unscrew the wheel mounting nut.
6. Carefully rocking, remove the wheel from shaft.
7. Clean the shaft with kerosene and apply TsIATIM-201grease to it. Install the wheel in reverse order.
8. Following installation, strain control cables and adjust the wheel's directional position with turnbuckles making sure it is set exactly along the aircraft centerline.

3.4.1.7 Braking Shoe Checkup

1. Remove main wheel.
2. Remove braking shoes control lever.
3. remove rear cover and inspect braking shoes and braking drum.
4. Shoes and drum should not have any damage. Broken springs are not allowed.
5. Brake pad facing should be at least 1mm higher than rivet heads. Otherwise replace the pads/braking shoes.

Flotation Landing Gear Routine Maintenance

1. Before each flight: check flotation landing gear condition, check if bolt joints are secure, make sure there are no cracks in the float body and no water inside the floats.

2. Routine maintenance should be done ashore after placing the aircraft on towing platform. Water reservoir bank should not be too steep. It is recommended that there are no rocks on the bottom as they can damage the floats. Routine maintenance on the water is allowed.

3. Periodic maintenance should be done only when ashore.
4. Periodic maintenance procedure:

a) thoroughly inspect float bodies both from inside and outside;
b) check water rudder operation and control cables condition;
c) lubricate swivel joints and cables with TsIATIM-201 grease;
d) inspect float frame and towing device, remove any rust;

3.5 Steering Structures

AILERONS are of drooped type. They deflect downwards along with flaps during take-off and landing which increases the wing lift. Each aileron has riveted aluminum frame with tubular spar and nine ribs, profiled edge trimming of fiberglass, and covered with skin made of 5P9KAT heat-shrinking cloth soaked with NTs551 varnish. Three mounting brackets and aileron control lever are installed on spar.

RUDDER has design similar to that of elevator. Primary structure consists of a spar with two hinge fittings and six ribs. Walking beam is installed in rudder's lower portion.

Please refer to *Airframe*, Sec. 2, Paragraph 2.4, for steering structures maintenance intervals. See paragraphs 3.2.1 and 3.3.1 for steering structures maintenance procedure.

4. ENGINE

For maintenance description see manual supplied together the aircraft.

5. CONTROL DEVICES

5.1 AIRCRAFT CONTROL

Aircraft control is dual with equal control possibilities from both the right and left pilot seats. Elevator and ailerons are controlled by control stick.

Two control sticks are pivotally mounted on common mount which is a pipe pivotally mounted on two brackets and can rotate around off-center axle. In the middle part of the mount there is a gimbal joint of ailerons control longitudinal shaft. Lower ends of control stick are pivotally connected by a rod which rotates gimbal joint of ailerons control longitudinal shaft using a lever located in its medium part. Rear end of the shaft is secured on the off-center axle. Control wiring of elevator and ailerons is rigid and consists of hollow rods and bellcranks with hinges, brand IIIC-6. Control stick movement to left and right results in shaft rotation that in its turn causes forward motion of ailerons control vertical rods. Through rods and bellcranks system motion of the vertical rods is converted into ailerons up and down movement.

Back and forward control stick movement results in forward motion of rods and bellcranks system attached to hinge joint on the control stick mount and to elevator bracket that causes up and down elevator movement. Downward motion of the ailerons together with flaps or so called "droop" is made with mixer, controlled by flaps control handle. There is no any trimmer on the elevator. There is a special mechanism on control stick – control stick flight discharger, which is used for forces release from control stick on pitch axis. Using hard rod this discharger makes extra rotational torque for control stick mount which is directed to the side opposite to the rotational torque made by the elevator. Discharger is control by a wheel located on master control board.

Rudder is controlled by PEDALS. Two blocks of the pedals are hinge jointed between by a rod through rotating sector of rudder control cable.

The distance between pedals and pilots seats is adjusted by a special device which allows to adjust it depending on the pilots height. Rudder control cables are attached to the sector. The sector, rotation from forward and back pedals movement causes cables forward motion, which in its turn moves rudder left and right using bellcrank on the rudder. Nose gear wheel control cable is also attached to this sector. Full movement of aircraft controls and control surfaces is set forth in the following table:

Control stick pitching movement, mm:

Pulling from neutral	150
Pushing from neutral	130
Control stick banking movement from neutral, mm	± 110
Pedals movement from neutral, mm	± 60

Foot pedals, Right pedal:	Forward	Rudder to the right	23°±1°
	Back	Rudder to the left	23°±1°
Control stick:	Pull	Elevator up	30°±1°
	Push	Elevator down	20°±1°
Control stick:	right	Right aileron up	24°±1°
		Left aileron down	14°±1°
	left	Left aileron up	24°±1°
		Right aileron down	14°±1°

5.1.1 AIRCRAFT CONTROLS MAINTENANCE

1. The smooth operation of the aircraft control systems is ensured through regular monitoring of rods, brackets, rockers, cables and control gear condition.
2. The clearance between adjacent moving parts of the aircraft control system shall be as minimum 10 mm, the clearance between the control systems moving parts and fixed aircraft structural elements shall be minimum 5 mm.
3. Adjustable rod end fittings shall be securely locked, and the shanks of the fitting threaded parts shall overlap with the check ports of the rod sleeves.
4. The bearings press-fitted into the control rockers shall ensure free movement of the rods.
5. All bearing connections shall be lubricated. Lubrication shall be performed during all types of maintenance recommended in Flight and maintenance manual , and as required.
6. When replacing lubrication, thoroughly wash out all old lubricants with kerosene, benzene B-70 or similar liquids and dry.
7. The rod end fittings shall be connected to the arms and rockers with bolts and pin-locked nuts. Self-locking nut use shall be PROHIBITED.
8. Adjustable tips and bolt joints shall be marked by red paint.
9. The foot-pedals and column movement shall be seizure-free.
10. Check the control wires conditions during maintenance. The cables shall be free from bend-caused deformation, dents, broken strands and threads, chafing and corrosion. The cable must be replaced if such damages are found.
11. Use only clean cotton cloth to remove dirt and old lubrication from the control cables. When the dirt is removed wipe the cables with a cloth soaked in NK-50 lubricant or 50% solution of CIATIM-201 lubricant and gasoline.
12. Shine is a visible sign of the cable chafing. In case the areas of dubious strain hardening or chafing are found slack the cable and bend this section. The damaged parts will fail and the wire must be replaced.
13. Corroded cables shall be wiped with rags until the rust is removed, replace cable if rust removal is impossible. Use of sand paper to remove corrosion is PROHIBITED.
14. Check cables condition in eye terminals and in the places of cables sealing into metal tips, as well as eye terminals condition, turnbuckles locking security and condition of the locking.
15. Threaded part of turnbuckles eye lugs should be screwed in to cylindrical part of the turnbuckle on 10 mm minimum. Eye lugs shall be locked by locking wire KO-0,8. Threaded part of the eye lugs and cylindrical part of the turnbuckle shall be marked by red paint.
16. Check the wire tension with a strain gauge. The tension force shall be within 35...40 kg) in summer and 25…30 kg in winter. Use turnbuckles to adjust the tension.
17. After all works performance lock threaded joints of turnbuckles by locking wire KO – 0.8, make control marking by red paint.

5.1.1.1 Aircraft Control System Check

1. When the foot-pedals and column are in the neutral position the control surfaces shall be in the neutral position as well, except for the rudder which should be 15 … 25 mm moved right on the rear edge to compensate propeller reaction.
2. Install angle gages on the ailerons, elevator and rudder.
3. Alternatively tilt the column and foot pedals to a full stop. Check the deflection angles of the aircraft control surfaces with angle gages. At the same time use the ruler to check the column and foot pedals deflection.
4. The following control surfaces deflection angles shall correspond to the full deflection of foot-pedals and column:

Foot pedals Right pedal:	**forward**	**rudder to the right**	23°±1°
	backward	**rudder to the left**	23°±1°
Control stick:	**pull**	**elevator up**	30°±1°
	push	**rudder down**	20°±1°
Control stick:	**to the right**	**right aileron up**	24°±1°
		left aileron down	14°±1°
	to the left	**left aileron up**	24°±1°
		right aileron down	14°±1°

5. Full controls deflection shall correspond to the following table:

Column pitch travel, mm. :	
pulled from the neutral position	150
pushed from the neutral position	130
Column bank travel from the neutral position, mm	± 110
Foot pedal travel from the neutral position, mm	± 60

5.1.1.2 Aircraft controls adjustment

1. Controls adjustment is carried out:
- In cases of control devices replacement;
- After wing panel, keel, stabilizer, control rods and control surfaces replacement;
- After wings and tail mounting and dismounting;
- During work operations foreseen in Maintenance program.
2. Adjustment is made after control system check up.
3. Rudder deflection angles adjustment is carried out through screwing in or out threaded tip of elevator fork or as required threaded tip of elevator rod eye lug close to manual post bracket.
4. Set extreme positions of the elevators by supports on control stick mount.
5. Ailerons angles are adjusted by adjustment of short vertical rod length (close to centre section) via screwing in or out rod threaded tip. If required adjust cross tie rod attached to aileron.
6. Set ailerons extreme positions using supports on the control stick mount.
7. Rudder control check and adjustment is as follows:
- Set pedals into neutral;
- Check matching of neutral position for right and left control posts pedals;
- if required set rudder deflection to the right side by 15 … 25 mm on the rear edge using turnbuckle;

- Check values of rudder full deflection angles, in doing so rudder in its extreme positions shall not touch elevator elements, adjust as required.;
- adjust by screwing in or out threaded tip of turnbuckles eye lugs, in one turnbuckle tip is screwed in and in another one screwed out;
- check rudder control cables tension in accordance with methods set forth in the point.4.2.8. Tension should be within 35...40 kG in summertime and 25...30 kG in winter, adjust the tension as required;
- Cables tension adjustment is carried out simultaneously with two turnbuckles to avoid rudder deflection angle change;
- check rudder deflection angle again after cables tension adjustment.

5.1.1.3 Flaps deflection angles check up and adjustment

1. Put angle gauge on the flaps.
2. Alternatively tilt flaps control handle into take off and landing position.
3. Check flaps deflection angles using angle gauge: 20°±1° in take off position, 40°±1° in landing position. Adjust as required.
4. Adjustment is made through vertical rod length adjustment via screwing in or out threaded tip of the rod fork, or if required by rod length adjustment from control lever on flaps.

5.2 Flaps control

FLAPS CONTROL IS manual. Flaps are controlled by control handle located in the cockpit on the front wall of pylon between pilot seats. There is a button on the flaps control handle, pressing this button results in mechanism lock release and the handle can be moved freely along guide plate. The plate has three seats corresponding to:

- position of retracted flaps;
- 20° extended flaps;
- 40° extended flaps.

After the button release, lock mechanism using spring comes in to one of three seats, thus allowing secure fixation of the flap in the desired position.

Flaps can be controlled both from the right and left pilot seats. Flaps are controlled by rods.

5.3 Engine control.

ENGINE is controlled by two engine control lever, carburetors preparators control lever and control cables in Bouden type braiding. Central throttle control lever and preparators control lever is located on master control board. Left engine control lever is located on the left side from left pilot seat and can be folded backwards along the seat. This lever is for convenient engine control from the left pilot seat. Both throttle control levers are mounted on one axle. Using control cables throttle control lever moves levers of carburetors throttle shutters. Preparators levers control is similar.

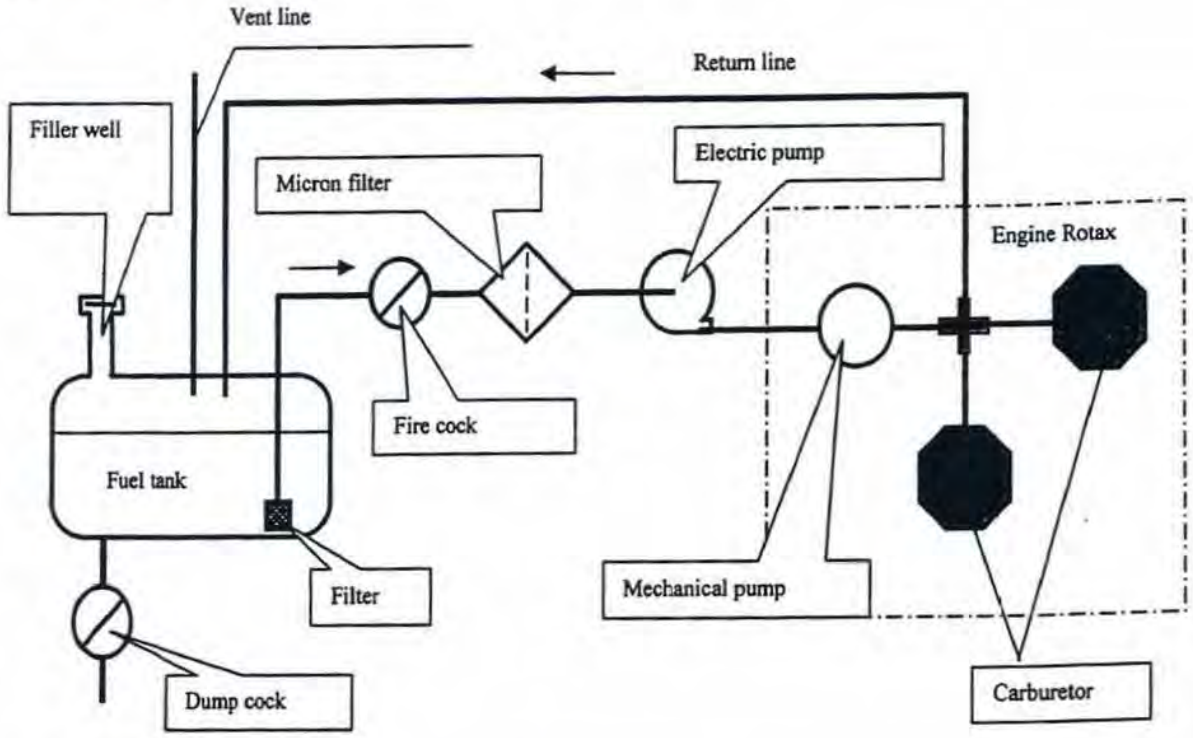
Engine control lever position "pull to full stop" corresponds to idle mode of engine. Engine control lever position "push up to full stop" corresponds to the take-off mode of the engine.

Preparators lever position "pull to full stop" corresponds to turn on mode. Preparators lever position "push up to full stop" corresponds to turn off mode.

6. FUEL SYSTEM

Fuel system serves for required reserve of fuel placement on the airplane and continuous fuel supply to engine in all modes of work and with all allowable aircraft evolutions. Unleaded motor gasoline min. RON 95,EN 228 Super, EN 228 Super plus is used as a fuel , see maintenance manual ROTAX-912, sec.10.2.2, sec. 13 Fuel by FAA/DOT

6.1 Fuel system design.



Fuel system includes:

- Fuel tank with filler well, dump cock and vent system;
- Fuel filter;
- Fuel fire cock;
- Electric fuel pump;
- Mechanical fuel pump with integrated filter;
- Fuel lines with fuel distribution unit;
- Fuel tank vent line.

FUEL TANK is located besides pilots seats and is separated from the cockpit by a special metal case. 60 liters tank is made of aluminum alloy AMG-2M and is attached to the lower beam by two clamps. It has filler well, vent pipe, bleed connection, intake manifold, return pipe. In the upper part of the tank there is a hole for fuel gauge sensor mounting.

Filler well of the tank is located on the right board of the cockpit and is closed by a screwed down treaded lid. Vent pipe is located in the upper part of the fuel tank. It is connected with atmosphere via drain pipe system. Intake manifold has meshed fuel filter with filtering capacity 0,3 mm. Feed line is connected with intake manifold.

DUMP COCK is installed under the cockpit and is connected with rubber tube with bleed connection of the fuel tank.

FIRE COCK serves for fuel feed stop from the tank to the engine. It is located in the feed line of the fuel tank between pilots seats.

FUEL FILTER AND ELECTRIC FUEL PUMP are installed in the fuel feed line. They are located on the back wall of the central pylon. Fuel filter serves for fuel cleaning from dirt and mechanical admixtures. Electric fuel pump creates pressure in the line in front of mechanical fuel pump.

MECHANICAL FUEL PUMP PIERBURG 720 971 55 of diaphragm type is located on the engine gear box lid. It provides fuel supply to the engine carburetors. The pump establishes pressure about 0.15 ... 0.3 MPa in the carburetors feed line.

FUEL LINES include feed and return lines. Feed line is made of metal pipes with internal diameter 6 mm and rubber rubes with internal diameter 8 mm. Return line is made of metal tubes with 5 cm internal diameter and rubber sleeves with internal diameter 6 mm. Fuel lines are located upright up across back wall of the central pylon and than along upper beam to the engine bed where its connected with connector of the fuel hose of the engine.

FUEL DISTRIBUTION UNIT is located in the feed line of the carburetors after mechanical fuel pump and serves for the fuel feed. It has four connectors. Fuel is supplied to the distribution unit through the first connector. The fuel is supplied to carburetors through second and third connectors. Orifice connection is connected with return line.

VENT SYSTEM LINE is connected with vent pipe of the fuel tank. It is made from metal tubes with internal diameter 8 mm. Vent line is located inside of the central pylon. It is made in the shape of vertical loop, radius 0,5 m to prevent fuel leaking from the tank during the aircraft evolutions. Outlet vent pipe is located under the cockpit.

6.2 Fuel system operation.

Fueling is accomplished through the filler well of the fuel tank. Fueling can be done through filling device or from jerry can. Fuel quantity in the fuel tank is measured by electrical fuel gauge.

For fuel supply to the engine it is necessary to turn on electrical fuel pump which pumps down fuel from the tank through the fuel filter and feed it to mechanical fuel pump through feed line. Pressure about 0.15 ... 0.3 mPa is established in the inlet of the pump, that provides its continuous operation in all modes of the engine operation and during all allowable aircrafts evolutions.

During engine operation mechanical fuel pump feeds fuel to the fuel distribution unit. Through two connectors of the distribution unit the fuel is fed to carburetors. Through the orifice in return connector excesses of the fuel runs into to return pipe and then is returned in to fuel tank. Orifice in fuel distribution unit allows to established 0.3 mPa pressure at the carburetors fuel supply pipes inlets..

The maintenance of the fuel system is accomplished in accordance with he Section 2.

6.3 FUEL SYSTEM MAINTENANCE

1. Inspect fuel tank. Make sure that its fastening is secure, fuel is not leaking and fuel and vent lines are attached securely.
2. Inspect fuel lines. Make sure that there are no fuel leaks, and lines joints are securely. Rubber tubes must not be torn, cracked or chafed. Fuel lines must to not touch aircraft design elements.
3. Check vent system cleanness. Blow it off with air under pressure 0.5...1.0 kG/cm^2.
   a) Remove rubber tube of the vent line from the fuel tank.
   б) Blow vent line off from the fuel tank side with the air under pressure 0.5...1.0 kG/cm^2.
   в) Connect vent line with the fuel tank.
4. Check fuel filter cleanness. Replace the contaminated filter.
5. In case if there is dirt in the fuel tank wash it with 2-3 times with 10 liters of pure gasoline. Fill tank with the gasoline and after rolling of the aircraft, drain the gasoline.
6. Avoid spilling gasoline on the cockpit skin as in long time effect gasoline can dissolve plastic foam in the medium layer of three layers fiber glass skin.
7. Check external condition, fastening security and air tightness of the fuel cock.
8. Check external condition, fastening security and air tightness of the dump cock.

7. PROPELLER

Three blades propeller of fixed pitch VN 31-20 Donchak –SM. Propeller consists of the metal hub and three composite blades. Propeller hub is assembled and consists of two halves bolted together.

The propeller is attached to the flange of gear unit output shaft with 6 bolts.

7.1. MAIN TECHNICAL CHARACTERISTICS

Parameter	Value
1. Type of propeller	Ground variable pitch
2. Direction of rotation (looking forward)	Right-handed
3. Number of blades	3
4. Diameter, mm (inch)	1700
5. Maximum permissible rotation frequency, rpm	2700
6. Propeller weight, kg (pounds)	3.59
7. Propeller moment of inertia, kg×cm² (pound x inch²)	Not more than 6000
8. Specified life, hour	300
9. Operating life, including storage life, years	5
10. Hub bolt torque, kg x m (lb/ft)	2.5÷3
11. Recommended airscrew blade incidence for the engine "ROTAX 912ULS"	18 ÷ 20 degrees for adjustment of airscrew blade incidence

7.2 GEOMETRICAL PARAMETERS CONTROL

Parameter description	**Allowable value**	**Actual value**
1. Blade tip flapping, mm:		
- axial	3.0	
- radial	1.5	
2. Static imbalance, g ×m	1.0	
3. Roughness of the blades setting angles with relative radius 0.75, angular minutes.	± 15	

7.3. Standard equipment

1. Blades.....3 pieces.
2. Hub.....1 piece.
3.Cover.....3 pieces.
4. Device for blades angles setting.....1 piece.

7.4. PROPELLER HUB

Propeller hub is metal, it consists of two halves, front ant rear. On the rear half of the hub there is a centering hole, diameter 47 mm for installation on the flange shaft. On the front half there is a centering

hole, diameter 25,4 mm for the device of blades angle setting. Halves of the hub are bolted together with 6 bolts with nuts. The tightening torque is 2.5 ... 3.0 kGxm.
Hub is bolted to the shaft flange with 6 bolts.

7.5 PROPELLER BLADES

Propeller blades are made from composite materials. They have scimitar shape, front edge is reinforced by splice plate. Blade shanks are put into hub and fixed in it due to friction force resulting from hub bolts tightening.
The device for blades angles setting is used for the propeller assembling and for blades angle adjustment on the ground. This device has an adjusting scale in angle degrees within adjusted pitch of the propeller. Scale interval is 0.5°.

7.6. STORAGE AND TRANSPORTATION

1. It is allowed to transport propeller by any type of transportation.
2. During transportation avoid mechanical damage of the blades and propeller hub.
3. Storage condition: ventilated room, temperature ±50° C, humidity not higher than 75%.

7.7 PROPLEER ASSEMBILNG

1. Inspect blades and both halves of the hub before assembling, make sure that there are no damages. Prepare cap screws.
2. Put rear half of the hub on the mounting plate with centering hole down. Rear half of the hub has a centering hole, 47 mm diameter, the front half of the hub has centering hole 25. 4 mm diameter.
3. Put blades in to hub's sleeves in accordance with their respective numbers – blade # 1 into hub's sleeve # 1, etc.
4. Install the front half of the hub so, that sleeves numbers would match with blades numbers. Put cap screws and tighten them manually.
5. Using device for angles setting, set angle of the blade # 1 on 20 degrees, and slightly tighten cap screws nuts.
6. Repeat this procedure for setting angles of blades # 2 and 3. .
7. Tighten all nuts and the cap screws. Tightening torque should be within 2.5÷3 kGxm.
8. Using device for angle settings check the angles of blades.
9. If the roughness of blades is more than ± 15 angular minutes, loosen nuts until gap 0.4÷0.6 mm will appear between hub halves, and repeat steps 4,5,6,7.
10. Install the assembled propeller on the engine shaft flange.

7.8 PROPELLER INSTALLATION

See Chapters 14.2.1 and 14.6.

7.9 ENGINE PARAMETERS CHECK UP AFTER PROPELLER INSTALLATION

1. Start the engine and make test run on the reduced program.
2. In FLIGHT MODE on the ground check crankshaft rpms. It must be within 5100...5150 rpm.
3. If crankshaft rpm exceeds limit of this range, adjust blades angle, for doing this dismount propeller and make the adjustment in accordance with steps 4,5,6,7. After that reinstall the propeller and check its parameters in TAKE OFF mode.

NOTE: Moving the blades to a bigger pitches, i.e. increase angle setting by 1° causes decrease of crankshaft rotation by approximately 100 rpm, Moving

the blades to lower pitch, i.e. angle decrease by 1° results in crankshaft rotation increase by approximately 100 rpm.

4. Final propeller adjustment is accomplished in accordance with crankshaft rotation which should not exceed maximum allowable value during the flight.

7.10 RULES OF PROPELLER OPERATION

1. Operational temperature range ±50° C.
2. Do not allow foreign objects, including water jets on the propeller during engine operation. .
3. Do not allow direct exhausts from the muffler to get on the propeller blades. After operation wipe propeller blades with soft and clean cotton cloth soaked in unleaded gasoline. We recommend to wash blades with car wash and wipe with clean cotton napkin.
4. After10 hours of operation after installation of hub on the engine inspect thoroughly blades roots with hub disassembled.
5. Inspect propeller every 25 hours of operation.
6. Designed resource is 300 hours or 5 years, including storage time.
7. The maintenance interval of the propeller is carried out in compliance with Chapter 2, p.23 Propeller.

7.11 CHECK UP OF PROPELLER KNOCK

Propeller knock is checked after propeller installation on the aircraft and after the running time in every 50 hours. Use dial indicator for check up.

7.11.1. Check up of blades axial flapping.

- Install dial indicator on the blade tip as shown on the Fig. 1
- Rotate the propeller and record readings of dial indicator for each blade. The difference between the biggest and the lowest reading should not exceed 3 mm.

7.11.2. Check up of blades radial flapping.

- Install dial indicator on the blade tip in position 2 as shown on the Fig. 1
- Rotate the propeller and record readings of dial indicator for each blade. The difference between the biggest and the lowest reading should not exceed 1.5 mm.

7.11.3. Propeller static thrust check-up.

1. Start the engine and warm it up. Stop the engine.
2. Fix dynamometer with measuring limit not less than 250 kGs with one end to tie-down unit of the site, attach another end of dynamometer to tie-down cables of additional tie-down device, used for the aircraft tie-down during engine test run as it is shown on the Fig.2.
3. Remove blocks from the wheels, check that all safety measures are observed, make sure that there are no any obstacles in front of the aircraft, start the engine.
4. Set ECL to TAKE-OFF mode, release breaks, keep this mode for at least 10 seconds.
5. Record dynamometer readings and set ECL to IDLE.
6. Repeat this check 3 more times to eliminate roughness of measurements.
7. Calculate arithmetic mean value of propeller static thrust.

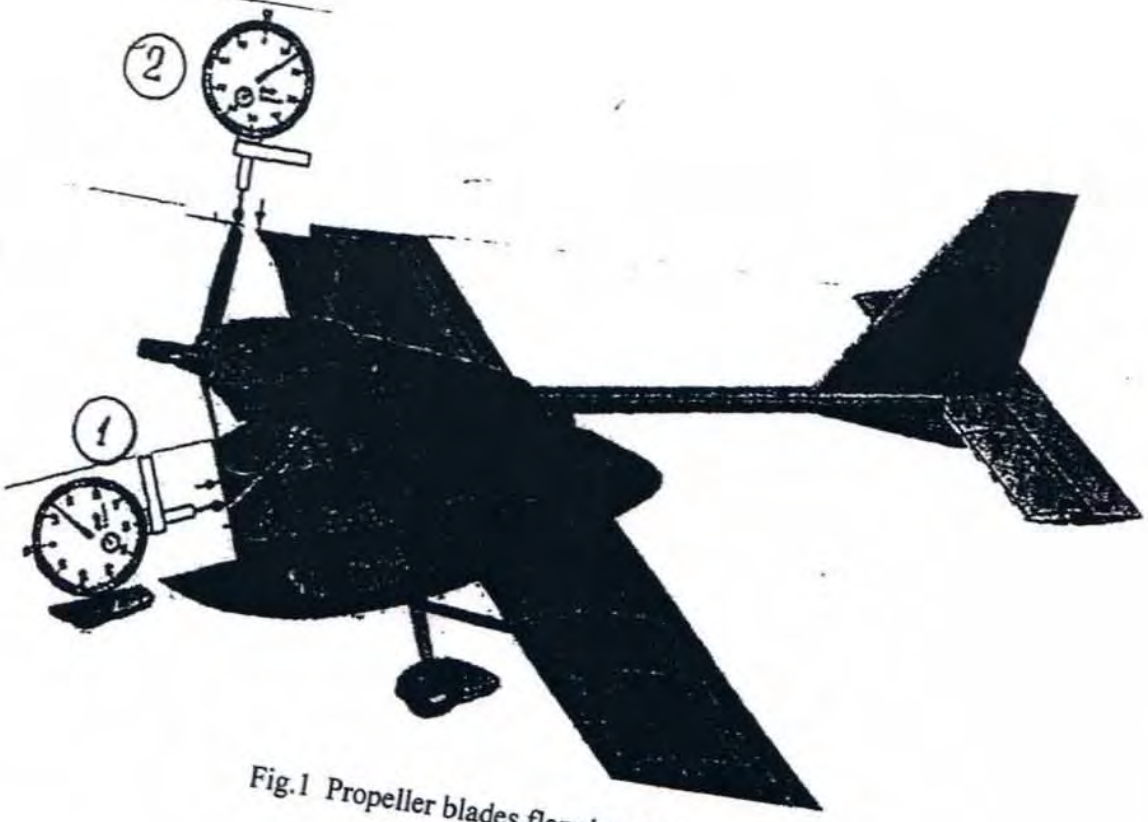


Fig.1 Propeller blades flapping check up.

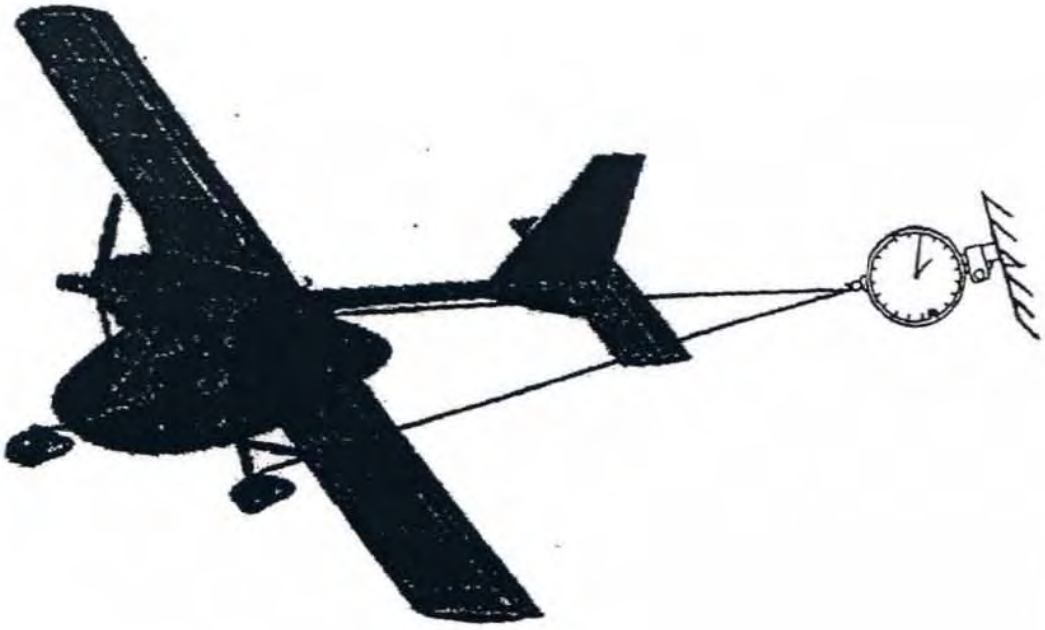


Fig. 2 Propeller static thrust check up.

8. FLIGHT OPERATION SYSTEMS

The cockpit of the aircraft is equipped by ventilation and heating systems which allows to make flight more comfortable.

COCKPIT VENTILLATION is provided by ram air through two air intakes, which are located on the sides of lower engine cowling.

COCKPIT HEATING is provided through hot air supply to the cockpit from the engine.

HEATING AND VENTILLATION PANEL is located on the ceiling of the cockpit in its front part. It has four windows closed by shutters. Hot air is supplied to two front windows through special sleeve. Air for the cockpit ventilation is supplied to two back windows. Air supply to the cockpit and its metering is provided through manual turning of the shutters.

The maintenance interval of flight operation systems is carried out in compliance with chapter 2, p.2.9 System of cockpit heating and ventilation.

9. INSTRUMENTS AND AVIONICS

9.1 INSTRUMENTATION ENGINEERING

9.1.1 Flight and navigation equipment.

Flight and navigation equipment is intended for determination of aircraft altitude and for getting information on the speed and height of the flight as well as on vertical speed during climbing and descent. Flight and navigation equipment includes:

- Speed indicator US-350.
- Altimeter VD-10K.
- Climb indicator VR-10M.
- Magnet compass KI-13K
- Slip indicator.

PRESSURE INSTRUMENTS: speed indicator US-350, altimeter VD-10K and variometer VR-10M are located at cockpit panel. Power supply for these instruments is coming from airspeed boom PVD-6 located on the left wing panel.

Airspeed boom PVD-6 is installed on the left wing panel on a 6 meters boom that allows to take it from disturbed flow area. The airspeed boom has two chambers – dynamic pressure chamber and static pressure chamber. Incoming air comes to the dynamic pressure chamber through the hole in the front part of airspeed boom. It stops in the chamber and in the form of overpressure through the feed line of the pressure instruments "Dynamics" is fed to barometric capsule of air speed indicator. .

Air which density and in turn air pressure decreases with height increase is supplied to static pressure chamber through intake holes on the cylindrical part of airspeed boom. This pressure is supplied to the housings of all three pressure instruments through the "Static" feed line. In the lower part of dynamic pressure chamber there are drain openings to remove moisture from the chamber.

Airspeed indicator US -350 serves for air speed measuring. In the housing of this device there is barometric capsule which is linked with the pointer cinematically. When the dynamic pressure is supplied to barometric capsule from the airspeed boom, the capsule expands and moves the pointer. To decrease roughness of readings from air density change static pressure is fed into this device. The range of speeds measuring is 0...350 km/hr. Allowable roughness of the readings is ±5 km/hr.

Two pointer altimeter VD-10K work is based on the principle of barometric pressure change by aneroid capsule. There are two aneroid capsules installed in sealed case of this device, these capsules are cinematically linked with two pointers. If the pressure change in the case, capsules expand or retracts that results in pointers move. Altimeter has sliding scale of barometric pressure, fixed scale of altitude with two pointers and two sliding indexes. Barometric pressure scale has a range of 670...790 mm of mercury column with scale graduation value 1 mm of mercury column. The range of the readings is 0 10 000 m. .

Sliding indexes of altimeter VD-10K, located at the front side of the device close to altitude scale. These indexes continue barometric scale in terms of pressure decrease and express it in altitude meters. Indexes readings are expressed in the same way as pointers readings. One index shows altitude in meters, second index in kilometers. Due to these indexes VD-10M altimeter can be used on high level aerodromes with atmosphere pressure less than 670 mm of mercury column

In lower part of the housing there is a cog-rail for altimeter adjustment. Use of cog-rail for matching of barometrical pressure scale readings with actual atmosphere pressure is PROHIBITED.

Allowable roughness of barometric pressure scale readings is ±1.5 mm of mercury column with air temperature +20 ± 5° C and ±2.0 mm of mercury column in other temperature conditions.

Variometer VR-10M is used for vertical speed measurement. Inside of sealed case there is a barometric capsule which is connected with a pointer cinematically. The capsule communicates with internal cavity through the capillary. Static pressure is fed to variometer case, this pressure starts changing when the flight altitude is changing. Due to the capillary the pressure in barometric capsule changes with delay in comparison with the pressure in the device case. As a result the capsule expands and compresses during altitude change and the pointer is moving. The deformation of the capsule is getting higher and device readings bigger with altitude change speed increase. If the altitude is not changing any more the pressure in the capsule and in the case becomes equal and the pointer shows «0».

Variometer has a cog-rail to adjust the roughness of pointing «0». Allowable roughness is ±0.5 m/s. The range of the measurement is ±10 m/s.

Feed lines of the pressure instruments are made from polyvinylchloride sleeves with 5 mm internal diameters and metal pipes with external diameter 5 mm. They have color and letters marking- blue circle and letter «C» for static pressure line and red circle and letter «Д» for dynamic pressure line. Each line has one water trap for condensate water collection. Water traps are located besides fuel tank..

SLIP INDICATOR is located on the instrument panel together with pressure instruments. Slip indicator is slightly bent glass tube sealed in from the both ends and filled in with ligroin. Inside of this pipe there is a ball which moves right and left from the center during skidding.

9.1.1.1 INSTRUMENTS MAINTENANCE

A. *Inspection of airspeed boom and pressure instruments supply system.*

1. Inspect airspeed boom PVD- 6m. Check external condition and fastening security. After flights termination airspeed boom shall be dressed in protective cover. Airspeed boom damages, cracks, dents, rust, chrome chipping. Airspeed booms with such damages has to be replaced.
2. Visually inspect intake dynamic hole and make sure that it is clean. Check the cleanness of the drain and static intake holes using locking wire KO-5.
3. Inspect feed lines of pressure instruments. They should be flanged, not touching pipelines and aircraft design elements, should not have any chafing, leaks and cuts. They should have markings:
   - Red circle or «Д» letter on dynamical pressure pipelines;
   - Blue circle or «C» letter on static pressure pipelines.

   Tips of the polyvinylchloride sleeves should be securely attached to the connectors of the devices, T-connectors and water traps, as well as to metal pipelines.

   Inspect water traps, check external condition, fastening security. Sleeves cracking is not allowed. If there is condensate take off water trap and remove condensate.
4. Inspect pressure instruments, check external condition and fastening security. Mechanical damages are not allowed.

B. *Pressure instruments inspection.*

1. Inspect altimeter, airspeed indicator, variometer, check external condition, and fastening security.
2. Check availability of colored marking of the air speed indicator scale:
   - White arch 90 km/hr ÷ 130 km/hr;
   - Green arch 110 km/hr ÷ 210 km/hr;
   - Yellow arch 210 km/hr ÷ 240 km/hr;

- Red line 240 km/hr;

3. Check locking of altimeter and variometer cog-rails by red color.

WARNING: It is prohibited to adapt altimeters scales readings. Altimeters with wrong locking should be removed and sent for check up.

C. *Working efficiency and pressure sealing of pressure instruments and airspeed boom.*

1. For work efficiency and pressure sealing of pressure instruments and airspeed boom see point 3.1.15 of this subsection.
2. Remove devices and sent them to laboratory of the aviation company having license and certificates for these type of works to check roughness within the dates specified in operational regulations.

D. *Bleeding of pressure instruments feed lines by compressed air.*

1. Disconnect pressure instruments feed lines from devices, airspeed boom and water traps connectors.

7. Bleed lines from the side of devices and airspeed boom with compressed air under 2...4 kG/cm².
8. Connect pressure instrument feed lines with devices, airspeed boom and water traps.
9. Check pressure sealing of pressure instruments and airspeed boom hermiticity.

WARNING: 1.Do not exceed 4 kG/cm².

2. Pressure instruments and airspeed boom seal check up should be done every time after mounting and dismounting works in the system.

9.1.2 Complex engine control unit «FLYdat».

Complex engine parameters control unit is used for engine control. Liquid crystal display of the device shows 10 parameters of engine operation. It is possible to control 7 parameters at the same time. Parameters control panels are located in two rows – four panels in a row.

Top row from left to right:

- crankshaft rpm;
- cylinder 1 or 2 exhaust gases temperature;
- cylinder head temperature;
- oil temperature.

Bottom row from left to right:

- engine operating time;
- cylinder 3 or 4 exhaust gases temperature;
- arrow-pointer for the couple of controlled cylinders;
- oil pressure.

Cylinders exhaust gases temperature is controlled alternatively. With 10 seconds interval panel displays information on exhaust gases temperature for cylinders 1 and 3 and than 2 and 4. Arrow points the couple of controlled cylinders, which temperature is displayed at the moment..

The device has integrated alarm system which warns if one or more parameters exceeds allowable limits. Rec panel Engine parameters starts flashing if one the controlled parameters exceeded limits, this parameter starts blinking.

The device has the following functions:

- engine parameters control;
- engine operation hours recording;
- alarm for limits exceeding;
- warning of maintenance necessity;
- technical condition self-control;

- accumulation of information for two last hours of operation;
- storing of maximum value for each parameter;
- storing information on limits exceeded;
- information transfer to PC.

This device has the following sensors:

- crankshaft rpm sensor – non-contact generator of electric impulses integrated into magneto-generator;
- cylinders exhaust gases temperature sensor – 4 thermocouples installed on exhaust pipes;
- oil temperature and cylinder head sensors – two thermo-resistors, one installed on the oil pump and another one on the head of the third cylinder;
- oil pressure sensor – membrane pressure sensor installed on the oil pump with variable resistor installed on the oil pump;
- engine operating hours sensor is engine coil which provides sensor operation only with turned on engine.

9.1.3 Fuel gauge

Fuel gauge is used for fuel reserve monitoring. The aircraft has automobile float fuel gauge. Fuel gauge indicator with LED signaling about the minimum reserve of the fuel is located on the right instrument panel.

Resistance transducer with minimum reserve LED is located in the upper part of the fuel tank. It can be accessed through access door from the left side in the baggage section of the cockpit. Alarm of minimum fuel reserve works if 7 liters of fuel is left.

9.1.3.1 Fuel gauge maintenance

A. *Fuel gauge check-up.*

1. Inspect fuel-gauge sensor. Check fastening security and wiring connections.
2. Check fuel gauge indicator. Check security of the wiring connections.
3. Turn Battery circuit breaker.
4. Check fuel gauge readings. It must show fuel reserve in the fuel tank. To determine fuel reserve use calibration table.
5. If fuel reserve is more than emergency reserve alarm lamp must not flash. If the fuel reserve is less the emergency reserve alarm lamp must flash.

B. *Fuel gauge calibration.*

1. 62 liters of fuel (AI 95 gasoline) must be available for fuel gauge calibration.
2. If there is fuel is the tank drain it completely. .
3. Turn on Battery circuit breaker..
4. Fill tank with 2 liters of fuel – non used reserve.
5. Start filling tank with 1 liter each time until alarm LED will stop flashing. Record the quantity of the fuel filled in
6. Fill such quantity of fuel so total reserve would be equal to 10 liters and record fuel gauge readings. Non used reserve is not included into total reserve.
7. Fill remaining 50 liters of the fuel into tank by 5 -10 liters, every time record fuel gauge readings.
8. Drain fuel from the fuel tank by 5-10 liters until alarm LED will flash, every time record fuel gauge readings.
9. After alarm LED will flash, drain remaining fuel and record the readings. Subtract 2 liters (non used reserve) from the resulting figure and record the difference.
10. Calculate emergency reserve of the fuel as arithmetic average of two measuring results and record it into calibration table.

11. Based on the results of the calibration make calibration chart and fill in calibration table. Calculate fuel gauge readings as arithmetic average of two measurements results (filling and draining of the fuel). .
12. Put calibration schedule on the right devices panel, and the put the copy of calibration table into the flight log book. or to the log book of flight prepare operations.

9.2 RADIO EQUIPMENT

Radio equipment is used to provide stable radio communication with control services on the ground and with other aircrafts. It includes:

- fm band aviation radio station IC A200;
- aviation handsets – 2 pieces.;
- Flight intercome;
- talk button.

Radio station works in 118...136 MGz. It allows to provide stable radio communication with all subscribers working in the frequency range. On the front panel of the station there is a turn on and volume adjustment handle «OFF. PULL TEST». Using tuning handle «PULL 25K» select 1 mGz fold adjustment interval and 25 or 50 kGz. Two selected tuning frequencies are displayed on LCD. On the left side there is working frequency in the right window frequency prepared for work with the next subscriber. Radio station memory can store ten more frequencies by means of frequencies channels programming. Channels switching button CH is used for channels programming and their displaying. Use frequency switch button for changing frequency.

Radio station is installed on the left instruments panel. Radio station antenna is located at the ceiling of the cockpit in its back part and is directed down. Antenna spike goes outside of the cockpit.

Radio station panel is shown on the Fig..69 Appendix 1. Scheme of electric connection of the station is shown in the Appendix 2.

AVIATION HANDSETS consist of headsets and microphone. Handsets are connected with aircraft intercom, which serves for communication between cockpit crew and allows cockpit crew transmit on the air. For communication between cockpit crew no additional buttons pressing is required. Threshold of aircraft intercom turns off pilot headsets if there are no voice signals and turn it on when one of the pilots starts speaking. At the same time it provides more comfortable conditions of flight as headphones decreases noise from the working engine. Operation threshold depending on the voice volume is adjusted by adjustment handle on the front panel of intercom system.

9.2.1 RADIO EQUIPMENT MAINTENANCE

1. Once a year radio station must be sent for check into meteorological control laboratory.
2. Aviation headsets and flight intercom system should be done together with radio station, see point 3.1.20 of this section. .
3. Inspect radio station, flight intercom, talk button. Check external condition, fastening security.
4. Inspect antenna. Check external condition, fastening security and cable connections. Mechanical damages of antenna are not allowed.
5. Inspect antenna cable and electric wiring harness. They have to be flanged, must not touch pipelines and structure elements., must not have any breaks, damages and cuts of insulation layer.
6. Remove dirt and dust from radio station, flight intercom system and aviation handsets. Wipe microphone and headsets covers with spirit.
7. Wash jacks and pins of flight intercom system of aviation handsets.

10. ELECRTIC SYSTEM

Airborne system of 12 V DC supply is designed to provide engine and all systems of the aircraft with the power. Power system is two-wire type. It includes:

1. AC Magneto-generator P12W250.
2. Battery 12 V, capacity 24 Ax hour.
3. Rectifier .
4. Condensator 22000 мкФ/25 В.
5. Circuit breakers
6. Fuses.
7. Switches and toggles.

MAGNETO-GENERATOR P12W250 is electrical device with rotor and starter installed on the engine. It includes:

- 10—poles generator;
- Generator flywheel with ten constant magnets;
- 8 stator coils providing operation of power supply system;

- 2 stator coils providing operation of ignition system.

Magneto-generator also provides work of ignition system.

Non-spillable battery serves for engine start up and is used for emergency source of power if generator will fail. The battery is installed behind of the central pylon.

RECTIFIER transforms A/C voltage of the generator into DC voltage and keeps it within 13,7..14,3 V. Maximum current rate is 28 A. Rectifier is attached to the front strut under instruments panels. .

CIRCUIT BREAKERS, FUSES, SWITCHES AND TOGGLES serve for protection of the circuit from the short circuits and for connection of power sources to on-board power system. Fuses block is located on the left instruments panel, circuit breakers and switches are installed on the central panel.

10.1 ENGINE START-UP SYSTEM

Engine start-up system serves for crankshaft preparation to the rotations of sparking and conditions of fuel and air mixture ignition in the engine cylinders. .

ELECTRIC STARTER has 0.6 kW power. It is installed on the generator housing using two M5 pins and a clamp.

Torque from the starter is transmitted through intermediate gear to freewheeling clutch installed on the engine crankshaft.

Engine start-up system includes: starter relay, which turns on battery into electric starter and START button closing electric starter circuit during engine start up.

Starter connection should be done in accordance with the scheme shown in the Appendix 2.

Starter relay is not designed for long operation. Working cycle duration is not more than 4 minutes.

Rated voltage in starter feed circuit	12 V.
Current, long term	75 A.
Current, short term (1sec.)	300 A.
Operational temperature	- 40 ...+100° C.

10.2 FUEL SYSTEM ELECTRIC EQUIPMENT

Electric equipment of the fuel system includes electric fuel pump 996 730, installed in fuel line. It is used for fuel pressure in the inlet of mechanical fuel pump.

10.3 ALARM SYSTEM

Two red alarm lamps are installed on the central pedestal "GENERATOR" and "ENGINE PARAMETERS". GENERATOR signal lamp flashes in case of generator failed. ENGINE PARAMETERS signal lamp flashes if one of eight controlled parameters exceeded allowable limits.

10.4 ELECTRIC EQUIPMENT MAINTENANCE

A. *Battery operation.*

1. Non-spillable battery «Sunlight» SP 12-26, capacity 26 A × hr, this battery does not require electrolyte level and density control. Remove dust and dirt from the battery surface.
2. Check the battery monthly with a discharge tester, if the voltage is less than 12 V charge the battery.
3. Inspect battery before installation, make sure that it is not cracked or damaged.
4. Install battery and fix it with binding screw clamp.
5. Connect wiring with the battery terminals in accordance with marking «+» and «-» and tighten nuts. Wiring lugs should not turn hand force is applied.

Б. *Electrical Equipment Assemblies and Wiring Harness Inspection and Check.*

1. Check the exterior and secure fastening of magnetoelectric generator, rectifier-regulator and starter relay. The wiring lugs connected to the terminals shall not turn when a hand force is applied.
2. Check the exterior and secure fastening of the circuit breakers (CB) and switches. The wiring lugs connected to the terminals shall not turn when a hand force is applied. When replaced only the circuit breakers of the rating specified in the circuit diagram shall be used.
3. Check the exterior and secure fastening of the fuse panel. The wiring lugs shall not be freely removable from the terminals.
4. Remove the wiring lugs. It shall require light force. Wash the terminals and lugs with alcohol. Fit the lugs onto the terminals.
5. Check the fuse secure fastening and rating compliance. It is PROHIBITED to install the fuses, which do not comply with the nominal rating values specified in the fuse panel table and in the circuit diagram.
6. Check the exterior and secure fastening of the terminal blocks. The wiring lugs connected to the terminals shall not turn when a hand force is applied.
7. Inspect the plug connectors. They shall be locked, swivel nuts and connector shanks shall not turn when the hand force is applied.
8. Disengage the plug connectors Wash the connector sockets and plugs with alcohol. Engage and lock the plug connectors.
9. Inspect the location of the "negative" wiring lugs connection to the frame. The wiring lugs shall not turn when a hand force is applied. In case oxide tint is found to show lug oxidation or terminal overheat, unscrew the lock screw, remove the oxidation products, strip the wire lugs and the frame connection spots.
10. Inspect the electrical harness across entire aircraft, check their exterior. The harness shall be securely flanged and shall not be in contact with piping and aircraft structural members, it shall be free from chafed, ruptured and cut insulation.
11. When the power supply unit is connected to the mains and the "BATTERY" CD is on it is PROHIBITED to perform electric equipment maintenance, assembly and disassembly, and repair works, except for the specified checks. The power supply can be connected to the on-board power system for troubleshooting purposes, provided the electric and fire safety requirements are observed.

11. STRUCTURAL REPAIR

11.1 REPAIR OF FIBER GLASS SKIN

1 Mark repaired section on the part being repair with 20±5 mm allowance from the damage edge.
2. Isolate surface which is not to be repaired by scotch tape and polythen film.
3. Remove paint coating from the repaired section using sandpaper.
4. Remove dust and degrease repaired section with a napkin soaked in rubber solvent. Repeat this procedure 2 times. With dry period 15-20 minutes.
5. Apply putty or epoxy bonding with a filler on the damaged area. Apply several layers of putty, every layer not thicker than 1 mm with leveling by a sand paper.
6. Remove isolation.
7. Level the surface thoroughly by a sand paper. Remove dust..
8. Restore paint coat. Polish repaired area with 3M «Perfect-1T-SH system to level area of paint coat restoring.

11.2 Metal structure elements repair
Duralumin skin repair.
A. Cracks repair.
1. Cut damaged area in the form of rectangle or circle
2. Cur new skin with 200 mm more than damaged area. Clean and rivet on the damaged area.
3. Degrease repaired area, prime and paint. .
B. Dents and chippings repair.
1. Remove lacquer and paint coating around damaged area.
2. Degrease and putty damage area.
3. After putty drying clean with sand paper, prime and paint. .
Duralumin structures repair.
Any type of repairs (e.g. deformation, cracks, etc.) of the power unit should be done only after the manufacturer(dealer) permission.
The following actions are required for taking a decision by a manufacturer (dealer)
Send feed back form, see section 13.;
Send pictures to manufacturer with damaged place with the ruler attached to it.

12. PAINTING AND COATING

12.1 PAINT AND LAQUER COATING REPAIR

1. Wash repaired surface with warm 36% solution of potash soap, and than with warm fresh water and than second time with warm demineralised water and immediately (not allowing surface to dry) wipe dry with clean napkins, let dry for 2 hours. .
2. Wipe repaired and adjacent areas with napkins soaked in solvent.
3. Isolate surfaces which will not be repaired by paper and polythen film using scotch tape.
4. Clean damaged areas by sand paper №220-320 (grit 3-5) to level surface. Remove dust.. Wipe the surface with a napkin soaked in solvent, let dry for 0,5 of an hour.
5. If the coating was damaged up to metal on aluminum part make the repair as follows:

- On the surfaces made of aluminum alloy coated with An OX nchr, including rivet heads make chemical oxidizing manually by putting a sponge with subsequent washing and drying;
- Apply 1 layer of prime, dry, polish, remove dust, wipe with napkin soaked in solvent.
- Apply two layer of enamel with drying in between.

Enamel and prime application and drying should be done in accordance with the instructions for these materials.

6. If composite parts were deeply damaged, repair as follows:

- Apply first layer of the leveling prime, dry, polish, remove dust, wipe with napkin soaked in solvent.
- Apply 1 layer barrier layer, dry, polish, remove dust, wipe with napkin soaked in solvent.
- Apply 2 layers of enamel, let dry between layers application.

Enamel and prime application and drying should be done in accordance with the instructions for these materials.

7. If coating on the composite parts was damaged up leveling prime repair as follows:

- Apply 1 layer of barrier prime, dry, polish, remove dust, wipe with napkin soaked in solvent.
- Apply two layers of enamel, let dry between layers application.

Enamel and prime application and drying should be done in accordance with the instructions for these materials.

8. If coating on the composite parts was damaged till leveling prime repair as follows:

- Apply two layers of enamel, let dry between layers application

Enamel application and drying should be done in accordance with the instructions for these materials.

12.2 REPAIR OF THE FABRIC COVERING

1. Mark on the repaired surface contour of the patch with 10 mm allowance from the damage area. The contour should have round shape.
2. Remove paint and lacquer from the damaged area with 1010±5mm allowance using sand paper (# 800-1000).
3. Cut a round patch of 5P9KAT heat-shrink fabric of appropriate diameter using jagged scissors.
4. Stress the component fabric at the damaged spot by fan-heating at 350°C (662°F). Control it visually to remove loosening.
5. Apply the nitro varnish NC-551 (Ceconite Super Seam or Randolph's Rand-O-Bond) over the repair surface edge and patch and immediately apply the patch. Remove cockles manually and press with brush. Let dry for 4 hours.
6. Repeatedly impregnate the patch and scraped surface with nitro varnish NC-551 using brush. Let dry for 4 hours.
7. The third impregnation shall contain 5 % aluminum powder PAP -1(2). Let dry for 4 hours.
8. Level possible sags by sandpaper (№1000-2000). Remove dust.
9. Restore paint and lacquer coating.
10. Polish repaired area with 3M «Perfect-1T-SH system to level area of paint coat restoring.

13 Feed back form

	Chart of faults occurred on LSA Elitar Sigma	Dealers registration number №

1.LSA identification data	
1.1.Owner:	
1.2.Address:	
1.3.Serial number:	1.4.Registration number:
2.Incident	
2.1.Pilot:	2.2.Engineer (technician)
2.3.Date, time:	2.4.Type (category):
2.5.Meteorological conditions:	
2.6.Type of the flight:	2.7.Flight stage:
3.Fault object	
3.1.System:	3.2assembly:
3.3.Part (technical number):	3.4. Hours in operation: From operation start Since last repair
4.Circumstances of failure detection	
4.1 External signs:	
4.2.Detection method:	
4.3.Detection method:	
4.4. Further actions:	
5.Additional data	

Made by:			
Name:	Position:	Signature:	Date:

14. REPAIR AND MODIFICATION

14.1 Certification Level.

14.1.1 Normal maintenance.

The following personnel is qualified for this type of maintenance:
1. Holder of certificate for repair and maintenance of LSA with a right of inspections or maintenance;
2 pilot certificate held by LSA owner.

Works scope:
1. inspection after 100 hours of work in accordance with the Flight and maintenance manual;
2. annual inspection of the aircraft in accordance with the flight and maintenance manual;
3. accumulator replacement;
4. wheels replacement:
5. propeller replacement;
6. remove and install skids and floats;
7. installation of radio station, flight intercom system, GPS and antenna;
8. disconnection and reconnection of wing planes and struts.
9 tail shocks replacement;
10. tail shock mounting and dismounting;
11. Keel mounting and dismounting;
12. stabilizer mounting and dismounting;
13. spring mounting and dismounting;
14. nose landing gear shock.

14.1.2 Complex maintenance.

The following personnel is qualified for this type of maintenance:
Holder of Mechanic certificate for the works with the aircraft structure and power plants or certificate for LSA maintenance with special training.

Works scope:

1. Control surfaces repainting;
2 Fabric coating repair;
3 Tire and brake jaws of wheel landing gear replacement;
4 coolant and oil change;
6 engine dismounting and installation;
7. aileron mounting and dismounting;
8. flaps mounting and dismounting;
9. elevator mounting and dismounting;
10. rudder mounting and dismounting.

14.2 Complete removal of engine.

14.2.1 Engine dismounting.
For engine removal proceed as follows:

- . Remove upper engine cowling, see 1, pos. 1.

Fig. 1

Take a screwdriver S=7 mm, remove 4 (four) screws at pos. 2 on the left side, (4) four screws on the right side on the right side at flight direction.
Remove upper cowling.
· Remove front part of lower cowling, see Fig.1, pos.3.

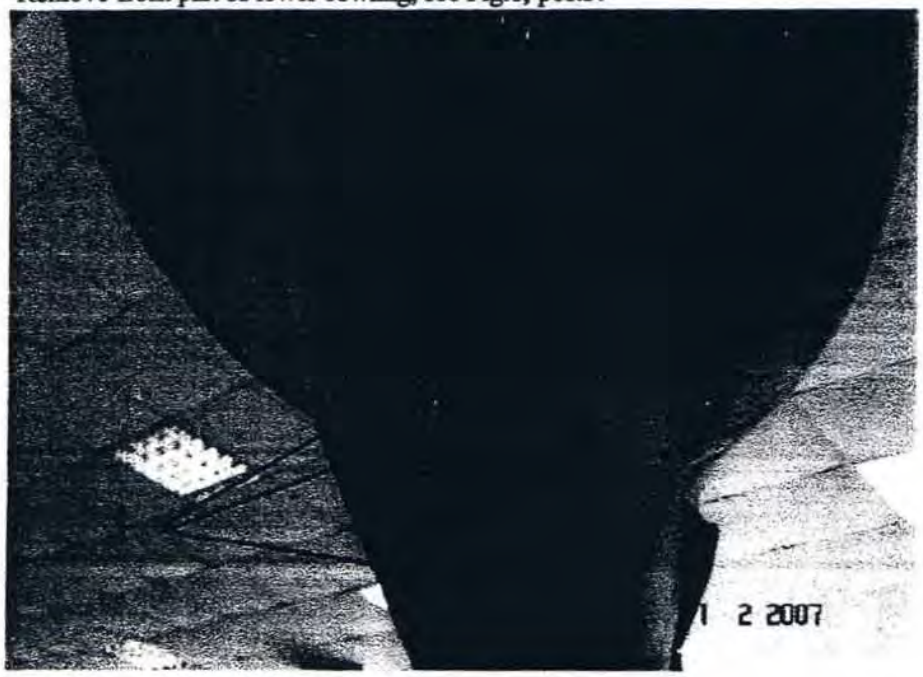


Fig.2

Take a screwdriver S=7 mm, remove 2 (two) screws at pos. 4 on the left side, 2 (two) screws at pos. 4 on the right side of flight direction and 3 (three) screws, see Fig. 2, pos. 1 on the bottom of the cowling.

Remove the front part of lower cowling.

- Remove the propeller.

Take screwdriver S=7mm, remove 6 (six) screws, Fig. 3, pos.1 of propeller spinner, Pos. 2.

Fig.3
Remove propeller spinner and put on the storage stand.
Take sidecutter and unlock six castle nuts of propeller fastening bolts, Fig. 4, pos. 1.

Fig.4
Take wrench S=12мм, Allen wrench S=14mm and holding propeller fastening bolt heads, Fig. 5, pos. 1, by the wrench S=14 mm unscrew castle nuts.

Fig.5

Put six unscrewed castle nuts and six washers in to separation box. Hold propeller, propeller spinner disc and propeller spacer, remove alternately 6 bolts of propeller fastening and remove propeller. Put removed propeller, propeller spinner disc and spacer on the storage stand.

- Remove rear part of the lower cowling, Fig. 1, pos. 6.

Take screwdriver S=7mm, unscrew 5 (five) screws Fig. 1, pos. 5 on the left side, 5 (five) screws Fig. 1, Pos. 5 on the right side of the flight direction.

Remove rear part of the lower cowling.

- Drain oil from the oil system of the engine in accordance with the flight and maintenance manual, section 14.3.1.
- Drain coolant from engine cooling system in accordance with the flight and maintenance manual, section 14.3.1
- Drain fuel from float chambers of 1-st and second carburetor in accordance with operation manual for «Rotax-912 ULS» engine.
- Remove air filters of the first and second carburetors.

Unlock with sidecutters, loosen binding screw clamp of 1-st and second carburetor, fig. 6, pos. 1.

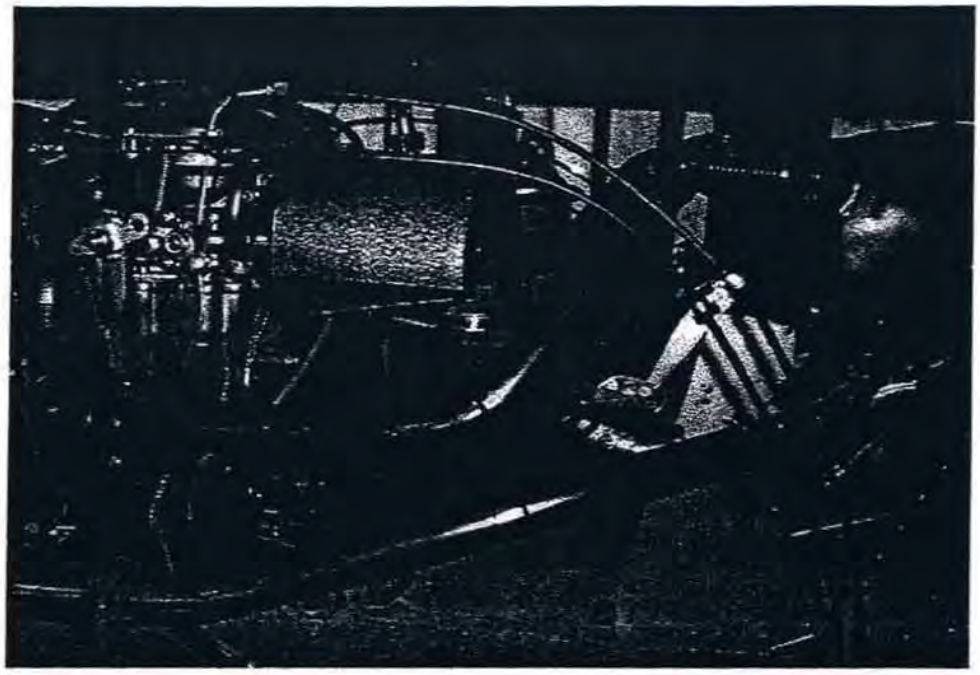


Fig. 6

Remove air filters with screens. Put blanks into intake channels of carburetors.

· Disconnect chlorvynil pipes of breathing from 1-st and 2-nd carburetors.

· Disconnect engine control system.

Unscrew screws of 1-st and second carburetors, Fig. 6, pos. 2. using hexagon drive and disconnect throttle shutters control cable.

Unscrew screws of 1-st and 2-nd carburetors, Fig. 6, pos. 3 and disconnect preparators control cable.

Take sidecutters, remove locking of tightening springs, Fig. 6, pos. 4 and remove springs using special hook (see Manual for «Rotax-912 ULS»). Take muffler, Fig. 6, pos.5.

Unscrew nuts of 1-st, 2-nd, 3-rd and 4-th cylinders exhaust pipes flanges fastening, Fig. 1, pos. 1.

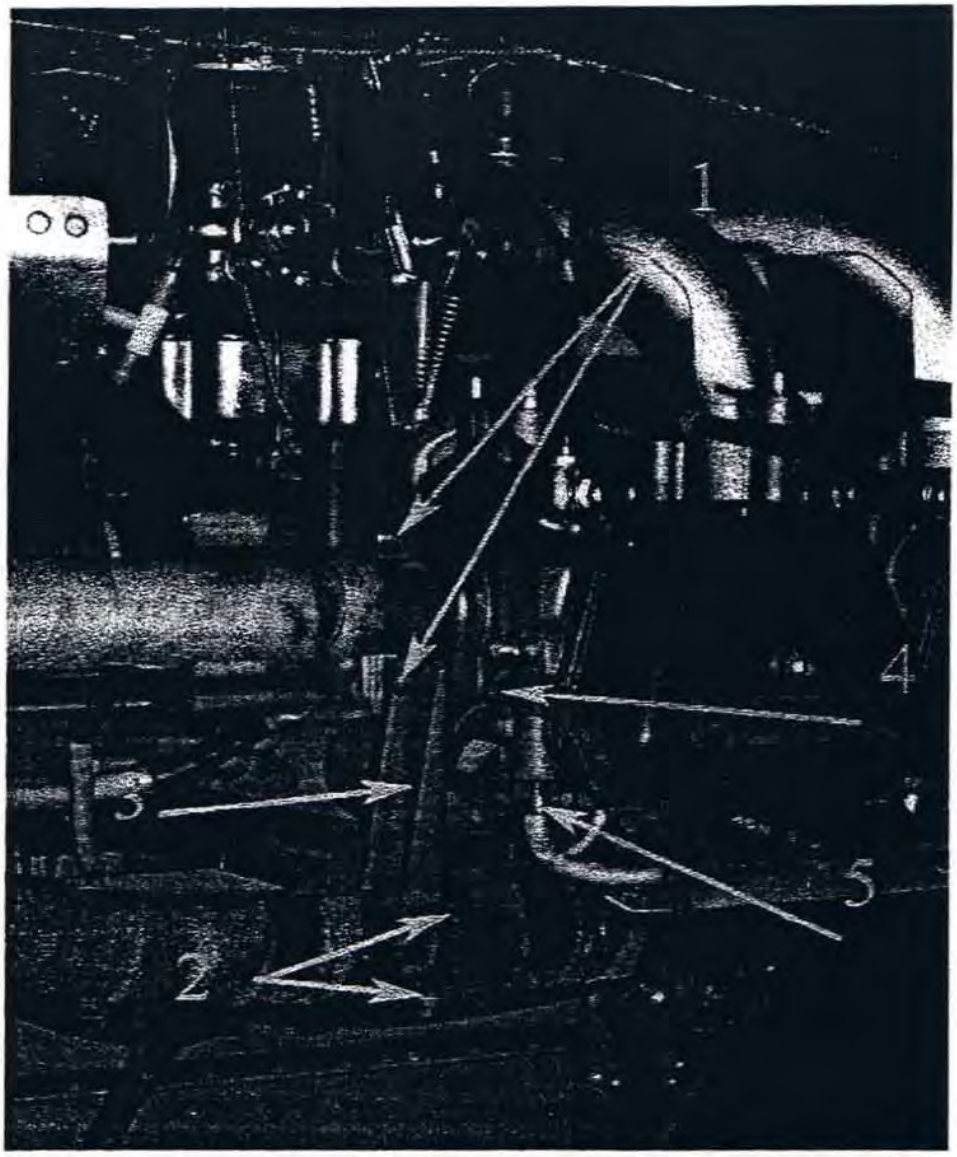


Fig.7

Loosen clamps of the brackets for 3-rd and 4-th cylinders Fig. 7, pos. 2 using wrench S= 8 mm. Loosen clamp of electric wiring harness, Fig. 7, pos. 4, using wrench S=8 mm. Close outlets of cylinders with blanks. Unscrew exhaust gases temperature sensors, 4 (four) sensors, Fig. 6, pos. 6 and 3-rd cylinder head temperature sensor, Fig. 7, pos. 5 using wrench S=13 mm. Take wrenches S=17mm, S=19mm and disconnect nipple connection of engine gasoline lines from fuel system gasoline line, Fig 8, pos. 1.

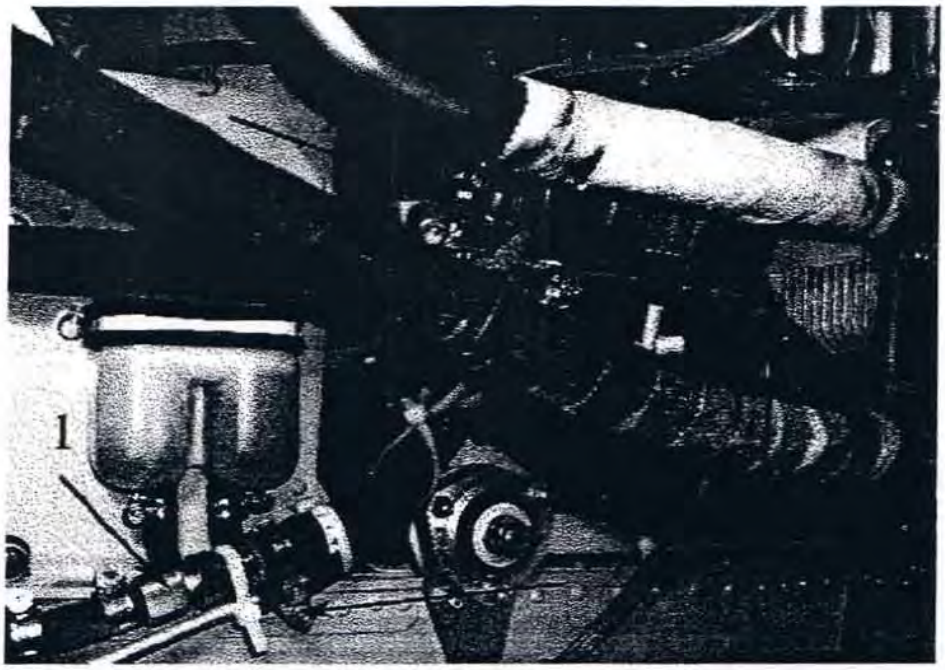


Fig.8

Loosen clamp Fig. 8, pos. 2, using screwdriver S=7 mm and disconnect gasoline line of fuel system return line. Take side cutters, unlock connector of electric wiring harness, Fig 9, pos.1 and disconnect it.

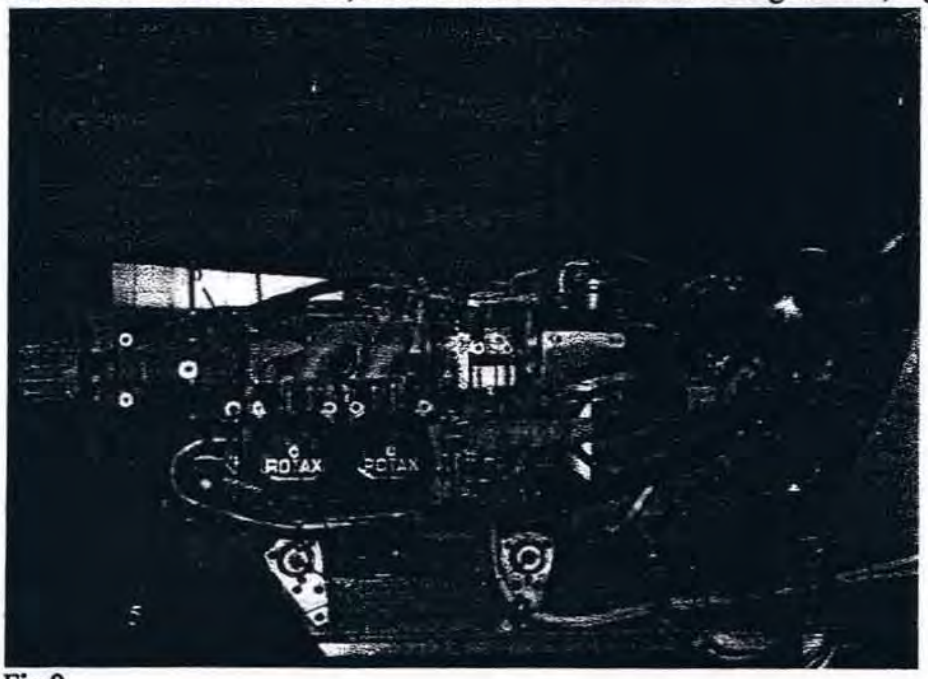


Fig.9

Disconnect starter electric wire from «+» terminal, Fig. 8, pos.3 using wrench S=10 mm and starter electric wire from «-» terminal, Fig. 9, pos. 2 using wrench S=8 mm and disconnect jack Fig. 9, pos. 3 of engine rotations sensor wiring.

Loosen Clamp Fig. 1, pos.1 using screwdriver S=7 mm, and disconnect pipe of oil system suction l main from the oil pump.

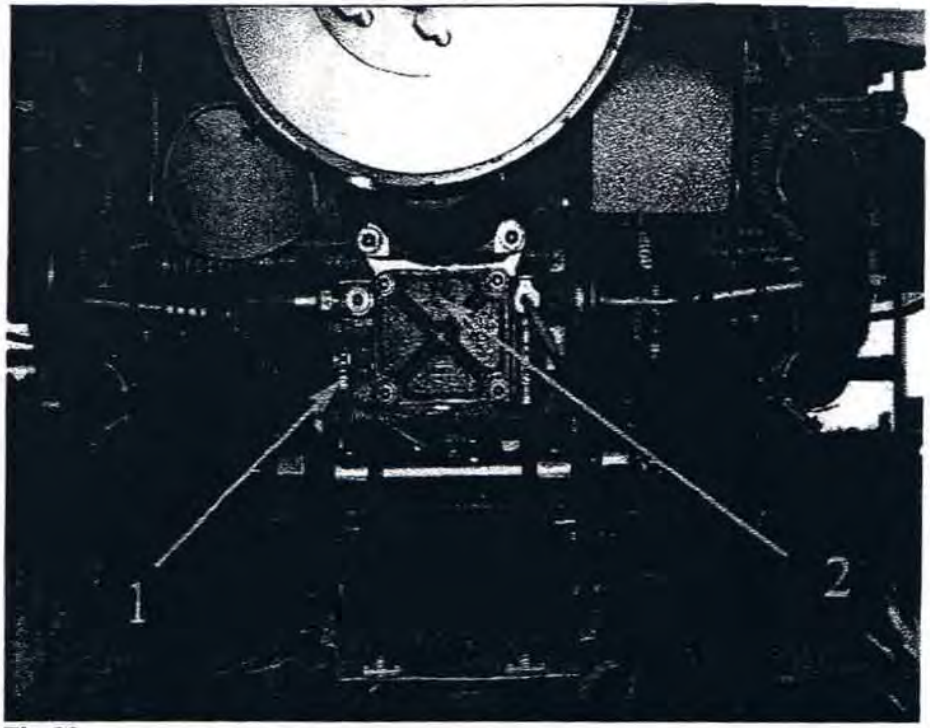


Fig.10
Loosen clamp Fig. 11, pos. 1 using #2 screwdriver and disconnect pipe of oil system return line from the oil tank.

Fig.11
Loosen clamp Fig. 12, pos. 1 and disconnect coolant gravity transfer tube from overflow reservoir.
To remove engine subframe: loosen clamp of oil system return line, Fig. 14, pos. 1 and disconnect it from tap nozzle Fig 14, pos. 2.

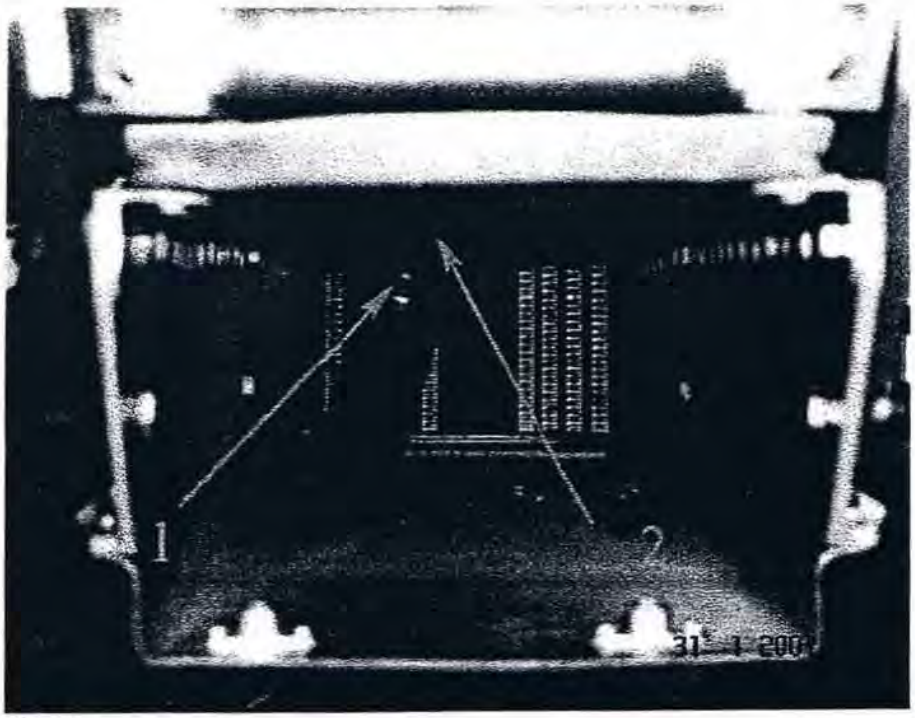


Fig.14.

Take pliers, loosen clamps of 1-st and 2-nd cylinders cooling system lines and disconnect them from the water pump.

Unlock and unscrew 4 (four) bolts of subframe fastening to the engine, Fig. 9, pos. 5.

Remove subframe Fig. 9, pos. 6 (keep spacers places between engine and subframe).

- **ATTENTION** after engine removal close opened parts of all engine systems pipelines with blanks.

14.2.2 Engine mounting.

Reverse procedure for engine dismounting.

14.3 OIL CHANGE.

14.3.1 OIL DUMPING.

- Start and heat the engine up to the operating temperature in accordance with «Rotax-912 ULS» Manual.
- Remove upper and lower cowlings of the engine (see p. 14.2.1).
- Cover cockpit windows with protective film to protect from fuel. Take screwdriver S= 7 mm, loosen clamp of oil tank orifice, Fig. 11, pos. 2 disconnect pipe and fix it vertically. Put and fix a reservoir for oil dumping (V= 3 L) under the fuel pump, Fig. 10, pos. 2

Take screwdriver S=7 mm, loosen clamp Fig. 1, Pos. 1 and disconnect suction main pipeline from the oil tank, put the end of disconnected pipeline into oil dumping reservoir.

Create slight excessive pressure on the end of the pipe line disconnected from the oil tank orifice, pressure should be sufficient to force out the oil from engine oil radiator and suction mains pipeline.

Take #2 screwdriver, loosen clamp of return pipeline, Fig. 11, pos. 1 from lead plug of oil tank. Disconnect pipe, remove flaring and put it into oil dumping reservoir.

Remove oil filter, magnet plug and inspect them in accordance with «Rotax-912 ULS» Manual.

Take screwdriver S=7мм, loosen clamp of vapour line, Fig 11, pos.3 and disconnect it form the oil tank filler outlet. Take S=7 mm screwdriver, loosen clamp Fig. 6, pos. 7 and dump oil (wash as required).

14.3.2 Oil filling.

- Install oil tank, tighten clamp Fig.6. pos. 3 using screwdriver S=7 mm.
- Connect vapour line to oil tank filler inlet and clamp Fig. 11, pos. 3 using screwdriver S=7 mm.
- Connect end of return line to lead plug of the oil tank. And tighten with a clamp Fig. 11, pos. 1.
- Connect end of the suction main to the oil tank and tighten by clamp, Fig. 10, pos. 1.

- Connect filler cone to the end of pipeline of disconnected from the oil tank orifice, fill suction mains and oil radiator with oil by propeller turning. After filling connect pipeline end with oil tank orifice and tighten with clamp Fig. 11, pos 2.

Fill oil filter with oil and install on the engine in accordance with the «Rotax-912 ULS» Manual.
Fill 2 liters of fuel into oil tank and make cold engine running until oil pressure will appear (check oil level in the tank with measuring stick).
Remove protection film from the cockpit windows.
Install lower and upper cowlings of the engine (See p. 14.2.1).
Start the engine in accordance with «Rotax-912 ULS»Manual.

14.4 COOLANT CHANGE.

14.4.1 COOLANT DRAIN.

- Remove upper and lower engine cowlings (see p. 14.2.1).
- Cover cockpit windows with protective film to protect from coolant.
- Turn off valve cover of the overflow reservoir, Fig. 12, pos. 3.
- Take screwdriver S=7mm, loosen clamp of the flexible coolant gravity transfer hose and disconnect it. Dump coolant through flexible hose in to reservoir with 3 liters capacity. After drain reconnect flexible hose and tighten coolant gravity transfer hose with a clamp, Fig. 15, pos. 2.

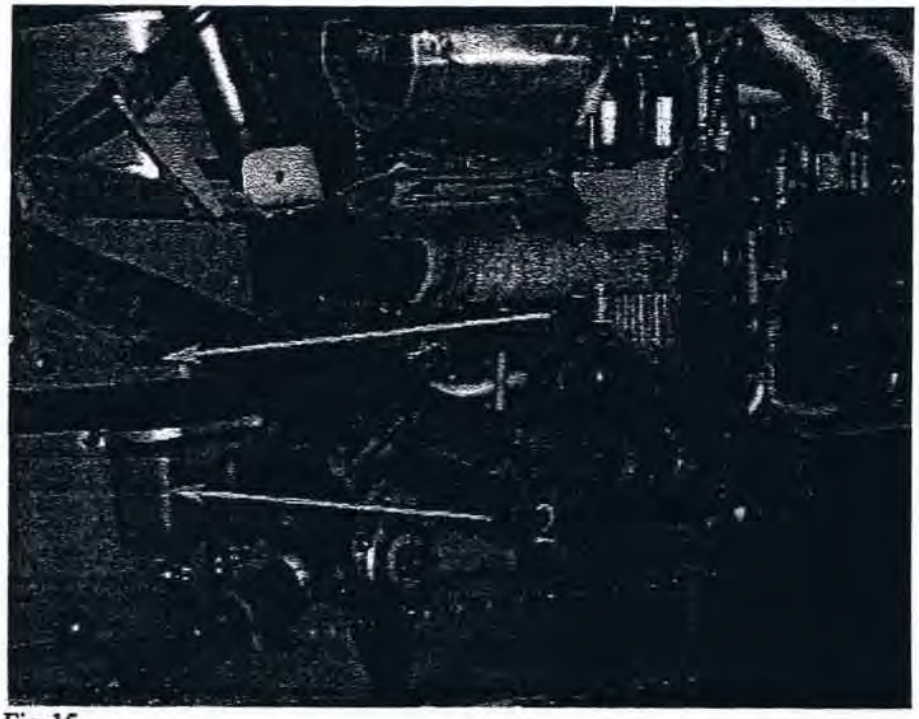


Fig.15

- Take a screwdriver S=7, loosen clamp, Fig. 16, pos. 1 and put a reservoir (V=3 L) under it, cautiously disconnect pipe from radiator, drain coolant form the cooling system.

Fig.16

- · After complete drain of the coolant connect pipe to radiator and tighten with a clamp, Fig 16., Pos.1
- · Put on valve cover of overflow reservoir, Fig. 12, pos. 3.
- · Remove protective film from the windows.
- · Install upper and lower cowlings of the engine.

14.4.2 Coolant filling.

- Remove upper and lower engine cowlings (see p. 14.2.1).
- Cover windows of the cockpit under the engine with protective film to protect from coolant.
- Open valve cover f overflow reservoir Fig. 12, pos.3, and fill engine cooling system t with coolant through reservoir filler using cone.
- After cooling system filling, open the overflow reservoir Fig. 15, pos.2 cover, Fig 15.? Pos.1 and fill it by halve of the volume using cone.
- Close the cover of overflow reservoir, Fig 15, pos.1.
- Remove protective film from the cockpit windows.
- Install lower and upper cowlings of the engine.

14.5 BATTERY CHANGE

1 Disconnect hot wires, pos.1, 2 and 3 from the battery, Fig. 17 and 18.
2 Unscrew clamp nut fixing the battery, pos. 4, Fig. 18 using wrench S=10 mm
3 Remove clamp, pos. 5. Fig. 19.
4 Replace the battery and proceed all steps in reverse order.

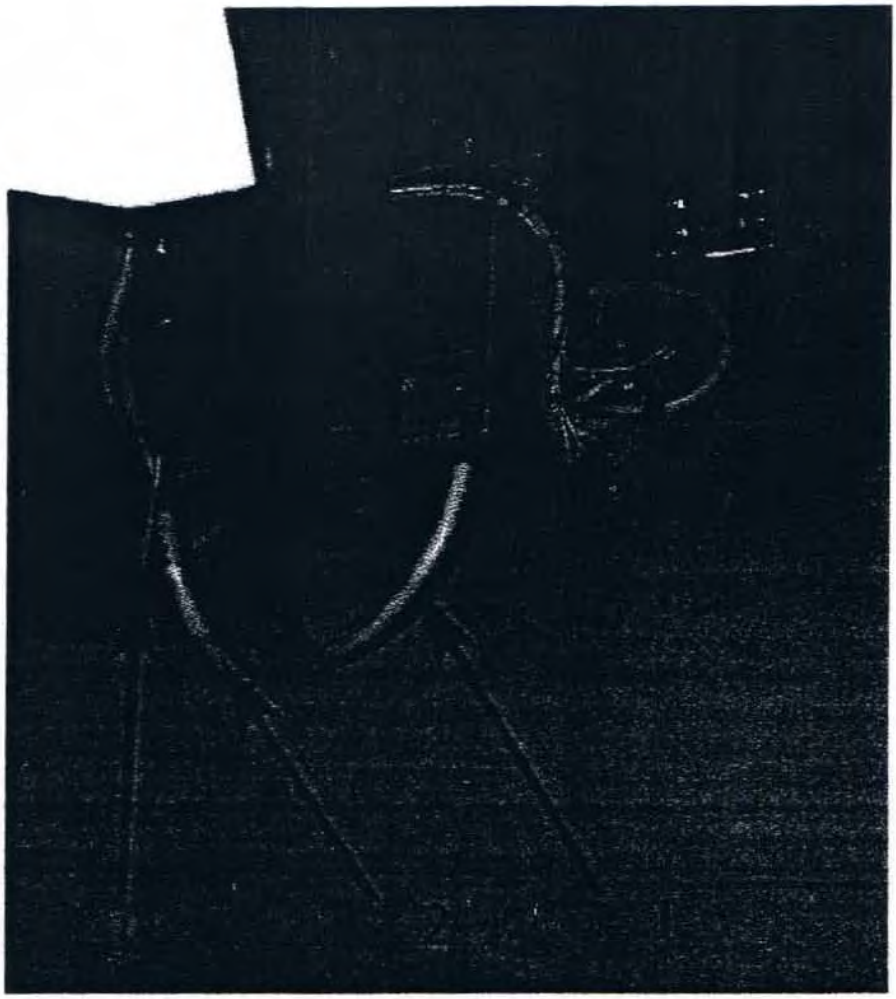


Fig. 17.

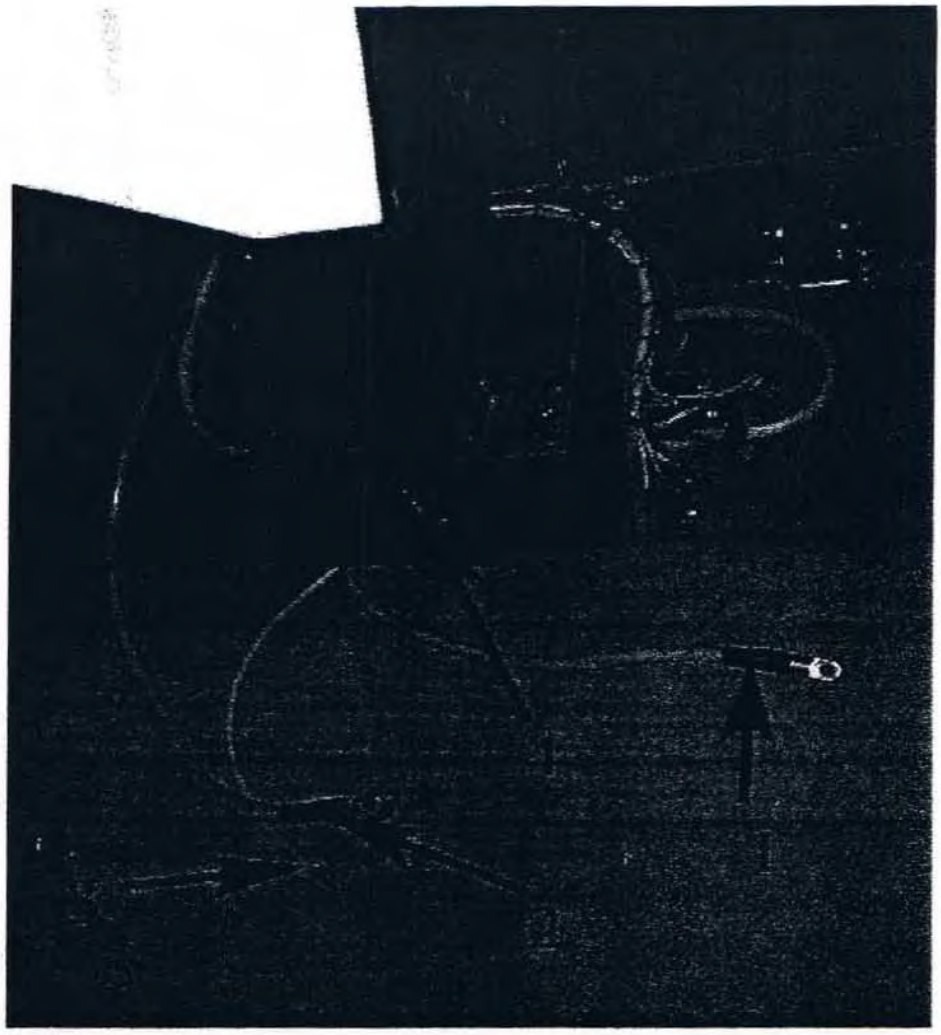


Fig. 18.

Fig. 19.

14.6 PROPELLER CHANGE.

1 Unscrew screws (pos.1) fixing spinner (pos. 2) with a blade screwdriver S=7 mm. Fig. 20.
2 Remove the spinner, pos. 2, Fig. 20.
3 Unscrew screws (pos. 3) fixing upper cowling (pos. 4) and screws (pos. 5) attaching front part of the lower cowling (pos. 6) with the rear part of the lower cowling (pos. 7) using blade screwdriver S= 7 mm, Fig. 21. Remove cowlings.
4 Unlock nuts, pos. 8, Fig. 22.
5 Remove nuts (pos. 8) using wrench S= 12 mm, Fig. 22.
6 Remove bolts, pos. 11, Fig. 22.
7 Remove propeller with the hub, pos. 12, Fig. 23.
8 Install propeller with hub in the reverse order.
9 Nuts should be tightened with a torque 2.5-3.0 kGm (18.1-21.7 lb x ft)
10 After propeller installation check axial and radial blade flapping. (Limits of flapping values are given in propeller technical description).

Fig.20.

Fig. 21.

Fig.22.

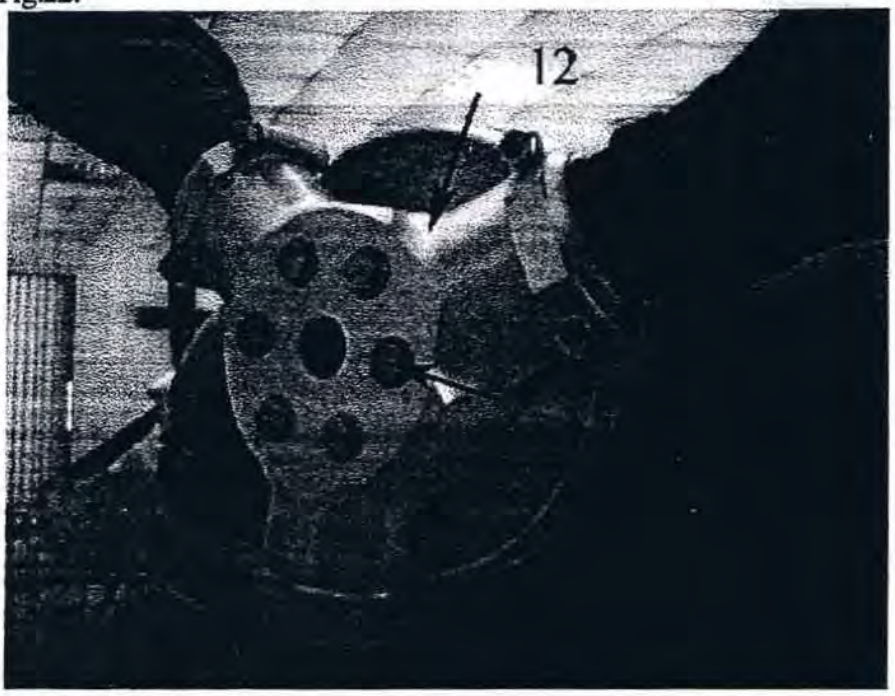


Fig 23

14.7 WINGS SRTUTS AND PLANES DISCONNECTION.

1 Put blocks under planes, pos.1, Fig 24.
2 Unscrew screws pos. 2, Fig 33 fixing lower fillet.
3 Unscrew screws (pos. 3 Fig 33, pos. 4, Fig 32) fixing upper fillet.
4 Remove upper and lower fillets.
5 Remove screws (pos.5, fig 31) fixing lower hatches..
6 Loosen clamps (pos. 6 and 7, Fig. 28), disconnect airspeed boom tubes (pos. 8, Fig 28).
7 Remove screws (pos. 9, Fig. 29) and disconnect airspeed boom bracket.
8 Disconnect quick plugs (pos. 10 and 11, Fig. 30) of flaps and ailerons control rod.
9 Disconnect connector (pos. 12, Fig. 26).
10 Remove locking pins (pos. 13, Fig. 35 and pos. 14, Fig 27).
11 Remove nuts (pos. 15, fig 27, pos. 16, Fig. 35).
12 Remove picketing shackle (pos. 17, Fig. 35), disconnect struts.
13 Remove locking pins (pos. 18, Fig. 25), remove nuts (pos. 19. Fig 25), disconnect planes..

14 Reconnect planes in reverse order.
15 Please note that during bolts installing (pos. 19, Fig. 25) put short bolt in the front fastening assembly and long one to the rear fastening assembly. Installing direction is against flight.

Fig. 24.

Fig. 25.

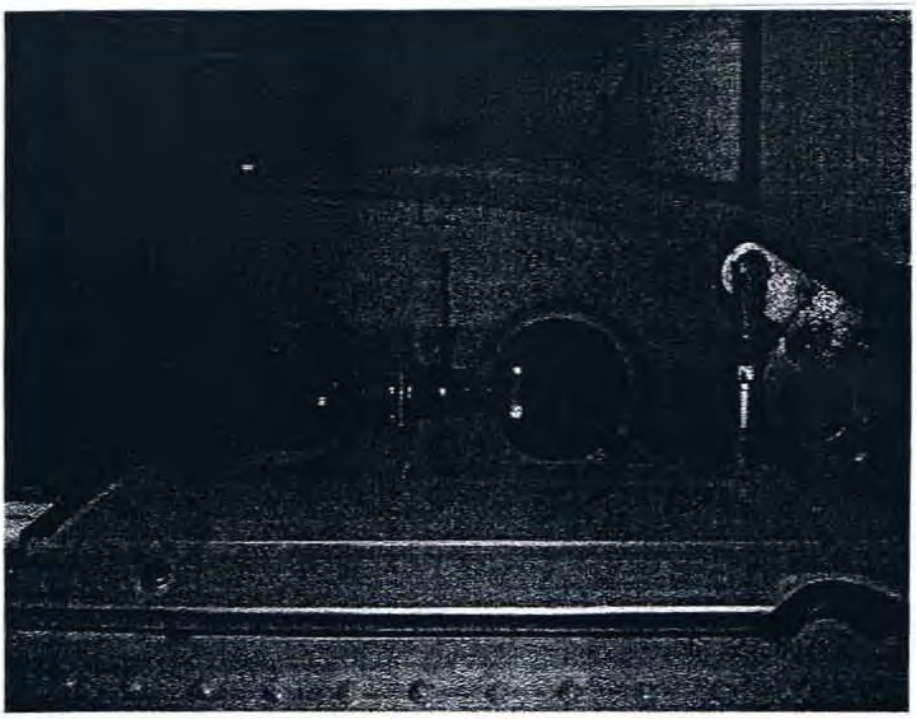


Fig. 26.

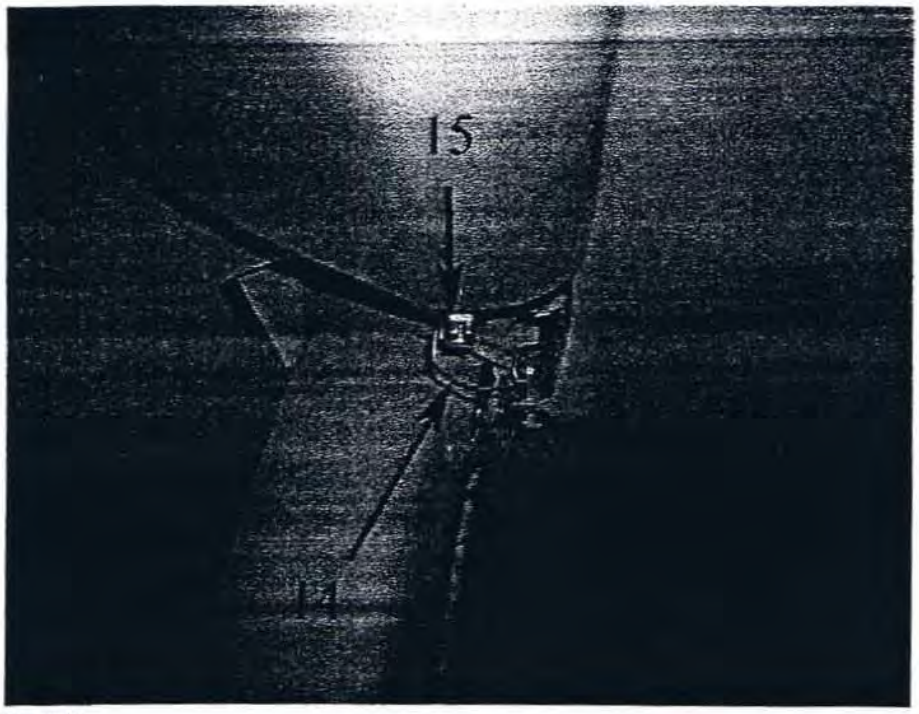


Fig. 27.

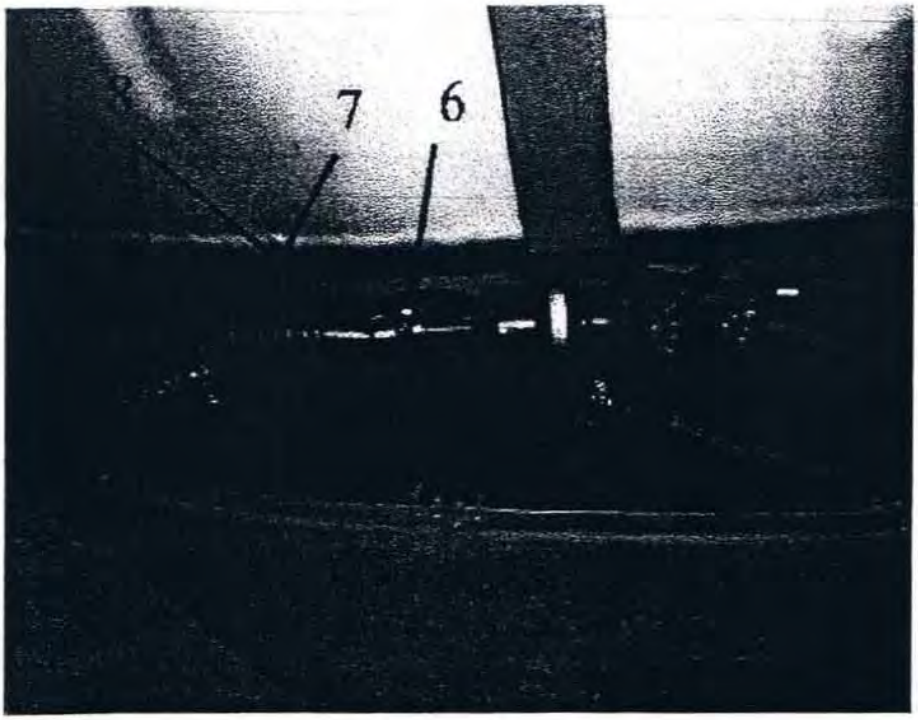


Fig. 28.

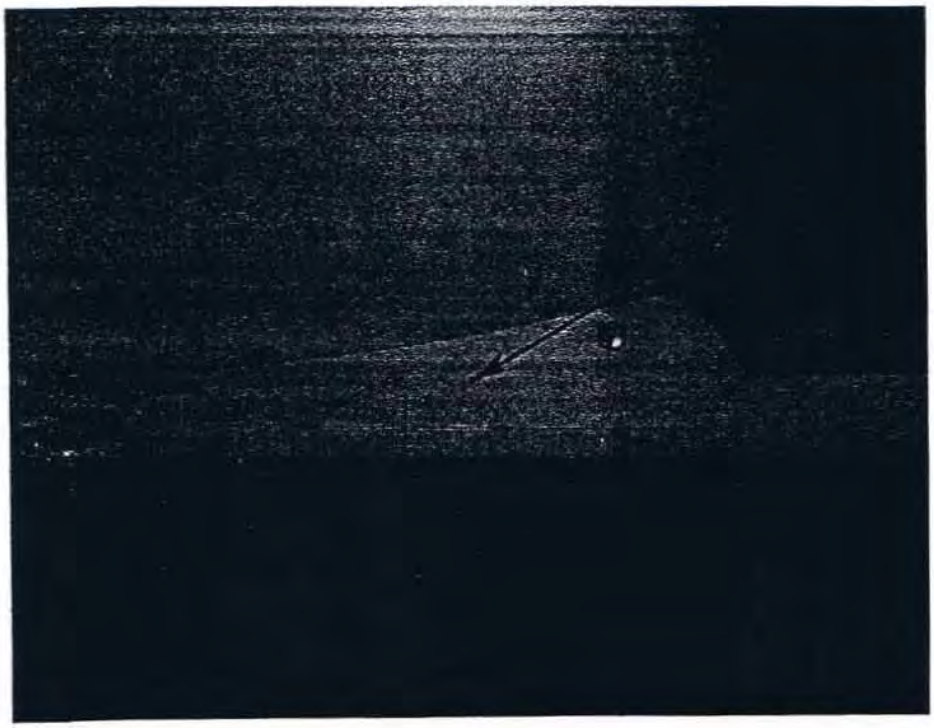


Fig. 29.

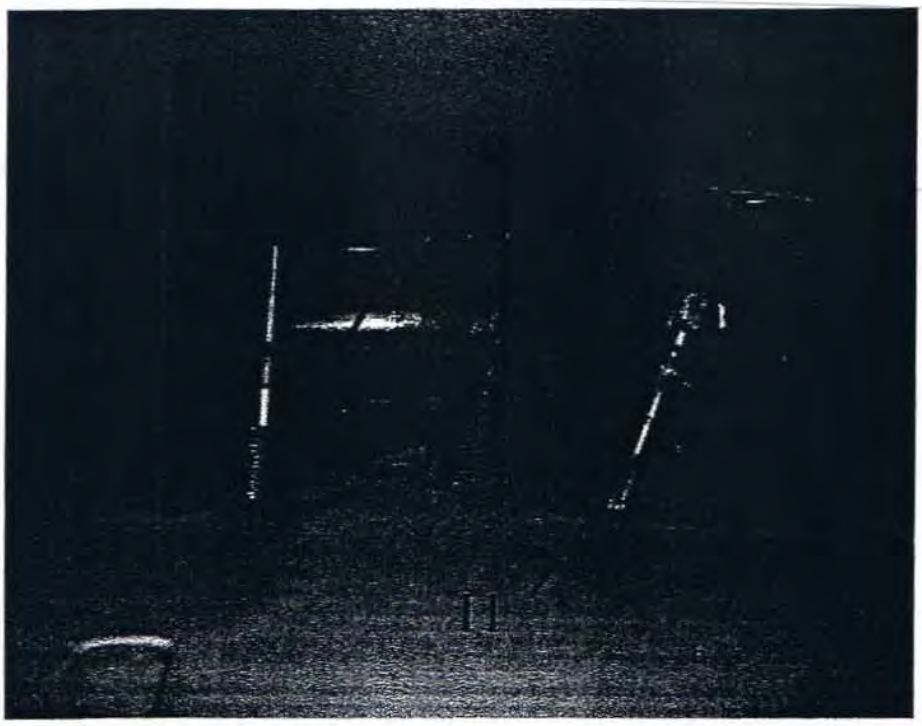


Fig. 30.

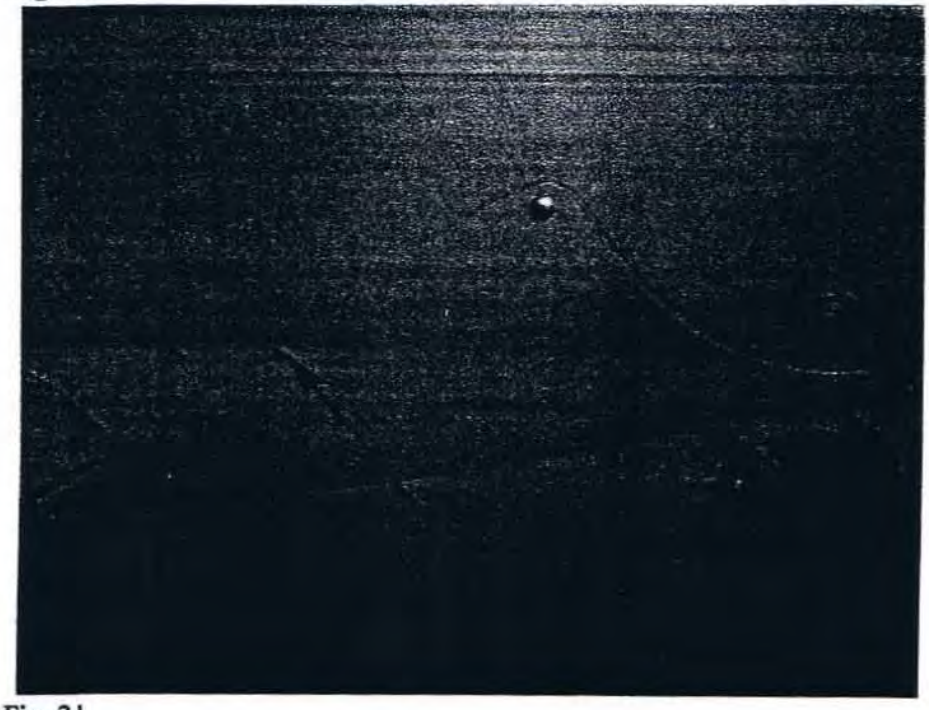


Fig. 31.

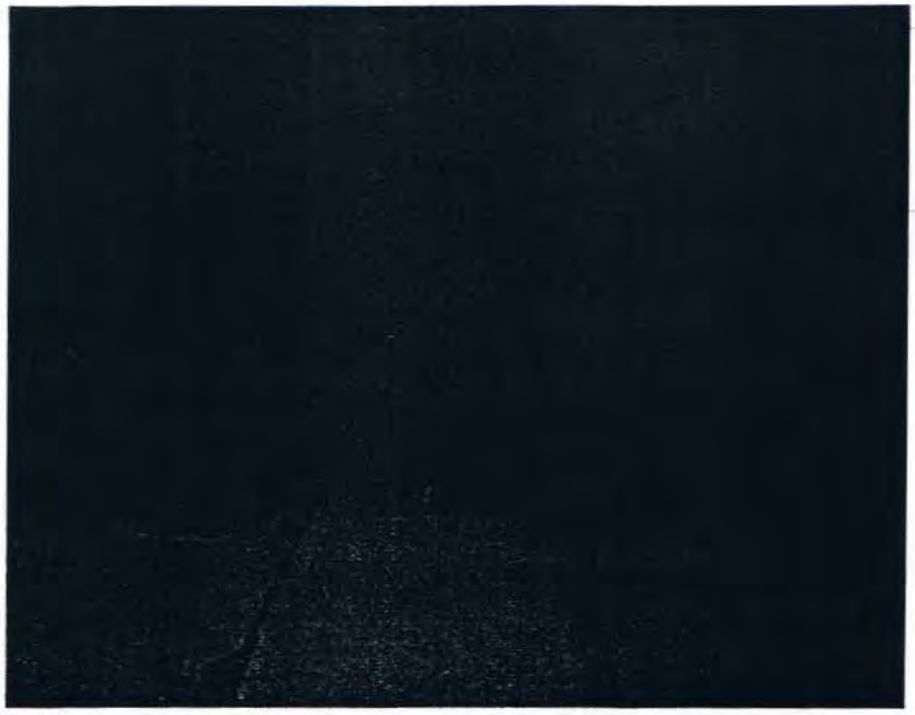


Fig. 32.

Fig. 33.

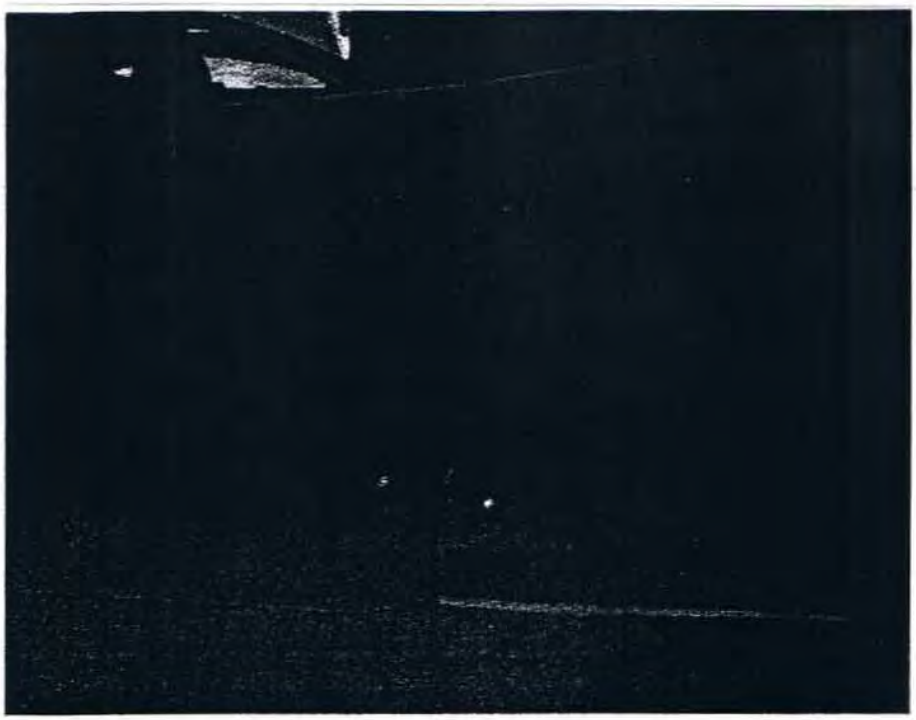


Fig. 34.

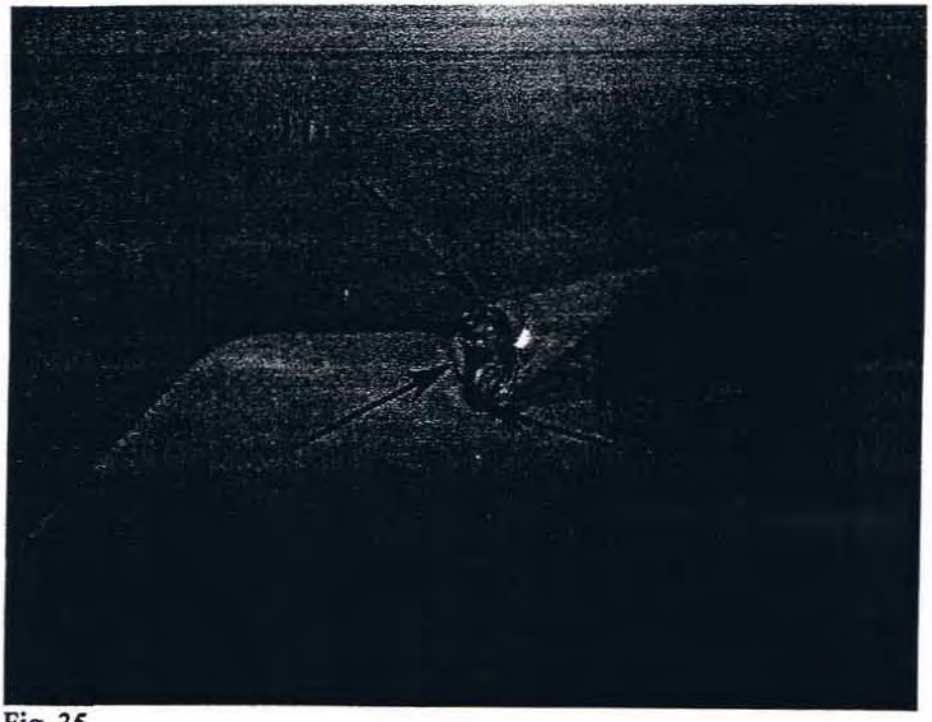


Fig. 35.

14.8 MAIN LANDING GEAR WHEEL REPLACEMENT.

1 Unscrew bolts (pos. 1 and 2, Fig. 36) fixing fairing (pos. 3) using a wrench.
2 Remove fairing (pos. 3, Fig. 36).
3 Remove bolt (pos. 4, Fig. 36) and remove cable (pos. 5).
4 Remove pin (pos. 6, Fig 38).
5 Remove nut (pos. 7< fig 38) using a wrench.
6 Remove wheel from the axle (pos. 8, Fig. 39).
7 Mount the wheel in reverse order.

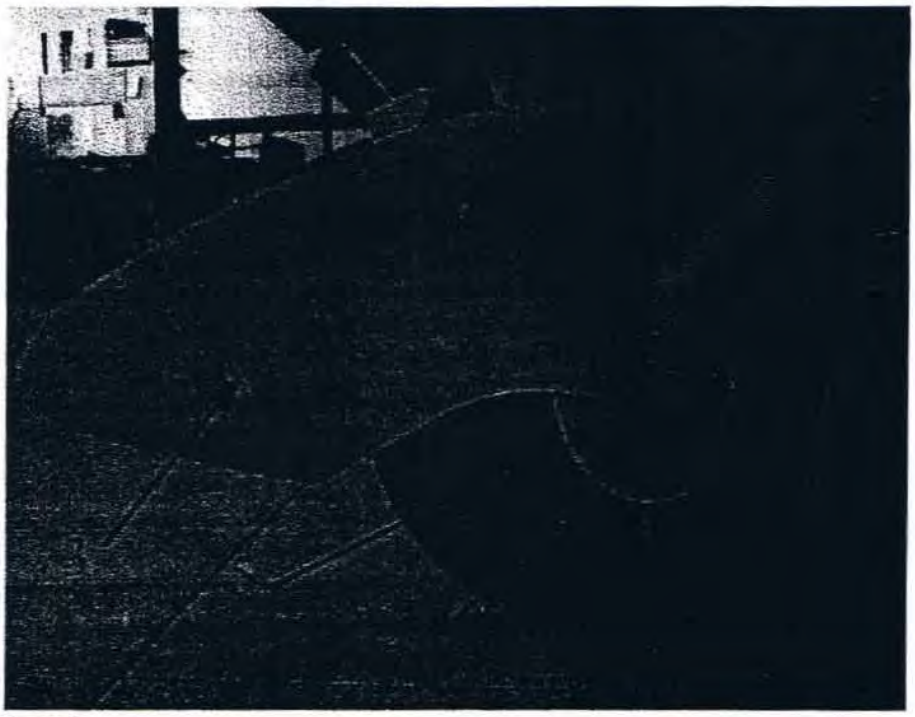


Fig. 36.

Fig. 37.

Fig. 38.

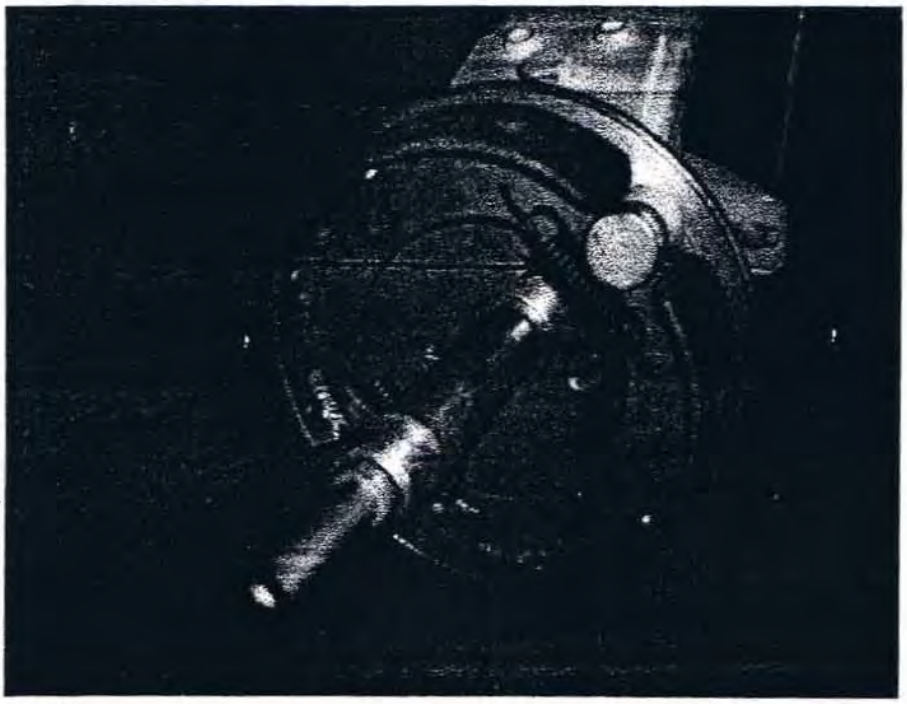


Fig. 39.

14.9 NOSE GEAR WHEEL REPLACEMENT.

1. Unlock and loosen front gear control cable (Pos. 1, Fig 40).
2. Unscrew bolts (pos.2, Fig. 40 and pos. 3, Fig 41) and remove the bracket (pos. 4, Fig 41).
3. Remove nut (pos. 5, Fig. 40) , remove bolt (pos. 6, Fig. 40).
4. Remove nut (pos. 7, Fig. 40) and disconnect front gear wheel.
5. Unscrew bolts of fairing fastening (pos. 8, Fig. 42) and remove the fairing.
6. Remove pin (pos. 9, Fig. 43).
7. Remove nut (pos. 10, Fig. 43).
8. Remove axle (pos. 11) and distance sleeves (pos. 12, Fig. 44).
9. Dismount the wheel (pos. 13, Fig 44).
10. Mount the wheel in the reverse order.

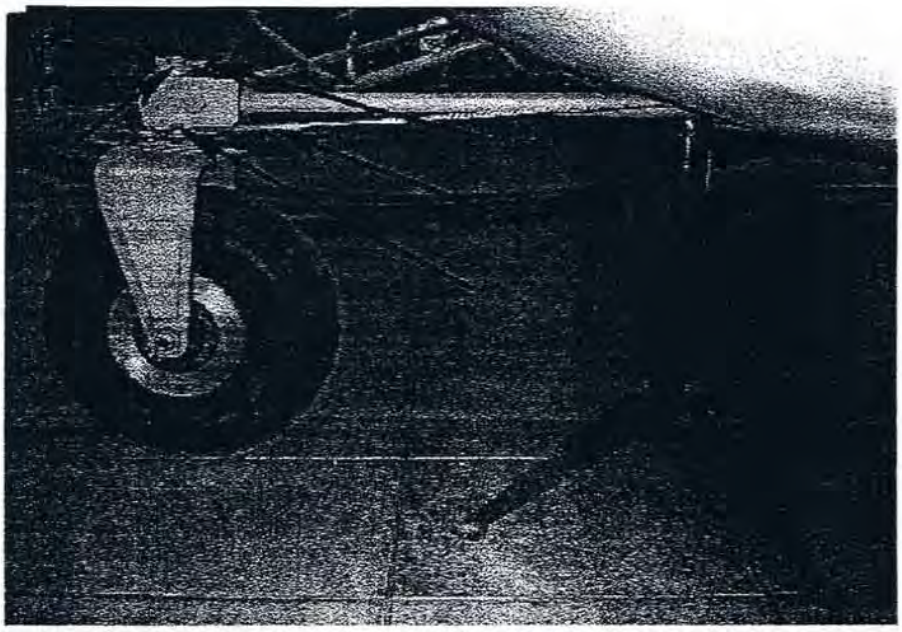


Fig. 40.

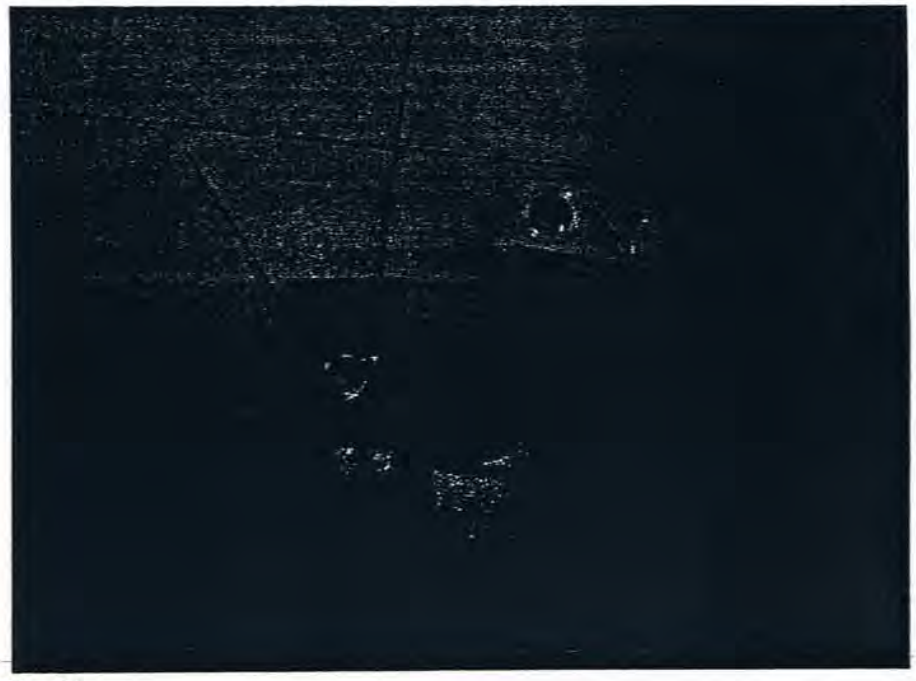


Fig. 41.

Fig. 42.

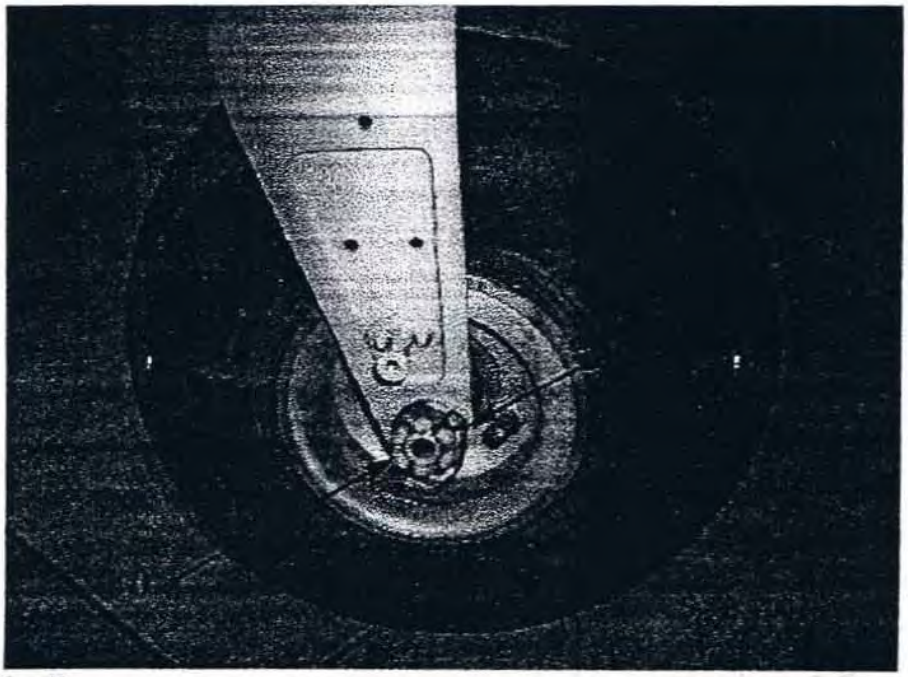


Fig. 43.

Fig. 44.

14.10 Front gear wheel tire replacement.
Take off wheel in accordance with Maintenance Manual, section 14.9. .
Vent pressure
Disconnect discs (pos. 1 and 2, Fig. 45)..
Remove tire, fig. 3, pos. 45.
Replace tire and assemble in reverse order.
NOTE: Please make sure that tube nipple is not distorted and tube is not damaged on the disc.

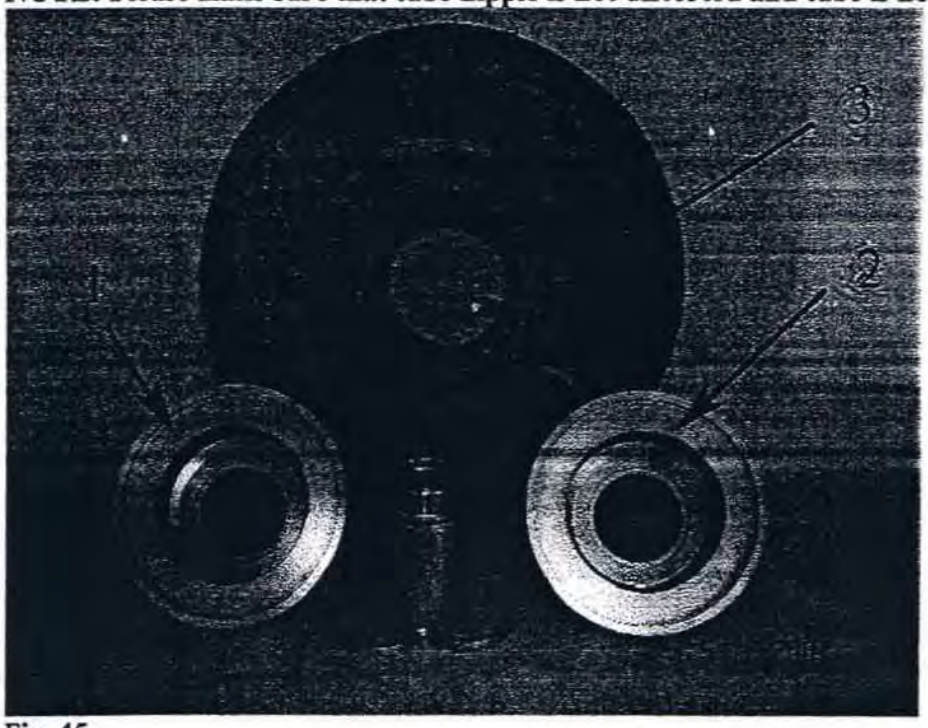


Fig. 45.

Fig. 46

14.11 Main gear wheel tire replacement.

1 Remove wheel in accordance with Maintenance Manual, section 14.8.

2 Vent pressure.

3 Unscrew nuts, pos. 1 and 2, fig. 47

4 Disconnect discs, pos. 3, Fig. 46, pos. 4, Fig. 47. .

5 Remove tire, Pos. 5, fig 47.

6 Replace tire and assemble in reverse order.

NOTE: Please make sure that tube nipple is not distorted and tube is not damaged on the disc.

Fig. 47.

14.12 MAIN GEAR BREAK JAWS REPLACEMENT.

1 Perform steps 1 .. 6 of the flight and maintenance manual, section 14.8 (main gear wheels replacement).

2 Remove springs, pos. 9, fig 48. .

3 Remove break jaws, pos. 10, fig. 48.

4 Mount new break jaws in reverse order.

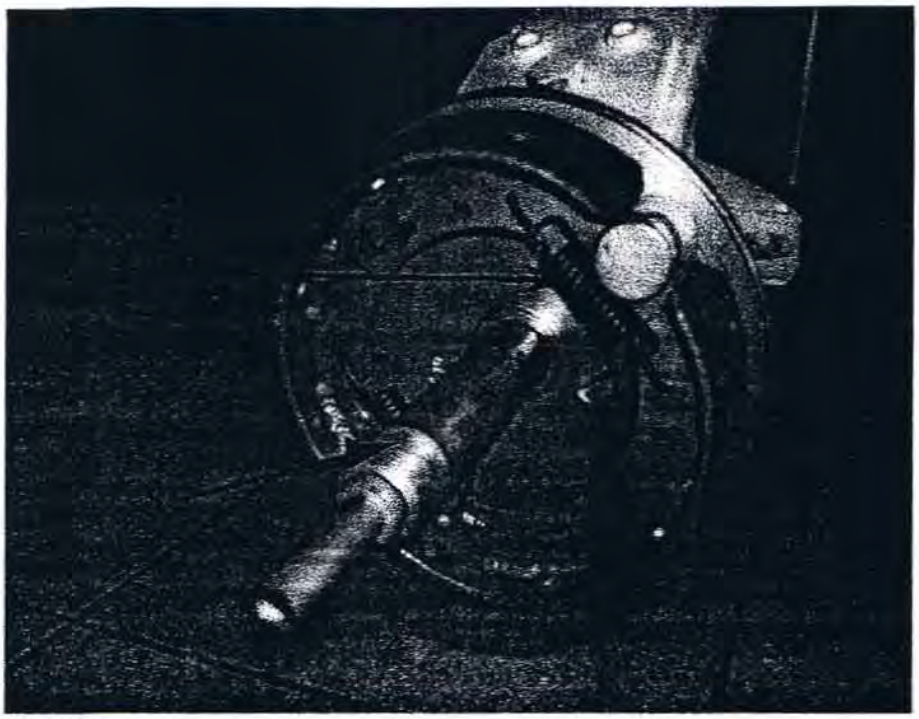


Fig. 48.

14.13 Main gear skids installation.

1 Put right skid, pos. 1 on the axle (pos. 2. fig. 49).

2 Put washer (pos. 3), put nut (pos. 4) on the axle (pos.2) using wrench (Fig. 49).

3 Lock the nut (pos. 4) with a pin (pos. 5) fig. 49.

4 Fix securing cord (pos. 6) to the wing strut (pos.7, Fig 50)

5 Repeat all steps for left skid.

6 Skids removal should be done in the reverse order.

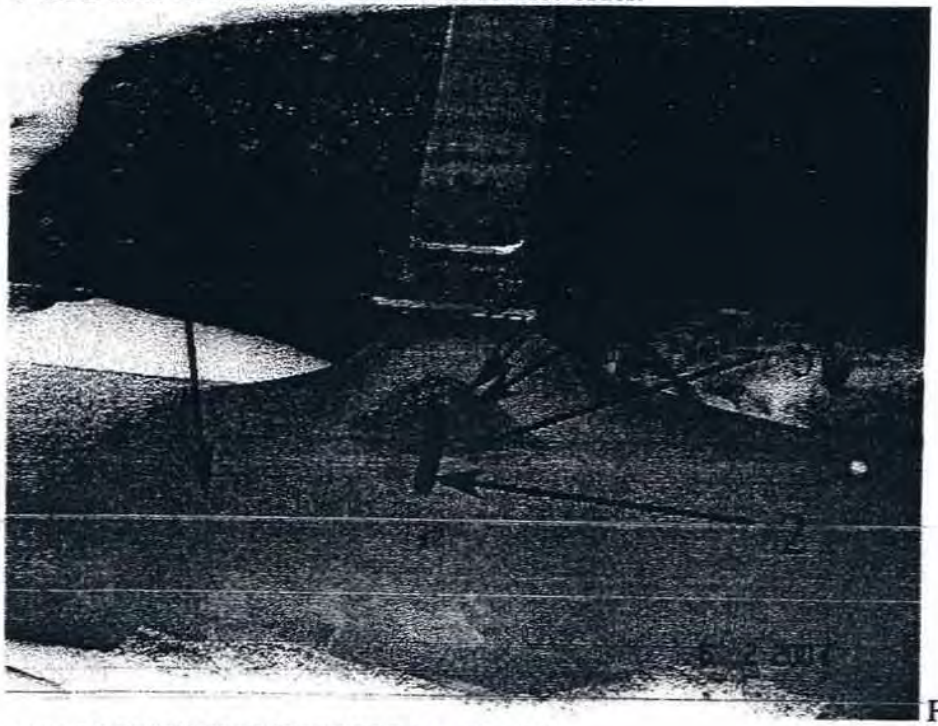


Fig. 49

14.14 FRONT SKI MOUNTING (see Fig. 51)

1 Slide the ski (1) under the fork (2).
2 Insert shaft (4).
3 Tighten the nut (3) with a wrench.
4 Lock the nut (3) with pin (5).
5 Fix the safety cord (6).
6 Skis are dismounted in reverse order.

Fig. 51

14.15 FLOAT-TYPE LANDING GEAR MOUNTING

1 Set service jacks (1) (Fig. 52) under outer wings.
2 Jack the aircraft up high enough to mount the float-type landing gear.
3 Detach the wheel landing gear together with springs.
4 Align the float-type landing gear into mounting position, insert the bolts (2) (Fig. 53), (3) (Fig. 54), and tighten the nuts.
5 Float-type landing gear is dismounted in reverse order.

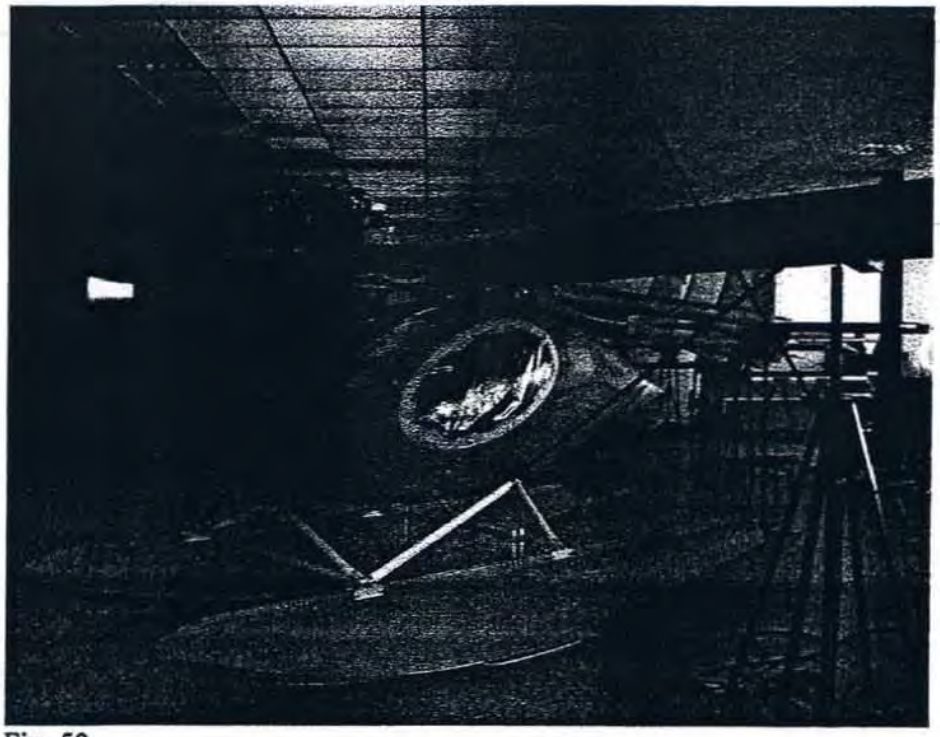
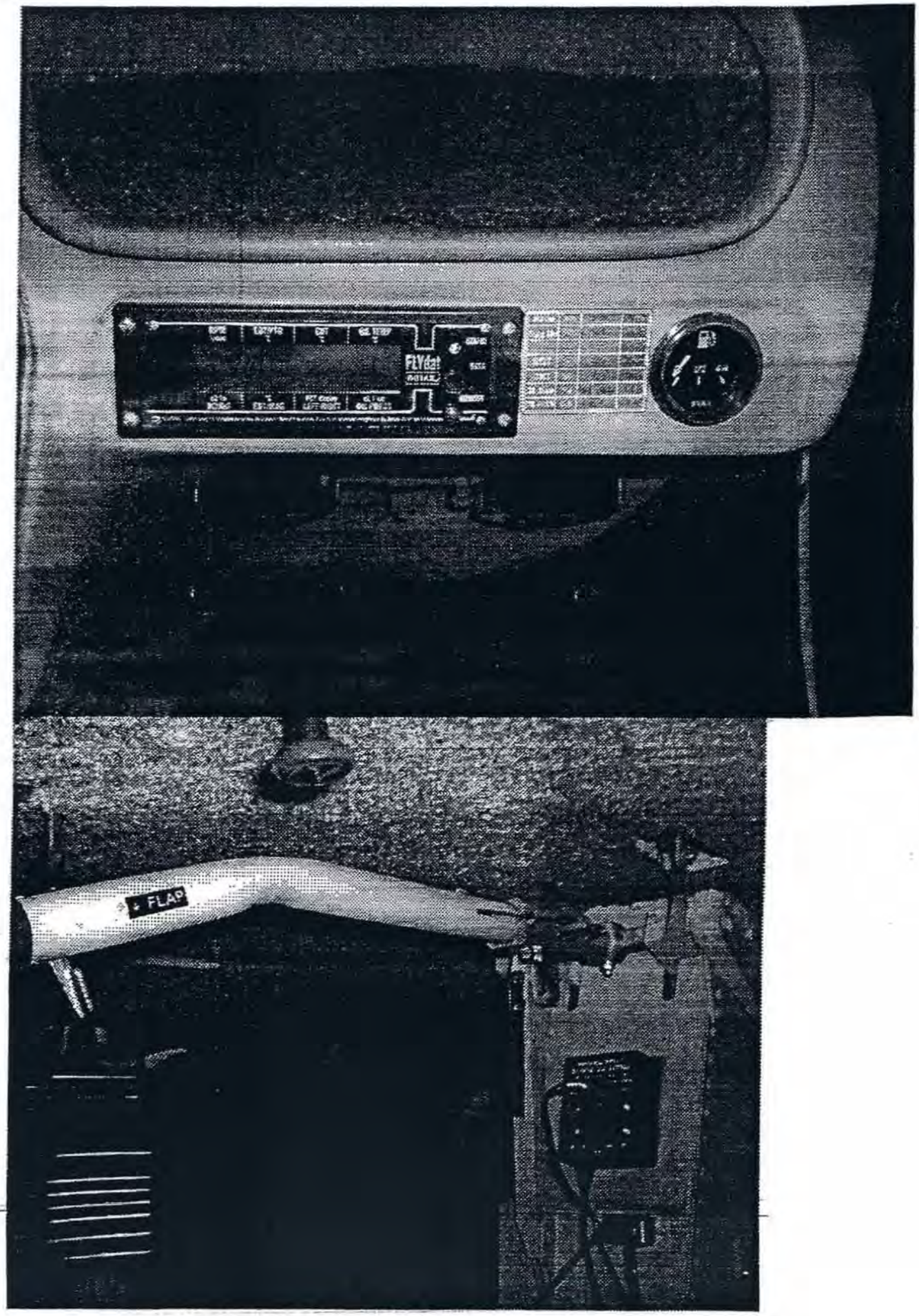


Fig. 52

Fig. 53


FLYdat
FLAP

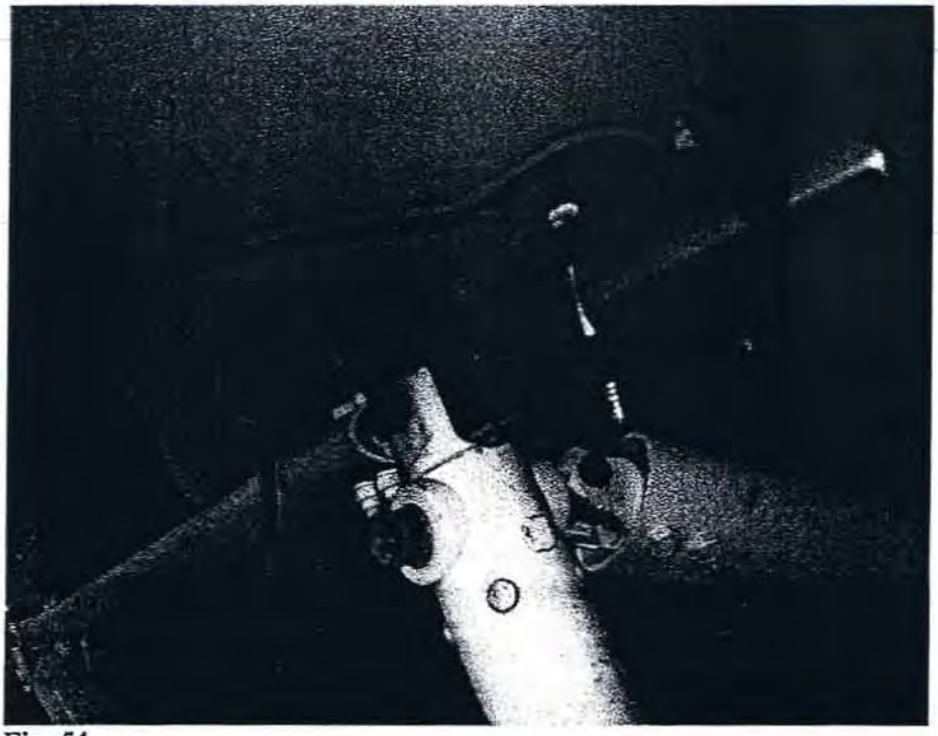


Fig. 54

14.16 AILERON DISMOUNTING AND MOUNTING (see. Fig. 55)

Required tools: 10 mm wrench - 2 pcs.
Parts required: 4 lock pins.
Personnel: 2 persons.
Set the flaps in landing position (40°).
Unlock and unscrew the nut (2) and detach aileron control rod (1) from the aileron.
Unlock and unscrew the bolt nuts (3) on aileron-hinge fittings (3 spots).
Remove the bolts and take the aileron (4) off.

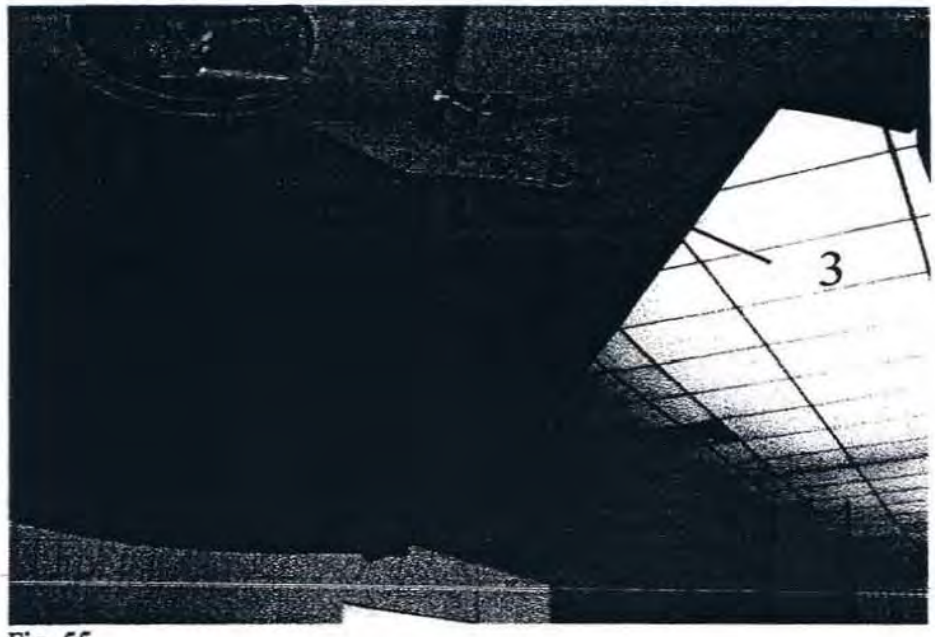


Fig. 55

Aileron is mounted in reverse order.

14.17 FLAP DISMOUNTING AND MOUNTING (see Fig. 56)

Tools required: 10 mm wrench - 2 pcs.
Spare parts required: 4 lock pins.
Personnel: 2 persons.
Unlock and unscrew the nut (2) and disconnect the flap control rod (1) from the flap.
Unlock and unscrew the bolt nuts (3) on flap-hinge fitting (3 spots).
Remove the bolts and remove the flap (4).

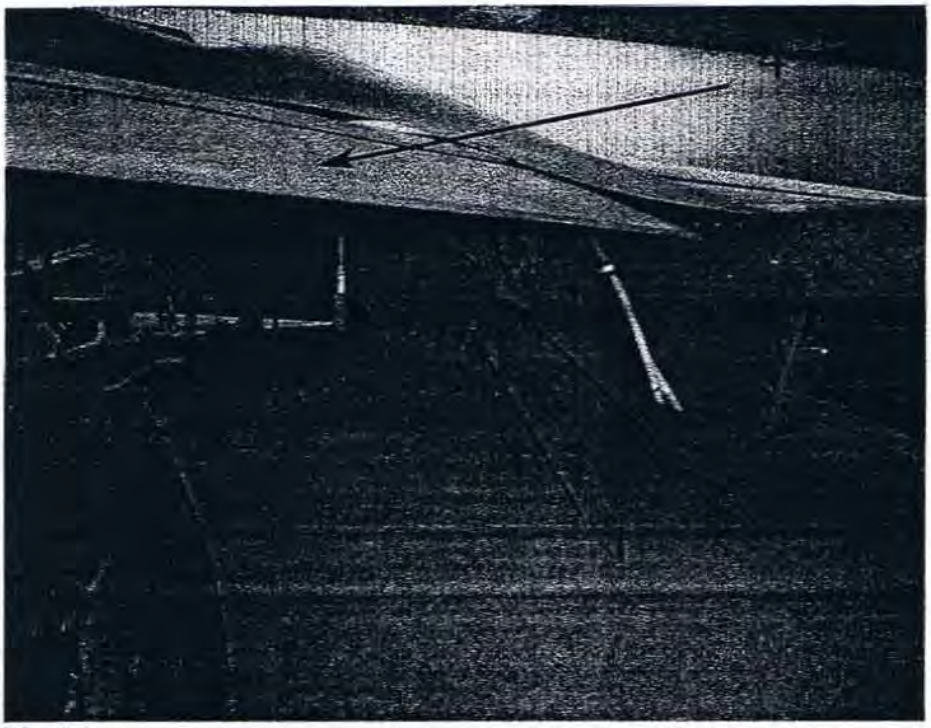


Fig. 56

Flap is mounted in reverse order.

14.18 ELEVATOR DISMOUNTING AND MOUNTING (see Fig. 57)

Required tools: 8 mm wrench – 1 pc, 10 mm wrench – 1 pc, cutters.
Parts required: 1 lock pin, KO-0,8 locking wire.
Personnel: 1 person.
1. Detach elevator control rod (1) from the elevator:
unlock and unscrew the nut (2);
remove the washer and the bolt.
2. Unlock and unscrew two bolts (4), and then remove the left balancing weight (3) from the elevator.
3. Unlock and unscrew two bolts (6), and remove the plate (5) on the right side of the elevator stabilizer.
4. Remove the elevator (7) carefully by having moved it along the rotation axes to the right in relation to elevator stabilizer.

Fig. 57

Elevator is mounted in reverse order.

14.19 RUDDER DISMOUNTING AND MOUNTING

Required tools: 8 mm wrench – 1 pc, 10 mm wrench – 1 pc, screwdriver, cutters.
Parts required: 1 lock pin, KO-0,8 locking wire.
Personnel: 1 person.
1. Disconnect control cables from the rudder brackets:
unlock one of turnbuckles (3) (Fig. 58) and use it to slack the cable;
unlock and unscrew the nut (4);
- remove the washer and the bolt;

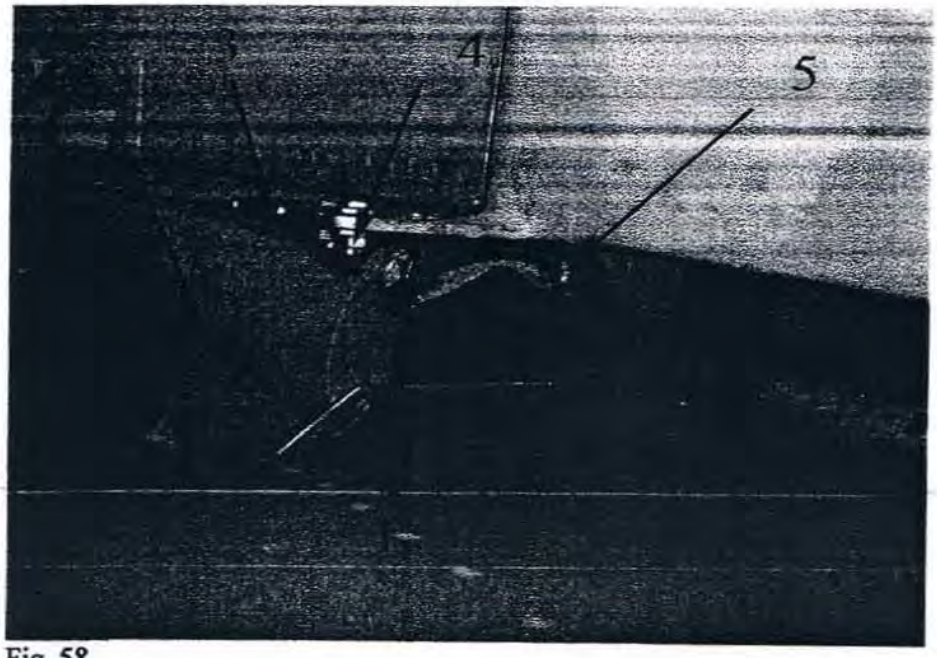


Fig. 58

- unlock and unscrew the nut (4), remove the washer and the bolt on the opposite side of the rudder.

Unlock the lower rudder pivot axis (5) and remove the spacing plate.

Detach safety beacon from the rudder fin:

unscrew the beacon mounting bolts and take the beacon out from the housing without damaging electric wires;

unscrew the housing to stabilizer mounting screw and remove the housing together with the fin tip;

disconnect safety beacon power supply electric connectors.

Holding the rudder (1) (Fig. 59) to prevent it from possible shift, unlock and unscrew two bolts (3) and remove the plate (2).

Remove the rudder by raising it up along the pivot axis.

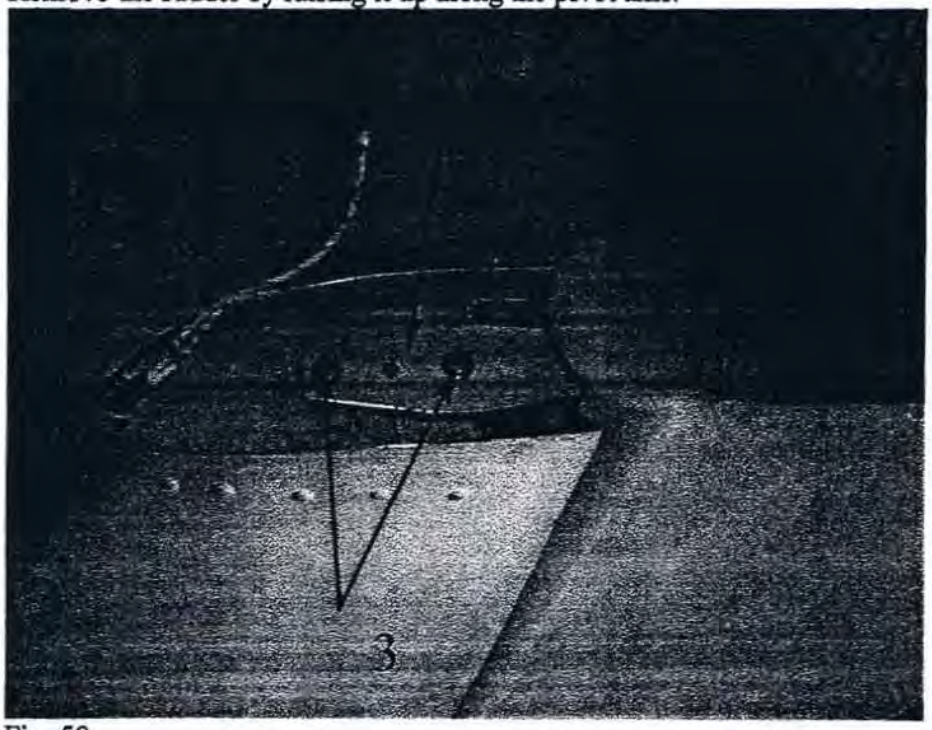


Fig. 59

Rudder is mounted in reverse order.

14.20 TAIL PLATE SPRING DISMOUNTING AND MOUNTING

Required tools: 7 mm screwdriver, 10 mm wrench – 2 pcs.

Parts required: none.

Personnel: 1 person.

1. Remove false keel detachable fairing (1) (Fig. 60).

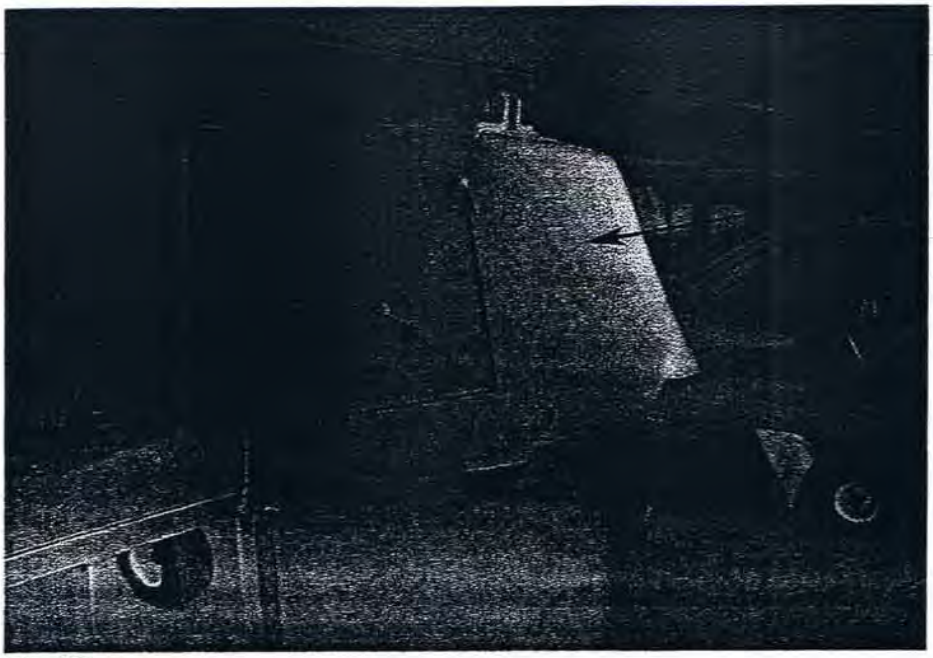


Fig. 60

2. Unscrew six screws (2).
3. Remove the fairing.
4. Unscrew self-locking nut (1) (Fig. 61).

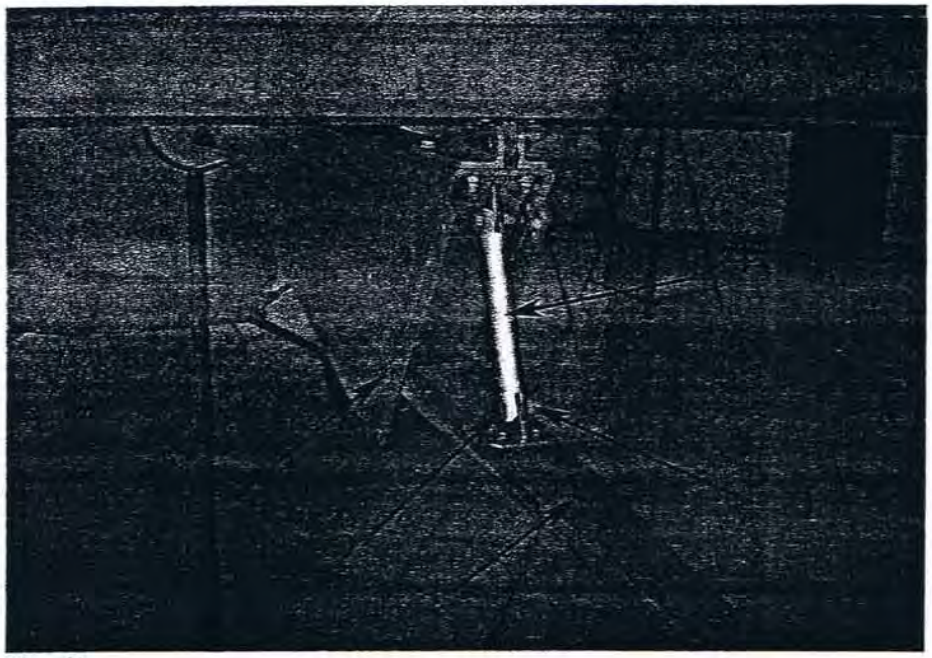


Fig. 61

5. Remove the bolt (2).
6. Detach the tail plate spring (3) from the rod (4).
7. Guide the tail plate spring downwards.
8. Unscrew two bolts (5) while holding self-locking nuts in the tail plate spring fork by a wrench.
9. Remove the bolts.
10. Remove the tail plate spring.

Tail plate spring is mounted in reverse order.

14.21 FIN DISMOUNTING AND MOUNTING (see Fig. 58)

Required tools: 10 mm and 14 mm wrenches.
Parts required: lock washer – 4 pcs.
Personnel: 2 persons.

1. Dismount the rudder as described in 14.19.
2. Unlock two bolts (1) on the fin's rear mounting unit.
3. Unscrew the bolts (1) while holding self-locking nuts by a wrench.
4. Unlock two bolts (2) on the fin's front mounting unit.
5. Unscrew the bolts (2).
6. Holding the fin in vertical position and with assistance of the second technician, lift the fin up and disconnect two upper safety beacon electric connectors.
7. Remove the fin.

Fin is mounted in reverse order.

14.22 STABILIZER DISMOUNTING AND MOUNTING (see Fig. 62)

Required tools: 12 mm wrench, side-cutting pliers.
Parts required: lock pin – 2 pcs.
Personnel: 1 person.

1. Remove the elevator as described in 14.18.
2. Unlock two grooved-head nuts (1) on the stabilizer mounting bracket (2).

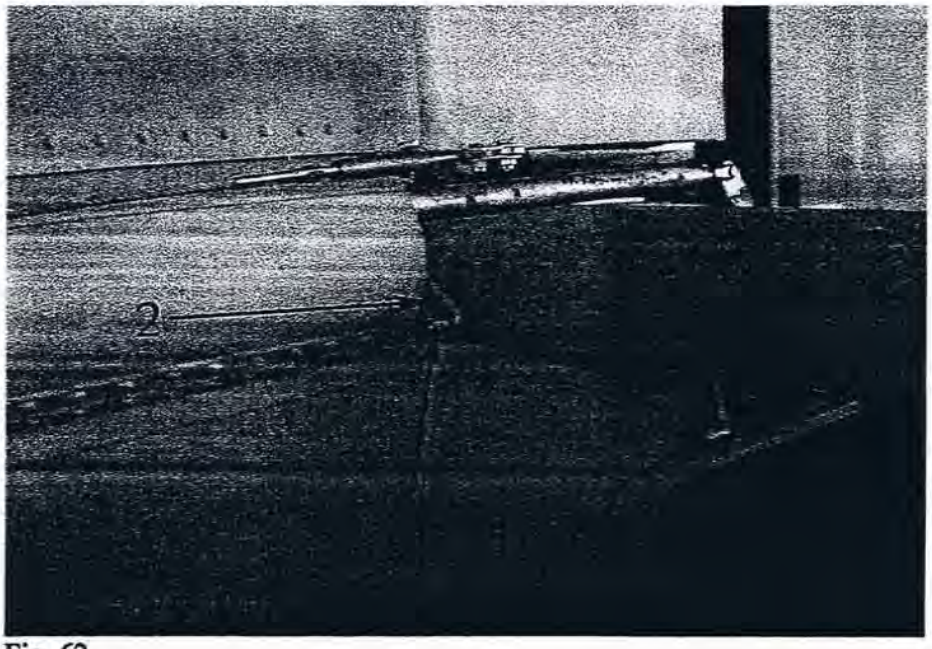


Fig. 62.

3. Unscrew two grooved-head nuts (1), remove the spacers and adjusting washers.
4. Lightly pull the stabilizer on the side of the tail plate spring in direction opposite to flight direction, and lead the stabilizer axes out from stabilizer mounting bracket.
5. Remove the stabilizer.

Stabilizer is mounted in reverse order.

14.23 MAIN LANDING GEAR SPRING REMOVAL AND MOUNTING

Required tools: screwdriver S=7mm, wrench S=12mm, wrench S=14mm, side-cutting pliers.
Parts required: lock pins – 2 pieces.
Personnel: 2 people.

1. Place airplane on lifting devices and lift it to the required height.
2. Remove main wheel according to Section 14.8.
3. Remove eighteen screws shown in Fig. 63 (1).

Fig.63

4. Remove rear bottom hatch (2).
5. Unscrew self-locking nut shown in Fig. 64 (1) holding a bolt head in its place (2).

Fig.64

6. Remove bolt (2).
7. Remove spring tip (4) from assembly (5).
8. Remove spring (3).

Mount main landing gear spring in reverse order.

14.24 NOSE LANDING GEAR SPRING REMOVAL AND MOUNTING

Required tools: screwdriver S=7mm, wrench S=10mm – 2 pieces.
Parts required: None.
Personnel: 2 people.

1. Place airplane on lifting devices and lift it to the required height.
2. Remove nose wheel according to Section 14.9.
3. Remove six screws shown in Fig. 65 (2).

Fig.65

4. Remove forward bottom hatch (1).
5. Remove left and right floors and central casing in the cockpit.
6. Unscrew two self-locking nuts shown in Fig. 66 (1) while holding bolt heads on the opposite side in their places (2).

Fig.66

6. Remove bolts.
7. Remove spring shown in Fig.65 (3) from rear bracket shown in Fig.66 (2).
8. Take spring out through forward bottom hatch.

Mount nose landing gear spring in reverse order.

15. Appendix 1. LSA Elitar-Sigma condition inspection after 100 flight hours (annual)

INSPECTION OF
LIGHT SPORT AIRCRAFT ELITAR-SIGMA CONDITION
AFTER 100 FLIGHT HOURS OR ANNUAL

Checklist

Aircraft Make/Model: _____ Serial Number:_____
Engine Make/Model: _____ Serial Number:_____
Date of Inspection: _____
TT Airframe: _____
TT Engine: _____

Before inspection remove or open all following items:
- lookout hatches,
- access doors,
- fairings,
- cowls.

After completion of initial visual inspection for leaks, aircraft and engine should be thoroughly cleaned.

It is necessary to inspect the following components of the fuselage and hull group:
Pass ___ Fail ___ Fabric and skin-for deterioration, distortion, other evidence of failure, and defective or insecure attachment of fittings.
Pass ___ Fail ___ Systems and components-for improper installation, apparent defects, and unsatisfactory operation.

It is necessary to inspect the following components of the cabin and cockpit group:
Pass ___ Fail ___ Generally/for uncleanlyiness and loose equipment.
Pass ___ Fail ___ Seats and safety belts for poor condition and apparent defects.
Pass ___ Fail ___ Windows and windshields for deterioration and breakage.
Pass ___ Fail ___ Instruments for poor condition, mounting, marking, and improper operation.
Pass ___ Fail ___ Flight and engine controls for improper installation and improper operation.
Pass ___ Fail ___ Batteries for improper installation and improper charge.
Pass ___ Fail ___ All systems for improper installation, poor general condition, apparent and obvious defects, and insecurity of attachment.

It is necessary to inspect the following components of the engine and nacelle group:
Pass ___ Fail ___ Engine section for visual evidence of excessive oil, fuel, or hydraulic leaks, and sources of such leaks.
Pass ___ Fail ___ Studs and nuts for improper torquing and obvious defects.
Pass ___ Fail ___ Internal engine for cylinder compression and for metal particles or foreign matter on screens and sump drain plugs.
Pass ___ Fail ___ Engine mount for cracks, looseness of its mounting, and looseness of engine mounted in it.
Pass ___ Fail ___ Flexible vibration dampeners for poor condition.
Pass ___ Fail ___ Engine controls for defects and improper travel.
Pass ___ Fail ___ Lines, hoses, and clamps for leaks, improper condition and looseness.
Pass ___ Fail ___ Exhaust system for cracks, defects, and improper attachment.
Pass ___ Fail ___ Accessories for apparent defects and insecurity of mounting.
Pass ___ Fail ___ All systems for improper installation, poor general condition, defects, and insecure attachment.
Pass ___ Fail ___ Cowling for cracks, and defects.

It is necessary to inspect the following components of the landing gear group:
Pass ___ Fail ___ All units for poor condition and insecurity of attachment.
Pass ___ Fail ___ Shock absorbing devices for cracks, defects, and insecurity of attachment.
Pass ___ Fail ___ Linkages, trusses, and members for undue or excessive wear fatigue.
Pass ___ Fail ___ Hydraulic lines for leakage.
Pass ___ Fail ___ Wheels for cracks, defects, and condition of bearings.
Pass ___ Fail ___ Tires for wear and cuts.
Pass ___ Fail ___ Brakes for improper adjustment.
Pass ___ Fail ___ Floats and skis for insecure attachment and obvious or apparent defects.

Pass ___ Fail ___ It is necessary to inspect all components of the wing for poor general condition, fabric or skin deterioration, distortion, evidence of failure, and insecurity of attachment.

Pass ___ Fail ___ It is necessary to inspect all components and systems that make up the complete empennage assembly for poor general condition, fabric or skin deterioration, distortion, evidence of failure, insecure attachment, improper component installation, and improper component operation.

It is necessary to inspect the following components of the propeller group:
Pass ___ Fail ___ Propeller assembly for cracks, nicks, and binds.
Pass ___ Fail ___ Bolts for improper torquing and lack of safetying.

It is necessary to inspect the following components of the radio group:
Pass ___ Fail ___ Radio and electronic equipment for improper installation and insecure mounting.
Pass ___ Fail ___ Wiring for improper routing, insecure mounting, and obvious defects.
Pass ___ Fail ___ Bonding and shielding for improper installation and poor condition.
Pass ___ Fail ___ Antenna for poor condition, insecure mounting, and improper operation.

It is necessary to inspect each installed piece of optional equipment on this listing for improper installation and improper operation.
Pass ___ Fail ___ Option number one
Pass ___ Fail ___ Option number two
Pass ___ Fail ___ Option number three
Pass ___ Fail ___ Option number four

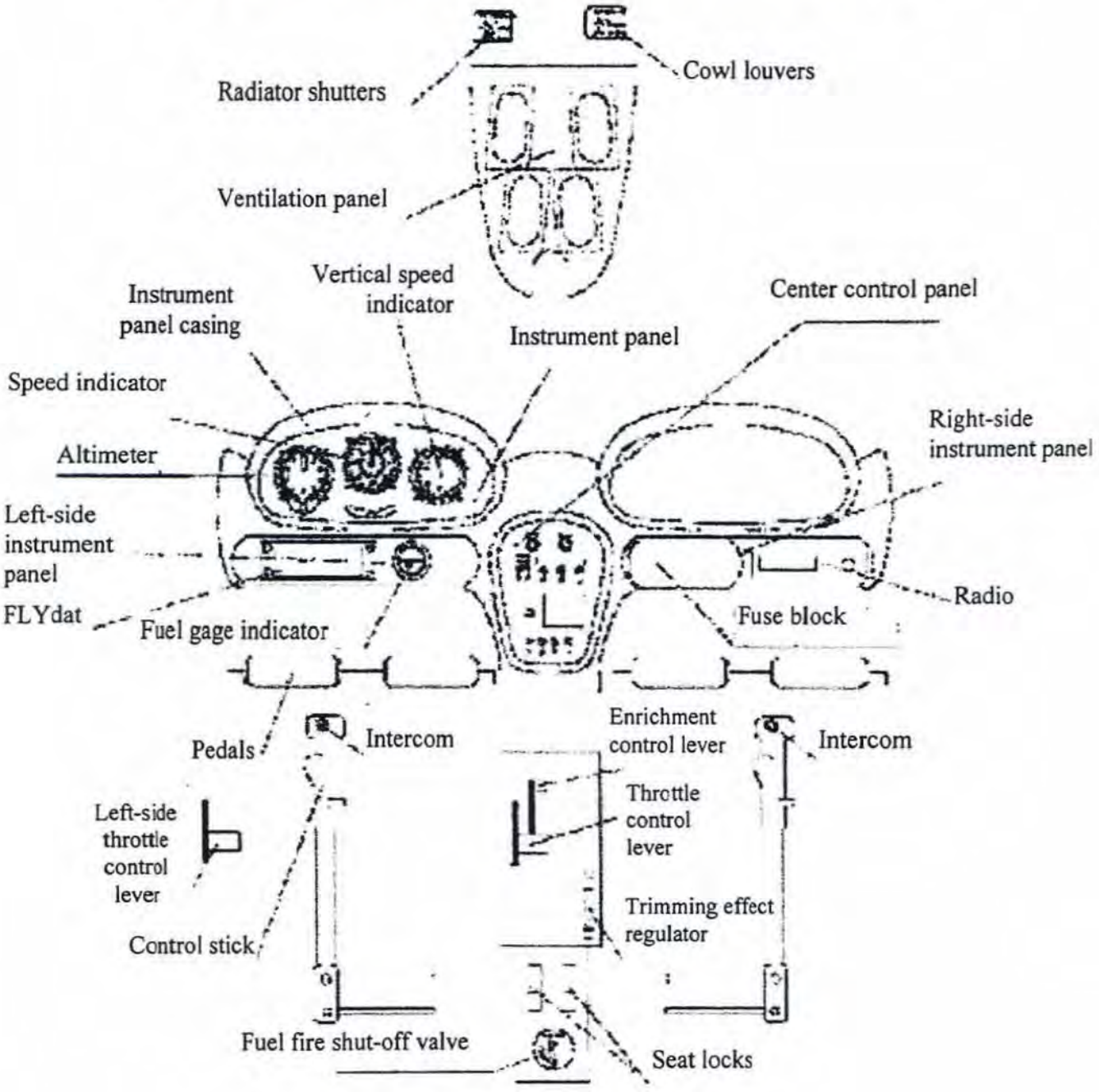
Pass ___ Fail ___ It is necessary to remove and check the ELT installed and calendar date currency of the batteries installed in accordance with FAA Advisory Circular 91-44 current revision.

Notes and explanation of unairworthy items found:

_____
_____
_____
_____
_____
_____
_____

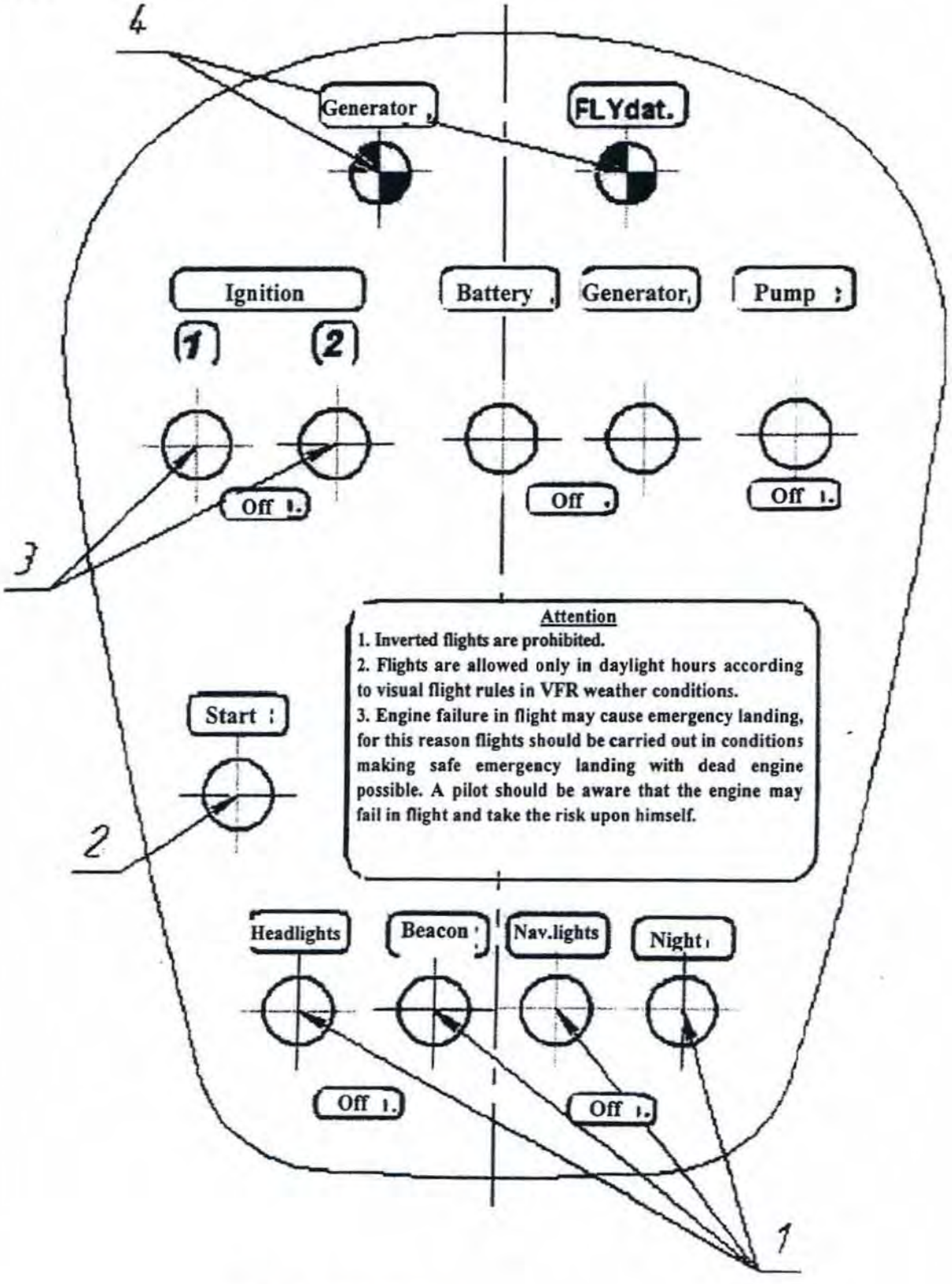
16. Appendix 2. Cockpit equipment

System of cockpit ventilation and of engine radiator shutters regulation



Instruments, equipment, aircraft and engine controls

17. Appendix 3. Central Panel



1. Switch VG-15K (7 pcs.)
2. Engine starter button KNR (1 pc.)
3. Circuit breaker AZSGK-25 (25 pcs.)
4. Indication lamp 12V, 3W (2 pcs.)

2.5 Electrical Connections

All electrical connections, except for the antenna, are made through a single, 25 pin, D subminiature connector. Figure 2-1 defines the electrical characteristics of all input and output signals and identifies the cable requirements for each signal. Required connector and associated hardware are supplied in the installation kit (P/N 010-10160-00). See figures B4 and B5 for interconnect wiring diagrams.

Larger pins are supplied for the connector to provide power and ground at pins 13, 14, 15, and 25 when required. Refer to Figure B4, Note 3.

Table 2-2 Pin Contact Part Numbers

Manufacturer	25 pin D-Subminiature connector (P102)	
	18 AWG (Power Only)	22-24 AWG
Garmin P/N	336-00023-00	336-00022-00
Military P/N	N/A	M39029/63-368
AMP	N/A	205090-1
Positronic	FC6018D	M39029/63-368
ITT Cannon	See Note 3	031-1007-42

Table 2-3 Recommended Crimp Tools

Manufacturer	Hand Crimping Tool	18 AWG		22-24 AWG	
		Positioner	Insertion/ Extraction Tool	Positioner	Insertion/ Extraction Tool
Military P/N	M22520/2-01	N/A	M81969/1-02	M22520/2-08	M81969/1-02
Positronic	9507	9502-11	M81969/1-02	9502-5	M81969/1-02
ITT Cannon	995-0001-584	N/A	N/A	995-0001-604	980-2000-426
AMP	601966-1	N/A	N/A	601966-5	91067-2
Daniels	AFM8	K774	M24308/1-02	K13-1	M24308/1-02
Astro	615717	N/A	M81969/1-02	615724	M81969/1-02

NOTES

1. Insertion/extraction tools from ITT Cannon are all plastic; others are plastic with metal tip.
2. Non-Garmin part numbers shown are not maintained by Garmin and consequently are subject to change without notice.
3. Alternate contacts for 18 AWG wire: As an alternative to the Positronic contacts listed (and provided in the installation kit), the installer may use contacts made by ITT Cannon under P/N 031-1007-001. These contacts require the use of a different crimp tool positioner than shown in the table, with the part numbers as follows: Daniels P/N K250, Astro P/N 616245, or ITT Cannon P/N 980-0005-722.
4. All wires must be passed through the backshell before being assembled to connector.
5. In aircraft equipped with a dropping resistor for +28 VDC buss voltage, make sure the dropping resistor is bypassed.

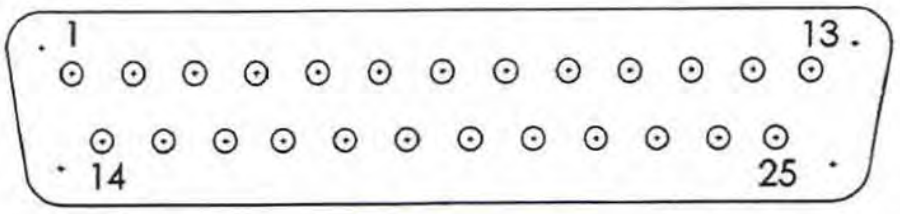


Figure 2-2 25 Pin D-Sub Connector Drawing

Table 2-4 25 Pin D-Sub Pin-Out Definitions

Pin	Description
1	Not Used
2	Do Not Connect
3	Altitude A1
4	Altitude C2
5	Altitude A2
6	Altitude A4
7	Altitude C4
8	External Ident
9	Altitude B1
10	Altitude C1
11	Altitude B2
12	Altitude B4
13	Ground
14	Switched Power Output
15	Aircraft Power (+11 to +33 VDC)
16	External Standby
17	External Suppression (Suppress I/O-GTX 320A)
18	Altitude D4
19	Not Used
20	Not Used
21	Not Used
22	Not Used
23	28 V Lighting
24	14 V Lighting
25	Ground

Identification	Item	Quantity	Comments
A1	Rectifier-regulator (in ROTAX-912 engine package)	1	
A2	Integrated engine control instrument FLYdat (in ROTAX-912 engine package)	1	
A3	Radio ICOM IC-A200	1	
A4, A5	Aircraft navigation lights	2	left – red, right - green
B1	Fuse block BPR13	1	
B2	Power supply unit "AEROFLASH"	1	
C1	Capacitor 22000mkF 25V	1	
F1, F2	Circuit breaker AZSGK-25	2	
F3,F4,F5, F6,F9,F10	Fuse 5A	6	
F7,F8,F11	Fuse 10A	3	
G1	Single-phase AC generator P12W250 (in ROTAX-912 engine package)	1	
G2	Electrical battery 12V 25Ah	1	
H1	Lamp indicating generator failure 12V 3W	1	
H2	Lamp indicating exceeding engine operating limits 12V 3W	1	
H3	Floodlight lamp 12V 55W	1	
H4	Beacon lamp A555A	1	
H5, H6	Aircraft navigation light lamp 12V	2	
K1	Starter relay (in ROTAX-912 engine package)	1	
K2	Headlight relay 12V 55W	1	
M1	Starter	1	
M2	Electrical fuel pump	1	
P1	Fuel level indicator with indicating lamp and gage lamp	1	
P2	Fuel quantity gage	1	

S1	Engine starter button KNR	1	
S2,S3,S4, S5,S6,S7,S8	Switch VG-15K	7	
S9	"Talk Button" PK2Z-2B (2c)	2	

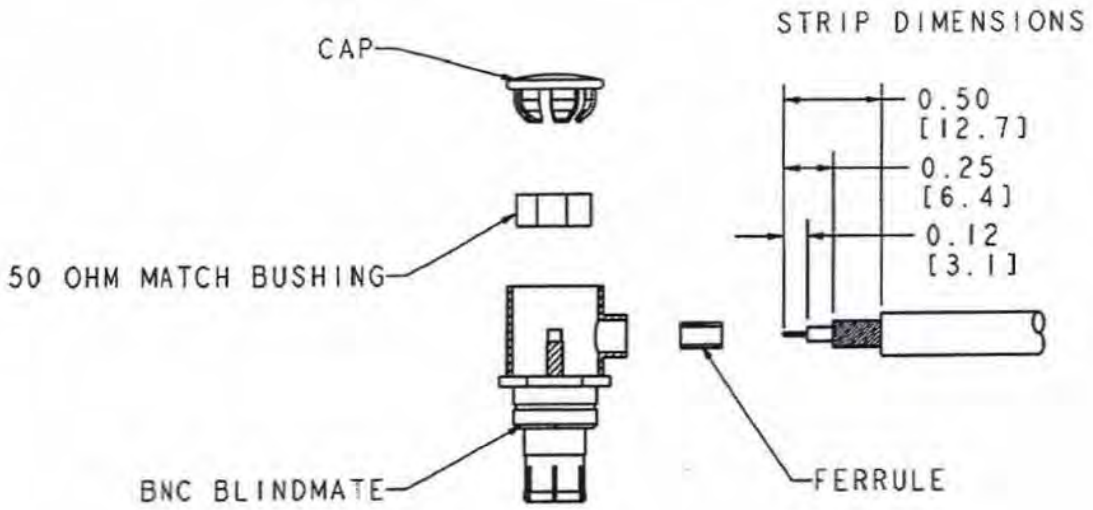


Figure 2-1 BNC Connector Assembly Drawing

A. Trim coax outer insulation back 0.50"

B. Trim braid (not center conductor or insulation) back 0.25".

C. Strip Insulation back 0.120".

NOTE

Place the ferrule over the coax braid, flush against the coax outer insulation before performing the next step if the outside diameter of the coax braid is smaller than the inside diameter of the center connector sidewall opening.

D. Insert cable (center conductor, dielectric and shield braid) through the sidewall of the connector and solder the center conductor to the center pin of the connector.

NOTE

When using low loss cable it may be necessary to flatten the solid wire center conductor slightly so it can fit the slot on the RF connector center pin. When soldering, avoid applying excess heat to the connector body, and center conductor insulator.

E. Heat the outside of the connector sleeve and at the same time apply solder between the braid and the sleeve. Continue to apply heat until the solder flows evenly.

F. Install 50 Ω Matching Bushing.

G. Insert connector cap and tack solder in two places.

2.4 GTX 320/320A Installation

NOTES

Avoid installing the unit near heat sources. If this is not possible, ensure that additional cooling is provided. Allow adequate space for installation of cables and connectors. The installer will supply and fabricate all of the cables. All wiring must be in accordance with FAA AC 43.13-2A.

GTX 320 units that are at Mod Level 1 must use the Mod Level 1 Rack Assembly. After Mod Level 1, GTX 320 installations are 0.170" (4.31 mm) deeper in the panel.

A. Assemble the connector/rack kit according to figure B2. Install the rack assembly according to the dimensions given in figures B1. Mounting brackets are not supplied due to the wide range of mounting configurations available. Suitable mounting brackets may be fabricated from sheet metal or angle stock. To ensure a sturdy mount, rear support for the unit should be provided.

B. Do not insert screws through the rear plate of the mounting tray, into the transponder. These holes are only for use with the adapter described in paragraph 2.8.

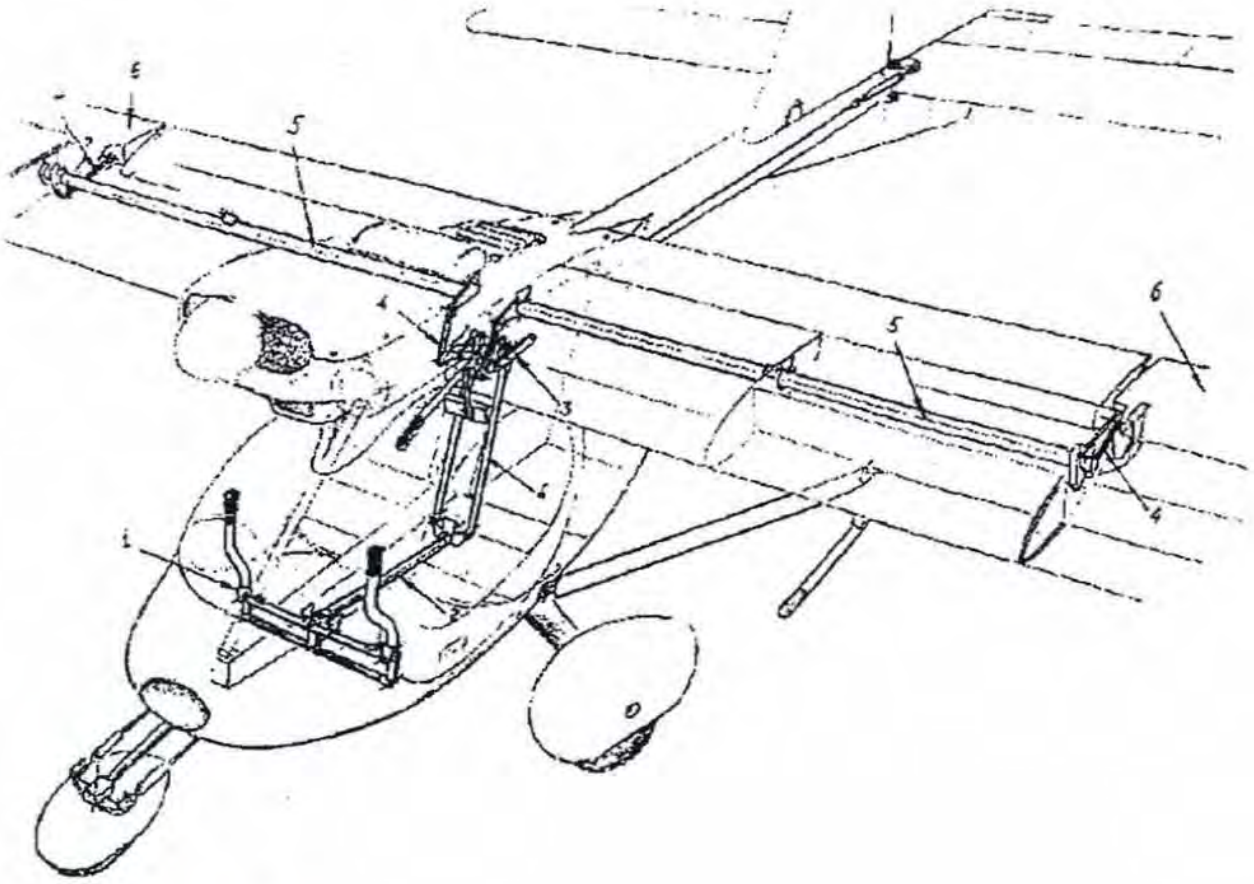
C. Looking at the bottom of the transponder, make sure the front lobe of the locking mechanism is in a vertical position. This can be accomplished by using a 3/32" Allen wrench through the face plate.

D. Slide the unit into the rack until the front lobe of the unit touches the rack. Guide pins on the back plate will help in the proper alignment of the unit in the rack.

E. Turn the Allen wrench clockwise until unit is secured in the rack. Continue turning until tight. Do not overtighten the screw.

F. To remove the unit from the rack, turn the 3/32" Allen wrench counterclockwise until it disengages from the rack.

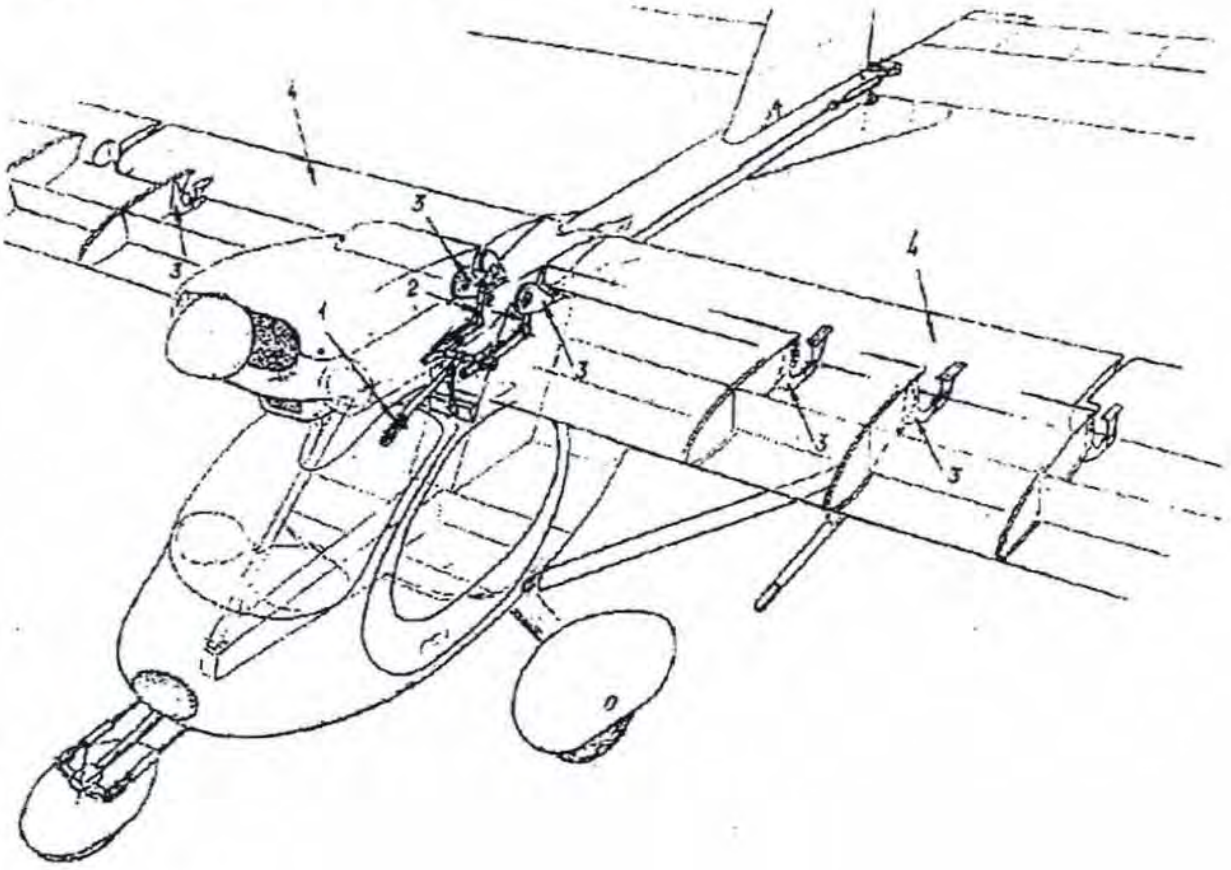
19. Appendix 5. Aileron Control Diagram



Aileron Control Diagram

1. Control station
2. Longitudinal shaft
3. Aileron droop mechanism
4. Control rod
5. Wing shaft
6. Aileron (deflection angles -25°… +18°)

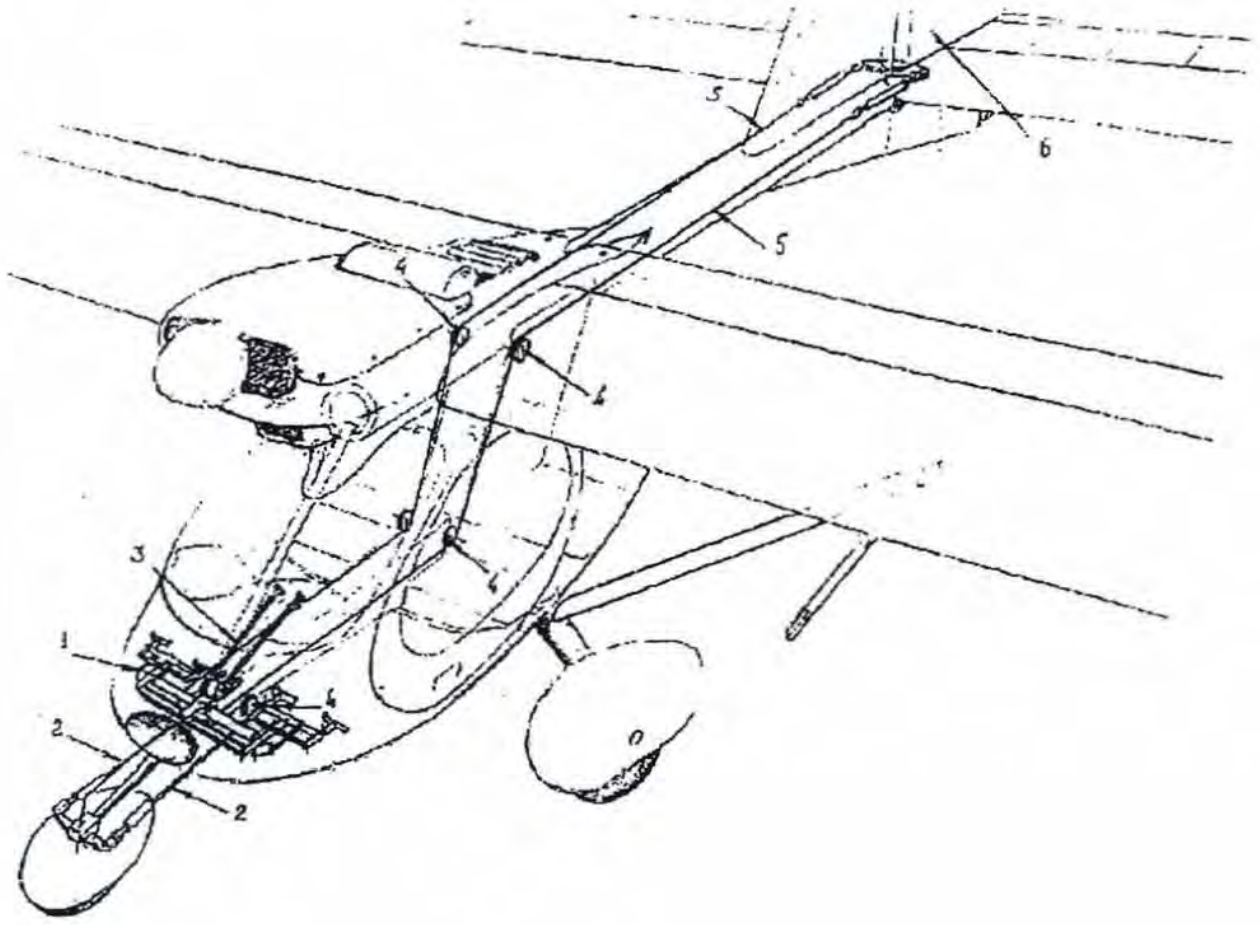
20. Appendix 6. Flap Control Diagram



Flap Control Diagram

1. Flap control lever
2. Flap control rods
3. Flap hinge brackets
4. Flap (takeoff position -20°, landing position -40°)

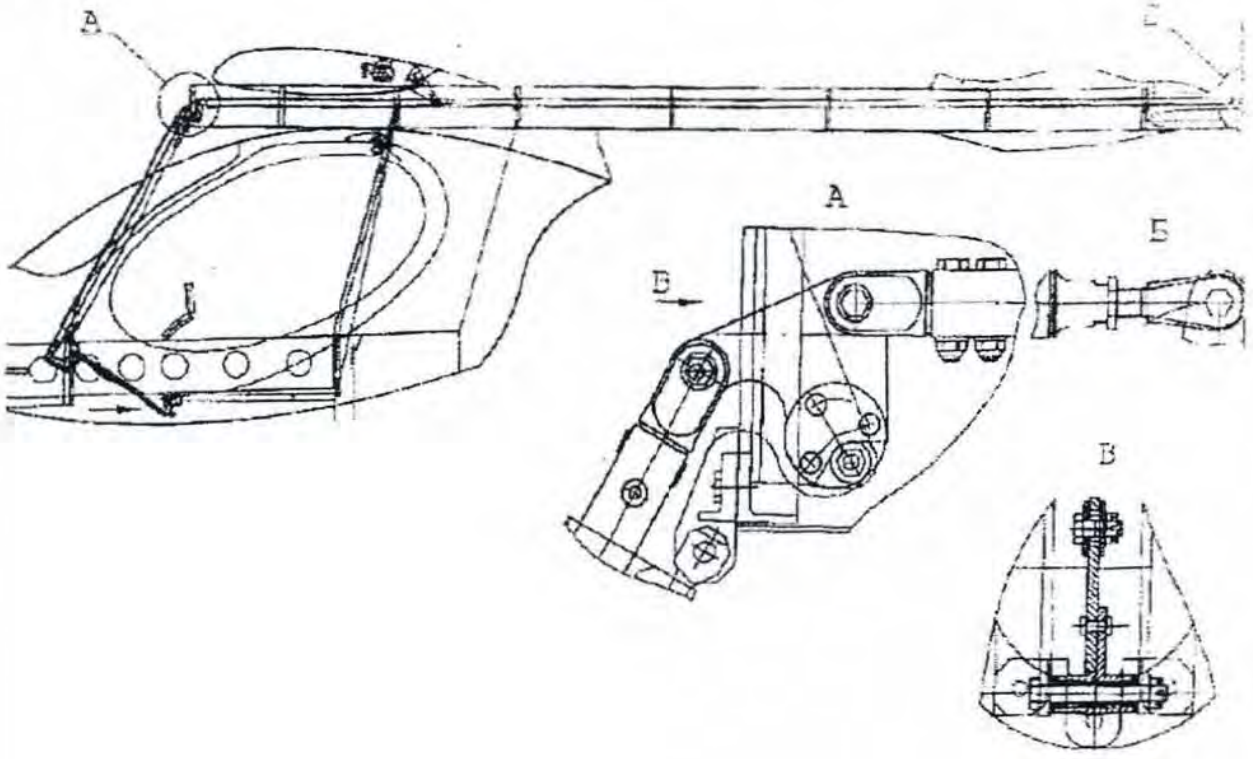
21. Appendix 7. Rudder Control Diagram



Rudder Control Diagram

1. Pedals
2. Nose landing gear control cables
3. Mechanism of pedals position adjustment to the pilot's height
4. Roller
5. Rudder control cables
6. Rudder (deflection angles -30°... +30°)

22. Appendix 8. Elevator Control Diagram



Elevator control diagram

23. Appendix 9. Tools and Equipment List

No.	NAME	QUANTITY
1.	2.	3.
	TOOLS	
1.	Wrenches	1
	x5.5	1
	x7	1
	x8	1
	x9	1
	x10	1
	x12	1
	x14	1
	x17	1
	x19	1
2.	Box wrenches	
	x5,5	1
	x7	1
	x9	1
	x10	1
	x8	1
	x12	1
	x14	1
	x17	1
	x19	1
3.	Socket head key with set of heads	
	x5,5	1
	x7	1
	x8	1
	x10	1
	x12	1
	x14	1
	x17	1
	x19	1
4.	Torque wrench with set of heads for hexagon-headed bolts	
	x8	1
	x10	1
	x12	1
	x14	1
	x17	1
	x19	1
5.	Universal-joint socket wrench with set of "star" heads	1
6.	Universal-joint socket wrench with set of "star" heads	1
7.	Socket wrench extension handle	1

1.	2.	3.
8.	Flat blade screwdrivers	
	L=85x3	1
	L=200x5	1
	L=250x6	1
9.	Phillips screwdrivers	
	L=150 #1	1
	L=200 #2	1
10.	Spark plug wrench	1
11.	Pliers	1
12.	Round-nose pliers	1
13.	Combination pliers	1
14.	Side-cutting pliers	1
15.	Electric soldering irons	
	x40W	1
	x60W	1
16.	Wire strippers	1
17.	Jack-knife	1
18.	Tweezers	1
19.	Hammer	1
20.	Wooden hammer	1
21.	Duralumin cotter driver	1
	CONSUMABLES	
1.	Cotton napkins, 50x50	10
2.	**Spark plug snuff remover**	1
3.	Car shampoo	
4.	Resin glass polish	1
5.	Soldering Flux	1
6.	Rosin	1
7.	POS-61 solder	0.1 kg
8.	KO-0,5 locking wire	2 m
9.	KO-0,8 locking wire	10 m
10.	Ethyl alcohol	0.5 L
11.	Kerosene	0.5 L
12.	B-70 petroleum spirit or rubber solvent	0.5 L
	ACCESSORIES	
1.	Folding ladder, H=1.5 m	1
2.	Upper beam support	1
3.	Filling accessory	1
4.	Duralumin cans, 20 L	3
5.	Gauge tanks	
	1 L	1
	5 L	1

1.	2.	3.
6.	Tank for test fuel sediment 0.5 L	1
7.	Tanks for waste oil, gas, and coolant	
8.	5 L	1
9.	20L	1
10.	Metal funnel, Ø = 200	1
11.	Plastic funnel with tip, Ø = 100	1
12.	Paper fuel filters	1
13.	Car foot pump	1
	Shock absorber filler pump	1
14.	High-pressure tank pressure regulator	
15.	rated 3.62 PSI (25 MPa)	1
16.	Syringe, 10 ÷50 cm^3	1
17.	Hair brush, width 50…100 mm	1
18.	Hair brush, width 10…15 mm	1
	Red paint	50 ml
	Dark blue paint	50 ml
	TESTING EQUIPMENT	
1.	KPU-3 test apparatus with set of heads for PVD-6m	1
2.	Car pressure gauge for landing gear tire pressure checkup	1
3.	Pressure gauge, max. 0.145 PSI (1 Mpa)	1
4.	Differential pressure meter, 2-hand or U-type	1
5.	Dynamometer, load range 250 ÷300 kg	1
6.	Dial indicator	1
7.	Caliper	1
8.	Metal ruler, 300 mm	1
9.	Level indicator	1
10.	Compression gauge	1
11.	Aileron, flap, and rudder angle indicator	1

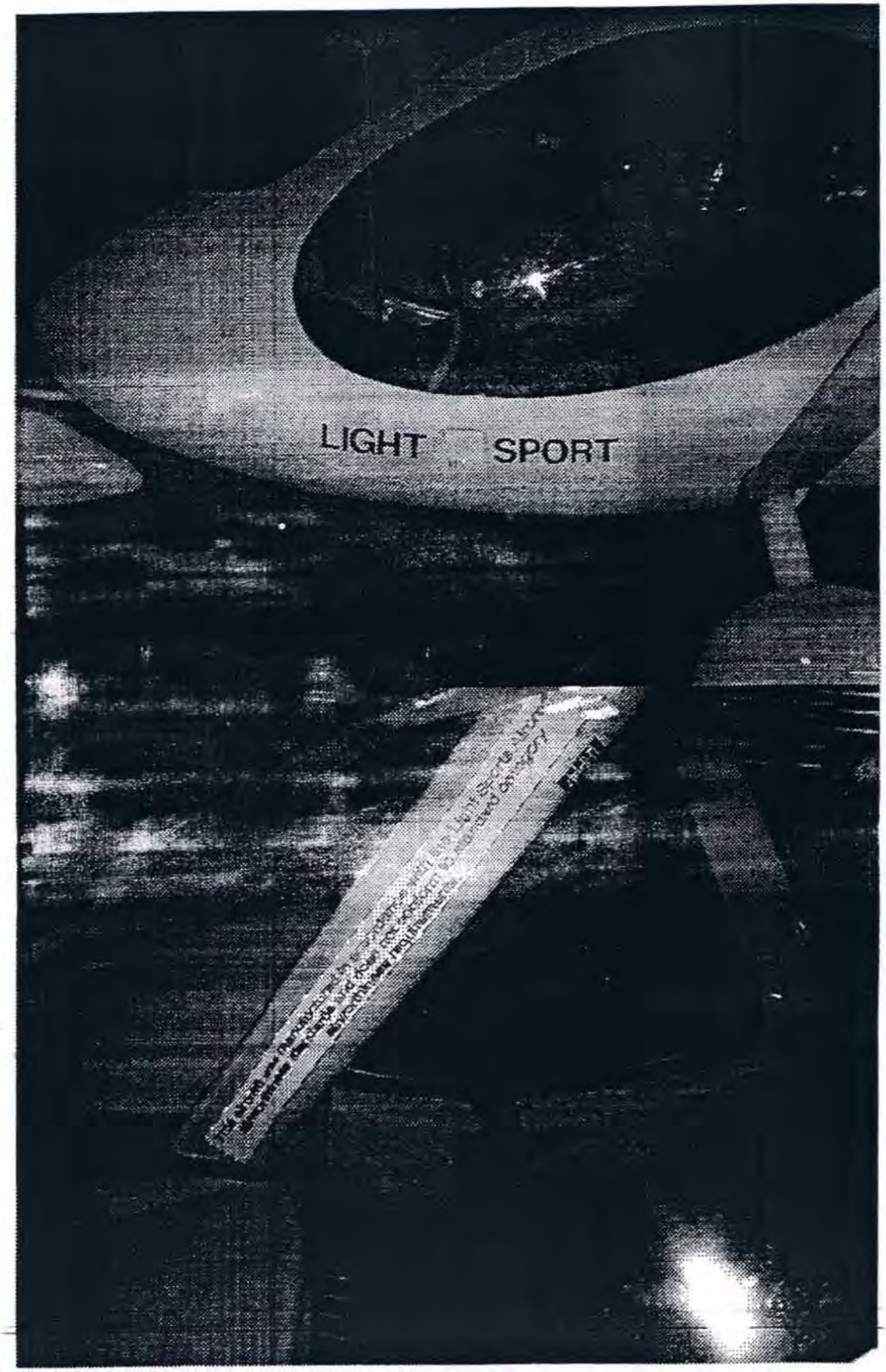
APPENIX 10 COCKPIT CONFIGURATION AND PLACARD

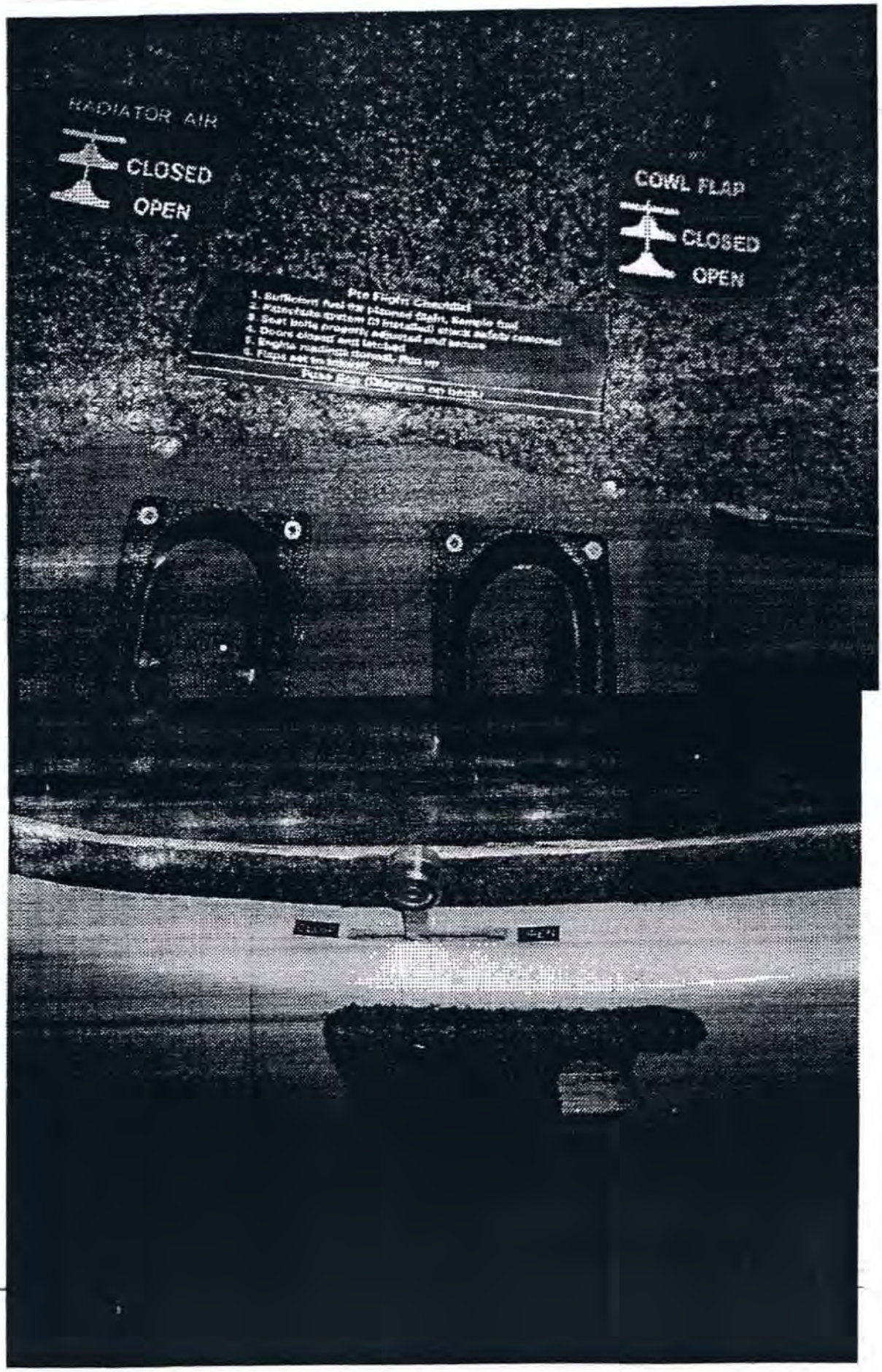
Sigma N222RU MAINTANCE MANUAL APPENDIX

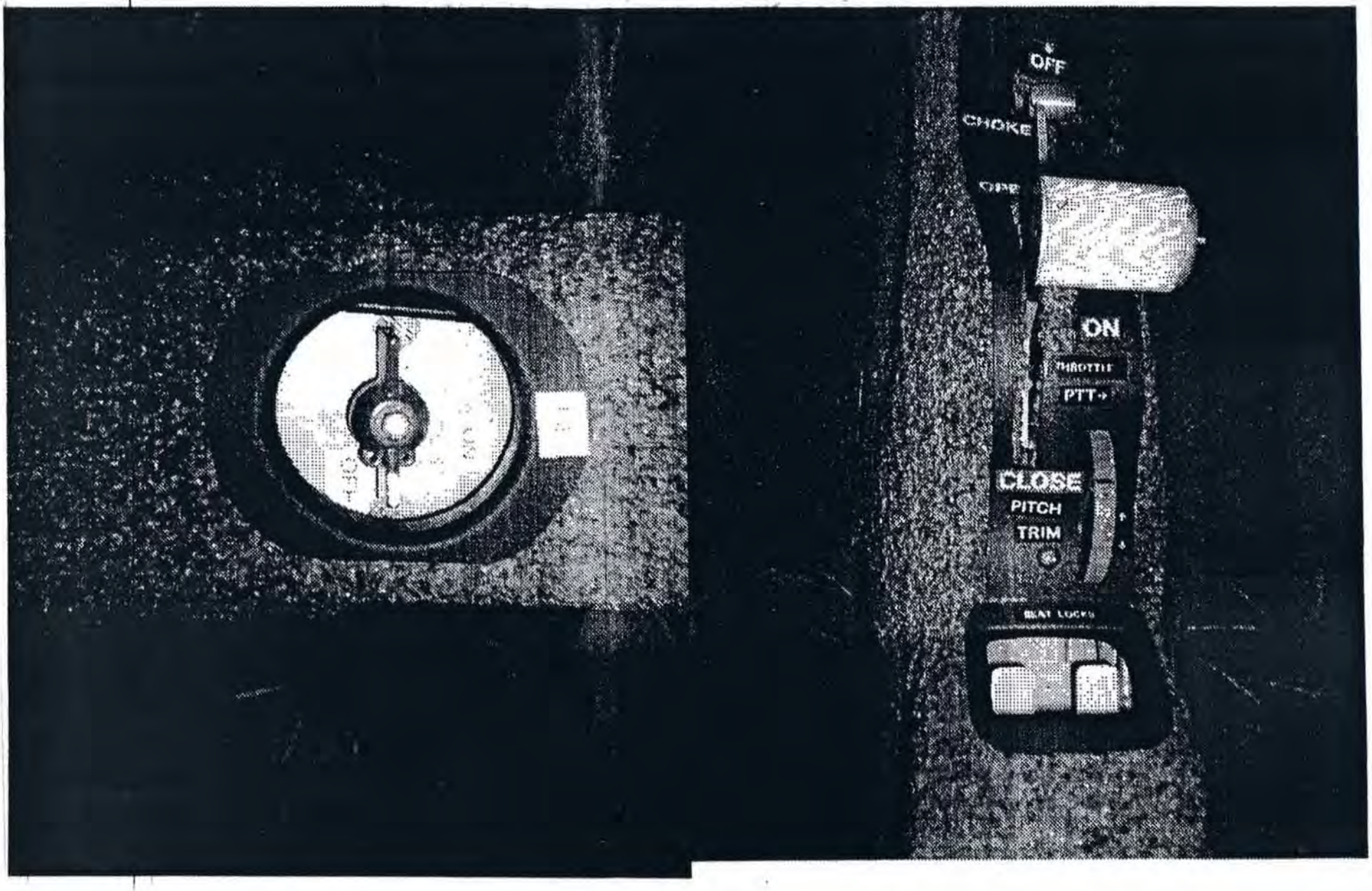
FlyDat, fuse block and fuel gauge found not in accordance with POH as received from factory. POH and maintenance manual pages updated by Vadim Degtyarev locally placed on file and approved by Luidmila Tarkhova.

The following pages depict aircraft cockpit configuration and placards of the following:

- Flight Instruments
- Switch Panel
- Fuel Valve
- Throttle Quadrant
- FlyDat and Fuel Gauge
- Overhead Preflight Checklist
- Door handles
- LIGHT SPORT decal
- Passenger Warning SLSA


LIGHT SPORT


RADIATOR AIR
CLOSED
OPEN
COWL FLAP
CLOSED
OPEN


OFF
CHOKE
ON
THROTTLE
PTT->
CLOSE
PITCH
TRIM


JDDE
PEDAL LOCK

APPENDIX 11 ALTIMETER INSTALLATION

Warranty

UMA, Inc. warrants all products to be free from defects in material and workmanship under normal use and operation. UMA does not warrant any product which has been damaged as the result of accident, abuse, negligence, improper operational voltage, lightning, fire, flood, or other acts of nature. Any indication that the unit has been opened can void warranty. Under no circumstances shall UMA be liable for any loss or damage, direct, consequential or incidental, arising from the use of or inability to use this product.

This warranty is limited to the repair or replacement, at the manufacturer's option, of any product or part thereof, which has been returned to UMA within the specified warranty period, and which after examination shall disclose to the customer serve department's satisfaction that the product is defective. Transportation to the factory or authorized service center must be prepaid; the product after repair or replacement, will be returned at the expense of the dealer or end customer. This warranty does not apply to any product or integral part thereof, which has been altered or serviced by other than the manufacturer or authorized service center.

The warranty period is twelve (12) months to the user.

This warranty supersedes all other warranties either expressed or implied and shall be governed and executed under the laws of the Commonwealth of Virginia, U.S.A.

Aircraft And Medical Instrume

UMA, Inc. • 260 N Main St., Box 100 • Dayton, Virginia 22821 • Phone (540)879-2(
FAX: (540) 879-27
E-mail umainc@rica.net Web Site http://www.umainstruments.

Altimeter Installation

Description:

The altimeter is one of the most used instrument in aircraft, it is also one of the oldest instruments. Since pressure changes with altitude, all altimeters used evacuated bellows or a capsule which expands or contracts due to the surrounding atmospheric pressure. Altimeter gives the altitude of the aircraft in relation to sea-level or to the ground.

Several types of altimeters exist, there are sensitive and non-sensitive altimeters. Sensitive altimeters have 2 or 3 pointers and have deviation markings every 20 feet, while non-sensitive have a single pointer and deviation markings every 100 feet. UMA only manufactures a non-sensitive type at this time.

Connection:

for 3 1/8" size- No connection is required, unless installed in a pressurized cabin or open cockpit with moving air behind panel.

Note: Do not connect 3 1/8" altimeter to static line, because case is not sealed and a static leak will result.

for 2 1/4" size- Connect "S" threaded (1/8" NPT) port to static line in aircraft.

Line-

Type: flexible tubing

Size: 1/4" OD X .028" - .035" ID

** Atmospheric pressure decreases approx. one inch of mercury per thousand feet.*

** Use knob to set barometric window to barometric pressure reading at closest airpo Altimeter reading should equal altitude of field, within 100 feet, after knob is set .*

** On the ground, to indicate absolute barometric pressure adjust Altimeter to zero then read mark in barometric window.*

APPENDIX 12 VERTICAL SPEED INDICATOR

Warranty

UMA, Inc. warrants all products to be free from defects in material and workmanship under normal use and operation. UMA does not warrant any product which has been damaged as the result of accident; abuse, negligence, improper operational voltage, lightning, fire, flood, or other acts of nature. Any indication that the unit has been opened can void warranty. Under no circumstances shall UMA be liable for any loss or damage, direct, consequential or incidental, arising from the use of or inability to use this product.

This warranty is limited to the repair or replacement, at the manufacturer's option, of any product or part thereof, which has been returned to UMA within the specified warranty period, and which after examination shall disclose to the customer serve department's satisfaction that the product is defective. Transportation to the factory or authorized service center must be prepaid; the product after repair or replacement will be returned at the expense of the dealer or end customer. This warranty does not apply to any product or integral part thereof, which has been altered or serviced by other than the manufacturer or authorized service center.

The warranty period is twelve (12) months to the user.

This warranty supersedes all other warranties either expressed or implied and shall be governed and executed under the laws of the Commonwealth of Virginia, U.S.A.

UMA

Aircraft And Medical Instr

UMA, Inc. • 260 N Main St., Box 1[illegible] Dayton, Virginia 22821 • Phone (540)87
FAX: (540) 87
E-mail umainc@rica.net Web Site http://www.umainstrun

Vertical Speed Indicator Installation Instructions

(Climb, or Rate of Climb Indicator)

Description:

This indicator senses the rate of climb or descent of an aircraft by measuring rate of pressure change due to the change in altitude. Several types of gauges standard VSI and a quick response IVSI. UMA only manufactures a standard V

Connection: Connect port to static line.

Line-

Type:

Size: 1/4" X .028" - .035"

Troubleshooting inaccurate Readings:

1.) First check all static connections, system must be airtight.

2.) If gauge is indicating descending at level flight, instrument case is probably leaking. Look around glass edge for discoloration. If suspected leak, return for

APPENDIX 13 AIRSPEED INDICATOR

Aircraft And Medical Instruments

UMA, Inc. • 260 N Main St., Box 100 • Dayton, Virginia 22821 • Phone (540)879-2040
FAX: (540) 879-2738
E-mail umainc@rica.net Web Site http://www.umainstruments.com

Airspeed Indicator Installation

There are three types of airspeed instruments.

IAS- Indicated Airspeed, is subject to slight Errors due to placement of the pitot and static sources and mechanical inaccuracies at various places in the range.
CAS- Calibrated Airspeed, airspeed reading that is corrected for errors caused by mounting and mechanics, ect.
TAS- True Airspeed, airspeed reading that is corrected for altitude and temperature differences.

Connections:

** All UMA airspeeds 2 1/4" and 3 1/8" have S and P stamped on rear of instrument.*

Connect "S" to static port of aircraft.
Connect "P" to pitot pressure tube.

Static Port:
Measures the outside atmospheric pressure. Ideally static port should be vented to left and right side of fuselage. Some pitot tubes offer a static connection. Static pressure should be connected to Airspeed, Altimeter, and Vertical Speed.

Pressure Port:
Connected to pitot line tube.

Pitot Tube: Size: 1/4" dia. aluminum tube approx. 6" lg.
Mounting: On left side of aircraft approx. 1' from wing, facing forward or into the relative wind so that it measures ram pressure effects.

Lines- Type: Size: 1/4" .028 - .035"wall thickness.

Airspeed Markings:
Vne = Red line, never exceeded
Vno = YA caution range, YA caution, max. structural cruising speed
Vfe = GA normal operating range, WA end, max. speed with flaps down
Vs1 = GA beginning, stall speed with gear and flaps up
Vs0 = WA beginning, stall speed with gear and flaps down

Trouble Shooting Inaccurate Readings:

1.) Pointer not reading zero when plane is at rest.
   a. Wind blowing into pitot-static tube.
   b. Water in connection tubes.
   c. Instrument in need of re-calibration.

2.) Instrument reading is lower than normal.
   a. Attention not given to the change in reading with altitude. Higher altitude = thinner air, thus lower reading.
   b. Pitot-static tube bent or damaged.
   c. Pitot-static tube not positioned correctly on aircraft.
   d. Connection tubing or instrument case not airtight.
   e. Instrument out of calibration.

3.) Instrument reading higher than normal.
   a. Connecting tubing or instrument case not airtight.
   b. Instrument out of calibration.

Warranty

UMA, Inc. warrants all products to be free from defects in material and workmanship under normal use and operation. UMA does not warrant any product which has been damaged as the result of accident, abuse, negligence, improper operational voltage, lightning, fire, flood, or other acts of nature. Any indication that the unit has been opened can void warranty. Under no circumstances shall UMA be liable for any loss or damage, direct, consequential or incidental, arising from the use of or inability to use this product.

This warranty is limited to the repair or replacement, at the manufacturer's option, of any product or part thereof, which has been returned to UMA within the specified warranty period, and which after examination shall disclose to the customer serve department's satisfaction that the product is defective. Transportation to the factory or authorized service center must be prepaid; the product after repair or replacement, will be returned at the expense of the dealer or end customer. This warranty does not apply to any product or integral part thereof, which has been altered or serviced by other than the manufacturer or authorized service center.

The warranty period is twelve (12) months to the user.

This warranty supersedes all other warranties either expressed or implied and shall be governed and executed under the laws of the Commonwealth of Virginia, U.S.A.

Prepared by R.T. Checked by P.G.	**AEROFLASH SIGNAL** 1715 West Carroll Avenue Chicago, IL 60612-2503 1-800-322-2052 • 1-312-733-3513	Page 1 of 1 Date 8/12/02 Revision Ltr: A ECO: 4427

Wiring Diagrams for Anti-Collision Light(s) and Flasher 150-0015

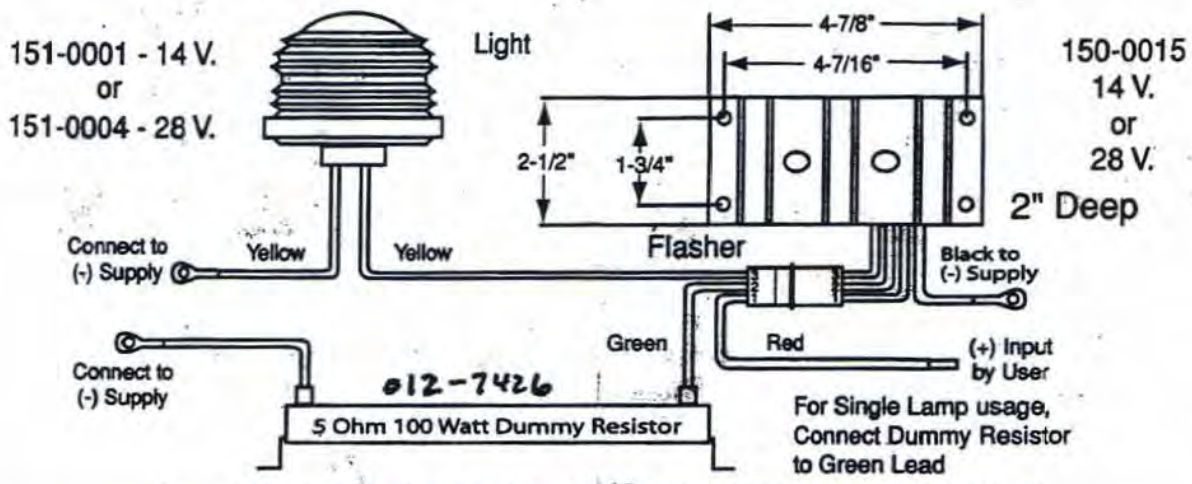


Fig 1 - Wiring Diagram for Single Light/Dummy Resistor

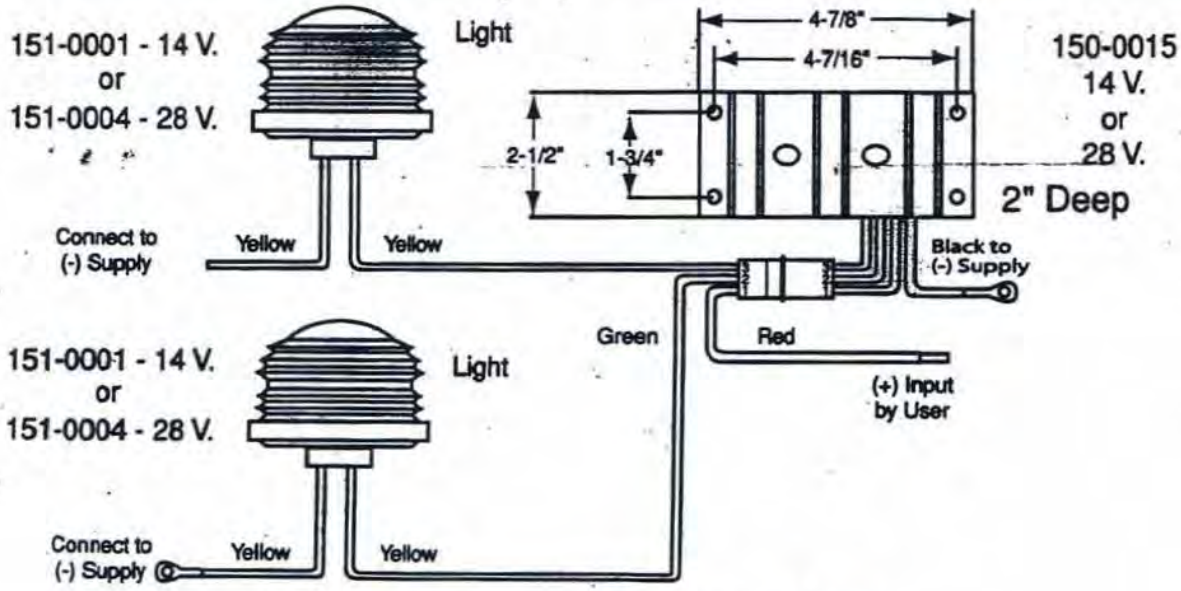


Fig 2 - Wiring Diagram for Two Lights

AEROFLASH SIGNAL 150-0015 FLASHER INSTRUCTIONS

1) FOR SINGLE LAMP OPERATIONS: FIGURE 1
Connect pin #1 (a red wire) to power input +28 volts or +14 volts. Connect pin #2 (a green wire) to one of the tabs on the Dummy Resistor. The other tab of the Dummy Resistor goes to ground. Connect pin #3 (a yellow wire) to one side of the lamp. The other side of the lamp goes to ground.

2) FOR DUAL LAMP OPERATION: FIGURE 2
Connect pin #1 (red wire) to power input +28 volts or + 14 volts. Connect pin #2 (a green wire) of the flasher unit and connect it to one side of a lamp (a yellow wire) and the other side of a lamp to ground. Pin #3 (a yellow wire) connects to the yellow wire of the other lamp and the other side of that lamp goes to ground.

Prep. by M.W. Ckd. by C.A.M.	**AEROFLASH SIGNAL** 1715 W. CARROLL AVE. *CHICAGO, IL 60612-9916* 1-800-322-2052 • 1-312-733-3513	Page 1 of 1 Date 8-12-02 *Rev. LTR A* *ECO #4422*

FEDERAL AVIATION ADMINISTRATION/PARTS MANUFACTURER APPROVAL

AEROFLASH P/N			DESCRIPTION	INSTALLATION ELIGIBILITY
OLD P/N	**NEW P/N**	**G.A.A.C. P/N**		
40-6 40-0027	040-0003	40-6A	24V. - 28V. Halogen Lamp	AA1B, AA5A, AA5B
40-14 40-0010	040-0028	40-14A	12V. - 14V. Halogen Lamp	AA1B, AA5A, AA5B
073-0141	SAME	73-154	Lamp Assy.	AA1B, AA5A, AA5B
150-0002	SAME	SAME	12V. - 14V. Single or Dual Flasher	AA1B, AA5A, AA5B
151-0001	SAME	A1E	12V. - 14V. Light Assy. Red Lens	AA1B, AA5A, AA5B
152-0003	152-0007	SAME	12V. - 14V. Power Supply	AA1B, AA5A, AA5B
153-0008 153-0003	SAME 153-0008		Strobe Assemblly	AA1B, AA5A, AA5B
		VARGA P/N		
073-0270	SAME	SAME	U-Type Flash Tube Assembly	2150A
152-0003 152-0008	152-0007	SAME	12V. - 14V. Power Supply	2150A
		ROCKWELL P/N		
150-0015	SAME	DVA - 2	12V. - 14V. or 24V. - 28V. Sgle. or Dual Flasher, DVA-2	112, 112B, 112TC, 112TCA, 114
151-0001	SAME	SAME	12V. - 14V. Light Assy. Red Lens	112, 112B, 112TC, 112TCA, 114
		GREAT LAKES P/N		
150-0015	SAME	DVA - 2	12V. - 14V. or 24V. - 28V. Sgle or Dual Flasher, DVA-2	2T-1A-1, -2
151-0001	SAME	SAME	12V. -14V. Light Assy. Red Lens	2T-1A-1, -2
		CESSNA P/N		
40-6 40-0027	040-0003	C17312-1	24V. - 28V. Halogen Lamp	210, 337, 28 Volt Version of 185, 188 206-207
40-14 40-0010	040-0028	C17312-3	12V. - 14V. Halogen Lamp	150, 172, 177, 177RG, 180, 182, 185, 188 206, 207
73-0165 73-0167	073-0270	C622006-0108	U-Type Flash Tube Assembly	150, 172, 177, 177RG, 180, 182, 188, 206 207, 210
150-0001	150-0002	C594501-0203	12V. - 14V. Single or Dual Flasher, A1E	150, 172, 177, 177RG, 180, 182, 185, 188 206, 207, 210
150-0009	SAME	C594501-0204	24V. - 28V. Single or Dual Flasher, A2E	337
150-0010	150-0015	C594502-0102	12V. - 14V. or 24V. - 28V. Single/Dual Flasher, DVA-2	150, 172, 177, 177RG, 180, 185, 188, 206, 207, 210
151-0001	SAME	C621001-0106	12V. - 14V. Lamp Assy. Red Lens, X1E-6	150, 172, 177, 177RG, 180, 182, 185, 188, 206, 207
151-0006	SAME	C621001-0102	24V. - 28V. Lamp Assy. Red Lens, X2E.	210, 337, 28 volt Version of 206, 207, 185, 188
152-0004	152-0007	C622008-0101	12V. - 14V. Power Supply	150, 172, 177, 177RG, 180, 182, 185, 188, 206, 207, R172, 210
152-0006	152-0010	C622008-0102	24V. - 28V. Power Supply	210, 28 volt Version of 185, 188, 206, 207, R182, 150, 172, 177, 177RG
153-0006	153-0009	C62206-0107	Wing Tip Strobe Assembly	150, 172, 177, 177RG, 180, 182, 185, 188 206, 207, 210

				Dwg. No. 140-0027

AEROFLASH SIGNAL

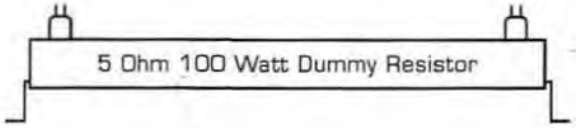
1715 W. Carroll Ave.
Chicago, IL 60612

INSTALLATION INSTRUCTIONS FOR A DUMMY LOAD RESISTOR

Dummy Load Resistor
PN 012-7426

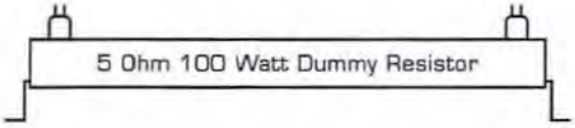
Weight = 3.5 oz.
Size = 6.5 in

150-0002



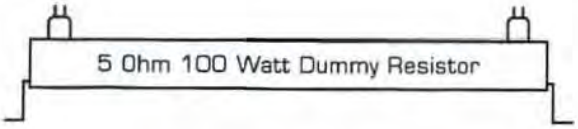
For Single Lamp Operation:
Connect one Terminal of the 5 ohm Dummy Resistor to the Yellow Flasher Lead from Pin #3 of the unmarked connector and the other Resistor Terminal to the Red Lead from Pin #2 of the unmarked connector (<+> Supply voltage - same as Flasher Red Lead). Make sure Resistor is securely mounted where it can dissipate heat well and does not heat the Flasher.

150-0003



For Single Lamp Operation:
Connect one Terminal of the 5 ohm Dummy Resistor to the remaining Yellow Flasher Lead and the other end of the resistor to ground. Make sure Resistor is securely mounted where it can dissipate heat well and does not heat the Flasher.

150-0015



For Single Lamp Operation
Connect one Terminal of the 5 ohm Dummy Resistor to the Green Flasher Lead from Pin #2 of the connector and the other Resistor Terminal to the <-> Supply voltage (Same as Flasher Black Lead). Make sure Resistor is securely mounted where it can dissipate heat well and does not heat the Flasher.

Drawn by E.G.	DATE 3/12/01
Checked by P.G.	DATE 3/12/01

GARMIN

320A

Transponder

pilot's guide

GARMIN International, Inc.
1200 East 151st Street, Olathe, Kansas 66062, U.S.A.
Tel. 913/397.8200 or 800/800.1020
Fax 913/397.8282

GARMIN (Europe) Ltd.
Unit 5, The Quadrangle, Abbey Park Industrial Estate, Romsey, SO51 9AQ, U.K.
Tel. 44/1794.519944
Fax 44/1794.519222

GARMIN Corporation
No. 68, Jangshu 2nd Road, Shijr, Taipei County, Taiwan
Tel. 886/2.2642.9199
Fax 886/2.2642.9099

Website Address: www.garmin.com

October 2000 Part Number 190-00133-09 Rev. A Printed in USA

Limited Warranty

GARMIN Corporation warrants this product to be free from defects in materials and workmanship for one year from the date of purchase. GARMIN will, at its sole option, repair or replace any components which fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor. The customer is, however, responsible for any transportation costs. This warranty does not cover failures due to abuse, misuse, accident or unauthorized alteration or repairs.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING ANY LIABILITY ARISING UNDER WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, STATUTORY OR OTHERWISE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, WHICH MAY VARY FROM STATE TO STATE.

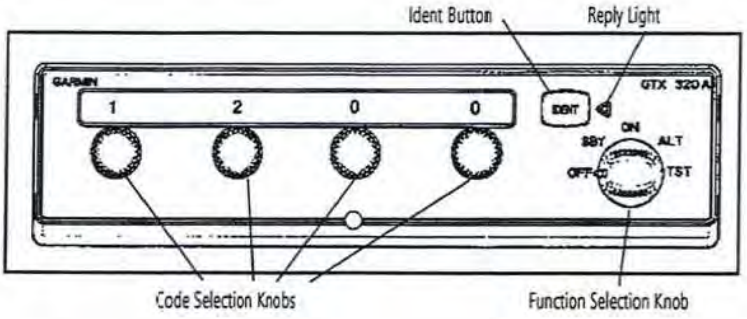
IN NO EVENT SHALL GARMIN BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE OR INABILITY TO USE THIS PRODUCT OR FROM DEFECTS IN THE PRODUCT. SOME STATES DO NOT ALLOW THE EXCLUSIONS OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

To obtain warranty service, call the GARMIN Customer Service department (913/397.8200) for a returned merchandise tracking number. The unit should be securely packaged with the tracking number clearly marked on the outside of the package, and sent freight prepaid and insured to a GARMIN warranty service station. A copy of the original sales receipt is required as the proof of purchase for warranty repairs. GARMIN retains the exclusive right to repair or replace the unit or software or offer a full refund of the purchase price at its sole discretion. SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

NOTE: The GTX 320A owner accepts all responsibility for obtaining the proper licensing before using the transponder.

NOTE: The coverage you can expect from the GTX 320A is limited to "line of sight". Low altitude or aircraft antenna shielding by the aircraft itself may result in reduced range. Range can be improved by climbing to a higher altitude. It may be possible to minimize antenna shielding by locating the antenna where dead spots are only noticed during abnormal flight attitudes.

CAUTION: The GTX 320A should be turned off before starting or shutting down aircraft engine(s).



Function Selector Switch:

The function selector switch is a five position rotary switch. The five positions are:

OFF-Turns off all power to the GTX 320A (the unit should be turned off before starting aircraft engine(s).

SBY-Turns the transponder on, but when in SBY the unit will not reply to any interrogations.

ON-The transponder transmits the aircraft's identification code (Mode A) but does not include altitude information.

ALT- The transponder transmits the aircraft's identification code, in Mode A and pressure altitude (29.92 inches Hg) information in Mode C provided the aircraft is equipped with an optional altitude encoder. The unit is normally operated in the ALT position at all times unless otherwise directed by ATC.

TST-Moving the switch to the TST position tests the reply light. The function selector is spring loaded and must be held in TST position. When released, it automatically returns to the ALT position.

Any time the function switch is in the ON or ALT position the transponder becomes an active part of the Air Traffic Control Radar Beacon System (ATCRBS). The transponder also responds to interrogations from TCAS equipped aircraft.

Code Selector

The code selector consists of four, eight-position switches that provide 4,096 active identification codes. The code selected should be either a VFR code or a code assigned by ATC. Regulations require that aircraft equipped with a transponder must operate the transponder, including Mode C equipment unless otherwise directed by ATC.

When making routine code changes, you should avoid inadvertent selection of codes 7500, 7600, or 7700 causing momentary false alarms at ground facilities. For example when switching from code 2700 to code 7200, switch first to 2200 then 7200, NOT to 7700 and then 7200.

This procedure applies to nondiscrete code 7500 and all discrete codes in the 7600 and 7700 series (i.e., 7600 to 7677, 7700 to 7777) which trigger special indicators in automated facilities. Only nondiscrete code 7500 will be decoded as the hijack code. An aircraft's transponder code is utilized for ATC tracking capability, therefore you should not turn the GTX 320A to SBY when making routine code changes.

Important Codes

1200-The United States VFR Code for any altitude.

7600-Loss of Communications.

7500-Hijacking (Never assigned by ATC without prior notification of the pilot that the aircraft is subject to unlawful interference).

7700-Emergency.

0000-Military use. Never squawk this Code.

See the Aeronautical Information Manual (AIM) for an explanation and uses of identification codes.

IDENT Button

On occasion, a controller will request "SQUAWK IDENT" to identify your transponder return from other aircraft. Respond by momentarily pressing the **IDENT** button, activating the Special Position Identification for approximately 20 seconds.

Reply Light

The reply light will blink each time the transponder replies to an interrogation. The reply light remains illuminated during the IDENT time interval and during **TST** function.

GTX 320A TRANSPONDER SPECIFICATIONS

TSO Compliance:	TSO C74c Class 1A
Temperature Range	-20°C to +55°C (Continuous Operation)
Installed weight with rack & connectors	2.9 lbs. (1.3 kg)
Physical dimensions:	
Bezel height	1.63 in. (41 mm)
Bezel width	6.25 in. (159 mm)
Depth behind panel incl. connectors	8.76 in. (223 mm)
Power Requirements	11.0 to 33.0 Vdc; Max Power Input: 12 Watts @ 500 prf
Humidity	95% @ +55°C for 16 Hours; 85% @ +38°C for 32 Hours
Altitude	50,000 Feet
Transmitter Frequency	1090 MHz
Transmitter Power	200 Watts Nominal
Receiver Frequency	1030 MHz
Receiver Sensitivity	-74dBm Nominal for 90% replies
Mode A Capability	4096 Identification Codes
Mode C Capability	100 Foot Increments from -1000 to 63,000 feet
External Suppression	Input - Low 0.5V; High 8V Output 18V Pulse

GARMIN International, Inc.
1200 East 151st Street, Olathe, Kansas 66062, U.S.A.

GARMIN (Europe) Ltd.
Unit 5, The Quadrangle, Abbey Park Industrial Estate, Romsey, SO51 9AQ, U.K.

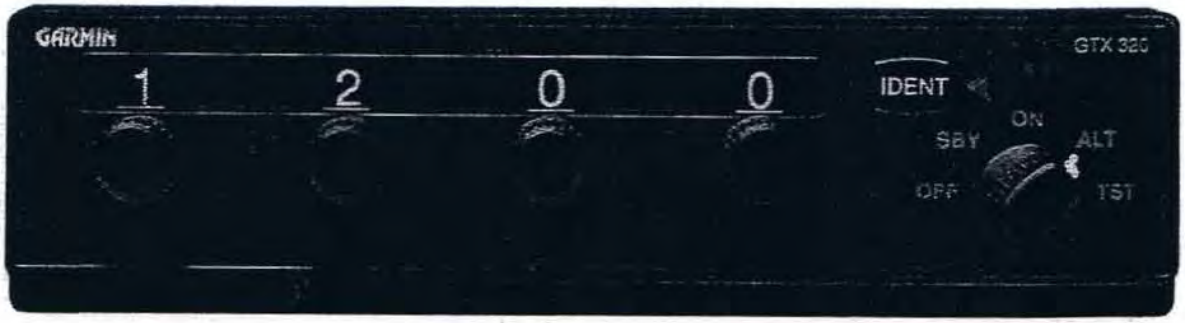
GARMIN Corporation
No. 68, Jangshu 2nd Road, Shijr, Taipei County, Taiwan

www.garmin.com

Part Number 190-00133-09 Rev. A

GARMIN

GTX 320/320A
Transponder Installation Manual



190-00133-01 July, 2006 Revision M

Garmin International, Inc.
1200 E. 151st Street
Olathe, KS 66062 USA
Telephone: 913-397-8200
Aviation Dealer Technical Support Line (Toll Free): (888) 606-5482
www.garmin.com

Garmin (Europe) Ltd.
Unit 5, The Quadrangle
Abbey Park Industrial Estate
Romsey, SO51 9DL U.K.
44/0870.851241

RECORD OF REVISIONS

Revision	Revision Date	Description	ECO #
A	02/10/97	Initial Rel	---
B	05/30/97	Clarify Antenna Requirements	7096
C	07/08/97	Lengthens Mount Screws, Add Notes	7344
D	08/21/97	Depth Behind Panel	7539
E	09/18/97	Wiring Diagram Corrections	7673
F	01/23/98	Add Spring Washer	8310
G	06/05/98	Correct reference to 50 ohm match bushing	8808
H	05/14/99	Updates and Corrections	10985
J	09/25/00	Redraw	14199
K	11/05/01	Updates and Clarifications	16878
L	06/06/02	Updated unit and accessory part numbers	18314
M	07/14/06	Corrected date on front cover and misc updates	40373

DOCUMENT PAGINATION

Section	Page Range
Table of Contents	iii — vi
Section 1	1-1 — 1-4
Section 2	2-1 — 2-10
Section 3	3-1 — 3-4
Appendix A	A-1 — A-8
Appendix B	B-1 — B-2
Appendix C	C-1 — C-16

INFORMATION SUBJECT TO EXPORT CONTROL LAWS

This document may contain information which is subject to the Export Administration Regulations ("EAR") issued by the United States Department of Commerce (15 CFR, Chapter VII, Subchapter C) and which may not be exported, released, or disclosed to foreign nationals inside or outside of the United States without first obtaining an export license. A violation of the EAR may be subject to a penalty of up to 10 years imprisonment and a fine of up to $1,000,000 under Section 2410 of the Export Administration Act of 1979. Include this notice with any reproduced portion of this document.

WARNING

This product, its packaging, and its components contain chemicals known to the State of California to cause cancer, birth defects, or reproductive harm. This Notice is being provided in accordance with California's Proposition 65. If you have any questions or would like additional information, please refer to our web site at www.garmin.com/prop65.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

GTX 320 HARDWARE MOD LEVEL HISTORY

The following table identifies hardware modification (Mod) Levels for the GTX 320 Transponder. Mod Levels are listed with the associated service bulletin number, service bulletin date, and the purpose of the modification. The table is current at the time of publication of this manual (see date on front cover) and is subject to change without notice. Authorized Garmin Sales and Service Centers are encouraged to access the most up-to-date bulletin and advisory information on the Garmin Dealer Resource web site at www.garmin.com using their Garmin-provided user name and password.

MOD LEVEL	SERVICE BULLETIN NUMBER	SERVICE BULLETIN DATE	PURPOSE OF MODIFICATION
1	NA	NA	Initial Release
2	9805	10-30-1998	Incorporates new circuitry in power supply

GTX 320A HARDWARE MOD LEVEL HISTORY

The following table identifies hardware modification (Mod) Levels for the GTX 320A Transponder. Mod Levels are listed with the associated service bulletin number, service bulletin date, and the purpose of the modification. The table is current at the time of publication of this manual (see date on front cover) and is subject to change without notice. Authorized Garmin Sales and Service Centers are encouraged to access the most up-to-date bulletin and advisory information on the Garmin Dealer Resource web site at www.garmin.com using their Garmin-provided user name and password.

MOD LEVEL	SERVICE BULLETIN NUMBER	SERVICE BULLETIN DATE	PURPOSE OF MODIFICATION

1 GENERAL DESCRIPTION

1.1 Introduction

This manual provides the installation and operating instructions for the Garmin GTX 320 and the GTX 320A Transponders. Information pertaining to the maintenance, alignment, and procurement of replacement parts is found in the GTX 320 Maintenance Manual, P/N 190-00133-02 and the GTX 320A Maintenance Manual, P/N 190-00133-08. After installation of the GTX 320/ GTX 320A, FAA Form 337 must be completed by an appropriately certificated agency and ATC transponder tests required by 14 CFR, Part 91.413 must be completed to return the aircraft to service.

1.2 Equipment Description

The Garmin GTX 320/320A Transponder is a radio transmitter and receiver that operates on radar frequencies. Receiving ground radar interrogations at 1030 MHz, it transmits a coded response of pulses to ground-based radar on a frequency of 1090 MHz.

As with other Mode A/Mode C transponders, the GTX 320/320A replies with any one of 4,096 codes, which differ in the position and number of pulses transmitted. By "replying" to ground transmissions, your GTX 320/320A enables ATC computers to display aircraft identification, altitude and ground speed on ATC radar screens. The GTX 320/320A is equipped with IDENT capability that activates the Special Position Identification Pulse (SPI) for approximately 20 seconds (18 seconds for the GTX 320A) identifying your transponder return from other aircraft on the controller's scope.

1.3 Technical Specifications

1.3.1 Transponder Specifications

Table 1-1 Transponder Specifications

Characteristic	Specification
TSO C74c Class 1A, JSTO C74C Class 1A	TSO, JTSO
(A1D1)-CA(BMN)XXXXXXZBABAUZXXXXXX	TSO ENV CAT
GTX 320: FAA TSO C74c; RTCA DO-160C, JTSO C74c GTX 320A: FAA TSO C74c; RTCA DO-160D, JTSO C74c	Applicable Documents
-20°C to +55°C (Continuous Operation)	Temperature Range
GTX 320: 14/28 VDC: 12 Watts Max. GTX 320A: 14/28 VDC: 20 Watts Max.	Power Requirements
95% @ +55°C for 16 Hours; 85% @ +38°C for 32 Hours	Humidity
50,000 Feet	Altitude
1090 MHz	Transmitter Frequency
125 Watts minimum, 150 Watts nominal at the antenna with 1.5 dB coaxial cable loss at 1090 MHz	Transmitter Power
1030 MHz	Receiver Frequency
GTX 320: -72 dBm Nominal for 90% replies GTX 320A: -74 dBm Nominal for 90% replies	Receiver Sensitivity
4096 Identification Codes	Mode A Capability
100 Foot Increments from -1000 to 63,000 Feet	Mode C Capability
Low ≤ 0.5 V; High ≥ 8 V	External Suppression Input

1.3.2 Physical Characteristics-GTX 320

Table 1-2 GTX 320 Physical Characteristics

Characteristic	Specification
Bezel Height	1.63 inches (41 mm)
Bezel Width	6.25 inches (159 mm)
Rack Height (Dimple to Dimple)	1.71 inches (43 mm)
Rack Width	6.30 inches (160 mm)
Depth Behind Panel with Connectors (measured from face of aircraft panel to rear of connector backshells)	8.78 inches (223 mm)
Weight (Unit Only)	1.7 lbs. (0.8 kg)
Weight (Installed with rack and connectors)	2.3 lbs. (1.1 kg)

1.3.3 Physical Characteristics-GTX 320A

Table 1-3 GTX 320A Physical Characteristics

Characteristic	Specification
Bezel Height	1.63 inches (41 mm)
Bezel Width	6.25 inches (159 mm)
Rack Height (Dimple to Dimple)	1.71 inches (43 mm)
Rack Width	6.30 inches (160 mm)
Depth Behind Panel with Connectors (measured from face of aircraft panel to rear of connector backshells)	8.78 inches (223 mm)
Weight (Unit Only)	2.3 lbs. (1.1 kg)
Weight (Installed with rack and connectors)	2.9 lbs. (1.3 kg)

1.4 Equipment Available

1.4.1 Available Configurations

Table 1-4 Available Configurations

Item	Garmin P/N
Garmin GTX 320 Transponder	010-00135-00
Garmin GTX 320A Transponder	010-00247-00
Garmin GTX 320 Transponder includes Garmin installation kit, P/N 010-10161-00	010-00135-03
Garmin GTX 320A Transponder includes Garmin installation kit, P/N 010-10161-01	010-00247-02

1.4.2 Installation Accessories

Table 1-5 Available Installation Accessories

Item	Garmin P/N
Mounting Rack	115-00285-00
Connector Kit	011-00651-01
Rear Backplate	011-00677-01
Mounting Rack, Rear Backplate and Connector Kit (Includes 115-00285-00, 011-00677-01 and 011-00651-01)	010-10161-01
Garmin GTX 320/320A Narco Adapter	010-10158-00
Garmin GTX 320/320A KT76A Adapter	010-10159-00
Garmin GTX 320/320A Antenna kit*	010-10160-00

* A transponder antenna approved to TSO C66( ) or C74( ) that has been installed to meet the requirements of this manual may be approved for use with the GTX 320/320A.

1.5 Additional Equipment Required

- Antenna Sealant - Use antenna manufacturer's instructions, install according to FAA AC 43.13-2A.
- Cables - The installer will supply all system cables. Cable requirements and fabrication is detailed in Section 2 of this manual.
- Hardware - #6 Flat Head Screw (6 ea.) and #6-32 Self Locking Nut (6 ea.). Hardware required to mount installation rack is not provided.

1.6 Installation Approval

The conditions and tests required for TSO approval of the GTX 320/320A Transponder and antenna are minimum performance standards. It is the responsibility of the installer to determine that the aircraft installation standards for a specific type or class of aircraft are in compliance with all applicable TSO requirements. The GTX 320/320A and antenna may be installed only if further evaluation by the applicant documents an acceptable installation and is approved by the administrator. For GTX 320/320A TSO compliance, see Appendix A. For antenna TSO compliance, refer to antenna manufacturer's literature.

1.7 ATC Transponder Tests and Inspections

The ATC transponder tests required by 14 CFR, Part 91.413 may be conducted using a bench check or portable test equipment and must meet the requirements prescribed in Part 43 Appendix F.

If portable test equipment with appropriate coupling to the aircraft antenna system is used, operate the test equipment for ATCRBS transponders at a nominal rate of 235 interrogations per second to avoid possible ATCRBS interference. An additional 3 dB loss is allowed to compensate for antenna coupling errors during receiver sensitivity measurements conducted in accordance with Part 43 Appendix F, Paragraph (c)(1) when using portable test equipment.

1.8 Limited Warranty

This Garmin product is warranted to be free from defects in materials or workmanship for two years from the date of purchase. Within this period, Garmin will at its sole option, repair or replace any components that fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor, provided that the customer shall be responsible for any transportation cost. This warranty does not cover failures due to abuse, misuse, accident or unauthorized alteration or repairs.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED OR STATUTORY, INCLUDING ANY LIABILITY ARISING UNDER ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, STATUTORY OR OTHERWISE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, WHICH MAY VARY FROM STATE TO STATE.

IN NO EVENT SHALL GARMIN BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE, OR INABILITY TO USE THIS PRODUCT OR FROM DEFECTS IN THE PRODUCT. Some states do not allow the exclusion of incidental or consequential damages, so the above limitations may not apply to you.

Garmin retains the exclusive right to repair or replace the unit or software or offer a full refund of the purchase price at its sole discretion. SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

To obtain warranty service, contact your local Garmin Authorized Service Center. For assistance in locating a Service Center near you, call Garmin Customer Service at one of the numbers shown below.

Products sold through online auctions are not eligible for rebates or other special offers from Garmin. Online auction confirmations are not accepted for warranty verification. To obtain warranty service, an original or copy of the sales receipt from the original retailer is required. Garmin will not replace missing components from any package purchased through an online auction.

Garmin International, Inc.
1200 East 151st Street
Olathe, Kansas 66062, U.S.A.
Phone: 913/397.8200
FAX: 913/397.8282

Garmin (Europe) Ltd.
Unit 5, The Quadrangle, Abbey Park Industrial Estate
Romsey, SO51 9DL, U.K.
Phone: 44/0870.851241
FAX: 44/0870.851251

2 INSTALLATION OVERVIEW

2.1 Introduction

This section provides the necessary information for installing the GTX 320/320A Transponders, and where required, optional accessories. Installation of the GTX 320/320A Transponder should comply with the aircraft Type Certificate (TC) or Supplemental Type Certificate (STC). Cabling will be fabricated by the installing agency to fit each particular aircraft. The guidance of FAA advisory circulars AC 43.13-1B and AC 43.13-2A, where applicable, may be found useful for accomplishing retro-fit installations that comply with FAA regulations. This section contains interconnect diagrams, mounting dimensions, and information pertaining to installation.

2.2 Unpacking and Inspecting Equipment

Carefully unpack the equipment and make a visual inspection of the unit for evidence of damage incurred during shipment. If the unit is damaged, notify the carrier and file a claim. To justify a claim, save the original shipping container and all packing materials. Do not return the unit to Garmin until the carrier has authorized the claim.

Retain the original shipping containers for storage. If the original containers are not available, a separate cardboard container should be prepared that is large enough to accommodate sufficient packing material to prevent movement.

2.3 Antenna Installation

2.3.1 Location Considerations

A. The antenna (Garmin P/N 010-10160-00) should be well removed from any major protrusions, the engine(s), propeller(s), and antenna masts. It should also be as far removed as practical from landing gear doors, access doors, or other openings that could alter its radiation pattern.

B. The antenna should be mounted on the underside of the aircraft and in a vertical position (relative to the position of the aircraft in level flight).

C. Avoid mounting the antenna within three feet of the ADF sense antenna or any other communication antenna and six feet from the DME antenna.

D. To prevent RF interference, the antenna must be mounted a minimum distance of three feet from the GTX 320/320A.

NOTE

If the antenna is being installed on a composite aircraft, ground planes may be required. Conductive wire mesh, radials, or thin aluminum sheets embedded in the composite material provide the proper ground plane allowing the antenna pattern (gain) to be maximized for optimum transponder performance.

2.3.2 Antenna Installation

Install the antenna according to the antenna manufacturer's instructions and FAA AC 43.13-2A.

2.3.3 Installation Approval Considerations for Pressurized Aircraft

Antenna and cable installations on pressurized cabin aircraft require FAA approved installation design and engineering substantiation data whenever such installations incorporate alteration (penetration) of the cabin pressure vessel by connector holes and/or mounting arrangements.

For needed engineering support pertaining to the design and approval of such pressurized aircraft antenna installations, it is recommended that the installer proceed according to any of the following listed alternatives:

1. Obtain approved antenna installation design data from the aircraft manufacturer.

2. Obtain an FAA approved Supplemental Type Certificate (STC) pertaining to and valid for the subject antenna installation.

3. Contact the FAA Aircraft Certification Office in the appropriate Region and request identification of FAA Designated Engineering Representatives (DERs) who are authorized to prepare and approve the required antenna installation engineering data.

4. Obtain FAA Advisory Circular AC-183C and select (and contact) a DER from the roster of individuals identified there under.

5. Contact an aviation industry organization such as the Aircraft Electronics Association and request their assistance.

2.3.4 Antenna Cable Installation

When routing antenna cables, observe the following precautions:

- All cable routing should be kept as short as possible and as direct as possible.
- Avoid sharp bends.
- Avoid routing cables near power sources (e.g., 400 Hz generators, trim motors, etc.) or near power for fluorescent lighting.
- Avoid routing cable near ADF antenna cable (allow at least a 12-inch separation).

The table below lists the recommended 50 ohm double shielded coax antenna cable vendor and the type to be used for specific lengths of cable. Adherence to this table will ensure that the coax installation will not exceed the maximum allowable 1.5 dB attenuation at the transmitter operating frequency of 1090 MHz.

Table 2-1 Antenna Coax Cable, Vendor & Type

Max. Length (feet)	ECS Type	MIL-C-17 Type	RG Type
8.8		M17/128	RG400
10.0	3C142B		
12.5		M17/112	RG304
17.0	311601	M17/127	RG393
21.0	311501		
27.0	311201		
41.0	310801		
Supplier Information	Vendor: Electronic Cable Specialists 5300 W. Franklin Drive Franklin, WI 53132 Tel: 800-327-9473 414-421-5300 Fax: 414-421-5301	MIL-C-17 types: See current issue of Qualified Products List QPL-17.	RG types: See current issue of Qualified Products List QPL-17.

2.3.5 Antenna Cable Connectors

One of two rack connectors is provided (item 6 or 12 in the installation drawing, figure B2). RF Adapter item 12 (P/N 330-00326-00) requires the cable to be terminated to an appropriate type BNC plug (provided by installer), which is then attached to item 12. Any 50 ohm, double shielded cable may be used, provided it introduces less than 1.5 dB attenuation at 1 GHz including the connector.

Connector item 6 (P/N 330-00198-00) requires the cable to be terminated directly to it and can accommodate only M17/128 (RG-400) cable. The completed cable including connectors must introduce no more than 1.5 dB attenuation at 1 GHz. Instructions for installing the item 6 are shown in Figure 2-1 and detailed in the following steps A-G.

2.6 Check Existing Coax and Antenna Before Using a GTX 320/320A Adapter in an Existing Installation

CAUTION

Before using a Narco or Bendix/King Adapter to install a GTX 320/320A into an existing installation, the RF coaxial cable, its connectors, and the antenna must be checked to ensure the following:

- There must be no corrosion or damage on the coax or its RF connectors that would adversely affect operation.
- The RF attenuation of the coax from the installation rack to the antenna must not exceed 1.5 dB at 1090 MHz.
- The antenna must not have corrosion, damage, or loose connections.

2.7 Installation Using Existing Narco AT 150 Installation Rack

The GTX 320 and GTX 320A can be used with an existing NARCO AT 150 Installation Rack by using the NARCO AT 150 Installation Adapter (P/N 011-00292-00). See figure B6 for the NARCO AT 150 Adapter assembly drawing.

NOTES

GTX 320 units that are at Mod Level 1 must use the Mod Level 1 NARCO Installation Adapter. After Mod Level 1, the GTX 320 sits 0.17" (4.3 mm) closer to the instrument panel. Also, when installing the GTX 320 in an existing NARCO AT 150 rack (using the AT 150 Adapter) and when the aircraft has a bus voltage of +28 VDC, make sure the +28 VDC dropping resistor is bypassed.

A. Slide the adapter into the rack installation until the jackscrew mates with its nut.

B. Turn the jack screw with a 3/32" Allen wrench until the adapter is secure.

C. Looking at the bottom of the transponder, make sure the front lobe of the locking mechanism is in a vertical position. This can be accomplished by using a 3/32" Allen wrench through the face plate.

D. Slide the unit into the rack until the front lobe of the unit touches the rack. Guide pins on the back plate will help properly align the unit in the rack.

E. Turn the Allen wrench clockwise until unit is secured in the rack. Continue turning until tight. Do not overtighten the screw.

F. To remove the unit from the rack turn the 3/32" Allen wrench counterclockwise until it disengages from the rack.

2.8 Installation Using Existing Bendix/King KT 76A/78A Installation Rack

The GTX 320 and GTX 320A can be used with an existing Bendix/King KT 76A/78A installation rack by using the KT 76A/78A Installation Adapter (P/N 011-00289-00). See figure B7 for the Bendix/King KT 76A/78A Adapter assembly drawing.

NOTES

GTX 320 units that are at Mod Level 1 must use the Mod Level 1 Bendix/King KT 76A/78A Installation Adapter. After Mod Level 1, the GTX 320 sits 0.17" (4.3 mm) closer to the instrument panel. Also, when installing the GTX 320 in an existing Bendix/King KT 76A/78A rack (using the KT 76A/78A Adapter) and when the aircraft has a bus voltage of +28 VDC, make sure the +28 VDC dropping resistor is bypassed.

A. Attach the KT 76A/78A installation adapter to the rear of the GTX 320 using the two captive screws on the adapter.

B. Looking at the bottom of the transponder, make sure the front lobe of the locking mechanism is in a vertical position. This can be accomplished by using a 3/32" Allen wrench through the face plate.

C. Slide the unit into the rack until the front lobe of the unit touches the rack. Guide pins on the back plate will help in the proper alignment of the unit in the rack.

D. Turn the Allen wrench clockwise until unit is secured in the rack. Continue turning until tight. Do not overtighten the screw.

E. To remove the unit from the rack, turn the 3/32" Allen wrench counterclockwise until it disengages from the rack.

3 POST INSTALLATION CONFIGURATION & CHECKOUT PROCEDURE

3.1 Aircraft Station Licensing Requirements

The Telecommunications Act of 1996, effective February 8, 1996, provides the FCC discretion to eliminate radio station license requirements for aircraft and ships. At the present time, you do not need an individual license to operate the GTX 320/320A aboard your private aircraft in many circumstances. To find out the specific details on whether you are exempt from licensing, please see FCC Fact Sheet PR 5000 or contact the FCC at (800)-322-1117.

If an aircraft license is required or desired, contact the FCC at (800)-322-1117 to request form 404, Application for Aircraft Radio Station License. The FCC also has a fax-on-demand service to provide forms by fax at (202)-418-0177.

The GTX 320/320A owner accepts all responsibility for obtaining the proper licensing before using the transponder.

3.2 Operation

NOTE

The coverage you can expect from the GTX 320/320A is limited to "line of sight". Low altitude or aircraft antenna shielding by the aircraft itself may result in reduced range. Range can be improved by climbing to a higher altitude. It may be possible to minimize antenna shielding by locating the antenna where dead spots are only noticed during abnormal flight attitudes.

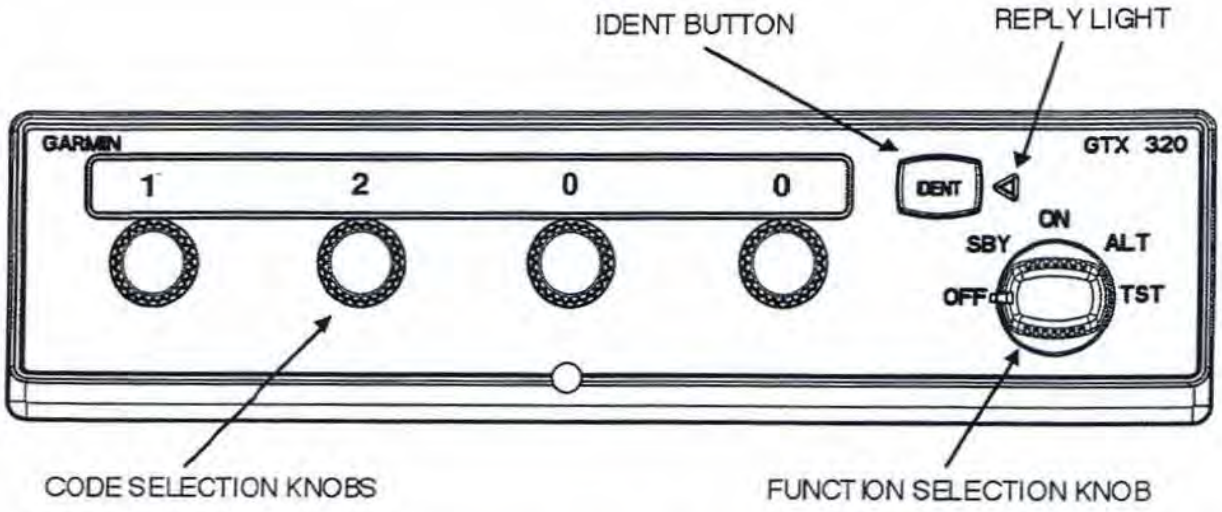


Figure 3-1. Transponder Front Panel (GTX 320 Shown)

NOTE

The Transponder should be turned off before starting aircraft engine(s).

3.2.1 Function Selection Switches

The function selector switch is a five position rotary switch. The five positions are:

- OFF — Turns off all power to the GTX 320/320A.
- SBY — Turns the transponder on, but when in SBY the transponder will not reply to any interrogations from the ground radar system.
- ON — Places the transponder in Mode A, the identification mode. In addition to the aircraft's identification code, the transponder will also reply to altitude interrogations (mode C) with signals that do not contain altitude information.
- ALT — Places the transponder in Mode A and Mode C, the identification and altitude reporting modes to respond to ATC aircraft identification interrogations and altitude interrogations with standard pressure altitude (29.92 inches Hg.) received from an external altitude digital encoder. The ALT position may be used in aircraft that are not equipped with the optional altitude encoder, however, the only response will be discreet signals that do not contain altitude information.

NOTE

Any time the function switch is in the ON or ALT position the transponder becomes an active part of the beacon system. Select ON or ALT as late as practical prior to takeoff and to OFF or SBY as soon as practical after completing landing roll unless the change to SBY has been accomplished previously at the request of ATC.

- TST — Turning the switch to the TST position tests the reply indicator. The TST position is spring loaded and must be held momentarily. When released, it will automatically return to the ALT position.

3.2.2 Code Selection

The code selector consists of four, eight position switches that provide 4,096 active identification codes.

NOTE

When making routine code changes, you should avoid inadvertent selection of codes 7500, 7600, or 7700 thereby causing momentary false alarms at automated ground facilities. For example when switching from code 2700 to code 7200, switch first to 2200 then 7200, NOT to 7700 and then 7200.

This procedure applies to nondiscrete code 7500 and all discrete codes in the 7600 and 7700 series (i.e., 7600-7677, 7700-7777) which trigger special indicators in automated facilities. Only nondiscrete code 7500 will be decoded as the hijack code. An aircraft's transponder code (when available) is utilized to enhance the tracking capabilities of the ATC facility, therefore you should not turn the transponder to SBY when making routine code changes.

See the Aeronautical Information Manual (AIM) for a detailed explanation of the identification codes.

3.2.3 IDENT Button

On occasion, the controller will request "SQUAWK IDENT". Respond by momentarily pressing and releasing the IDENT button. Pressing the IDENT button activates the Special Position Identification Pulse (SPI) for approximately 20 seconds identifying your transponder return from other aircraft on the controller's scope.

3.2.4 Reply Light

The reply light will blink each time the transponder replies to ground interrogation. The reply light also remains lit during the IDENT time interval.

Blank Page

APPENDIX A

CERTIFICATION DOCUMENTS

A.1 Continued Airworthiness

Other than for regulatory periodic functional checks, maintenance of the GTX 320/320A is "on condition" only. Refer to the GTX 320 and GTX 320A Maintenance Manuals. Periodic maintenance of the GTX 320/320A is not required.

This section provides assistance to the installing agency in preparing Instructions for Continued Airworthiness (ICA) in response to Bulletin Number HBAW 98-18, "Checklist for Instructions for Continued Airworthiness for Major Alterations Approved Under the Field Approval Process", effective 10/7/98.

Aviation Authority approved installers are hereby granted permission to reference appropriate service instructions and excerpts from this Installation Manual to accomplish the Instructions for Continued Airworthiness. This permission does not construe suitability of the documents. It is the applicant's responsibility to determine the suitability of the documents for the ICA.

Following is a suggested ICA for a Garmin GTX 320/320A unit installation. Some of the checklist items do not apply, in which case they should be marked "N/A" (Not Applicable).

Instructions For Continued Airworthiness, Garmin GTX 320/320A

1. Introduction

[Aircraft that has been altered: Registration (N-) number, Make, Model and Serial Number]

Content, Scope, Purpose and Arrangement:	This document identifies the Instructions for Continued Airworthiness for the modification of the above aircraft by installation of a Garmin GTX 320/320A.
Applicability:	Applies to aircraft altered by installation of the Garmin GTX 320/320A.
Definitions/Abbreviations:	None, N/A.
Precautions:	None, N/A.
Units of Measurement:	None, N/A.
Referenced Publications:	Garmin GTX 320/320A Installation Manual, P/N 190-00133-01 Garmin GTX 320 Maintenance Manual, P/N 190-00133-02 Garmin GTX 320A Maintenance Manual, P/N 190-00133-08 Garmin STC # [applicable STC number for the specific model installed, refer to Appendix B of this manual]. Garmin GTX 320/320A Pilot's Guide, P/N 190-00133-09.
Distribution:	This document should be a permanent aircraft record.

2. Description of the Alteration

Installation of the Garmin GTX 320/320A, with interface to Encoding Altimeter or Blind Encoder. Refer to section 2.4 and Appendix B of this manual for interconnect information. Antenna installation, removal and replacement should be in accordance with applicable provisions of AC43.13-1B and 43.13-2A.

3. **Control, Operation Information**
   Refer to the GTX 320/320A Pilot's Guide.

4. **Servicing Information**
   N/A

5. **Maintenance Instructions**
   Maintenance of the GTX 320/320A is 'on condition' only. Periodic maintenance is not required. Refer to the GTX 320 and the 320A Series Maintenance Manuals.

6. **Troubleshooting Information**
   Refer to the GTX 320 and the GTX 320A Maintenance Manuals.

7. **Removal and Replacement Information**
   Refer to section 2.4 of this manual. If the unit is removed and reinstalled, a functional check of the equipment should be conducted in accordance with section 3.2 of this manual.

8. **Diagrams**
   Refer to Appendix B of this manual.

9. **Special Inspection Requirements**
   N/A

10. **Application of Protective Treatments**
    N/A

11. **Data: Relative to Structural Fasteners**
    Antenna installation, removal and replacement should be in accordance with applicable provisions of AC43.13-1A and 43.13-2A. Also, refer to section 2.3 of this manual.

12. **Special Tools**
    N/A

13. **This Section is for Commuter Category Aircraft Only**
    A. Electrical loads: Refer to section 1.3 of this manual.
    B. Methods of balancing flight controls: N/A.
    C. Identification of primary and secondary structures: N/A.
    D. Special repair methods applicable to the airplane: Antenna installation, removal, and replacement should be in accordance with applicable provisions of AC43.13-1B and 43.13-2A.

14. **Overhaul Period**
    No additional overhaul time limitations.

15. **Airworthiness Limitation Section**
    N/A.

16. Revision

To revise this ICA, a letter must be submitted to the local FSDO with a copy of the revised FAA Form 337, and revised ICA. The FAA inspector accepts the change by signing Block 3 and including the following statement:

"The attached revised/new Instructions for Continued Airworthiness (date _____) for the above aircraft or component major alteration have been accepted by the FAA, superseding the Instructions for Continued Airworthiness (date _____)."

17. Assistance

Flight Standards Inspectors have the resources to respond to questions regarding the ICA.

Implementation and Record Keeping

For major alterations performed in accordance with FAA field approval policy, the owner/operator operating under Part 91 is responsible for ensuring that the ICA is made part of the applicable section 91.409 inspection program for their aircraft. This is accomplished when a maintenance entry is made in the aircraft's maintenance record in accordance with section 43.9. This entry records the major alteration and identifies the original ICA location (e.g., Block 8 of FAA Form 337, dated _____) along with a statement that the ICA is now part of the aircraft's inspection/maintenance requirements.

A.2 Environmental Qualification Form (GTX 320)

NOMENCLATURE: GTX 320 Airborne ATC Transponder Equipment

TYPE/MODEL/PART NO.: 010-00135-00/10 TSO - C74c Class 1A

MANUFACTURER'S SPECIFICATION AND/OR OTHER APPLICABLE SPECIFICATION: 004-00042-00

MANUFACTURER: Garmin International

ADDRESS: 1200 E 151st St, Olathe, Kansas 66062

Table A-1 GTX 320 EQF Table

Conditions	RTCA DO-160C Section	Description of Conducted Tests
Temperature and Altitude	4.0	Equipment tested to Categories A1 & D1 except as noted
Low Temperature	4.5.1	
High Temperature	4.5.2. & 4.5.3	
In-Flight Loss of Cooling	4.5.4	Cooling air not required
Altitude	4.6.1	
Decompression	4.6.2	
Overpressure	4.6.3	
Temperature Variation	5.0	Equipment tested to Category C
Humidity	6.0	Equipment tested to Category A
Shock	7.0	Equipment tested according to DO-160C, Par. 7.2.1
Operational	7.2	
Crash Safety	7.3	
Vibration	8.0	Equipment tested without shock mounts to Categories B, M and N (Table 8-1)
Explosion	9.0	Equipment identified as Category X, no test required
Waterproofness	10.0	Equipment identified as Category X, no test required
Fluids Susceptibility	11.0	Equipment identified as Category X, no test required
Sand and Dust	12.0	Equipment identified as Category X, no test required
Fungus	13.0	Equipment identified as Category X, no test required
Salt Spray	14.0	Equipment identified as Category X, no test required
Magnetic Effect	15.0	Equipment tested to Class Z
Power Input	16.0	Equipment tested to Category B
Voltage Spike	17.0	Equipment tested to Category A

Table A-1 GTX 320 EQF Table (continued)

Conditions	RTCA DO-160C Section	Description of Conducted Tests
Audio Frequency Susceptibility	18.0	Equipment tested to Category B
Induced Signal Susceptibility	19.0	Equipment tested to Category A
Radio Frequency Susceptibility	20.0	Equipment tested to Category U
Radio Frequency Emission	21.0	Equipment tested to Category Z
Lightning Induce Transient Susceptibility	22.0	Equipment identified as Category XXXX, no test required
Lightning Direct Effects	23.0	Equipment identified as Category X, no test required
Icing	24.0	Equipment identified as Category X, no test required
Other Tests		
Remarks- None		

A.3 Environmental Qualification Form (GTX 320A)

Nomenclature: GTX320A Airborne ATC Transponder Equipment

Type/Model/Part No.: 010-00247-( ) TSO - C74c Class 1A
(Includes 011-00728-( ))

Manufacturer's Specification And/Or Other Applicable Specification: 004-00111-00

Manufacturer: Garmin Corporation

Address: 1200 E 151st St., Olathe, Kansas 66062

Table A-2 GTX 320A EQF Table

Conditions	RTCA DO-160D Section	Description of Conducted Tests
Temperature and Altitude	4.0	Equipment tested to Categories A1 & D1
Low Temperature	4.5.1	
High Temperature	4.5.2. & 4.5.3	
In-Flight Loss of Cooling	4.5.4	Cooling Air Not Required
Altitude	4.6.1	
Decompression	4.6.2	
Overpressure	4.6.3	
Temperature Variation	5.0	Equipment tested to Category C
Humidity	6.0	Equipment tested to Category A
Shock	7.0	Equipment tested to Category B
Vibration	8.0	Equipment tested in each aircraft type to aircraft zone 2. Aircraft Type 2 and 6 were tested to Category S2, Vibration level B2. Aircraft Type 3, 4 and 5 were tested to Category S, Vibration level M. Note: Vibration level M modified to increase level to RTCA DO-160C Curve N for Helicopters as follows-0.1 inches peak-to-peak double amplitude from 5 Hz to 17 Hz, 1.5 g-Pk from 17 Hz to 500 Hz.
Explosion	9.0	Equipment identified as Category X, no test required
Waterproofness	10.0	Equipment identified as Category X, no test required
Fluids Susceptibility	11.0	Equipment identified as Category X, no test required
Sand and Dust	12.0	Equipment identified as Category X, no test required
Fungus	13.0	Equipment identified as Category X, no test required

Table A-2 GTX 320A EQF Table (continued)

Conditions	RTCA DO-160D Section	Description of Conducted Tests
Salt Spray	14.0	Equipment identified as Category X, no test required
Magnetic Effect	15.0	Equipment tested to Class Z
Power Input	16.0	Equipment tested to Category A
Voltage Spike	17.0	Equipment tested to Category A
Audio Frequency Susceptibility	18.0	Equipment tested to Category B
Induced Signal Susceptibility	19.0	Equipment tested to Category A
Radio Frequency Susceptibility	20.0	Equipment tested for conducted susceptibility to Category T, radiated susceptibility to Category T, and pulse test to Category T.
Radio Frequency Emission	21.0	Equipment tested to Category B, Equipment tested to Category M up to 2 GHz.
Lightning Induced Transient Susceptibility	22.0	Equipment identified as Category XXXX, no test required
Lightning Direct Effects	23.0	Equipment identified as Category X, no test required
Icing	24.0	Equipment identified as Category X, no test required
Electrostatic Discharge	25.0	Equipment identified as Category X, no test required
Remarks- None		

Blank Page

APPENDIX B

STC PERMISSION

Consistent with N8110.69 or Order 8110.4, Aviation Authority approved installations are hereby granted permission to use STC # SA00642WI data to modify aircraft.

United States of America

Department of Transportation -- Federal Aviation Administration

Supplemental Type Certificate

Number SA00642WI

This certificate issued to -

GARMIN International
1200 East 151st Street
Olathe, KS 66062

certifies that the change in the type design for the following product with the limitations and conditions thereto as specified hereon meets the airworthiness requirements of Part 3 *of the* Civil Air *Regulations.*

Original Product - Type Certificate Number : 2A3

Make : Mooney

Model : M20J

Description of Type Design Change:
Installation of GARMIN Transponder, GTX 320, in accordance with GARMIN Master Document List (MDL) Number 005-00060-00, Revision G, Dated April 2, 1998, or later FAA Approved Revision.

Limitations and Conditions: Compatibility of this design change with previously approved modifications must be determined by the installer. If the holder agrees to permit another person to use this certificate to alter the product, the holder shall give the other person written evidence of that permission.

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application : November 20, 1995

Date of issuance : April 02, 1998

Date reissued :

Date amended :

By direction of the Administrator

(Signature)

Jose R. Flores
Senior Electrical/Avionics Engineer
Wichita Aircraft Certification Office

(Title)

Any alteration of this certificate is punishable by a fine of not exceeding $1,000, or imprisonment not exceeding 3 years, or both.

FAA Form 8110-2(10-68) PAGE 1 of 2 PAGES This certificate may be transferred in accordance with FAR 21.47.

APPENDIX C

ASSEMBLY AND INSTALLATION DRAWINGS

C.1 GENERAL

This section contains the following installation drawings:

- C-1, GTX 320/320A Outline Drawing
- C-2, GTX 320/320A Connector/Rack Kit Assembly Drawing
- C-3, GTX 320/320A Recommended Panel Cutout Dimensions
- C-4, GTX 320/320A Interconnect Wiring Diagram
- C-5, Dual Transponder Interconnect Wiring Diagram
- C-6, Narco AT 150 Installation Adapter Assembly Drawing
- C-7, King KT 76A/78A Adapter Assembly Drawing

Blank Page

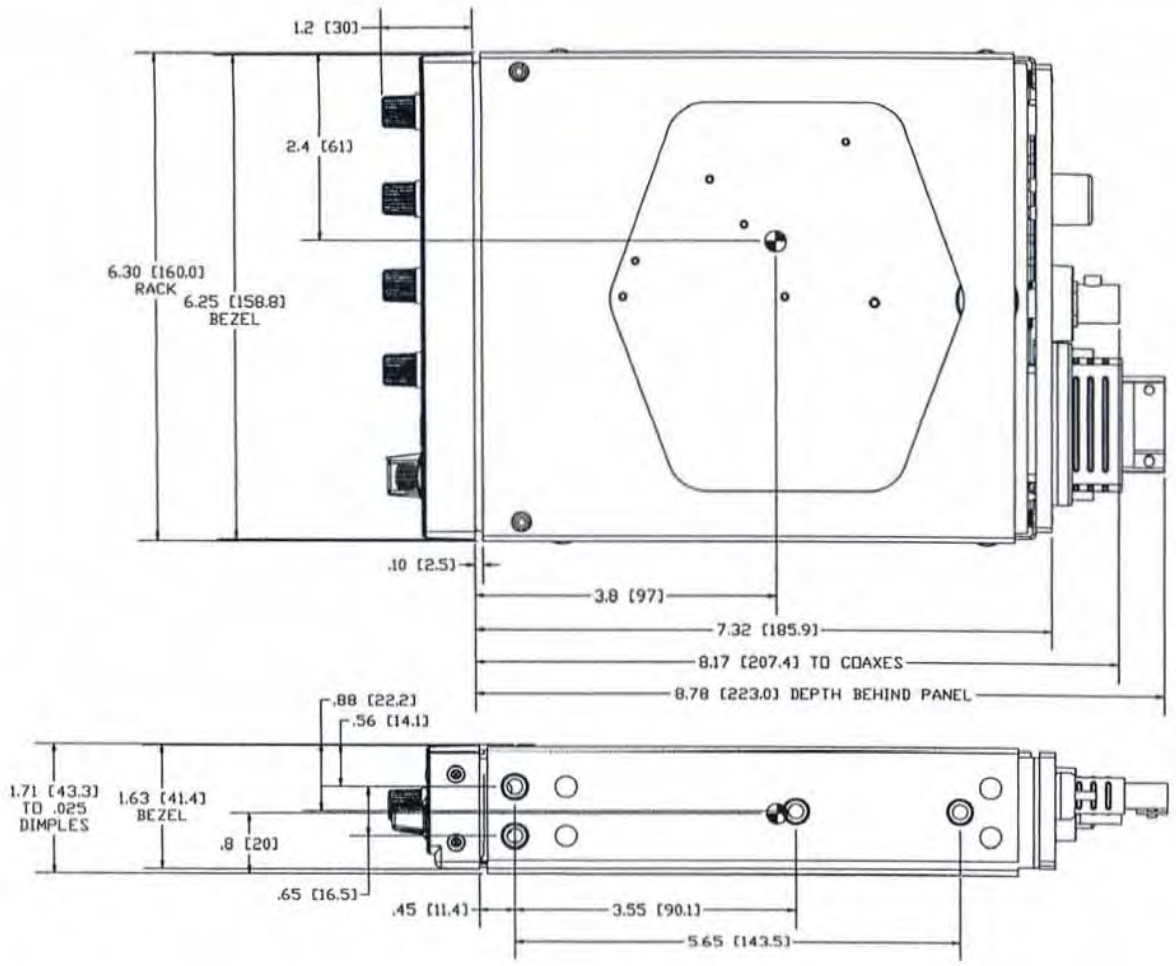
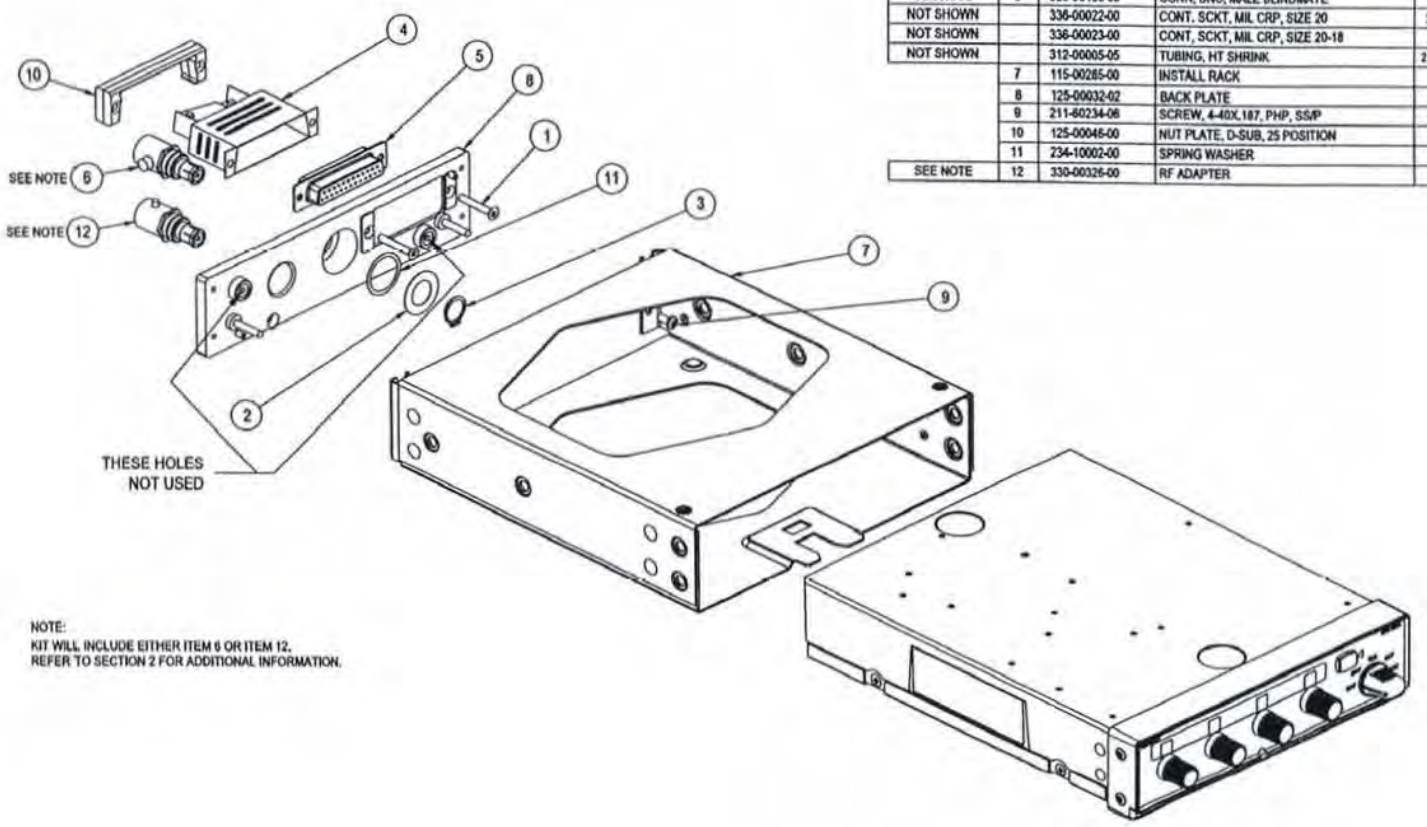


Figure C-1 GTX 320/320A OUTLINE DRAWING

011-00338-00 CONNECTOR/RACK KIT				
	ITEM	PART NUMBER	DESCRIPTION	QTY
	1	211-63234-12	SCREW, 4-40X.75, FLHP, SS/P	2
	2	212-20014-00	WSHR, FLAT, NON-STD, SS	1
	3	232-00013-01	SNAP RING, EXT, 7/16	1
	4	330-00220-25	BACKSHELL, D-SUB, METAL, 25 POS.	1
	5	330-00184-25	CONN., D-SUB, MIL CRP, SCKT, 25	1
SEE NOTE	6	330-00198-00	CONN, BNC, MALE BLINDMATE	1
NOT SHOWN		336-00022-00	CONT, SCKT, MIL CRP, SIZE 20	25
NOT SHOWN		336-00023-00	CONT, SCKT, MIL CRP, SIZE 20-18	5
NOT SHOWN		312-00005-05	TUBING, HT SHRINK	2.0IN.
	7	115-00285-00	INSTALL RACK	1
	8	125-00032-02	BACK PLATE	1
	9	211-60234-06	SCREW, 4-40X.187, PHP, SS/P	4
	10	125-00046-00	NUT PLATE, D-SUB, 25 POSITION	1
	11	234-10002-00	SPRING WASHER	1
SEE NOTE	12	330-00326-00	RF ADAPTER	1



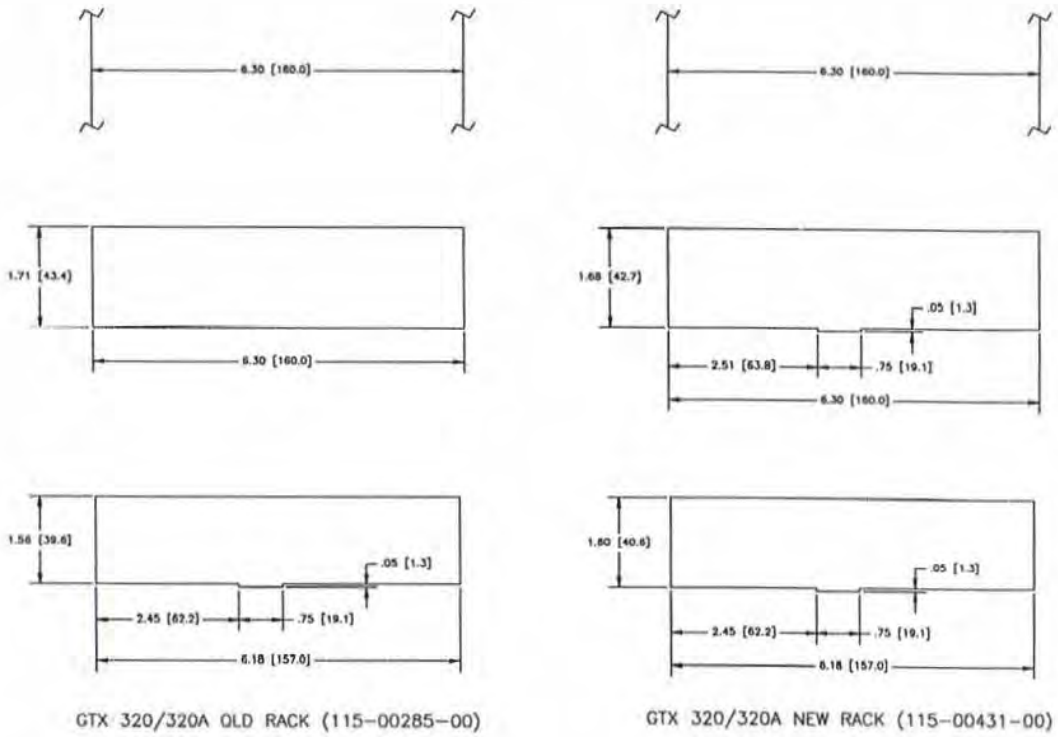
NOTE:
KIT WILL INCLUDE EITHER ITEM 6 OR ITEM 12.
REFER TO SECTION 2 FOR ADDITIONAL INFORMATION.

Figure C-2 GTX 320/320A CONNECTOR/RACK KIT ASSEMBLY DRAWING

OPTION 1:
STACK CUTOUT (RACK INSTALLED FROM FRONT OF AIRCRAFT PANEL)

OPTION 2:
RADIO CUTOUT (RACK INSTALLED FROM FRONT OF AIRCRAFT PANEL)

OPTION 3:
RADIO CUTOUT (RACK INSTALLED FROM BACK OF AIRCRAFT PANEL ONLY) MAXIMUM AIRCRAFT PANEL THICKNESS IS .125 INCH [3.2 mm]



GTX 320/320A OLD RACK (115-00285-00)

GTX 320/320A NEW RACK (115-00431-00)

NOTES:
1. DIMENSIONS: INCH [mm].
2. IF THE FRONT LIP OF THE MOUNTING RACK IS BEHIND THE SURFACE OF THE AIRCRAFT PANEL, THE UNIT CONNECTORS MAY NOT FULLY ENGAGE.

Figure C-3 GTX 320/320A RECOMMENDED PANEL CUTOUT DIMENSIONS

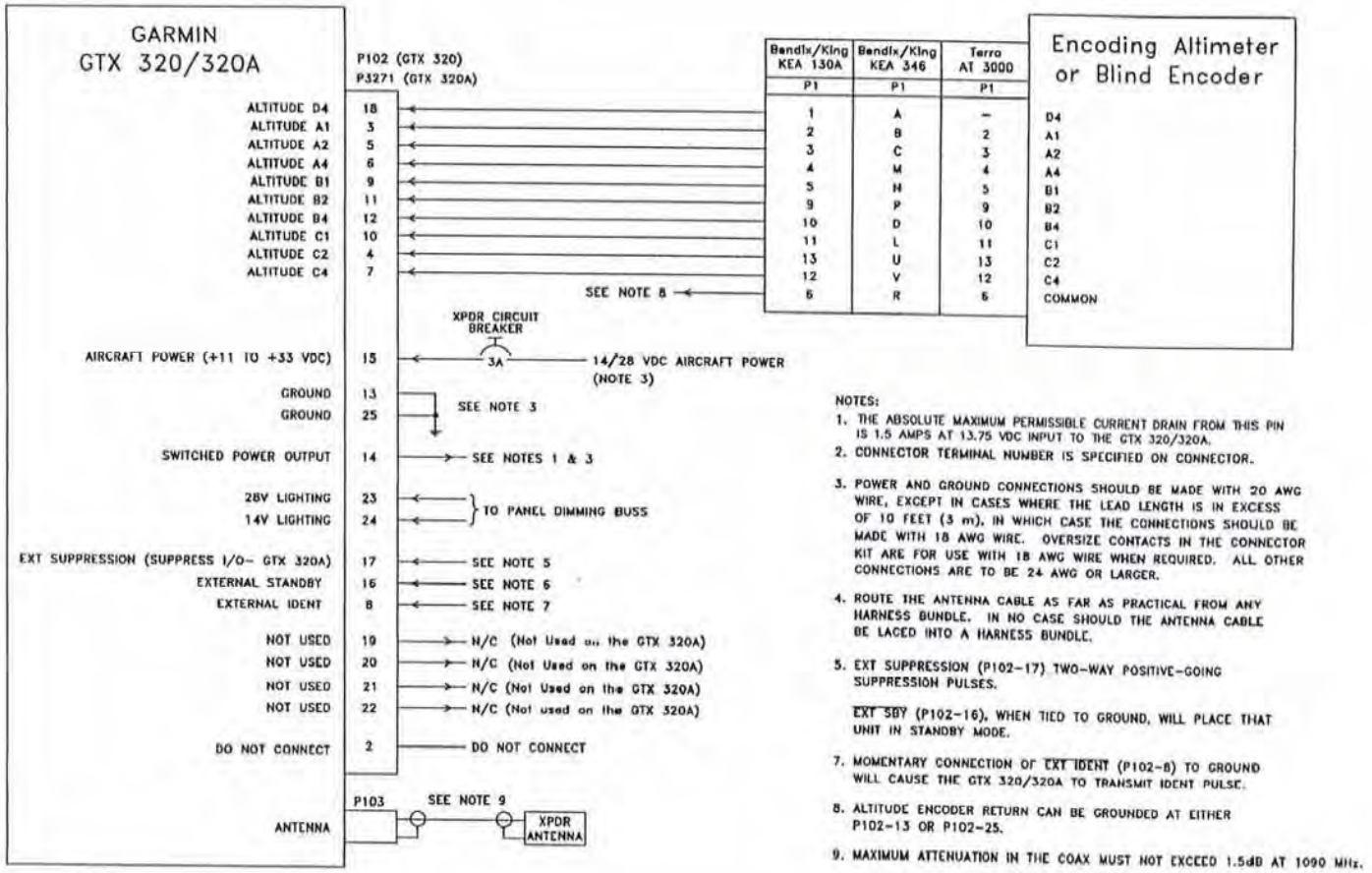


Figure C-4 GTX 320/320A INTERCONNECT WIRING DIAGRAM

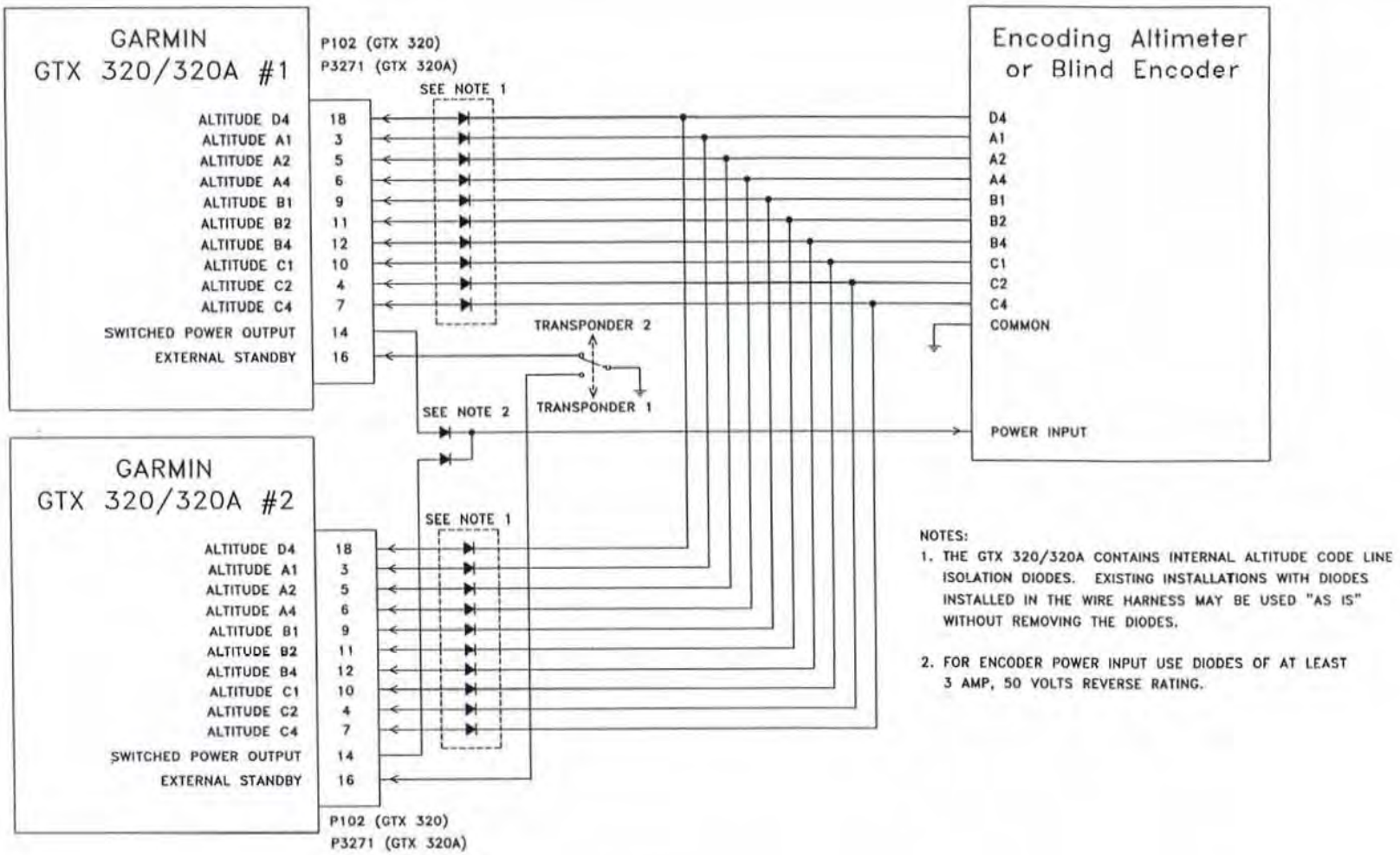


Figure C-5 GTX 320/320A DUAL TRANSPONDER INTERCONNECT WIRING DIAGRAM

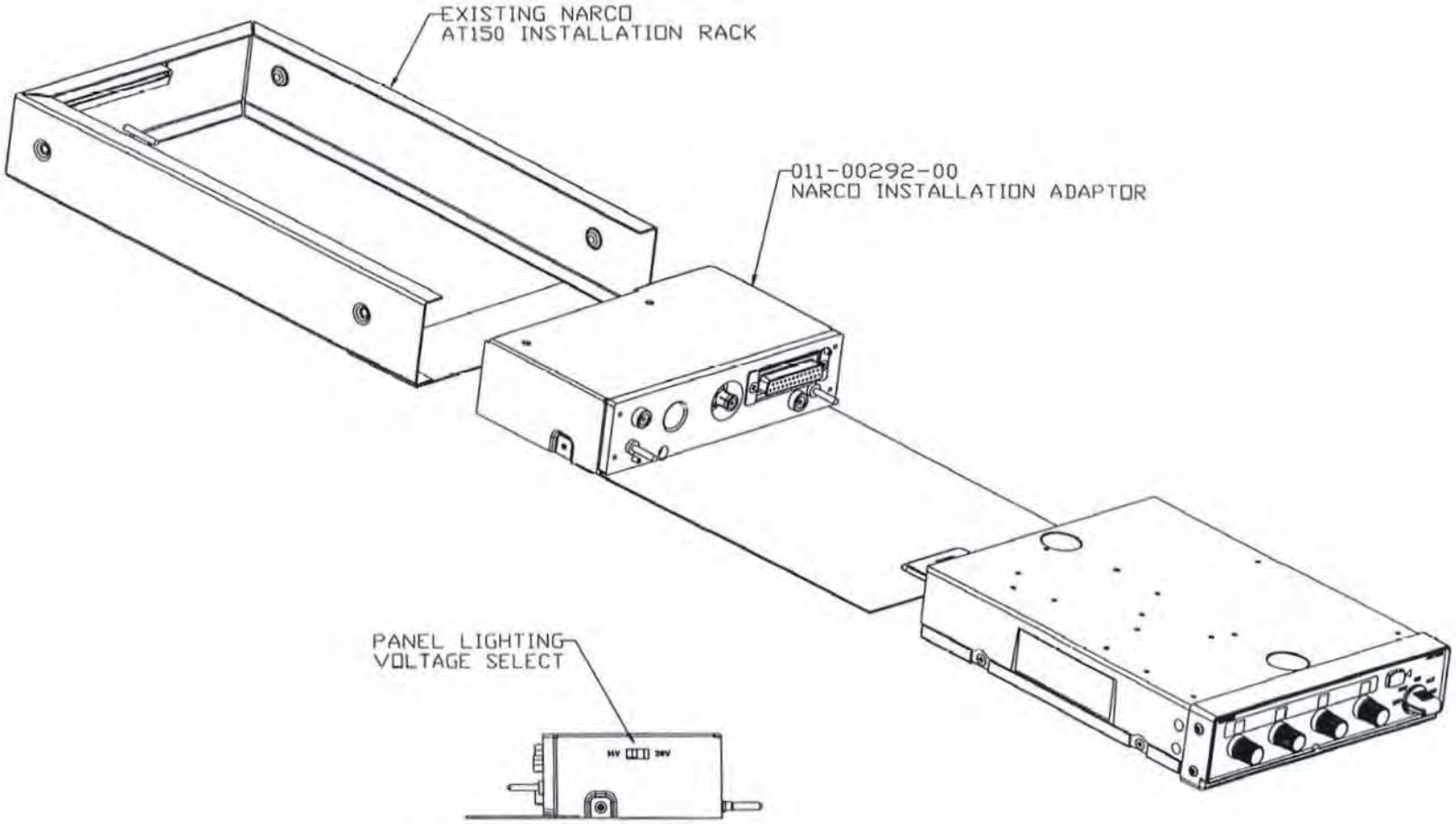


Figure C-6 NARCO AT 150 INSTALLATION ADAPTER ASSEMBLY DRAWING

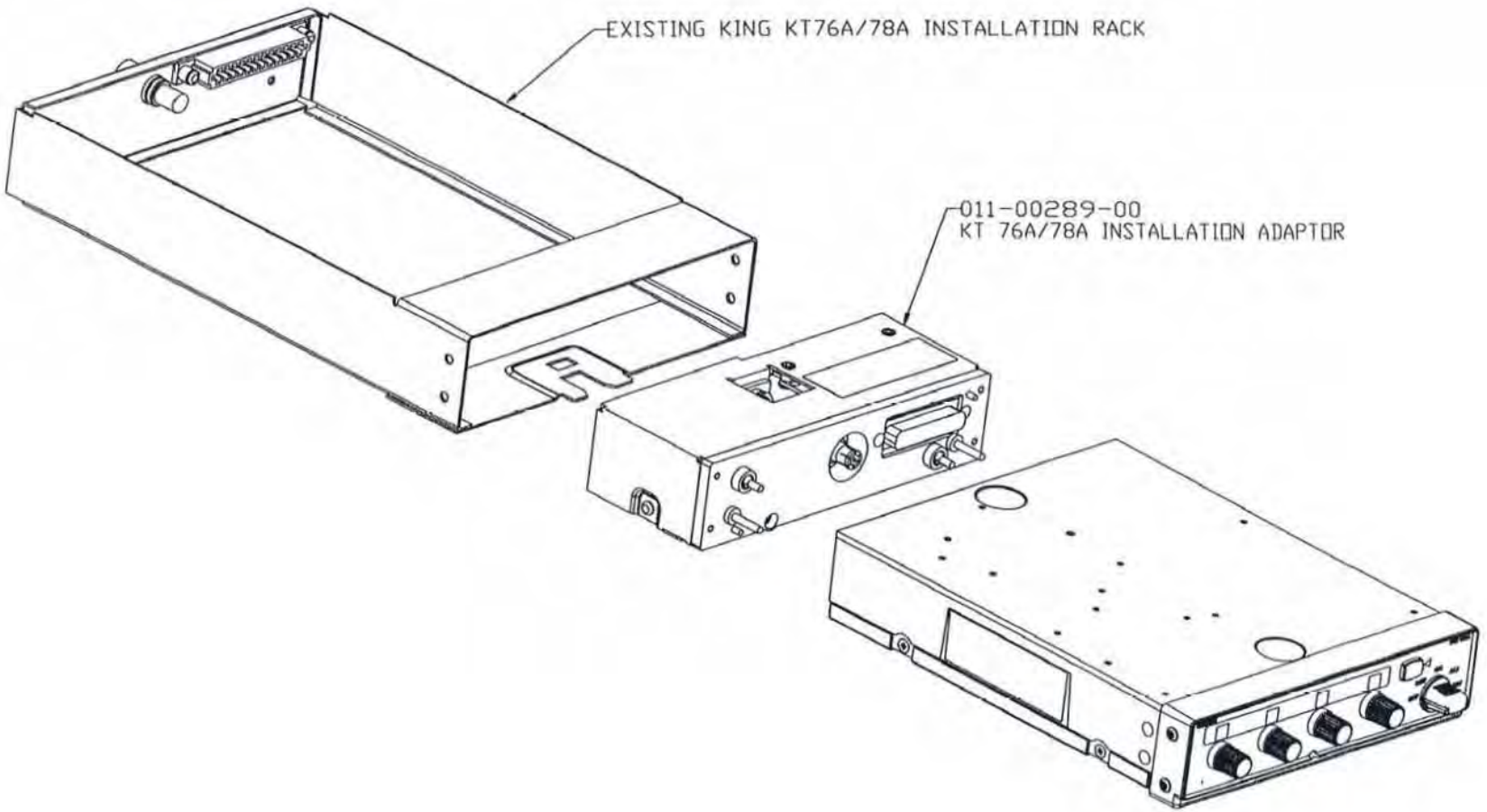


Figure C-7 KING KT 76A/78A ADAPTER ASSEMBLY DRAWING

R.A. Miller Industries, Inc.
P.O. Box 858
Grand Haven, MI 49417-0858
(616) 842-9450
www.rami.com

AV-22

Transponder Antenna for General Aviation

Frequency Range: 1030-1090 MHz

Installation Instructions

1.) Mounting location should be on the belly of the aircraft at least 18" from any other metal protrusions and on as flat a surface as possible.

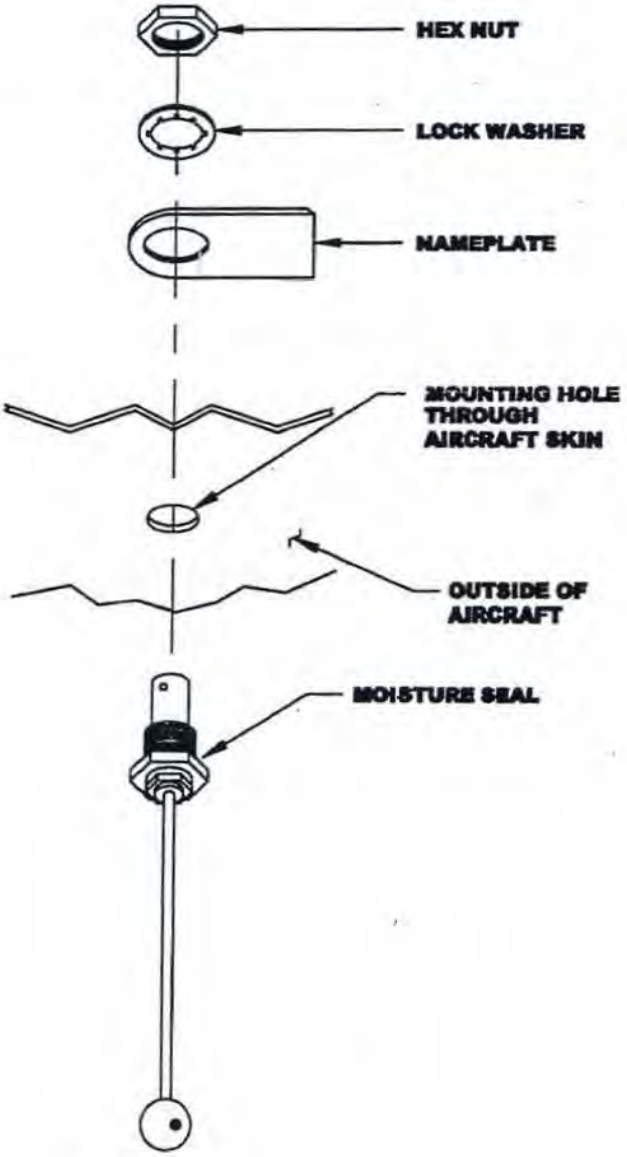
2.) Drill mounting hole (see options below) through the aircraft skin at desired location. Remove all burrs from around edge to allow proper seating of moisture seal.

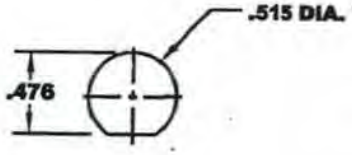
3.) Disassemble antenna by removing the hex nut, lock washer and nameplate as show in the illustration.

4.) Insert the antenna through the mounting hole from the outside of the aircraft.

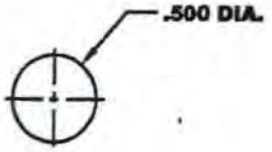
5.) Slide nameplate and lock washer over the BNC connector of the antenna from the inside of the aircraft. Thread the hex nut onto the BNC connector and tighten securely.

6.) Connect the antenna to the aircraft radio using a cable with a BNC type connector attached (not supplied).





MOUNTING HOLE OPTION #1



MOUNTING HOLE OPTION #2

Document #27-3414-1
Rev.: B Revised: March, 2006

Trans-Cal Industries, Inc.

Model SSD120-(XX)A
&
Model SSD120-(XX)AE

All Solid State Altitude Encoder/Digitizer
Owner/Installation Manual
Operating Ceilings from 30,000 to 42,000 Feet.

T.S.O. C88a Approved

Trans-Cal Industries, Inc.
Van Nuys Airport
16141 Cohasset Street
Van Nuys, CA 91406-2908
(818) 787-1221 (800) 423-2913 FAX (818)787-8916
www.trans-cal.com

August 8, 2006 Document Number: 881000 Rev. D

Please Note:

It is the responsibility of the installer of this equipment, within a specific type or class of aircraft, to determine that the aircraft operating conditions are within TSO standards.

Trans-Cal Industries, Inc.
16141 Cohasset Street
Van Nuys, CA 91406

818/787-1221
800/423-2913
FAX 818/787-8916
www.trans-cal.com

Ordering Information:

To receive additional copies of this publication, order Trans-Cal Industries part number **881000 rev. C.**

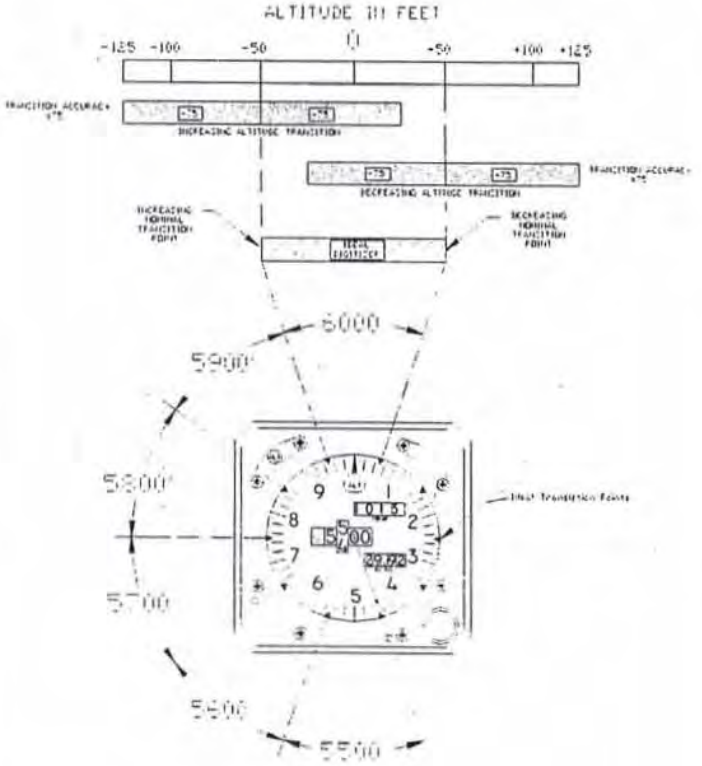
History of Revision

Revision	Date	Description
--	07/98	Production release.
A	10/99	Added SL70 transponder data pg. 15.
B	12/01	Added GTX 327 transponder pg. 13. Corrected current pg. 3. Clarified calibration §3.3.3 added diagram.
C	08/04	Updated Manual.
D	08/06	Updated warranty from 40 to 48 months.

Table of Contents

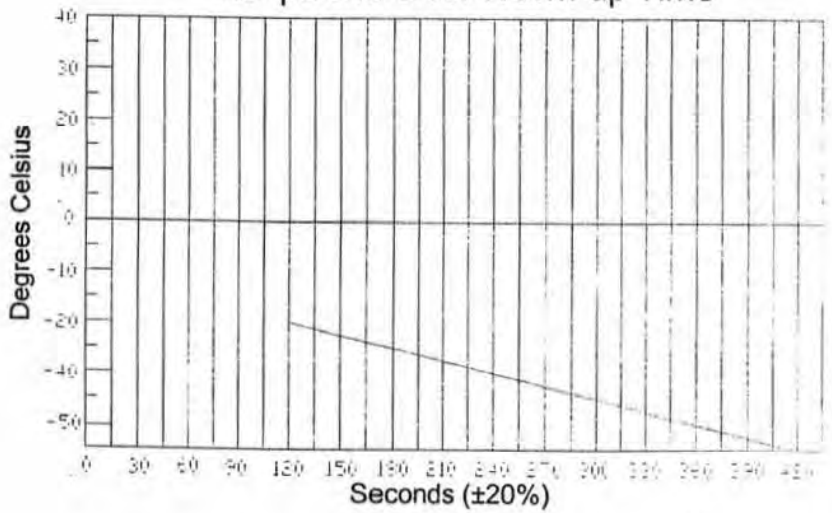
Altitude Digitizer to Primary Flight Altimeter

Figure 1
Altitude Digitizer to Primary Flight Altimeter
Correspondence
Reference TSO-C88a and SAE AS8003



Temperature vs. Warm-up Time:

Figure 3
Temperature vs. Warm-up Time



3.3 Calibration

3.3.1 General
Ref: FAR 91.217; FAA Advisory Circular 43-6A
FAR 91.413; FAR 43-Appendix E and F.

Each altitude encoder is calibrated to an NIST traceable pressure datum; however, when the unit is installed in an aircraft for use as the transponder's mode "C" altitude encoder, it must be recalibrated for correspondence to the aircraft's primary flight altimeter as required by FAR 91.217 and 91.413.

Model SSD120-(XX)A and SSD120-(XX)AE altitude digitizers are designed to be field calibrated to meet this requirement, as per the procedure described in §3.3.3. The correspondence required for digitizers is fully addressed in SAE Aerospace Standard AS8003 §3.11. This correspondence standard requires altitude digitizer's to report within ±125 feet of the primary flight altimeter's reading when the pressure datum is set to 29.92 In. Hg., (1013 MB) absolute.

The standard further requires a transition accuracy of ±75 feet of the nominal transition point for that altitude. A transition is defined as the point at which the digitizer changes from one altitude to the next, either increasing or decreasing altitude. This nominal transition point occurs 50 feet prior to the altitude in question. See figure 1.

3.3.2 Calibration Equipment Required.

A pitot-static test set capable of exercising the altimeter and the altitude encoder over a range of -1000 feet to the maximum altitude of the encoder, and a test set (ramp tester) capable of interrogating the transponder are required.

3.3.3 Calibration Procedures.

1. Connect the pitot-static test equipment to the aircraft's static line, and the transponder test set per the manufacturer's recommendations. The encoder's two adjustment potentiometers are identified as L and H, meaning Low and High altitude. The low adjustment is closest to the edge of the housing, and the high adjustment is closer to the center of the housing.
   (Note: Changing either potentiometer will affect the other. An adjustment made to the low potentiometer, correcting the low transition point, will move the high transition point, and require an adjustment of the high potentiometer.)

2. Apply power to the altitude encoder/transponder.

3. Set the primary flight altimeter barometric pressure to 29.92 In Hg (1013 MB).

4. Interrogate the transponder with the ramp tester, while observing the altitude code, decrease pressure to the point where the altitude code just makes the transition to the maximum altitude encoded. Verify that the digitizer is within ±125 feet of the altimeter's reading. If not, adjust the high potentiometer until the digitizer's transition point is within ±30 feet of the nominal transition point; 29,950 feet for a 30,000 foot digitizer.

5. Increase pressure until the digitizer's output just makes the transition from 100 feet to 0 feet. Verify that the altitude digitizer reads within ± 125 feet of the altimeter. If not, adjust the digitizer's low potentiometer until the digitizer's transition point is within ±30 feet of the nominal transition point (+50 feet) as read on the altimeter.

6. Repeat steps (D) and (E) until the ± 125 tolerance is achieved for the maximum calibration altitude and the minimum calibration altitude.

7. Exercise the aircraft's static system over the operating range of the altitude encoder and, with increasing and decreasing pressure, verify at a minimum of ten test points that the altitude digitizer and primary flight altimeter is within the ±125 foot tolerance. If correspondence is not achieved at any test point the altimeter may need calibration.

8. Verify that the altitude digitizer's output is disabled when the transponder is not in mode "C", or when the "Altitude Disable" switch is in the disable position.

1.3 Equipment Specifications (continued)

1.3.9 Environmental.

All SSD120-(XX)A and SSD120-(XX)AE encoders have been designed, tested and approved to meet the requirements of TSO-C88a, in accordance with RTCA Document DO-160b, dated July 1984 (specifics provided upon request.)

Operating Temperature:	SSD120-(XX)A	-20° to +70°C.
	SSD120-(XX)AE	-55° to +70°C.
Storage Temperature (non-operational):		-60° to +85°C.

1.3.10 Over Range.

The SSD120-(XX)A or SSD120-(XX)AE series of altitude encoders will not be damaged when operated beyond their specified maximum altitude up to 100,000 feet MSL, or over pressured to 18 psi maximum.

Section 2.0 Operation

2.1 General

The SSD120-(XX)A and SSD120-(XX)AE series of altitude encoders are designed to be mounted within a pressurized or non-pressurized, but temperature controlled location within aircraft operated up to 42,000 feet MSL. Usually remotely located, the encoder is fully automatic in operation and normally controlled by the transponder.

2.2 Operating Instructions

Place the transponder in mode "C", altitude reporting mode, and apply power to the encoder. In some installations the encoder will automatically be supplied power when the transponder is energized; in others, power to the encoder may be supplied through a separate circuit breaker. If power to the encoder is provided directly from the avionics buss, follow the power-up procedures recommended by the transponder manufacturer.

In some installations, the transponder controls the encoder by enabling and disabling the encoder outputs. In still other installations, the encoder's output is not controlled by the transponder and is continually enabled, (pin 6 of the altitude encoder is grounded.)

Section 3.0 Installation and Calibration

3.1 Mechanical Installation

The SSD120-(XX)A and SSD120-(XX)AE series of altitude encod ers may be mounted in any attitude within the internal structure of the aircraft. *DO NOT* mount the encoder in the direct airstream or either hot or cold air ducts. The mounting position should allow for a short pressure line from the encoder to the altimeter, and allow access to the encoder's adjustments.

Use #4-40 machine screws, sheet metal screws, or pop rivets to attach the encoder or the mounting tray to the airframe. Secure the mating connector to the encoder housing using the captive #4-40 screwlock assembly provided. Refer to the outline drawing for mechanical dimensions and the installation block diagram.

3.2 Electrical Installation

The altitude encoder is designed to operate on either 14 or 28 VDC power source. These voltages can be A+ switched power provided by the transponder or can be provided by the avionics buss. If using the avionics buss, protect the circuit with a 1 Amp fuse or circuit breaker. Ground, pin 15, should be connected to aircraft ground (A-).

The encoder label and the outline drawing provide electrical connector/function information. Use this data when connecting the altitude encoder to the transponder.

In some installations where older transponders are used, the transponder may not provide an "altitude disable" function. In this case, an instrument panel mounted switch for this function may be required.

Section 1.0 Introduction & Specifications

1.1 Scope

This manual provides detailed installation, calibration and operating instructions for the Trans-Cal Industries' Model SSD120-(XX)A and SSD120-(XX)AE* (see note 1) series of altitude encoders.

1.2 Equipment Description

This device is approved under F.A.A. T.S.O. C88a. The SSD120-(XX)A and SSD120-(XX)AE series of altitude encoders are self contained solid state electronic devices which, when connected to an aircraft static and electrical system, converts pressure altitude into the digital data set forth in the International (ICAO) Standard for SSR Pressure Altitude Transmission. In accordance with U.S. National Standards for Common System Component Characteristics for the I.F.F. Mark X (SIF)/Air Traffic Control Radar Beacon System SIF/ATCRBS.

In operation, with the encoder connected to the aircraft's transponder in mode "C" operation and interrogated by an air traffic control station, the transponder will utilize the encoder data to reply with the aircraft's altitude referenced to 29.92 In. Hg. (1013 MB.)

1.3 Equipment Specifications

1.3.1 Warm-Up Time:

SSD120-(XX)A	+20°C to +70°C	No warm-up time.
	-20°C to +20°C	See figure 1.
SSD120-(XX)AE	-55°C to -20°C	See figure 1.

1.3.2 Operating Altitude:

Model SSD120-30A	or SSD120-30AE	-1000 to +30,000 feet.
Model SSD120-35A	or SSD120-35AE	-1000 to +35,000 feet.
Model SSD120-42A	or SSD120-42AE	-1000 to +42,000 feet.

See High Altitude Series manual for the units listed below:

Model SSD120-50A	or SSD120-50AE	-1000 to +50,000 feet.
Model SSD120-62A	or SSD120-62AE	-1000 to +62,000 feet.
Model SSD120-65A	or SSD120-65AE	-1000 to +65,000 feet.
Model SSD120-80A	or SSD120-80AE	-1000 to +80,000 feet.

* Note 1: (E) Extended operating temperature range: -55°C to +70°C.

1.3 Equipment Specifications (continued)

1.3.3 Code Output.

The encoder's digitized output code is in accordance with the U.S. National Standard for Common System Component Characteristics for the IFF Mark X (SIF) Air Traffic Control Radar Beacon System, SIF/ATCRBS, as amended 8 March 1971.

1.3.4 Accuracy.

The encoder accuracy is ±50 feet from -1000 to 30,000 feet and ±75 feet from 30,000 feet to 42,000 feet, when measured from the altitude transition points of the digital code and referenced to 29.92 In. Hg. (1013 MB.)

1.3.5 Mechanical Characteristics.

Weight: 10 oz. **Dimensional:** See outline drawing.

1.3.6 Input Power Requirement.

The SSD120-(XX)A or SSD120-(XX)AE models operating up to 42,000 feet will operate on either 14 or 28 VDC at 0.600 Amps.

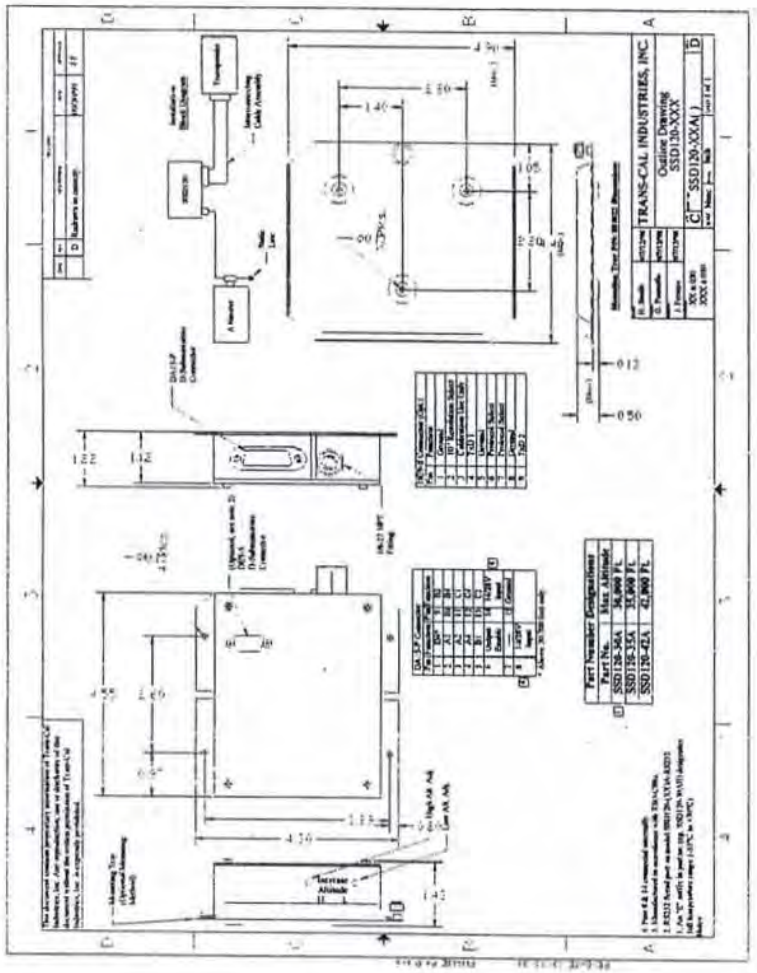
1.3.7 Output Signal Characteristics.

The encoder's output is provided by the "uncommitted" collectors of a transistor array and must be "pulled-up", through a resistive load by the transponder. The pull-up voltage may be 3 to 50 VDC at 50 ma sink current.

1.3.8 Input Signal Requirements.

Pin 6 of the altitude encoder must be either grounded or connected to the transponder strobe (output enable.)

Outline Drawing



Narco AT-50 and AT-50A Installation

Narco AT-50 and AT-50A Installations

The Narco AT-50 or AT-50A transponder will not accept data from the Trans-Cal SSD120-(XX)A until the following modifications have been completed:

1. The strobe modification as outlined in Narco service bulletin no. AT-50A-5 dated 19 February 1975 has been performed on the transponder.

2. A modification to the Trans-Cal SSD120-(XX)A removing the data line decoupling capacitor network.

The SSD120-(XX)A may be ordered from the factory with Mod. 1 completed, or the altitude digitizer may be modified in the field as outlined below.

Instructions for field modification:

1. Remove the 4 screws, lockwashers and cover plate. Do not remove the D-Sub serial data connector.

2. Remove and discard the C1 capacitor network (refer to figure 1 below.) The network may be removed using a pair of pliers to slowly rock the network back and forth until it breaks away.

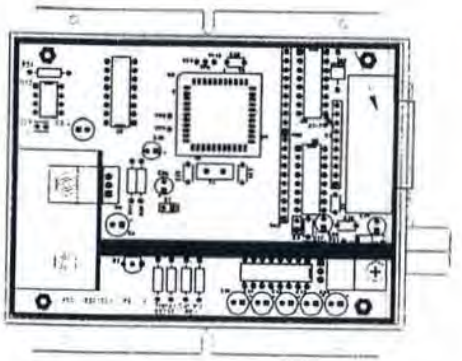
3. Replace the cover plate, 4 lockwashers and screws.

4. A modification label is located on the side of the altitude digitizer. Using an indelible ink pen, place an "X" in the box identifying modification 1 as complete.

Figure 1

15 Pin D-Subminiature Connector —

C1 Capacitor Network —



Encoder Interconnections

The following encoder/transponder interconnections are provided as a quick reference only, and though they are correct to the best of our knowledge, always consult the latest installation, operation, and service bulletins from the equipment manufacturer.

Table I

SSD120 15 pin conn.	SSD120 Function	KT76/78 Pin Number	King KT-76A/78A Pin Number	King KXP Pin Number
1	D4	**	**	V
2	A1	6	M	G
3	A2	7	K	H
4	A4	9	J	J
5	B1	4	E	K
9	B2	1	C	L
10	B4	2	B	M
11	C1	3	D	P
13	C2	8	L	R
12	C4	10	H	S
6	Output Enable	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.
8 or 14*	14 to 28VDC Input.	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.
15	Ground	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.

*Pins 8 and 14 are connected together internally.
**Data for this connection is not available at this time.

Table II

SSD120 15 pin Conn.	Function	Cessna RT359A, RT459A, RT859A Pin Number	Narco AT-150 AT-50, AT-50A Pin Number	Narco AT6A AT-5 AT-6 Pin Number	Garmin GTX 327 Pin Number
1	D4	10	**	**	18
2	A1	14	7	2	3
3	A2	13	6	4	5
4	A4	15	8	8	6
5	B1	19	12	9	9
9	B2	17	10	10	11
10	B4	16	9	11	12
11	C1	21	14	1	10
13	C2	18	11	3	4
12	C4	20	13	5	7
6	Output Enable	11	5	12	13 or 25 or aircraft ground.
*8 or 14	14 to 28VDC Input	9	18	13	14 to 28VDC Input
15	Ground	Connect to aircraft ground.	Connect to aircraft ground.	14	Connect to aircraft ground.

*Pins 8 and 14 are connected together internally.
**Data for this connection is not available at this time.
***Narco transponders see page 12 for modification requirements.

Table III

SSD120 15 Pin Conn.	Function	Edo-Air RT-777 Pin Number	Genave Beta 5000 Pin Number	Radair 250 Pin Number	Becker Avionic Systems ATC3401 ATC2000
1	D4	15	0	15	23
2	A1	7	4	7	16
3	A2	5	5	6	15
4	A4	3	6	13	14
5	B1	12	7	9	17
9	B2	13	8	10	19
10	B4	14	9	11	18
11	C1	8	10	14	22
13	C2	6	11	16	21
12	C4	4	12	12	20
6	Output Enable	2	3	19	24
8 or 14 *	14 to 28VDC Input	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.	2	22	6
15	Ground	2	Connect to aircraft ground.	Connect to aircraft ground.	24

*Pins 8 and 14 are connected together internally.
**Data for this connection is not available at this time.

Table IV

SSD120 15 Pin Conn.	Function	Bendix TPR-2060 Pin Number	Bendix TR641A/B Pin Number	Wilcox 1014A Pin Number	UPS AT Apollo SL70 Pin Number
1	D4	**	N	C	35
2	A1	4	A	k	13
3	A2	6	B	c	31
4	A4	8	C	W	12
5	B1	9	D	T	33
9	B2	10	E	L	14
10	B4	11	F	D	32
11	C1	3	H	P	16
13	C2	5	J	f	34
12	C4	7	K	Z	15
6	Output Enable	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.
8 or 14 *	14 to 28VDC Input	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.	Connect to aircraft's avionics buss protected by a fuse or circuit breaker.
15	Ground	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.	Connect to aircraft ground.

*Pins 8 and 14 are connected together internally.
**Data for this connection is not available at this time.

Table V

SSD120 15 Pin Conn.	Function	Bendix/King KGP 560 EGPWS	Bendix/King KMH 870 IHAS Processor	This column left blank intentionally.	This column left blank intentionally.
1	D4	No connection	18		
2	A1	12	11		
3	A2	52	10		
4	A4	33	9		
5	B1	14	14		
9	B2	34	13		
10	B4	73	12		
11	C1	32	17		
13	C2	13	16		
12	C4	72	15		
6	Output Enable	Connect to aircraft ground.	Connect to aircraft ground.		
8 or 14 *	14 to 28VDC Input	Connect to avionics buss via circuit breaker.	Connect to avionics buss via circuit breaker.		
15	Ground	Connect to aircraft ground.	Connect to aircraft ground.		

*Pins 8 and 14 are connected together internally.

WARRANTY REGISTRATION

Trans-Cal Industries warrants each Model SSD120-(XX)A(E) Solid State digitizer / serializer to be free of defects in workmanship and materials for a period of 42 months after purchase. This warranty applies to the original purchaser of the instrument.

Trans-Cal's obligation under this warranty is limited to repairing or replacing any unit returned to Trans-Cal during the life of this warranty provided:

(1) The defective unit is returned to us, **transportation pre-paid.**
(2) Prior approval is obtained from Trans-Cal.
(3) The unit has not been damaged by misuse, neglect, improper operation, accident alteration or improper installation.

Trans-Cal DOES NOT reimburse labor costs on warranty repairs. Trans-Cal Industries will be the sole judge as to the cause of the malfunction and wherein the responsibility lies. No other obligation or liability is expressed or implied.

For the above warranty to become effective, the attached registration card must be completed and returned to Trans-Cal Industries, properly filled out and signed by the dealer selling or installing this equipment.

Mail to: Trans-Cal Ind., Inc., 16141 Cohasset St., Van Nuys, CA 91406

---------- cut here ----------

MODEL: SSD120-( )A(E) SERIAL NO: A-_____

AIRCRAFT:_____ **NUMBER:**_____

OWNER:_____

ADDRESS:_____

CITY:_____ **STATE:**_____ **ZIP:**_____

DEALER:_____

INSTALLED BY:_____

LICENSE NO:_____

INSTALLATION DATE:_____

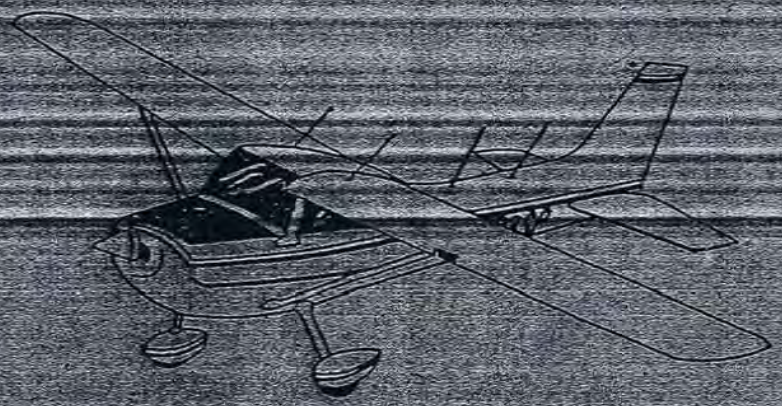
I hereby certify the above instrument was installed in accordance with the instructions of Trans-Cal Industries, and the installation was done to industry standards. I further certify the instrument was properly working on the above date.

SIGNED:_____

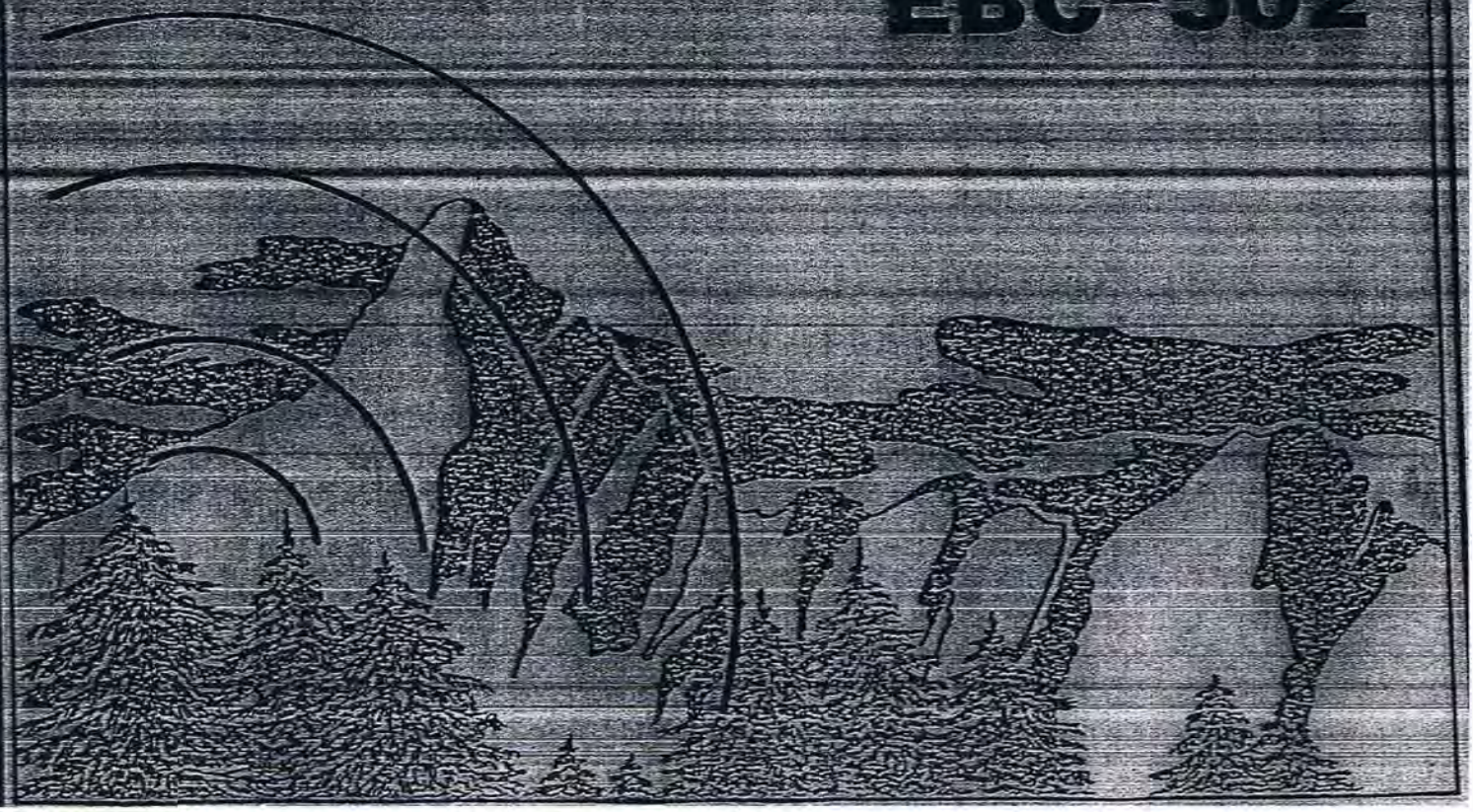
PRINT NAME:_____

emergency beacon corp.

15 River Street ■ New Rochelle, N.Y. 10801
(914) 235-9400 ■ Fax (914) 576-7075



EBC-502



EBC-502
INSTRUCTION AND MAINTENANCE MANUAL

EMERGENCY BEACON CORPORATION
15 RIVER STREET
NEW ROCHELLE, NY 10801
PHONE (914) 235-9400
FAX (914) 576-7075
800-382-0079
MADE IN THE U.S.A.

October 2000
Rev. 3

TABLE OF CONTENTS

REVISION RECORD

REVISION NUMBER	DATE	PAGE	REVISION
Rev. 0	September, 1993		Original
Rev. 1	September, 1995		Manual revised to reflect addition of test lamp feature
Rev. 2	September, 1996	Title page	Name of manual changed.
Rev. 3	October, 2000		Manual format changed.

SECTION 1
GENERAL DESCRIPTION

The EBC-502 is an Emergency Locator Transmitter (ELT) which meets all of the requirements of TSO-C91a in the Portable (P) and Automatic Portable (AP) categories (See Figure 1). It is designed to be mounted in the cabin of the aircraft, within reach of the pilot or co-pilot. As with all EBC ELTs, the increased survivability needs of cabin mounting have been met. The electronics and the activation system are completely encapsulated, and extra protection has been provided for the crystal. Our encapsulation method provides added protection against shock and moisture. The unit transmits simultaneously on the civil 121.5 MHz and military 243.0 MHz emergency frequencies.

The EBC-502 is equipped with a separate audible monitor seated below the ELT in the mounting bracket. It is linked to the ELT via a DC power connector, eliminating the need for a wire harness. The audible monitor is powered by its own internal transistor battery and will emit a loud beeping tone whenever the ELT is transmitting. This is used to alert the pilot or other individuals in the vicinity of an ELT activation.

A self test lamp indication is provided as a simple means of testing the ELT for proper signal output.

The EBC-502's toggle switch is recessed within the ELT to protect it against inadvertent activation or damage caused by flying debris.

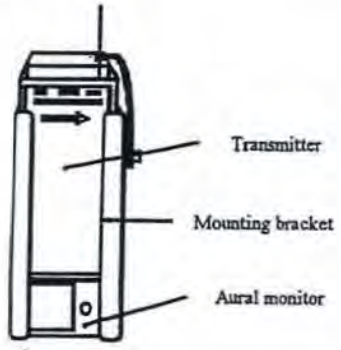


FIGURE 1: EBC-502

SECTION 2
DESCRIPTION OF THE TOGGLE SWITCH POSITIONS

ON position:
Placing the toggle switch in this position (near the antenna) activates the ELT's transmitter. The ELT will radiate an emergency distress signal on 121.5 MHz and 243.0 MHz simultaneously.

ARM position:
This position (center position) places the ELT in a standby mode. The ELT will activate if it senses a crash.

OFF/TEST position:
This position deactivates the transmitter. To deactivate, momentarily hold the switch in this position (near the test lamp) and quickly release. This position is spring loaded and the switch will return to the "ARM" position (center position) when released. This position is also used to test the transmitter for proper signal output. Please refer to section 7 for more information.

DISABLING THE AUTOMATIC ACTIVATION FEATURE
The shipping wire used for transporting the ELT should be saved and used whenever the ELT is removed from its mount for maintenance. Inserting the shipping wire into the sockets located near the test lamp will disable the automatic activation feature.

SECTION 3
ELT INSTALLATION

RTCA Document DO-183 paragraph 3.1.8 describes the mounting requirements which must be followed when choosing a location on which to mount an ELT. It reads as follows:

THE ELT SHALL BE MOUNTED TO PRIMARY AIRCRAFT LOAD CARRYING STRUCTURES SUCH AS TRUSSES, BULKHEADS, LONGERONS, SPARS, OR FLOOR BEAMS (NOT AIRCRAFT SKIN). THE MOUNTS SHALL HAVE A MINIMUM STATIC LOCAL DEFLECTION NO GREATER THAN 2.5mm (0.1 INCH) WHEN A FORCE OF 450 NEWTONS (100 lbs) IS APPLIED TO THE MOUNT IN THE MOST FLEXIBLE DIRECTION. DEFLECTION MEASUREMENTS SHALL BE MADE WITH REFERENCE TO ANOTHER PART OF THE AIRFRAME NOT LESS THAN 0.3 METER (1 FOOT) NOR MORE THAN 1.0 METER (3 FEET) FROM THE MOUNTING LOCATION.

INSTALLATION INSTRUCTIONS:

1. The EBC-502 must be installed by a certified airframe mechanic. This installation must be entered in the aircraft log.
2. The EBC-502 must be installed with the "DIRECTION OF FLIGHT" arrow pointing toward the nose of the aircraft.
3. The EBC-502 antenna must be vertical with as much of the antenna visible through a window as possible when viewed from the outside of the aircraft. The minimum dimension of the window where the ELT is mounted should be 12 inches in height and 13 inches in width.
4. The antenna should be at least one inch away from any metal window part.
5. The EBC-502 mounting bracket must be securely attached as per the above DO-183 requirements. After selecting a suitable location meeting all of the above requirements, drill

and mount the EBC-502 mounting bracket. Please refer to Figure 2 for an installation recommendation.

6. The shipping wire must be removed before the ELT is installed into its mount. Do not discard. Keep it near the ELT for future use.

The shipping wire disables the automatic activation feature of the ELT and is only to be used when the ELT is removed from its mount in non-emergency situations.

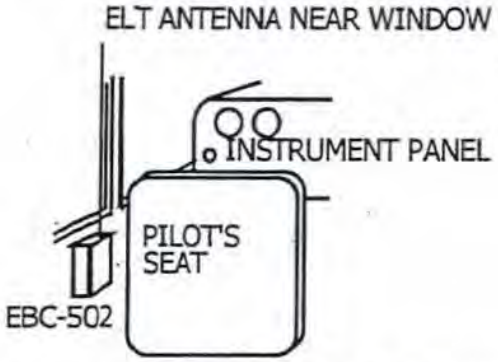


FIGURE 2: EBC-502 INSTALLATION SUGGESTION

SECTION 4
FINAL INSTALLATION

1. Before the ELT is installed into its mounting bracket, the following test must be performed. It is recommended that such test receive prior approval of the nearest control tower. FAA and FCC[i] regulations require that transmitter test be performed only during the first 5 minutes of each hour and last no longer than 3 audio sweeps.

DO NOT ACTIVATE THE TRANSMITTER UNTIL YOU THOROUGHLY UNDERSTAND HOW TO DEACTIVATE IT! Please refer to section 7.

A: Set com receiver or portable radio to 121.5MHz.
B: Place toggle switch in the ON position. The distinctive ELT swept tone should be heard over the radio receiver.
C: Deactivate the ELT by holding the toggle switch in the spring loaded OFF/TEST position, and then quickly releasing and allowing it to return to the center (ARM) position.
D:To test the G-switch circuitry, hold the ELT in the palm of your hand. Extend your arm horizontally to your side. The direction of flight arrow should be pointing away from you and the antenna should be pointing upwards. Apply a quick forward swinging motion around your body. Proper activation is indicated when the PEOW-PEOW signal is heard through the radio. The ELT can also be activated by holding it at waist level with the arrow pointing down and then apply a rapid upward motion. The distinctive audio sweep should be heard over the radio.
E: Deactivate ELT by placing the toggle switch in the spring loaded OFF/TEST position, then quickly releasing it.

2. Slide the audible monitor into the mounting bracket and then the ELT. Be certain that the connectors in the ELT and audible monitor mate with one another. Press down on the ELT until it is fully seated within the bracket.

3. To test the audible monitor, place the ELT toggle switch in the ON position and listen for loud beeps from the audible monitor, then deactivate and rearm the ELT by momentarily holding the toggle switch in the spring loaded OFF/TEST position, then quickly releasing).

SECTION 5
PERIODIC MAINTENANCE

The following inspection procedures are based on FAA ACTION NOTICE A8150.3 EMERGENCY LOCATOR TRANSMITTER RECOMMENDED SUPPLEMENTAL INSPECTION PROCEDURE (PART 91 OPERATIONS)[ii] The FCC mandates that the transmitter test be performed only during the first 5 minutes of each hour and last no longer than 3 audio sweeps of the ELT signal. This test must be performed a minimum of once a year. (Those parts of FAA ACTION NOTICE A8150.3 which are not applicable to the EBC 502 ELT have been omitted or amended in this restatement).

1. Remove ELT from the mount and inspect the mounting hardware for stability. All required mounting hardware should be reinstalled and secured.

2. Open unit and inspect the ELT. Verify that the ELT battery is a factory-approved GS-52 battery, and check its expiration date.

WARNING: THE EBC-502 WAS CERTIFIED TO TSO-C91a AS A COMPLETE SYSTEM WHICH INCLUDED A GS-52 BATTERY PACK. TO MAINTAIN COMPLIANCE WITH TSO-C91a, A GS-52 BATTERY PACK MUST BE USED.

3. To test the G-switch circuitry, hold the ELT in the palm of your hand. Extend your arm horizontally to your side. The direction of flight arrow should be pointing away from you and the antenna should be pointing upwards. Apply a quick forward swinging motion around your body. Proper activation is indicated when the PEOW-PEOW signal is heard through the radio. The ELT can also be activated by holding it at waist level with the arrow pointing down and then apply a rapid upward motion. The distinctive audio sweep should be heard over the radio. (See note 1 below).

4. Reinstall the ELT into its mount and verify the proper direction of crash activation. Confirm that the audible alarm plug and the ELT jack are properly mated.

5. Activate the ELT using the ELT "ON" switch. The ELT should be heard on the airplane's VHF radio com receiver when tuned to 121.5 MHz. The audible monitor should emit a loud intermittent tone whenever the ELT is activated.

WARNING! DO NOT USE THE AUDIBLE MONITOR AS A TEST DEVICE! IT IS SOLELY AN INDICATING DEVICE. IT HAS NO DIAGNOSTIC FUNCTION.

6. To test the transmitter electronics, hold the toggle switch in the spring loaded OFF/TEST position and observe the amber test lamp. A pulsing variation in lamp intensity should be observed. (See note 2 below).

7. Verify that all switches are properly labeled and positioned.
NOTES:
1. This is not a precise check; thus, it only indicates that the G-switch is working.
2. This is not a measured check. It is an indication that the ELT is radiating a sufficient signal to aid search and rescue

SECTION 6
OPERATING LIMITATIONS and BATTERY REPLACEMENT

FAR 91.207(c) requires that the battery in the ELT must be replaced before the replacement date marked on the EBC-502 or when the transmitter has been in use for more than one cumulative hour. We recommend replacement six months sooner if the ELT is stored in a location where the average ambient temperature is normally above 80 degrees Fahrenheit. The battery should not be stored in a location where the ambient temperature is above 110 degrees Fahrenheit.

WARNING: The EBC-502 is designed to be used with battery pack, P/N GS-52. The ELT will not meet the requirements of TSO-C91a if used with another type of battery. If the battery is not connected exactly as stated, the ELT will be damaged. GS-52 battery packs are available from Emergency Beacon Corporation and its dealers.

GS-52 BATTERY REPLACEMENT PROCEDURE:

1. Verify that the ELT is off.
2. Unscrew the 4 back cover screws and remove cover.
3. Observe the manner in which the battery is situated within the ELT. The new GS-52 battery must be installed in the same physical orientation as the current GS-52 battery.
4. Remove the plastic wire nuts from the old GS-52 battery by turning them counterclockwise. Remove the old GS-52 battery.
5. Remove tape from the new GS-52 battery wires and place battery in the ELT.
6. Twist red wire from ELT and red wire from the GS-52 battery together and screw on plastic wire nut.
7. Twist black wire from ELT and black wire from the GS-52 battery together and screw on plastic wire nut.
8. Reinstall back cover and replace 4 cover screws.
9. Install new "REPLACE BATTERY BEFORE" label on the side of the ELT.
10. The replacement date must be entered in the aircraft maintenance record.

AUDIBLE MONITOR BATTERY REPLACEMENT:

The battery in the audible monitor MUST be replaced every time the ELT battery is replaced. For best performance, use an Eveready or Duracell alkaline 9 volt transistor battery.

PROCEDURE:
1. Unscrew the 4 back cover screws and remove cover.
2. Remove the old battery and replace with new one.
3. Reinstall cover and screws.

WARNING: Before the ELT can be considered ready for use, the functional tests and procedures described in section 4, Final Installation, MUST be performed.

SECTION 7
OPERATING INSTRUCTIONS

The EBC-502 **MUST** be installed together with the audible monitor or the system will not meet the requirements of TSO-C91a as they pertain to the activation monitor. The battery in the audible monitor must be replaced every time the battery in the ELT is replaced.

DO NOT ACTIVATE THE TRANSMITTER UNLESS YOU THOROUGHLY UNDERSTAND HOW TO DEACTIVATE IT! THE TRANSMITTER CAN BE DEACTIVATED BY MOMENTARILY HOLDING THE TOGGLE SWITCH HANDLE IN THE SPRING LOADED **OFF/TEST** POSITION AND QUICKLY RELEASING IT, ALLOWING IT TO RETURN TO THE CENTER POSITION. SETTING THE SWITCH TO THE **ARM** POSITION FROM THE **ON** POSITION WILL NOT DEACTIVATE THE TRANSMITTER. KEEP IN MIND THAT THE **OFF/TEST** POSITION IS SPRING LOADED AND THE SWITCH WILL RETURN ON ITS OWN TO THE CENTER POSITION WHEN RELEASED. IF YOU PHYSICALLY HAVE TO MOVE THE SWITCH TO THE CENTER POSITION, THEN YOU HAVE NOT DEACTIVATED THE TRANSMITTER.
The emergency signal should be monitored on the aircraft communications radio set to 121.5MHz.

TO MANUALLY ACTIVATE THE ELT
Move the toggle switch handle to the "ON" position. The audible monitor should emit a loud pulsing beep approximately once a second.

WARNING! DO NOT USE THE AUDIBLE MONITOR AS A TEST DEVICE! IT IS SOLELY AN INDICATING DEVICE WITH NO DIAGNOSTIC FUNCTION.

TEST LAMP FEATURE
Normal power output and modulation may be tested by holding the switch in the spring loaded OFF/TEST position and observing the amber light. A pulsing variation in lamp intensity should be observed. A steady lamp indication or no lamp indication can mean a possible fault in the transmitter or

a weak battery pack. Have a certified mechanic check the battery pack for proper voltage. If the battery is weak, replace it. If this does not correct the problem, contact the factory, or refer to section 8 for shipping instructions.
NOTE: Some units will not give a lamp indication unless the antenna is grasped near its top. This is normal.

REMOVING THE ELT FROM ITS BRACKET
Remove the ELT by pulling up on the lanyard cord. Whenever the ELT is removed from its mount for a non-emergency, the audible monitor must remain connected to the ELT. Otherwise, an inadvertent activation may go unnoticed. We highly recommend that the shipping wire supplied for shipping purposes be saved and used every time the ELT is temporarily removed from the aircraft. The shipping wire disables the crash sensor.

REMOVING THE AUDIBLE MONITOR FROM THE MOUNTING BRACKET
Remove the ELT from its mount and then remove the audible monitor by pushing it up from the bottom.

INSTALLING THE ELT AND AUDIBLE MONITOR
Install the audible monitor into the bracket until it is fully seated in its mount, then install the ELT. Be certain to properly mate the connectors and that the ELT is fully seated on the monitor.

NOTE: In an emergency, if it becomes necessary to exit the aircraft with the ELT, removal of the audible monitor is not necessary; its sole function is that of an indicating device. It is not required for the emergency operation of the ELT.

SECTION 8
REPAIRS

The EBC-502 is not field repairable because the circuit board, switch, etc., are totally encapsulated. The only authorized repair facility is the EBC factory (FAA MMF 111-120). Should repairs become necessary, send the beacon to the factory. A note describing the problem or giving other pertinent information would aid in troubleshooting. Emergency Beacon Corporation will evaluate the unit and contact the owner with a repair estimate. There is a nominal fee for this inspection.

SHIPPING INSTRUCTIONS:

1. Disconnect and separately tape the battery leads before shipping. This will prevent the battery leads from shorting. Ship the disconnected battery enclosed in the ELT.

2. Enclose a note describing the problem. Be sure to give your name, address and phone number.

3. Pack well and insure.

Shipping costs to and from the factory are paid by the customer. Send the unit to : Emergency Beacon Corporation; 15 River Street, New Rochelle, NY USA 10801

SECTION 9
EBC-502 SPECIFICATIONS

Range- Satellite	1200+ miles
Range-Search Aircraft	line of sight
Operating Life	More than 48 hrs.
Operating Temperature	-20°C to +55°C
Battery Type and Shelf Life	Alkaline/4 years
Frequencies	121.5 MHz and 243.0 MHz simultaneously
Frequency Stability	+/-0 005%
Modulation	Swept Tone 1600 Hz to 300 Hz 2-4/second
Modulation Duty Cycle	33% min., 55% max
Modulation Percentage	100%
Peak Effective Radiated Power	minimum 50 mW for 50 hours at -20°C
Automatic Activation	Velocity change of 3.5 ft./sec
Altitude	50,000 ft.
Decompression	8000 ft. to 40,000 ft.
High Pressure	-15,000 ft.
Humidity	95%, 50 hours
Shock performance	1000 G's, 6 axis
Vibration	10 G's
Immersion Test	Withstands 24 hours in salt water

Physical

Size	2.5" W x 2" D x 8.5" H
Weight	2.75 lbs
Case	Aluminum
Finish	Yellow Baked Enamel
Antenna	Flexible, stainless steel whip extends 19" above the top of the unit

[i] - DO-183, Minimum Operational Performance Standards for Emergency Locator Transmitters. RadioTechnical Commission for Aeronautics, 1140 Connecticut Avenue, N.W., Suite 1020, Washington, D.C. 20036. May 13, 1983.
[ii] - Emergency Locator Transmitters (ELT's) - Recommended Supplemental Inspection Procedure (Part 91 Operations), Action Notice A 8310.1. Federal Aviation Administration General Aviation Airworthiness Alerts, Federal Aviation Administration, 800 Independence Avenue, Washington, D.C. 20591, Approval Date - September 23, 1988.
[iii] - See Footnote #2

EBC-502 TWO YEAR WARRANTY

FOR YOUR RECORDS:
Type of Equipment:_____

Model No._____ Serial No._____

Date Purchased:_____ Dealer:_____
PLEASE NOTE: ALL WARRANTIES ARE NULL AND VOID IF NON-FACTORY APPROVED BATTERIES ARE EVER USED IN YOUR ELT.

The EMERGENCY BEACON CORPORATION instrument you purchased is conservatively designed and was carefully inspected before shipment. Properly operated in accordance with the instructions furnished, it will provide you with trouble-free service. Should repairs become necessary, write or call EMERGENCY BEACON CORPORATION describing symptoms of faulty operation. Instructions will be sent to you for obtaining service, if factory judges necessary, authorization for shipment will be given to you. Do not ship without first obtaining this authorization. Pack well and insure when shipping. Repairs will be made without charge for materials and labor within two years from date of warranty registration. Transportation charges both ways are to be borne by the customer. Beyond this warranty period fair charges will be made for service by skilled personnel using factory approved/new parts. This warranty is void if:

1- ELT is damaged in transit.
2- ELT is abused in any way.
3- Repair is attempted by persons not authorized by EBC.
4- Unapproved battery is installed.

EMERGENCY BEACON CORPORATION, 15 River Street, New Rochelle, New York USA 10801
Phone: (914)235-9400 Fax (914)576-7075

(CUT HERE AND RETURN TO FACTORY)

TWO YEAR WARRANTY REGISTRATION

Model No:_____ Serial No:_____
Date Purchased:_____
How did you hear of this product?_____
What persuaded you to purchase it?_____
Dealer:_____ City:_____
My name:_____
Address:_____
City:_____ State:_____ Zip:_____

Return this portion to: EMERGENCY BEACON CORPORATION
15 RIVER ST.
NEW ROCHELLE, NY 10801 USA

PLEASE NOTE: ALL WARRANTIES ARE NULL AND VOID IF NON-FACTORY APPROVED BATTERIES ARE EVER USED IN THE ELT.

Emergency Beacon Corp.

Invoice

Date	Page
Jun 27, 2007	1
Invoice Number 05846	

15 River Street
New Rochelle, NY, 10801
Phone: (914) 235-9400
Fax: (914) 576-7075

Sold To:

A & P A/C MAINTANENCE
2111 SMITHTOWN AVE
RONKONKOMA, NY 11779

Ship To:

A & P A/C MAINTANENCE
2111 SMITHTOWN AVE
RONKONKOMA, NY 11779

Order No.	Order Date	Customer No.	Salesperson	PO Number	Ship Via	Terms
SO4284	Jun 27, 2007	7253		VERBAL		MC

Qty. Ord.	Qty. Shp.	Qty. B/O	Item Number	Description
1	1	0	FN000195	EBC 502 ELT Serial #:210077 EBC 502 ELT EMERGENCY LOCATOR TRANSMITTER DATE OF BATTERY EXPIRATION: 09/2009
			FRGHT	PICK-UP

Comments:

Tax summary:

RS 0.00

SAMARA VVV-AVIA

Elitar Sigma

Factory Engineering

Samara, Russia

Dear Sir or Madam

Our engineering department has made a detailed review of the provided information and determined that wheel and brake system changes have been made by A & P Aircraft Maintenance, Inc. located in USA done in accordance with factory standards. Please accept this letter as an approval and authorization for the following changes made to the aircraft. If you should have any questions please contact us at:

Company: "Samara VVV-Avia"
Address: Russian Federation, A4, Smyshliaevka Airport, Samara
Telephone: (+7)927019-81-98
E-mail: elitar-avia@mail.ru

Director Samara VVV-Avia OOO

A.N.Frolov

A&P AIRCRAFT MAINTENANCE, INC.

Annual ~ 100 Hour ~ Repairs ~ Modifications ~ STC's ~ Restorations ~ Top Overhauls ~ Engine changes ~ Emergency Recovery

MacArthur Airport
2111 Smithtown Avenue
Ronkonkoma, NY 11779
631-588-7771
apacft@aol.com
www.apaircraft.com

Edward Libassi
President
Licensed A&P/IA Inspector

June 12, 2012

Elitar Sigma
Factory Engineering
Samara, Russia

Dear Sir,

Please be advised that the Sigma, serial number 002, wheel and brake system has been modified. Please review the changes and update your records. Please send me a letter approving and authorizing these changed

REMOVED
Original equipment Figure 23, Main undercarriage C4-4150-0-1

INSTALLED: Company "Matco Mfg"

Matco wheel assembly	Part number: WHLW51CC.75
Matco brake disc	Part number: D4
Matco Axel	Part number: A7
Matco 3D four inch XT brake assembly	Part number: PH-4XT
Matco Brake reservoir	Part number: 8722-40L
Matco master cylinder	Part number: MCM-4GH
Condor tire and tube 500x5	Part number: 072-312-0

Yours truly,

Edward Libassi
President

A&P AIRCRAFT MAINTENANCE, INC.

Annual ~ 100 Hour ~ Repairs ~ Modifications ~ STC's ~ Restorations ~ Top Overhauls ~ Engine changes ~ Emergency Recovery

MacArthur Airport
2111 Smithtown Avenue
Ronkonkoma, NY 11779
631-588-7771
apacft@aol.com
www.apaircraft.com

Edward Libassi
President
Licensed A&P/IA Inspector

June 12, 2012

Elitar Sigma
Factory Engineering
Samara, Russia

Уважаемые господа,

Обратите внимание, что Sigma, серийный номер 002, колеса и тормозной системы была изменена. Пожалуйста, ознакомьтесь с изменениями и обновления записей. Пожалуйста, пришлите мне письмо утверждения и санкционирования этих изменились

УДАЛЕНЫ
Оригинальный рисунок оборудование 23, Главное шасси C4-4150-0-1

УСТАНОВЛЕНО: Компания "Matco МФГ"
Matco колеса в сборе Артикул: WHLW51CC.75
Matco дисковые тормоза Артикул: D4
Matco Axel Номер: A7
Matco 3D-четыре дюйма XT тормозной Артикул: PH-4XT
Matco тормозной резервуар номер: 8722-40L
Matco главного цилиндра Номер заказа: MCM-4GH
Шины Кондор и трубы 500x5 Номер заказа: 072-312-0

Yours truly,

Edward Libassi
President

A&P AIRCRAFT MAINTENANCE, INC.

Annual ~ 100 Hour ~ Repairs ~ Modifications ~ STC's ~ Restorations ~ Top Overhauls ~ Engine changes ~ Emergency Recovery

MacArthur Airport
2111 Smithtown Avenue
Ronkonkoma, NY 11779
631-588-7771

Edward Libassi
President
Licensed A&P/IA Inspector

Date: June 12, 2012

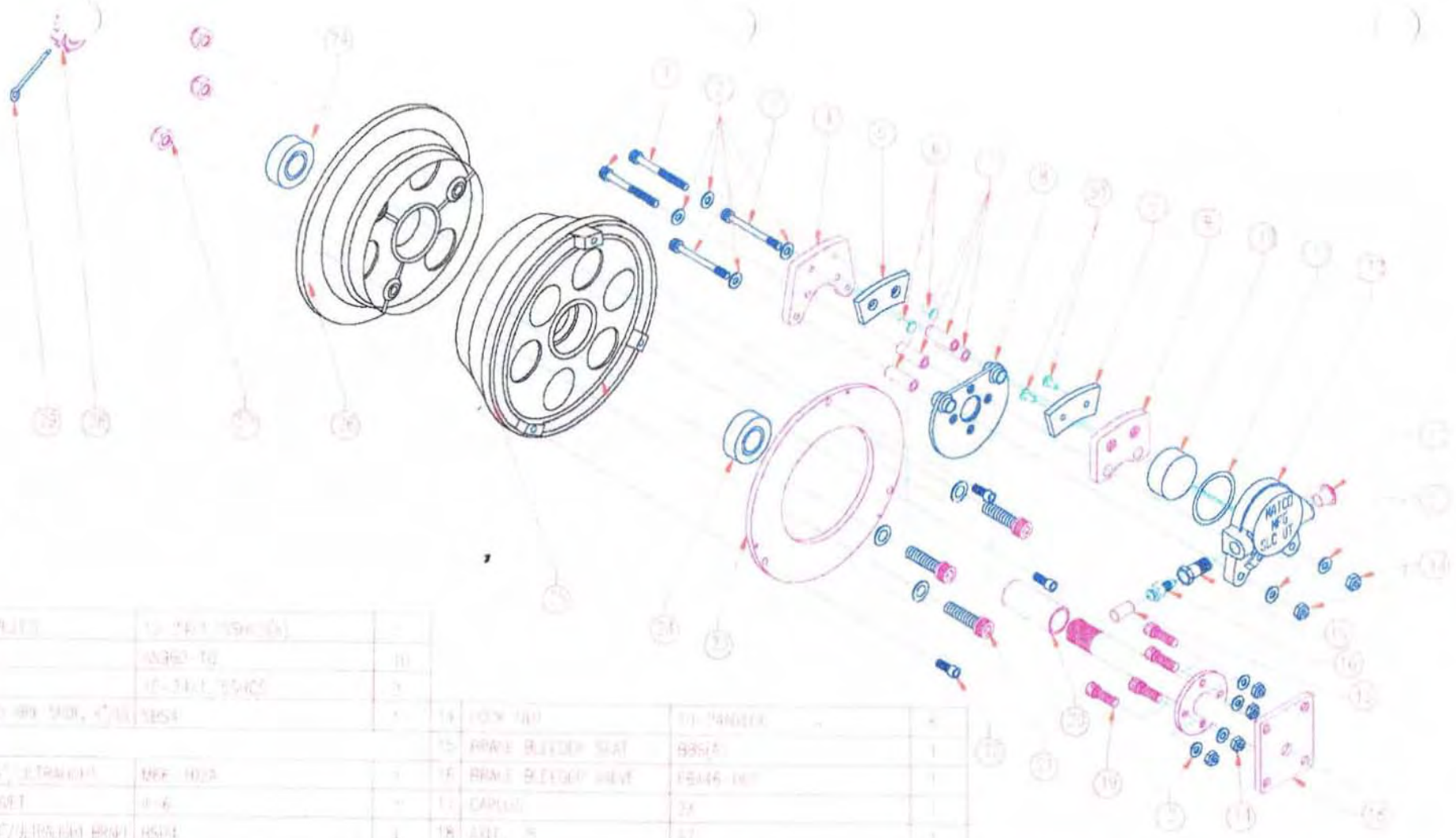
Revision to Weight and Balance/Equipment List

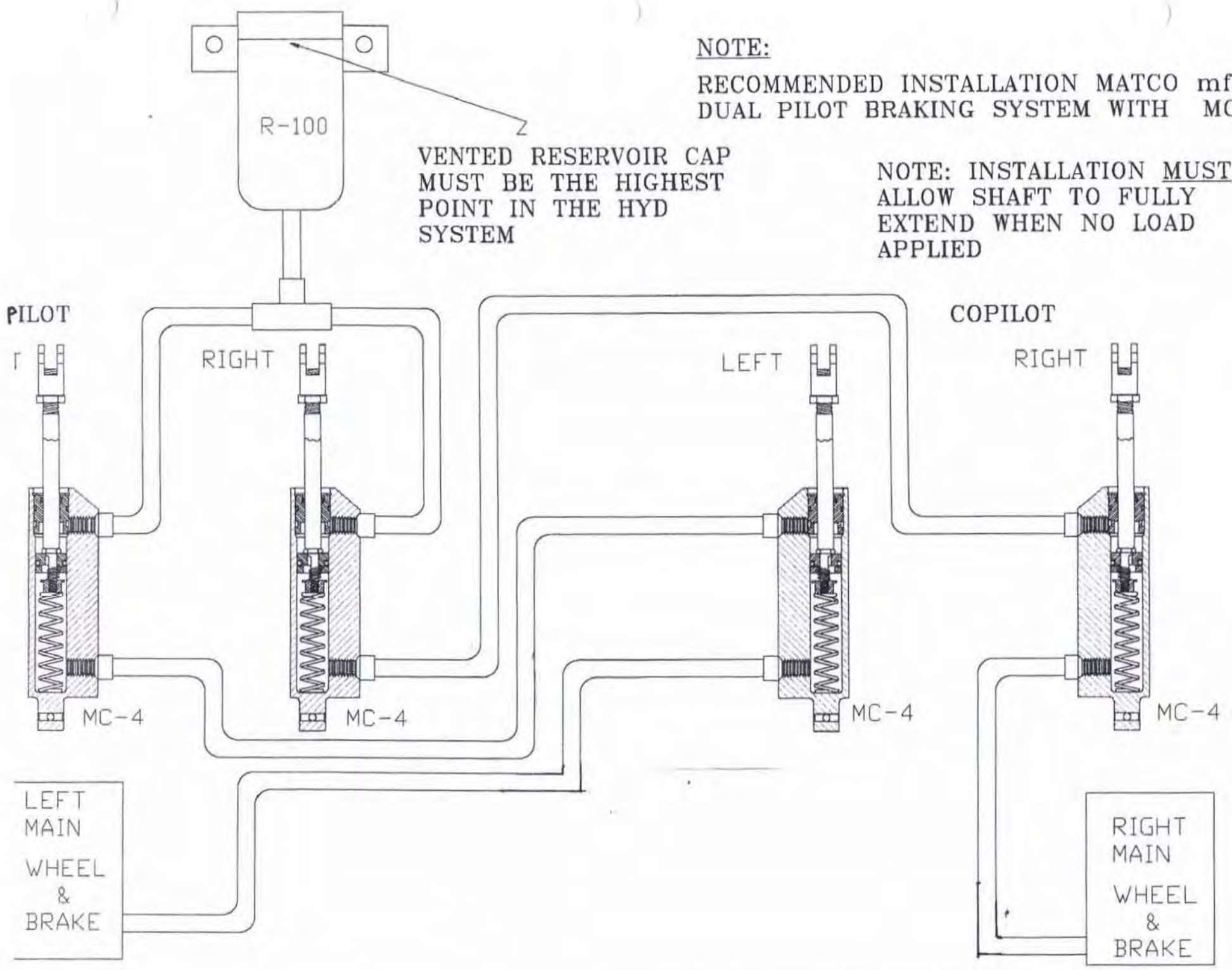
Aircraft Number: N: 222RU
Serial number: 002
Make: Elitar Sigma
Model:

ITEM	*WEIGHT*	*ARM*	*MOMENT*
Old Useful Load: 464 lbs			
Aircraft Empty:	859 lb	16.89	14506
Dated: 6-13-2007			
Equipment removed:			
Original wheel and brakes	16	22.80	364.80
Original Landing gear	4.8	22.80	109.44
Equipment installed:			
Matco Mfg			
Wheel assembly	18.8	22.80	428.64
Brake caliper and axel	4.8	22.80	109.44
Brake disc	1.0	22.80	22.80
Master cylinder	1.8	-17.0	-30.60
Brake reservoir	.4	-15.0	-6.00
Factory upgrade landing gear	7.2	22.80	164.16
Totals:	872.20	16.88	14720.20

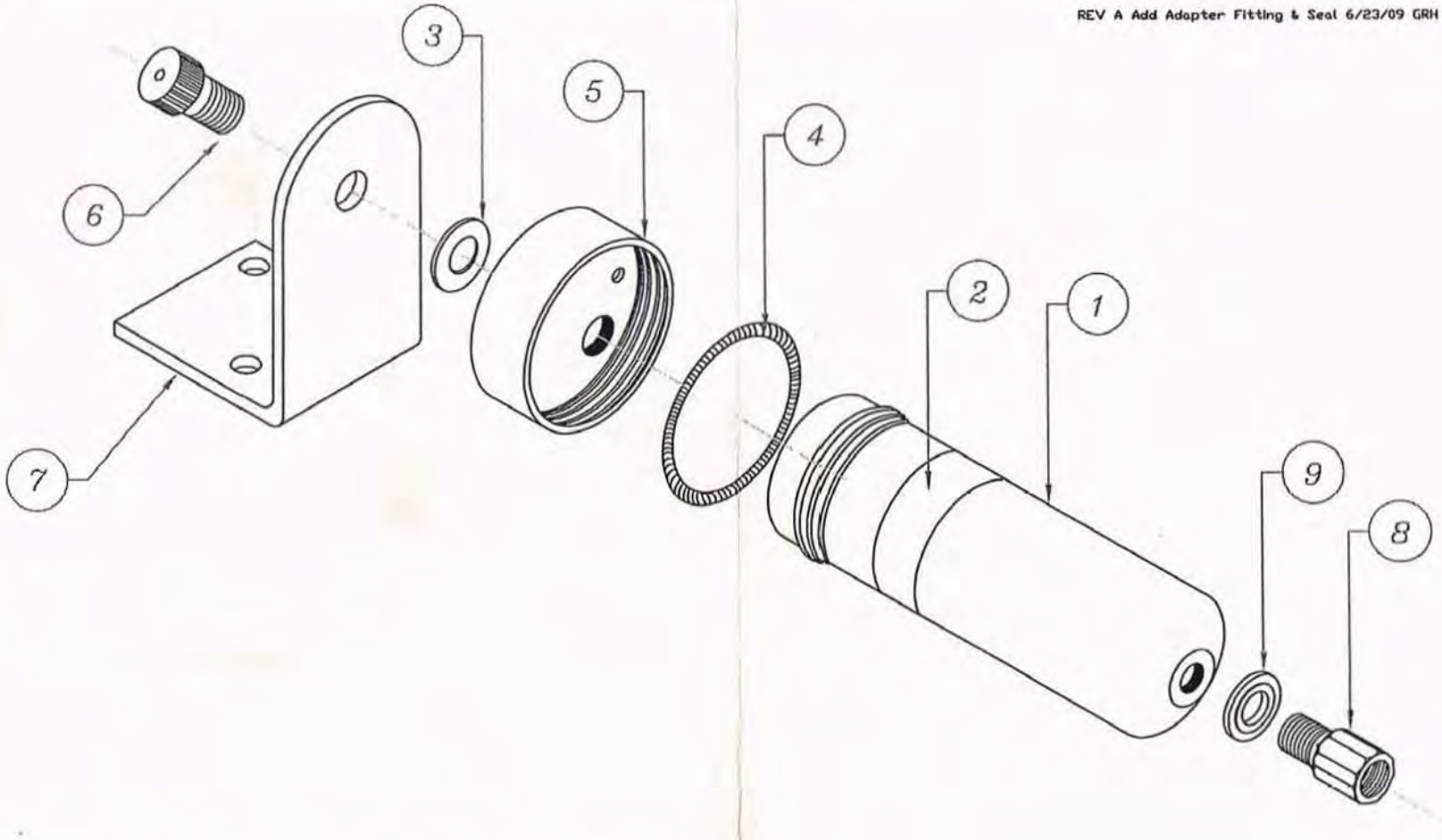
Revised aircraft empty: 872.20
New Empty Weight cg: 16.88
New Useful Load: 450.80

Signature of Authorized Individual


MATCO
MFG.
CLEVELAND


R-100
VENTED RESERVOIR CAP MUST BE THE HIGHEST POINT IN THE HYD SYSTEM
NOTE:
RECOMMENDED INSTALLATION MATCO mfg DUAL PILOT BRAKING SYSTEM WITH MC-4
NOTE: INSTALLATION MUST ALLOW SHAFT TO FULLY EXTEND WHEN NO LOAD APPLIED
PILOT
COPILOT
RIGHT
LEFT
RIGHT
MC-4
MC-4
MC-4
MC-4
LEFT MAIN WHEEL & BRAKE
RIGHT MAIN WHEEL & BRAKE

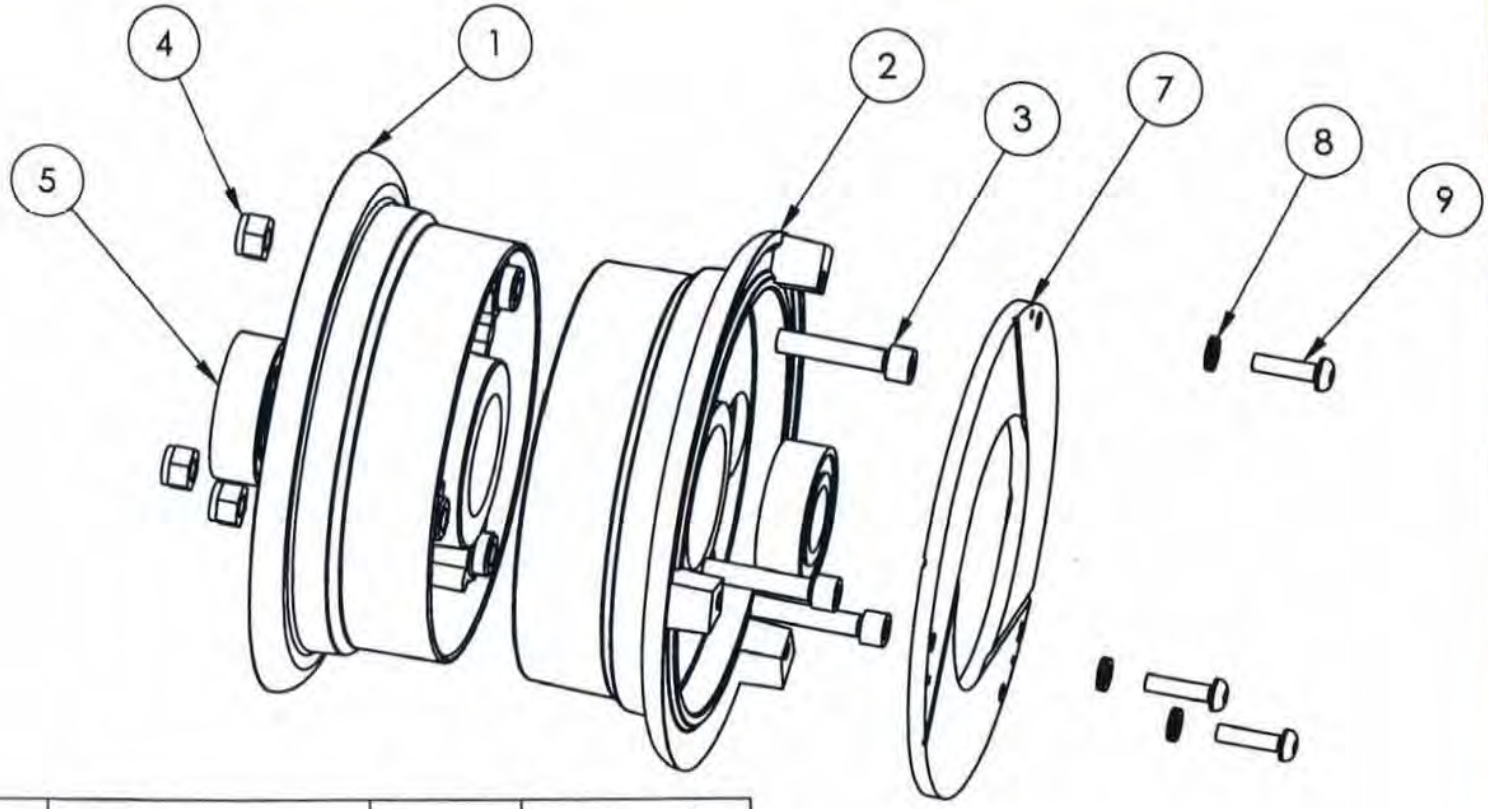
REV A Add Adapter Fitting & Seal 6/23/09 GRH



NO.	PART NAME	INVENTORY NO.	REQ'D
1	POLYCARBONATE BOWL	8722-40L	1
2	LABEL	LABELMAT06	1
3	WASHER	AN960-516L	1
4	O-RING BUNA N	2-027	1
5	RESERVOIR CAP	R-001	1
6	CAP PLUG	2P50NS	1
7	MOUNTING BRACKET	R-002	1
8	ADAPTER FITTING	F40HC5	1
9	STAT-O-SEAL	600-0101-375	1

MATCO mfg
2361 S 1560 West
(801) 335-0582
WOODS CROSS, UT 84087

DRAWING TITLE: R-100 REMOTE RESERVOIR
FILE NAME: ISO-REST
DRW. BY: MY KIM
DATE: JUNE 11, 1993
CK. BY:
SCALE:
SHEET# 1 OF 1
REVISION A



ITEM #	Part Number	Description	W50CC/QTY.	W50CC.75/QTY.
1	WHL50C	WHEEL HALF, DIE CAST	1	1
2	WHLB50C	WHEEL HALF, DIE CAST BRAKE	1	1
3	MSC.25-20x1.25SHCS	BOLT, SHCS .25-20X1.25	3	3
4	MSC.25-20NYLOCK	NUT, NYLOCK	3	3
5	MSC1630DCTN	Bearing, Ball 0.75	-	2
5	MSC1628DCTN	Bearing, Ball 0.625	2	-
7	WHLD4	DISC, BRAKE 4 INCH 0.188 Thick	1	1
8	MSCNL5	WASHER SET, NORLOC	3	3
9	MSC10-24X.75BHCS	SCREW, BUTTON HEAD	3	3

NOTE: For 51 Series Wheels Use 51 part Number (I.E. W51CC uses B51C and W51C Halves)

Brake Assemblies:

WHEEL SERIES	BRAKE ASSEMBLY
W50CC, W51CC	WHLB4XT-2
W50CC.62D, W50CC.75D	WHLB3-2
W50CCD.62, W50CCD.75	WHLB4-DXTMH

MATCO mfg
2361 S 1560 West
Woods Cross, UT 84087 USA

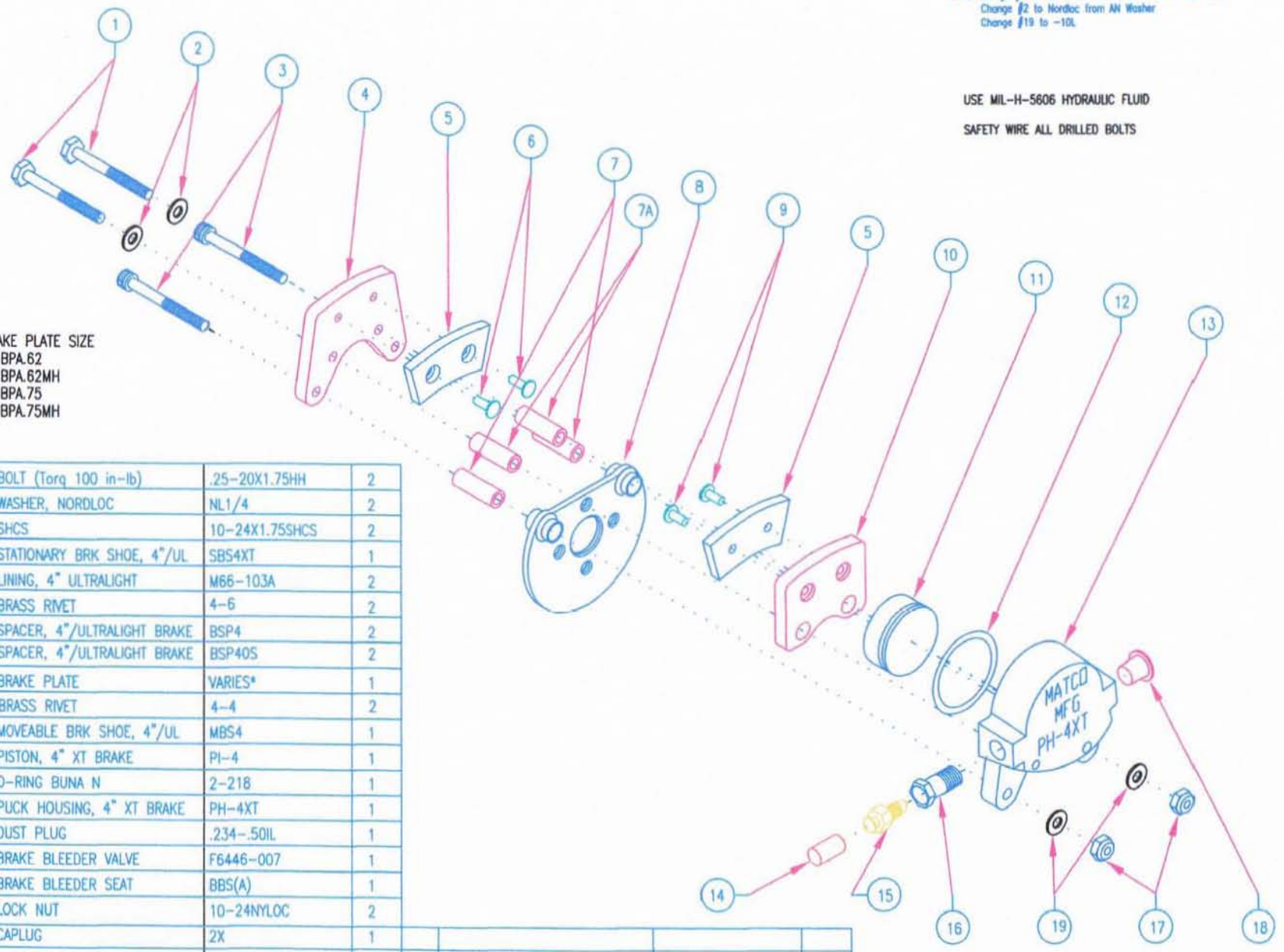
NOMENCLATURE: WHEEL, MAIN 5 " W50CC.75		PART NUMBER: WHLW50CC.75		SCALE: 1:2	TOLERANCES (EXCEPT AS NOTED) DO NOT SCALE DRAWING LINEAR .XX = ± .03 .XXX = ± .01 ANGULAR ± 1/2 CONCENTRIC ± .01
MATERIAL: Aluminum		DRAWING NO.: WHEEL/3D-W50CC.75	REVISION: A	Est Wt. (lb): 3.6770	
DRAWN BY: George R. Happ	FINISH: NONE	DATE: 1/4/2012	CHECKED BY	SHEET 1 OF 1 SHEET SIZE A	

REV A Correct 2 AN960-416L 1/25/07 GRH

REV B Change #1 to Hex Head from SHCS 10-15-08 GRH
Change #2 to Nordloc from AN Washer
Change #19 to -10L

USE MIL-H-5606 HYDRAULIC FLUID

SAFETY WIRE ALL DRILLED BOLTS



*BRAKE PLATE SIZE
BPA.62
BPA.62MH
BPA.75
BPA.75MH

NO.	PART NAME	INVENTORY NO.	REQ'D
1	BOLT (Torq 100 in-lb)	.25-20X1.75HH	2
2	WASHER, NORDLOC	NL1/4	2
3	SHCS	10-24X1.75SHCS	2
4	STATIONARY BRK SHOE, 4"/UL	SBS4XT	1
5	LINING, 4" ULTRALIGHT	M66-103A	2
6	BRASS RIVET	4-6	2
7	SPACER, 4"/ULTRALIGHT BRAKE	BSP4	2
7A	SPACER, 4"/ULTRALIGHT BRAKE	BSP40S	2
8	BRAKE PLATE	VARIES*	1
9	BRASS RIVET	4-4	2
10	MOVEABLE BRK SHOE, 4"/UL	MBS4	1
11	PISTON, 4" XT BRAKE	PI-4	1
12	O-RING BUNA N	2-218	1
13	PUCK HOUSING, 4" XT BRAKE	PH-4XT	1
14	DUST PLUG	.234-.501L	1
15	BRAKE BLEEDER VALVE	F6446-007	1
16	BRAKE BLEEDER SEAT	BBS(A)	1
17	LOCK NUT	10-24NYLOC	2
18	CAPLUG	2X	1
19	WASHER	AN960-10L	2

3-4BRAKE	MATCO mfg 2361 S 1560 West WOODS CROSS, UT 84087 (801) 335-0582	3D FOUR INCH XT BRAKE ASSEMBLY	DRAWN BY: G. HAPP AUTHORIZED BY:	SCALE: NONE DATE: OCTOBER 3, 2002	REVISION: B

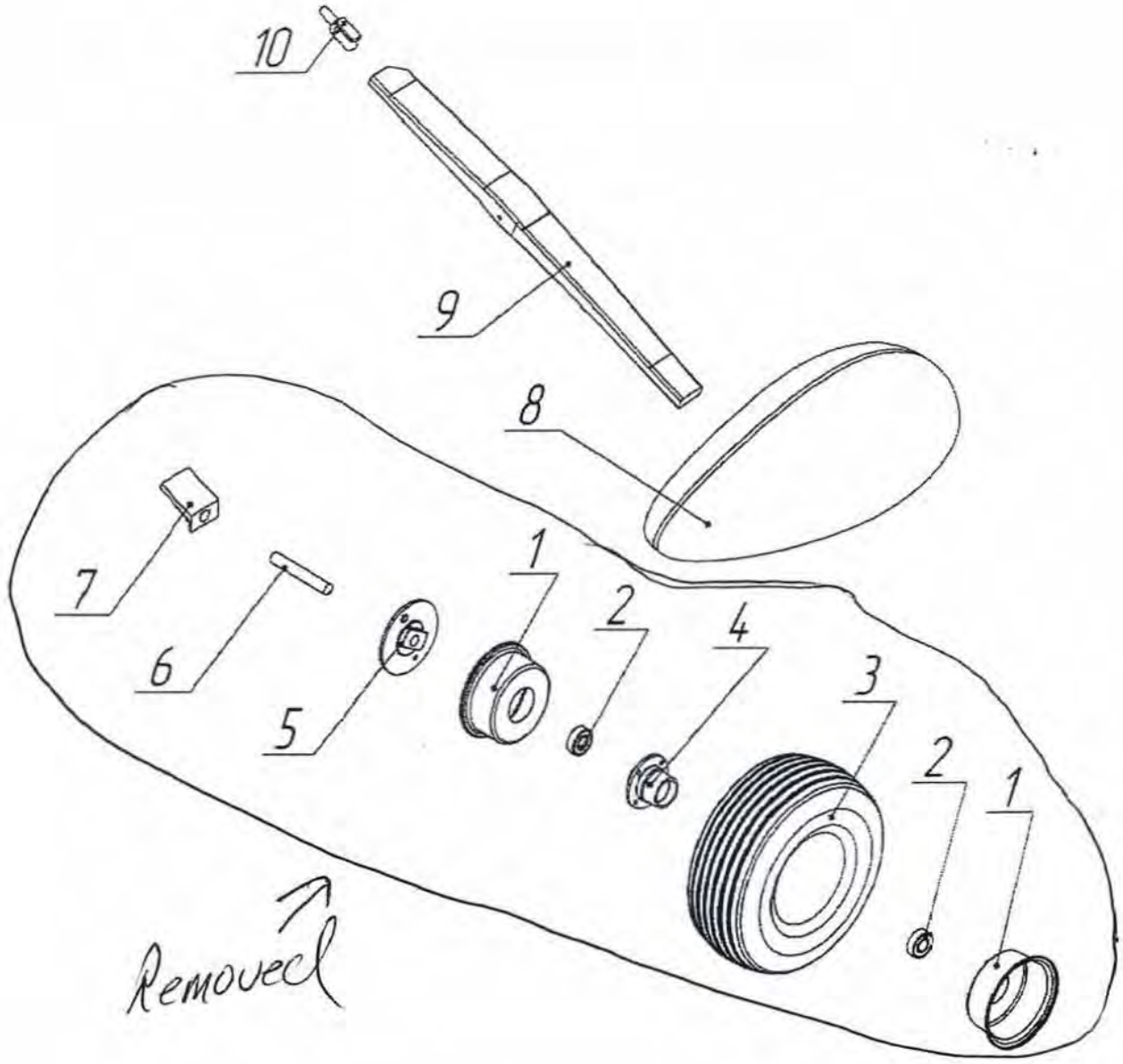


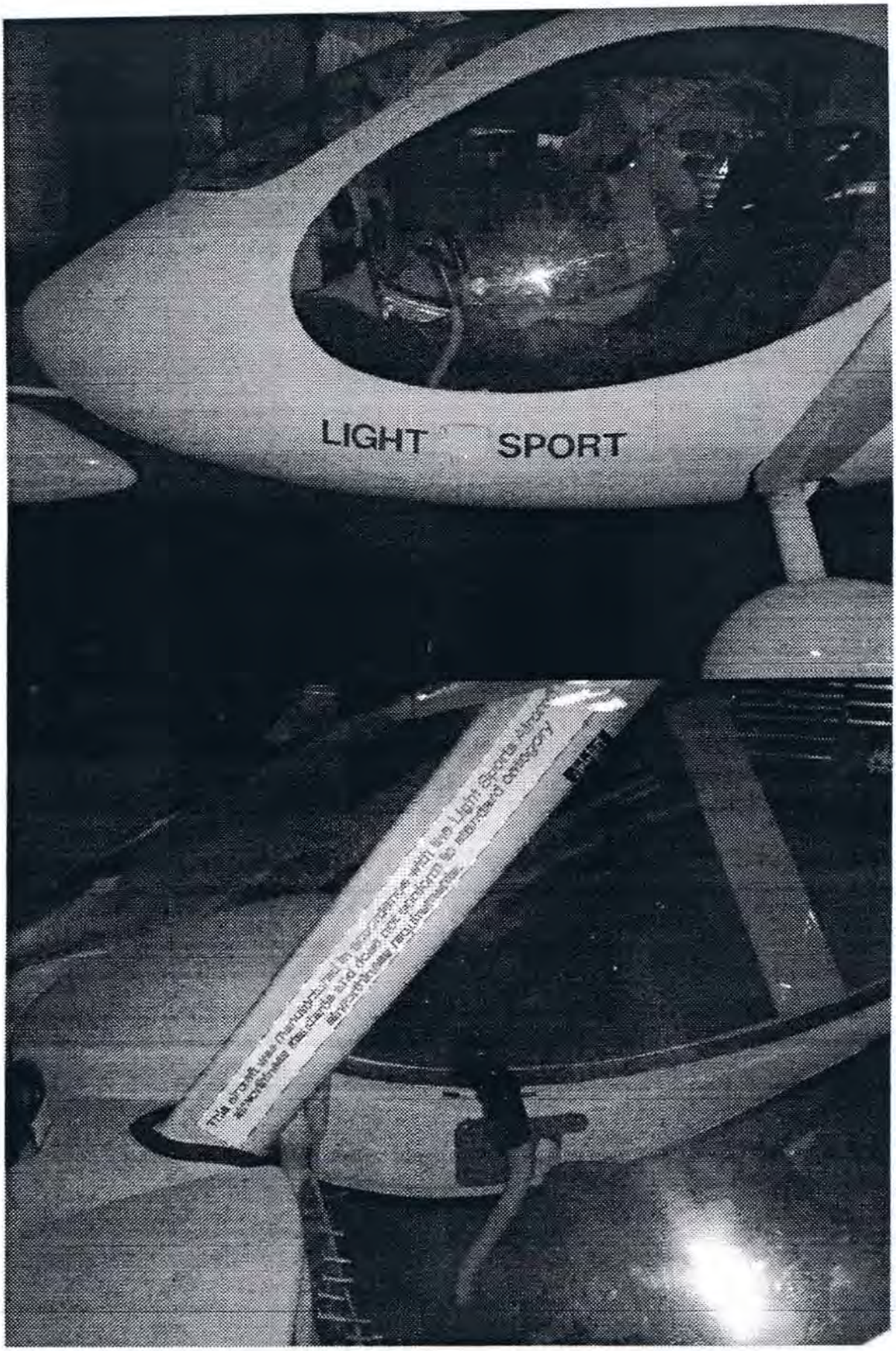
Fig.23 Main undercarriage C4-4150-0-1

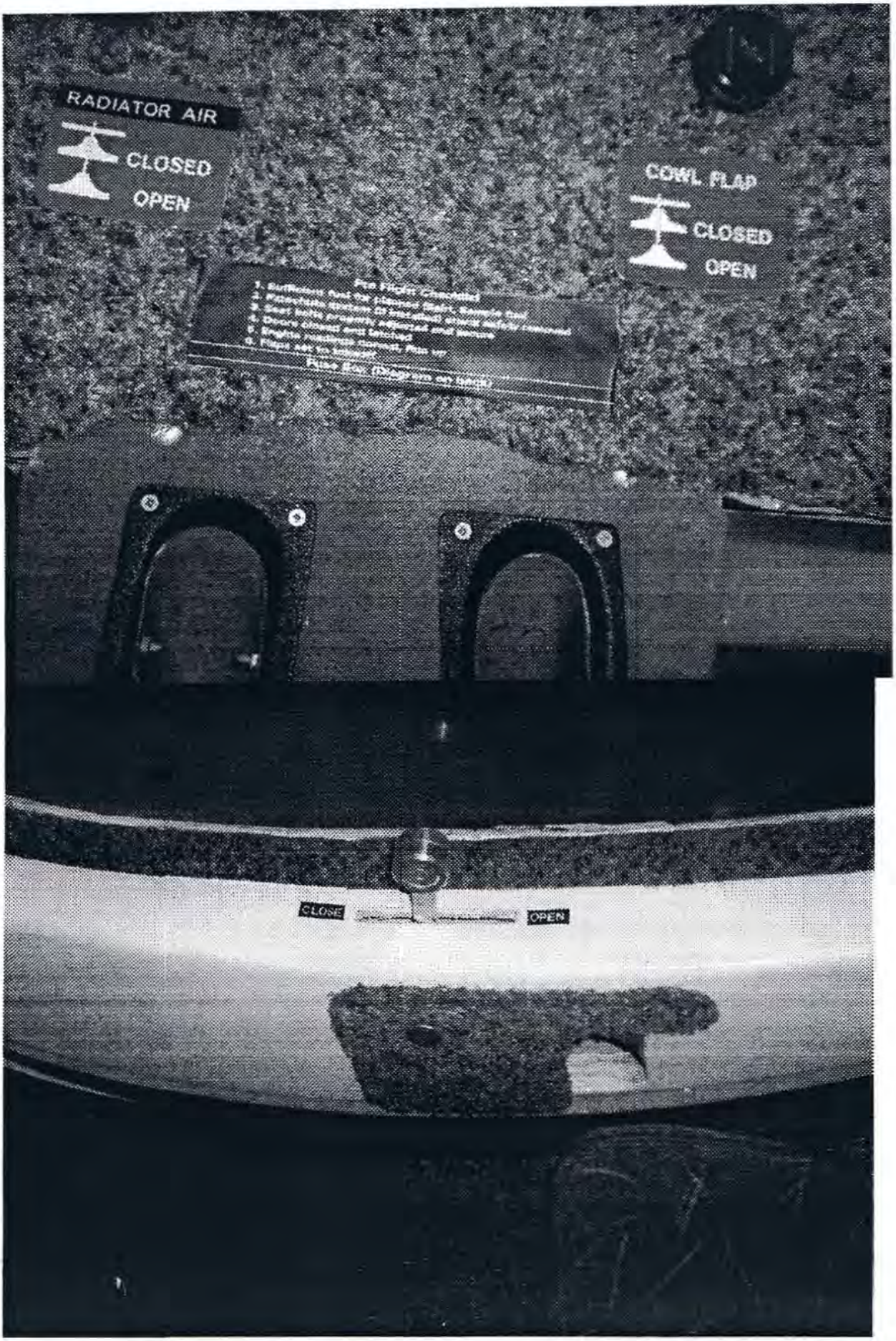
Sigma N222RU MAINTANCE MANUAL APPENDIX

FlyDat, fuse block and fuel gauge found not in accordance with POH as received from factory. POH and maintenance manual pages updated by Vadim Degtyarev locally placed on file and approved by Luidmila Tarkhova.

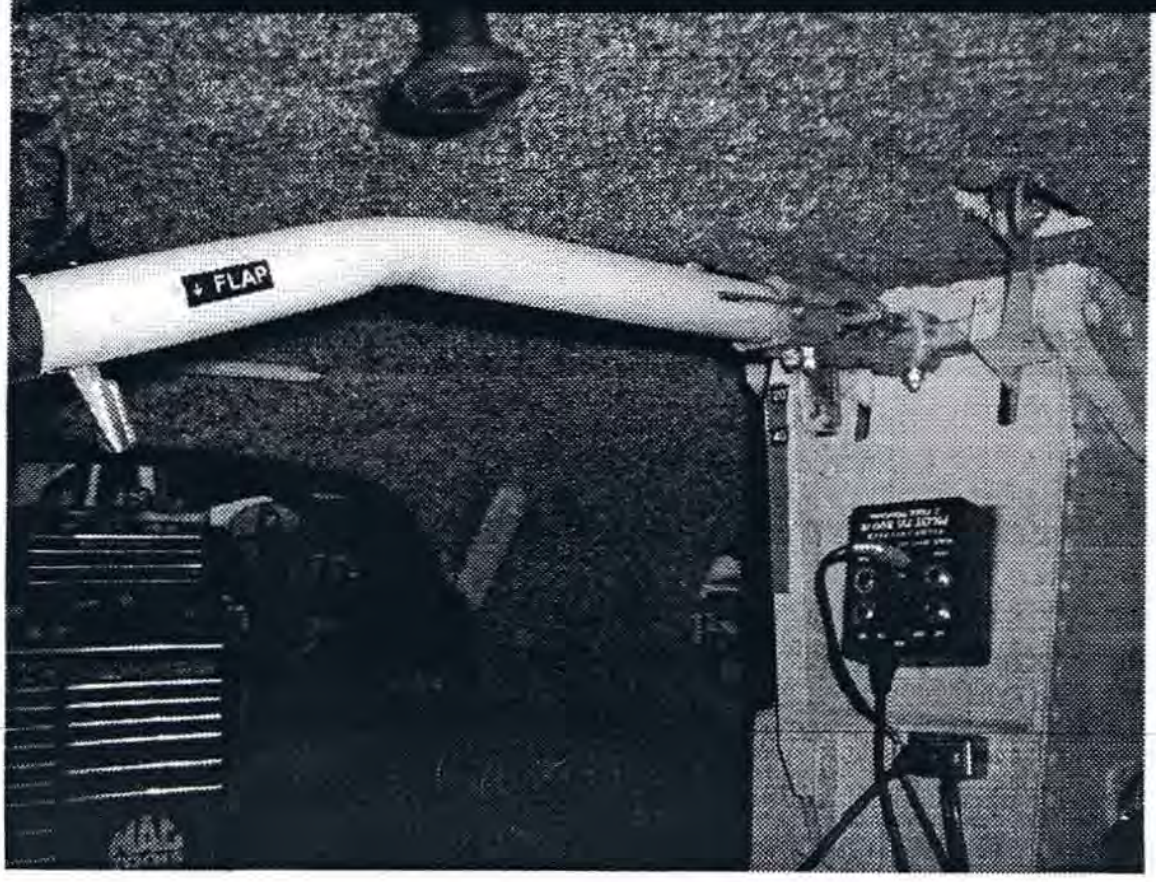
The following pages depict aircraft cockpit configuration and placards of the following:

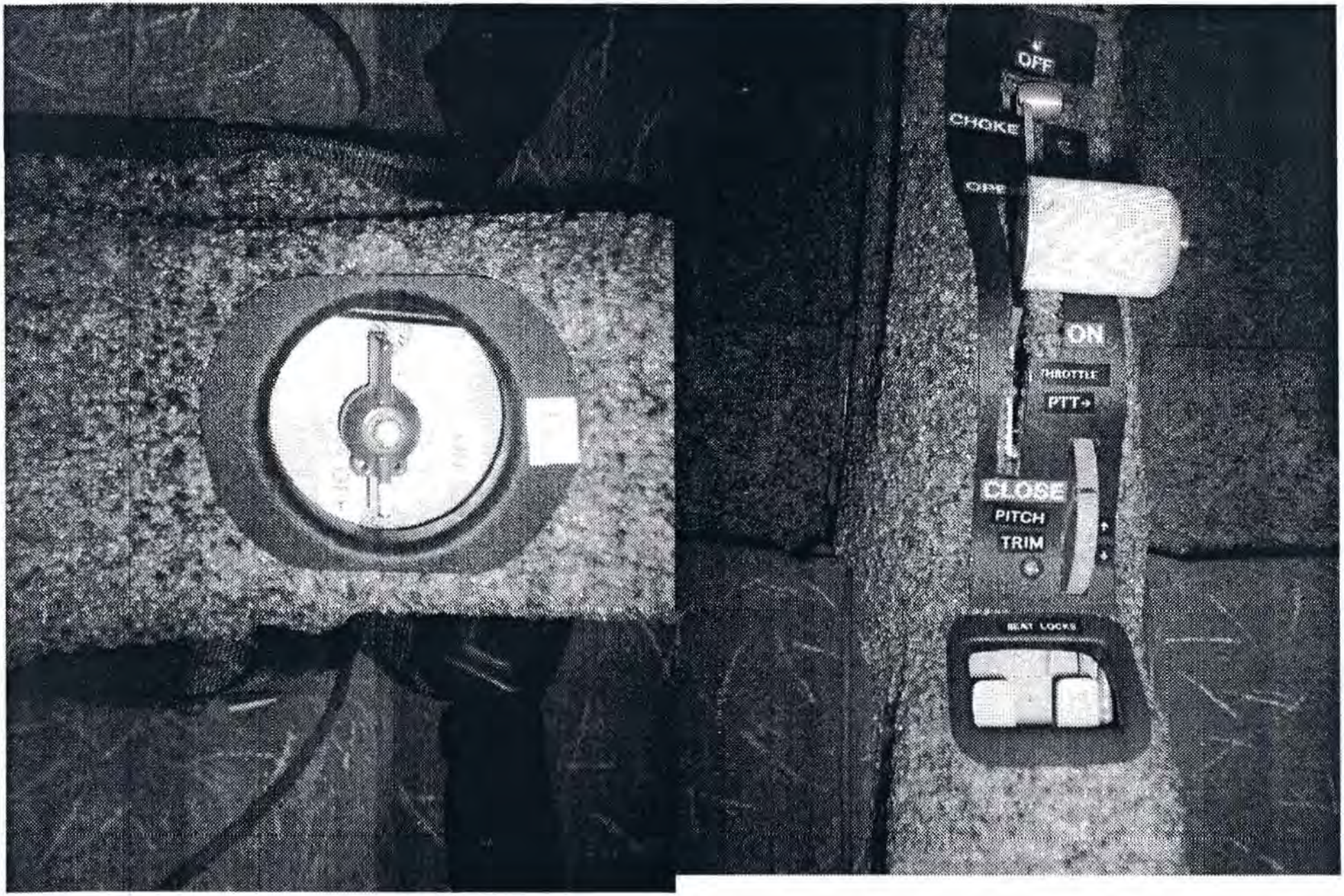
- Flight Instruments
- Switch Panel
- Fuel Valve
- Throttle Quadrant
- FlyDat and Fuel Gauge
- Overhead Preflight Checklist
- Door handles
- LIGHT SPORT decal
- Passenger Warning SLSA


LIGHT SPORT


RADIATOR AIR
CLOSED
OPEN
COWL FLAP
CLOSED
OPEN
CLOSE
OPEN


FLYdat
ROTAX


FLAP


OFF
CHOKE
ON
THROTTLE
PTT
CLOSE
PITCH
TRIM
SEAT LOCKS


COMPASS 4 DEGREE OFF
NAV
JDDE
PEDAL LOCK

APPENDIX 11 ALTIMETER INSTALLATION

Warranty

UMA, Inc. warrants all products to be free from defects in material and workmanship under normal use and operation. UMA does not warrant any product which has been damaged as the result of accident, abuse, negligence, improper operational voltage, lightning, fire, flood, or other acts of nature. Any indication that the unit has been opened can void warranty. Under no circumstances shall UMA be liable for any loss or damage, direct, consequential or incidental, arising from the use of or inability to use this product.

This warranty is limited to the repair or replacement, at the manufacturer's option, of any product or part thereof, which has been returned to UMA within the specified warranty period, and which after examination shall disclose to the customer serve department's satisfaction that the product is defective. Transportation to the factory or authorized service center must be prepaid; the product after repair or replacement, will be returned at the expense of the dealer or end customer. This warranty does not apply to any product or integral part thereof, which has been altered or serviced by other than the manufacturer or authorized service center.

The warranty period is twelve (12) months to the user.

This warranty supersedes all other warranties either expressed or implied and shall be governed and executed under the laws of the Commonwealth of Virginia, U.S.A.

Aircraft And Medical Instrument

UMA, Inc. • 260 N Main St., Box 100 • Dayton, Virginia 22821 • Phone (540)879-204
FAX: (540) 879-273
E-mail umainc@rica.net Web Site http://www.umainstruments.co

Altimeter Installation

Description:

The altimeter is one of the most used instrument in aircraft, it is also one of the oldest instruments. Since pressure changes with altitude, all altimeters used evacuated bellows or a capsule which expands or contracts due to the surrounding atmospheric pressure. Altimeter gives the altitude of the aircraft in relation to sea-level or to the ground.

Several types of altimeters exist, there are sensitive and non-sensitive altimeters. Sensitive altimeters have 2 or 3 pointers and have deviation markings every 20 feet, while non-sensitive have a single pointer and deviation markings every 100 feet. UMA only manufactures a non-sensitive type at this time.

Connection:

for 3 1/8" size- No connection is required, unless installed in a pressurized cabin or open cockpit with moving air behind panel.

Note: Do not connect 3 1/8" altimeter to static line, because case is not sealed and a static leak will result.

for 2 1/4" size- Connect "S" threaded (1/8" NPT) port to static line in aircraft.

Line-

Type: flexible tubing

Size: 1/4" OD X .028" - .035" ID

* *Atmospheric pressure decreases approx. one inch of mercury per thousand feet.*

* *Use knob to set barometric window to barometric pressure reading at closest airpo Altimeter reading should match altitude of field, within ±100 feet, after knob is set .*

* *On the ground, to indicator absolute barometric pressure adjust Altimeter to zero then read mark in barometric window.*

Warranty

UMA, Inc. warrants all products to be free from defects in material and workmanship under normal use and operation. UMA does not warrant any product which has been damaged as the result of accident; abuse, negligence, improper operational voltage, lightning, fire, flood, or other acts of nature. Any indication that the unit has been opened can void warranty. Under no circumstances shall UMA be liable for any loss or damage, direct, consequential or incidental, arising from the use of or inability to use this product.

This warranty is limited to the repair or replacement, at the manufacturer's option, of any product or part thereof, which has been returned to UMA within the specified warranty period, and which after examination shall disclose to the customer serve department's satisfaction that the product is defective. Transportation to the factory or authorized service center must be prepaid; the product after repair or replacement will be returned at the expense of the dealer or end customer. This warranty does not apply to any product or integral part thereof, which has been altered or serviced by other than the manufacturer or authorized service center.

The warranty period is twelve (12) months to the user.

This warranty supersedes all other warranties either expressed or implied and shall be governed and executed under the laws of the Commonwealth of Virginia, U.S.A.

UMA

Aircraft And Medical Instru

UMA, Inc. • 260 N Main St., Box 100 • Dayton, Virginia 22821 • Phone (540)87
FAX: (540) 87
E-mail umainc@rica.net Web Site http://www.umainstrum

Vertical Speed Indicator Installation Instructions

(Climb, or Rate of Climb Indicator)

Description:

This indicator senses the rate of climb or descent of an aircraft by measuring rate of pressure change due to the change in altitude. Several types of gauges standard VSI and a quick response IVSI. UMA only manufactures a standard V

Connection: Connect port to static line.

Line-

Type:

Size: 1/4" X .028" - .035"

Troubleshooting inaccurate Readings:

1.) First check all static connections, system must be airtight.

2.) If gauge is indicating descending at level flight, instrument case is probably leaking. Look around glass edge for discoloration. If suspected leak, return for

APPENDIX 13 AIRSPEED INDICATOR

UMA, Inc. • 260 N Main St., Box 100 • Dayton, Virginia 22821 • Phone (540)879-2040
FAX: (540) 879-2738
E-mail umainc@rica.net Web Site http://www.umainstruments.com

Aircraft And Medical Instruments

Airspeed Indicator installation

There are three types of airspeed instruments.

IAS- Indicated Airspeed, is subject to slight Errors due to placement of the pitot and static sources and mechanical inaccuracies at various places in the range.
CAS- Calibrated Airspeed, airspeed reading that is corrected for errors caused by mounting and mechanics, ect.
TAS- True Airspeed, airspeed reading that is corrected for altitude and temperature differences.

Connections:

** All UMA airspeeds 2 1/4" and 3 1/8" have S and P stamped on rear of instrument.*

Connect "S" to static port of aircraft.
Connect "P" to pitot pressure tube.

Static Port:
Measures the outside atmospheric pressure. Ideally static port should be vented to left and right side of fuselage. Some pitot tubes offer a static connection. Static pressure should be connected to Airspeed, Altimeter, and Vertical Speed.

Pressure Port:
Connected to pitot line tube.

Pitot Tube: Size: 1/4" dia. aluminum tube approx. 6" lg.
Mounting: On left side of aircraft approx. 1' from wing, facing forward or into the relative wind so that it measures ram pressure effects.
Lines- Type: Size: 1/4" .028 - .035"wall thickness.

Airspeed Markings:
Vne = Red line, never exceeded
Vno = YA caution range, YA caution, max. structural crusing speed
Vfe = GA normal operating range, WA end, max. speed with flaps down
Vs1 = GA beginning, stall speed with gear and flaps up
Vs0 = WA beginning, stall speed with gear and flaps down

Trouble Shooting Inaccurate Readings:

1.) Pointer not reading zero when plane is at rest.
   a. Wind blowing into pitot-static tube.
   b. Water in connection tubes.
   c. Instrument in need of re-calibration.

2.) Instrument reading is lower than normal.
   a. Attention not given to the change in reading with altitude. Higher altitude = thinner air, thus lower reading.
   b. Pitot-static tube bent or damaged.
   c. Pitot-static tube not positioned correctly on aircraft.
   d. Connection tubing or Instrument case not airtight.
   e. Instrument out of calibration.

3.) Instrument reading higher than normal.
   a. Connecting tubing or Instrument case not airtight.
   b. Instrument out of calibration.

Warranty

UMA, Inc. warrants all products to be free from defects in material and workmanship under normal use and operation. UMA does not warrant any product which has been damaged as the result of accident, abuse, negligence, improper operational voltage, lightning, fire, flood, or other acts of nature. Any indication that the unit has been opened can void warranty. Under no circumstances shall UMA be liable for any loss or damage, direct, consequential or incidental, arising from the use of or inability to use this product.

This warranty is limited to the repair or replacement, at the manufacturer's option, of any product or part thereof, which has been returned to UMA within the specified warranty period, and which after examination shall disclose to the customer serve department's satisfaction that the product is defective. Transportation to the factory or authorized service center must be prepaid; the product after repair or replacement, will be returned at the expense of the dealer or end customer. This warranty does not apply to any product or integral part thereof, which has been altered or serviced by other than the manufacturer or authorized service center.

The warranty period is twelve (12) months to the user.

This warranty supersedes all other warranties either expressed or implied and shall be governed and executed under the laws of the Commonwealth of Virginia, U.S.A.

Prepared by R.T. Checked by P.G.	**AEROFLASH SIGNAL** 1715 West Carroll Avenue Chicago, IL 60612-2503 1-800-322-2052 • 1-312-733-3513	Page 1 of 1 Date 8/12/02 Revision Ltr: A ECO: 4427

Wiring Diagrams for Anti-Collision Light(s) and Flasher 150-0015

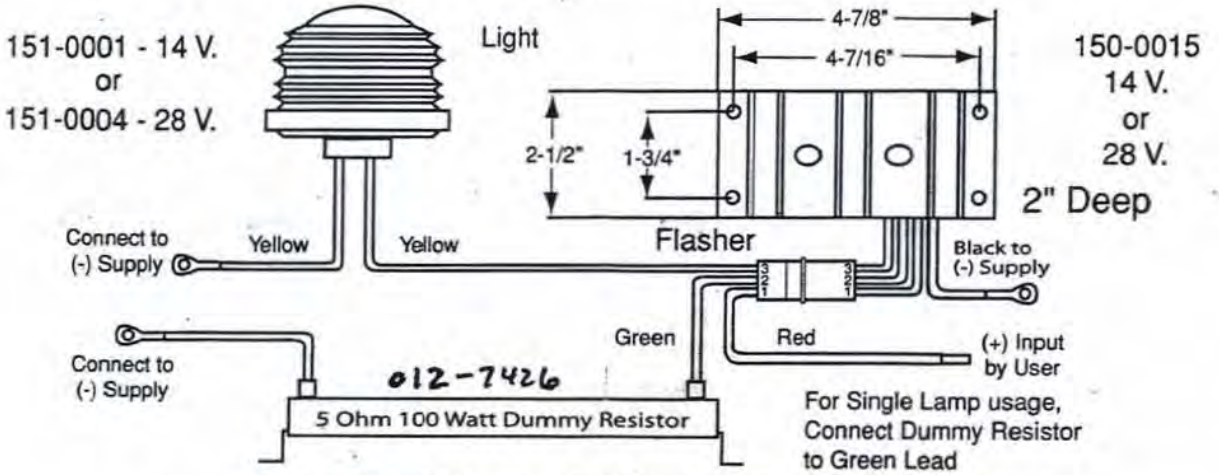


Fig 1 - Wiring Diagram for Single Light/Dummy Resistor

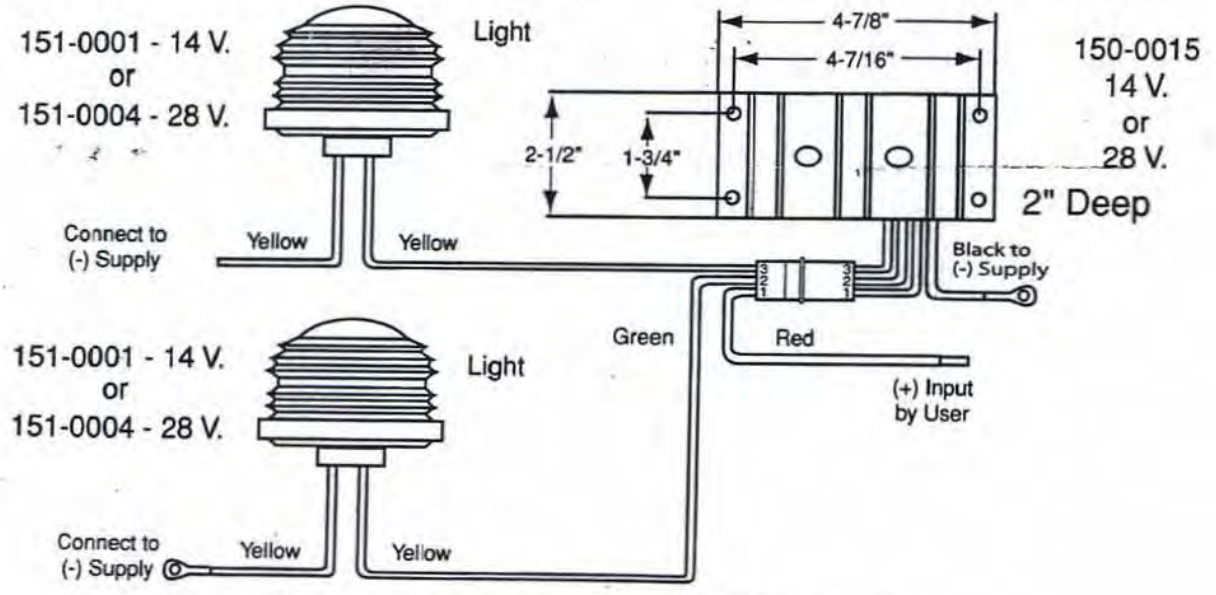


Fig 2 - Wiring Diagram for Two Lights

AEROFLASH SIGNAL 150-0015 FLASHER INSTRUCTIONS

1) FOR SINGLE LAMP OPERATIONS: FIGURE 1

Connect pin #1 (a red wire) to power input +28 volts or +14 volts. Connect pin #2 (a green wire) to one of the tabs on the Dummy Resistor. The other tab of the Dummy Resistor goes to ground. Connect pin #3 (a yellow wire) to one side of the lamp. The other side of the lamp goes to ground.

2) FOR DUAL LAMP OPERATION: FIGURE 2

Connect pin #1 (red wire) to power input +28 volts or + 14 volts. Connect pin #2 (a green wire) of the flasher unit and connect it to one side of a lamp (a yellow wire) and the other side of a lamp to ground. Pin #3 (a yellow wire) connects to the yellow wire of the other lamp and the other side of that lamp goes to ground.

Prep. by M.W. Ckd. by C.A.M.	**AEROFLASH SIGNAL** 1715 W. CARROLL AVE. CHICAGO, IL 60612-9916 1-800-322-2052 • 1-312-733-3513	Page 1 of 1 Date 8-12-02 Rev. LTR A ECO #4422

FEDERAL AVIATION ADMINISTRATION/PARTS MANUFACTURER APPROVAL

AEROFLASH P/N			DESCRIPTION	INSTALLATION ELIGIBILITY
OLD P/N	**NEW P/N**	**G.A.A.C. P/N**		
40-6 40-0027	040-0003	40-6A	24V. - 28V. Halogen Lamp	AA1B, AA5A, AA5B
40-14 40-0010	040-0028	40-14A	12V. - 14V. Halogen Lamp	AA1B, AA5A, AA5B
073-0141	SAME	73-154	Lamp Assy.	AA1B, AA5A, AA5B
150-0002	SAME	SAME	12V. - 14V. Single or Dual Flasher	AA1B, AA5A, AA5B
151-0001	SAME	A1E	12V. - 14V. Light Assy. Red Lens	AA1B, AA5A, AA5B
152-0003	152-0007	SAME	12V. - 14V. Power Supply	AA1B, AA5A, AA5B
153-0008 153-0003	SAME 153-0008		Strobe Assembly	AA1B, AA5A, AA5B
		VARGA P/N		
073-0270	SAME	SAME	U-Type Flash Tube Assembly	2150A
152-0003 152-0008	152-0007	SAME	12V. - 14V. Power Supply	2150A
		ROCKWELL P/N		
150-0015	SAME	DVA - 2	12V. - 14V. or 24V. - 28V. Sgle. or Dual Flasher, DVA-2	112, 112B, 112TC, 112TCA, 114
151-0001	SAME	SAME	12V. - 14V. Light Assy. Red Lens	112, 112B, 112TC, 112TCA, 114
		GREAT LAKES P/N		
150-0015	SAME	DVA - 2	12V. - 14V. or 24V. - 28V. Sgle or Dual Flasher, DVA-2	2T-1A-1, -2
151-0001	SAME	SAME	12V. -14V. Light Assy. Red Lens	2T-1A-1, -2
		CESSNA P/N		
40-6 40-0027	040-0003	C17312-1	24V. - 28V. Halogen Lamp	210, 337, 28 Volt Version of 185, 188 206-207
40-14 40-0010	040-0028	C17312-3	12V. - 14V. Halogen Lamp	150, 172, 177, 177RG, 180, 182, 185, 188 206, 207
73-0165 73-0167	073-0270	C622006-0108	U-Type Flash Tube Assembly	150, 172, 177, 177RG, 180, 182, 188, 206 207, 210
150-0001	150-0002	C594501-0203	12V. - 14V. Single or Dual Flasher, A1E	150, 172, 177, 177RG, 180, 182, 185, 188 206, 207, 210
150-0009	SAME	C594501-0204	24V. - 28V. Single or Dual Flasher, A2E	337
150-0010	150-0015	C594502-0102	12V. - 14V. or 24V. - 28V. Single/Dual Flasher, DVA-2	150, 172, 177, 177RG, 180, 185, 188, 206, 207, 210
151-0001	SAME	C621001-0106	12V. - 14V. Lamp Assy. Red Lens, X1E-6	150, 172, 177, 177RG, 180, 182, 185, 188, 206, 207
151-0006	SAME	C621001-0102	24V. - 28V. Lamp Assy. Red Lens, X2E.	210, 337, 28 volt Version of 206, 207, 185, 188
152-0004	152-0007	C622008-0101	12V. - 14V. Power Supply	150, 172, 177, 177RG, 180, 182, 185, 188, 206, 207, R172, 210
152-0006	152-0010	C622008-0102	24V. - 28V. Power Supply	210, 28 volt Version of 185, 188, 206, 207, R182, 150, 172, 177, 177RG
153-0006	153-0009	C62206-0107	Wing Tip Strobe Assembly	150, 172, 177, 177RG, 180, 182, 185, 188 206, 207, 210

				Dwg. No. 140-0027

AEROFLASH SIGNAL

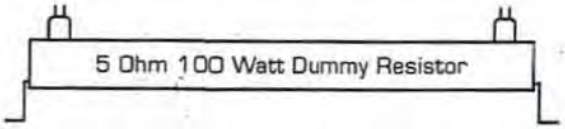
1715 W. Carroll Ave.
Chicago, IL 60612

INSTALLATION INSTRUCTIONS FOR A DUMMY LOAD RESISTOR

Dummy Load Resistor
PN 012-7426

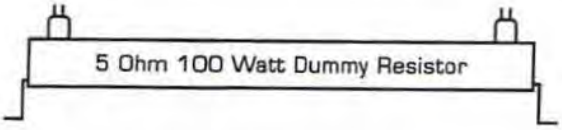
Weight = 3.5 oz.
Size = 6.5 in

150-0002



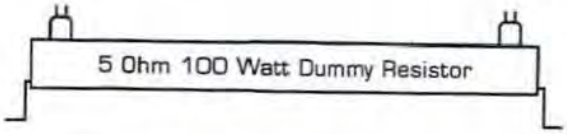
For Single Lamp Operation:
Connect one Terminal of the 5 ohm Dummy Resistor to the Yellow Flasher Lead from Pin #3 of the unmarked connector and the other Resistor Terminal to the Red Lead from Pin #2 of the unmarked connector (<+> Supply voltage - same as Flasher Red Lead). Make sure Resistor is securely mounted where it can dissipate heat well and does not heat the Flasher.

150-0003



For Single Lamp Operation:
Connect one Terminal of the 5 ohm Dummy Resistor to the remaining Yellow Flasher Lead and the other end of the resistor to ground. Make sure Resistor is securely mounted where it can dissipate heat well and does not heat the Flasher.

150-0015



For Single Lamp Operation
Connect one Terminal of the 5 ohm Dummy Resistor to the Green Flasher Lead from Pin #2 of the connector and the other Resistor Terminal to the <-> Supply voltage (Same as Flasher Black Lead). Make sure Resistor is securely mounted where it can dissipate heat well and does not heat the Flasher.

Drawn by E.G.	DATE 3/12/01
Checked by P.G.	DATE 3/12/01

GARMIN

GTX 320A

Mode A/C Transponder

pilot's guide

GARMIN International, Inc.
1200 East 151st Street, Olathe, Kansas 66062, U.S.A.
Tel. 913/397.8200 or 800/800.1020
Fax 913/397.8282

GARMIN (Europe) Ltd.
Unit 5, The Quadrangle, Abbey Park Industrial Estate, Romsey, SO51 9AQ, U.K.
Tel. 44/1794.519944
Fax 44/1794.519222

GARMIN Corporation
No. 68, Jangshu 2nd Road, Shijr, Taipei County, Taiwan
Tel. 886/2.2642.9199
Fax 886/2.2642.9099

Website Address: www.garmin.com

October 2000 Part Number 190-00133-09 Rev. A Printed in USA

Limited Warranty

GARMIN Corporation warrants this product to be free from defects in materials and workmanship for one year from the date of purchase. GARMIN will, at its sole option, repair or replace any components which fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor. The customer is, however, responsible for any transportation costs. This warranty does not cover failures due to abuse, misuse, accident or unauthorized alteration or repairs.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING ANY LIABILITY ARISING UNDER WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, STATUTORY OR OTHERWISE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, WHICH MAY VARY FROM STATE TO STATE.

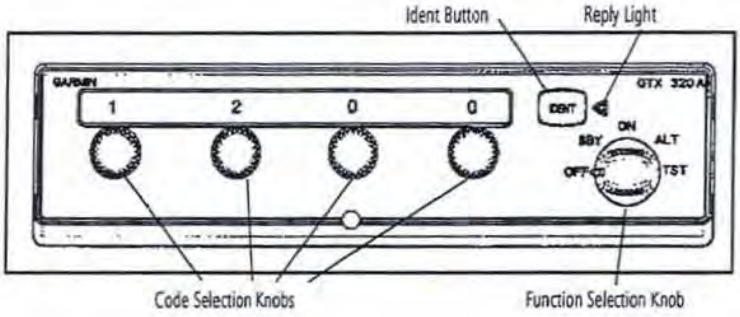
IN NO EVENT SHALL GARMIN BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE OR INABILITY TO USE THIS PRODUCT OR FROM DEFECTS IN THE PRODUCT. SOME STATES DO NOT ALLOW THE EXCLUSIONS OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATIONS MAY NOT APPLY TO YOU.

To obtain warranty service, call the GARMIN Customer Service department (913/397.8200) for a returned merchandise tracking number. The unit should be securely packaged with the tracking number clearly marked on the outside of the package, and sent freight prepaid and insured to a GARMIN warranty service station. A copy of the original sales receipt is required as the proof of purchase for warranty repairs. GARMIN retains the exclusive right to repair or replace the unit or software or offer a full refund of the purchase price at its sole discretion. SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

NOTE: The GTX 320A owner accepts all responsibility for obtaining the proper licensing before using the transponder.

NOTE: The coverage you can expect from the GTX 320A is limited to "line of sight". Low altitude or aircraft antenna shielding by the aircraft itself may result in reduced range. Range can be improved by climbing to a higher altitude. It may be possible to minimize antenna shielding by locating the antenna where dead spots are only noticed during abnormal flight attitudes.

CAUTION: The GTX 320A should be turned off before starting or shutting down aircraft engine(s).



Function Selector Switch:

The function selector switch is a five position rotary switch. The five positions are:

OFF-Turns off all power to the GTX 320A (the unit should be turned off before starting aircraft engine(s).

SBY-Turns the transponder on, but when in SBY the unit will not reply to any interrogations.

ON-The transponder transmits the aircraft's identification code (Mode A) but does not include altitude information.

ALT- The transponder transmits the aircraft's identification code, in Mode A and pressure altitude (29.92 inches Hg) information in Mode C provided the aircraft is equipped with an optional altitude encoder. The unit is normally operated in the ALT position at all times unless otherwise directed by ATC.

TST-Moving the switch to the TST position tests the reply light. The function selector is spring loaded and must be held in TST position. When released, it automatically returns to the ALT position.

Any time the function switch is in the ON or ALT position the transponder becomes an active part of the Air Traffic Control Radar Beacon System (ATCRBS). The transponder also responds to interrogations from TCAS equipped aircraft.

Code Selector

The code selector consists of four, eight-position switches that provide 4,096 active identification codes. The code selected should be either a VFR code or a code assigned by ATC. Regulations require that aircraft equipped with a transponder must operate the transponder, including Mode C equipment unless otherwise directed by ATC.

When making routine code changes, you should avoid inadvertent selection of codes 7500, 7600, or 7700 causing momentary false alarms at ground facilities. For example when switching from code 2700 to code 7200, switch first to 2200 then 7200, NOT to 7700 and then 7200.

This procedure applies to nondiscrete code 7500 and all discrete codes in the 7600 and 7700 series (i.e., 7600 to 7677, 7700 to 7777) which trigger special indicators in automated facilities. Only nondiscrete code 7500 will be decoded as the hijack code. An aircraft's transponder code is utilized for ATC tracking capability, therefore you should not turn the GTX 320A to SBY when making routine code changes.

Important Codes

1200-The United States VFR Code for any altitude.

7600-Loss of Communications.

7500-Hijacking (Never assigned by ATC without prior notification of the pilot that the aircraft is subject to unlawful interference).

7700-Emergency.

0000-Military use. Never squawk this Code.

See the Aeronautical Information Manual (AIM) for an explanation and uses of identification codes.

IDENT Button

On occasion, a controller will request "SQUAWK IDENT" to identify your transponder return from other aircraft. Respond by momentarily pressing the **IDENT** button, activating the Special Position Identification for approximately 20 seconds.

Reply Light

The reply light will blink each time the transponder replies to an interrogation. The reply light remains illuminated during the IDENT time interval and during **TST** function.

GTX 320A TRANSPONDER SPECIFICATIONS

TSO Compliance:	TSO C74c Class 1A
Temperature Range	-20°C to +55°C (Continuous Operation)
Installed weight with rack & connectors	2.9 lbs. (1.3 kg)
Physical dimensions:	
Bezel height	1.63 in. (41 mm)
Bezel width	6.25 in. (159 mm)
Depth behind panel incl. connectors	8.76 in. (223 mm)
Power Requirements	11.0 to 33.0 Vdc; Max Power Input: 12 Watts @ 500 prf
Humidity	95% @ +55°C for 16 Hours; 85% @ +38°C for 32 Hours
Altitude	50,000 Feet
Transmitter Frequency	1090 MHz
Transmitter Power	200 Watts Nominal
Receiver Frequency	1030 MHz
Receiver Sensitivity	-74dBm Nominal for 90% replies
Mode A Capability	4096 Identification Codes
Mode C Capability	100 Foot Increments from -1000 to 63,000 feet
External Suppression	Input - Low 0.5V; High 8V Output 18V Pulse

GARMIN International, Inc.
1200 East 151st Street, Olathe, Kansas 66062, U.S.A.

GARMIN (Europe) Ltd.
Unit 5, The Quadrangle, Abbey Park Industrial Estate, Romsey, SO51 9AQ, U.K.

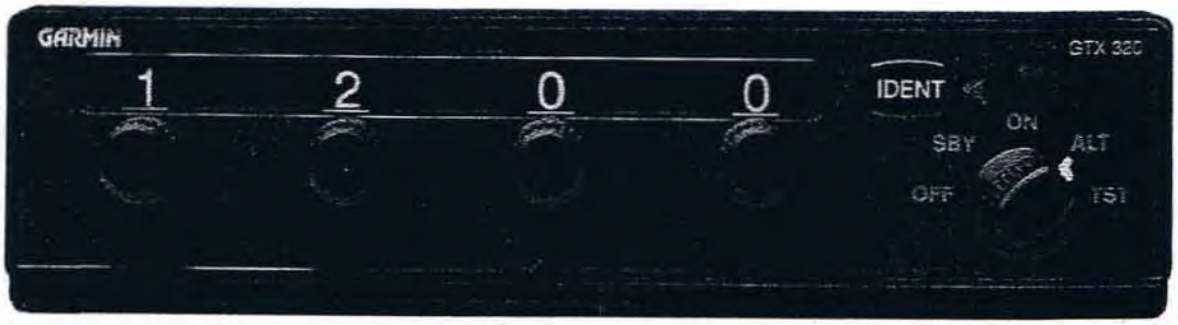
GARMIN Corporation
No. 68, Jangshu 2nd Road, Shijr, Taipei County, Taiwan

www.garmin.com

Part Number 190-00133-09 Rev. A

GARMIN

GTX 320/320A
Transponder Installation Manual



190-00133-01 July, 2006 Revision M

Garmin International, Inc.
1200 E. 151st Street
Olathe, KS 66062 USA
Telephone: 913-397-8200
Aviation Dealer Technical Support Line (Toll Free): (888) 606-5482
www.garmin.com

Garmin (Europe) Ltd.
Unit 5, The Quadrangle
Abbey Park Industrial Estate
Romsey, SO51 9DL U.K.
44/0870.851241

RECORD OF REVISIONS

Revision	Revision Date	Description	ECO #
A	02/10/97	Initial Rel	---
B	05/30/97	Clarify Antenna Requirements	7096
C	07/08/97	Lengthens Mount Screws, Add Notes	7344
D	08/21/97	Depth Behind Panel	7539
E	09/18/97	Wiring Diagram Corrections	7673
F	01/23/98	Add Spring Washer	8310
G	06/05/98	Correct reference to 50 ohm match bushing	8808
H	05/14/99	Updates and Corrections	10985
J	09/25/00	Redraw	14199
K	11/05/01	Updates and Clarifications	16878
L	06/06/02	Updated unit and accessory part numbers	18314
M	07/14/06	Corrected date on front cover and misc updates	40373

DOCUMENT PAGINATION

Section	Page Range
Table of Contents	iii — vi
Section 1	1-1 — 1-4
Section 2	2-1 — 2-10
Section 3	3-1 — 3-4
Appendix A	A-1 — A-8
Appendix B	B-1 — B-2
Appendix C	C-1 — C-16

INFORMATION SUBJECT TO EXPORT CONTROL LAWS

This document may contain information which is subject to the Export Administration Regulations ("EAR") issued by the United States Department of Commerce (15 CFR, Chapter VII, Subchapter C) and which may not be exported, released, or disclosed to foreign nationals inside or outside of the United States without first obtaining an export license. A violation of the EAR may be subject to a penalty of up to 10 years imprisonment and a fine of up to $1,000,000 under Section 2410 of the Export Administration Act of 1979. Include this notice with any reproduced portion of this document.

WARNING

This product, its packaging, and its components contain chemicals known to the State of California to cause cancer, birth defects, or reproductive harm. This Notice is being provided in accordance with California's Proposition 65. If you have any questions or would like additional information, please refer to our web site at www.garmin.com/prop65.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

GTX 320 HARDWARE MOD LEVEL HISTORY

The following table identifies hardware modification (Mod) Levels for the GTX 320 Transponder. Mod Levels are listed with the associated service bulletin number, service bulletin date, and the purpose of the modification. The table is current at the time of publication of this manual (see date on front cover) and is subject to change without notice. Authorized Garmin Sales and Service Centers are encouraged to access the most up-to-date bulletin and advisory information on the Garmin Dealer Resource web site at www.garmin.com using their Garmin-provided user name and password.

MOD LEVEL	SERVICE BULLETIN NUMBER	SERVICE BULLETIN DATE	PURPOSE OF MODIFICATION
1	NA	NA	Initial Release
2	9805	10-30-1998	Incorporates new circuitry in power supply

GTX 320A HARDWARE MOD LEVEL HISTORY

The following table identifies hardware modification (Mod) Levels for the GTX 320A Transponder. Mod Levels are listed with the associated service bulletin number, service bulletin date, and the purpose of the modification. The table is current at the time of publication of this manual (see date on front cover) and is subject to change without notice. Authorized Garmin Sales and Service Centers are encouraged to access the most up-to-date bulletin and advisory information on the Garmin Dealer Resource web site at www.garmin.com using their Garmin-provided user name and password.

MOD LEVEL	SERVICE BULLETIN NUMBER	SERVICE BULLETIN DATE	PURPOSE OF MODIFICATION

1 GENERAL DESCRIPTION

1.1 Introduction

This manual provides the installation and operating instructions for the Garmin GTX 320 and the GTX 320A Transponders. Information pertaining to the maintenance, alignment, and procurement of replacement parts is found in the GTX 320 Maintenance Manual, P/N 190-00133-02 and the GTX 320A Maintenance Manual, P/N 190-00133-08. After installation of the GTX 320/ GTX 320A, FAA Form 337 must be completed by an appropriately certificated agency and ATC transponder tests required by 14 CFR, Part 91.413 must be completed to return the aircraft to service.

1.2 Equipment Description

The Garmin GTX 320/320A Transponder is a radio transmitter and receiver that operates on radar frequencies. Receiving ground radar interrogations at 1030 MHz, it transmits a coded response of pulses to ground-based radar on a frequency of 1090 MHz.

As with other Mode A/Mode C transponders, the GTX 320/320A replies with any one of 4,096 codes, which differ in the position and number of pulses transmitted. By "replying" to ground transmissions, your GTX 320/320A enables ATC computers to display aircraft identification, altitude and ground speed on ATC radar screens. The GTX 320/320A is equipped with IDENT capability that activates the Special Position Identification Pulse (SPI) for approximately 20 seconds (18 seconds for the GTX 320A) identifying your transponder return from other aircraft on the controller's scope.

1.3 Technical Specifications

1.3.1 Transponder Specifications

Table 1-1 Transponder Specifications

Characteristic	Specification
TSO C74c Class 1A, JSTO C74C Class 1A	TSO, JTSO
(A1D1)-CA(BMN)XXXXXXZBABAUZXXXXXX	TSO ENV CAT
GTX 320: FAA TSO C74c; RTCA DO-160C, JTSO C74c GTX 320A: FAA TSO C74c; RTCA DO-160D, JTSO C74c	Applicable Documents
-20°C to +55°C (Continuous Operation)	Temperature Range
GTX 320: 14/28 VDC: 12 Watts Max. GTX 320A: 14/28 VDC: 20 Watts Max.	Power Requirements
95% @ +55°C for 16 Hours; 85% @ +38°C for 32 Hours	Humidity
50,000 Feet	Altitude
1090 MHz	Transmitter Frequency
125 Watts minimum, 150 Watts nominal at the antenna with 1.5 dB coaxial cable loss at 1090 MHz	Transmitter Power
1030 MHz	Receiver Frequency
GTX 320: -72 dBm Nominal for 90% replies GTX 320A: -74 dBm Nominal for 90% replies	Receiver Sensitivity
4096 Identification Codes	Mode A Capability
100 Foot Increments from -1000 to 63,000 Feet	Mode C Capability
Low ≤ 0.5 V; High ≥ 8 V	External Suppression Input

1.3.2 Physical Characteristics-GTX 320

Table 1-2 GTX 320 Physical Characteristics

Characteristic	Specification
Bezel Height	1.63 inches (41 mm)
Bezel Width	6.25 inches (159 mm)
Rack Height (Dimple to Dimple)	1.71 inches (43 mm)
Rack Width	6.30 inches (160 mm)
Depth Behind Panel with Connectors (measured from face of aircraft panel to rear of connector backshells)	8.78 inches (223 mm)
Weight (Unit Only)	1.7 lbs. (0.8 kg)
Weight (Installed with rack and connectors)	2.3 lbs. (1.1 kg)

1.3.3 Physical Characteristics-GTX 320A

Table 1-3 GTX 320A Physical Characteristics

Characteristic	Specification
Bezel Height	1.63 inches (41 mm)
Bezel Width	6.25 inches (159 mm)
Rack Height (Dimple to Dimple)	1.71 inches (43 mm)
Rack Width	6.30 inches (160 mm)
Depth Behind Panel with Connectors (measured from face of aircraft panel to rear of connector backshells)	8.78 inches (223 mm)
Weight (Unit Only)	2.3 lbs. (1.1 kg)
Weight (Installed with rack and connectors)	2.9 lbs. (1.3 kg)

1.4 Equipment Available

1.4.1 Available Configurations

Table 1-4 Available Configurations

Item	Garmin P/N
Garmin GTX 320 Transponder	010-00135-00
Garmin GTX 320A Transponder	010-00247-00
Garmin GTX 320 Transponder includes Garmin installation kit, P/N 010-10161-00	010-00135-03
Garmin GTX 320A Transponder includes Garmin installation kit, P/N 010-10161-01	010-00247-02

1.4.2 Installation Accessories

Table 1-5 Available Installation Accessories

Item	Garmin P/N
Mounting Rack	115-00285-00
Connector Kit	011-00651-01
Rear Backplate	011-00677-01
Mounting Rack, Rear Backplate and Connector Kit (Includes 115-00285-00, 011-00677-01 and 011-00651-01)	010-10161-01
Garmin GTX 320/320A Narco Adapter	010-10158-00
Garmin GTX 320/320A KT76A Adapter	010-10159-00
Garmin GTX 320/320A Antenna kit*	010-10160-00

* A transponder antenna approved to TSO C66( ) or C74( ) that has been installed to meet the requirements of this manual may be approved for use with the GTX 320/320A.

1.5 Additional Equipment Required

- Antenna Sealant - Use antenna manufacturer's instructions, install according to FAA AC 43.13-2A.
- Cables - The installer will supply all system cables. Cable requirements and fabrication is detailed in Section 2 of this manual.
- Hardware - #6 Flat Head Screw (6 ea.) and #6-32 Self Locking Nut (6 ea.). Hardware required to mount installation rack is not provided.

1.6 Installation Approval

The conditions and tests required for TSO approval of the GTX 320/320A Transponder and antenna are minimum performance standards. It is the responsibility of the installer to determine that the aircraft installation standards for a specific type or class of aircraft are in compliance with all applicable TSO requirements. The GTX 320/320A and antenna may be installed only if further evaluation by the applicant documents an acceptable installation and is approved by the administrator. For GTX 320/320A TSO compliance, see Appendix A. For antenna TSO compliance, refer to antenna manufacturer's literature.

1.7 ATC Transponder Tests and Inspections

The ATC transponder tests required by 14 CFR, Part 91.413 may be conducted using a bench check or portable test equipment and must meet the requirements prescribed in Part 43 Appendix F.

If portable test equipment with appropriate coupling to the aircraft antenna system is used, operate the test equipment for ATCRBS transponders at a nominal rate of 235 interrogations per second to avoid possible ATCRBS interference. An additional 3 dB loss is allowed to compensate for antenna coupling errors during receiver sensitivity measurements conducted in accordance with Part 43 Appendix F, Paragraph (c)(1) when using portable test equipment.

1.8 Limited Warranty

This Garmin product is warranted to be free from defects in materials or workmanship for two years from the date of purchase. Within this period, Garmin will at its sole option, repair or replace any components that fail in normal use. Such repairs or replacement will be made at no charge to the customer for parts or labor, provided that the customer shall be responsible for any transportation cost. This warranty does not cover failures due to abuse, misuse, accident or unauthorized alteration or repairs.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESS OR IMPLIED OR STATUTORY, INCLUDING ANY LIABILITY ARISING UNDER ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, STATUTORY OR OTHERWISE. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, WHICH MAY VARY FROM STATE TO STATE.

IN NO EVENT SHALL GARMIN BE LIABLE FOR ANY INCIDENTAL, SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES, WHETHER RESULTING FROM THE USE, MISUSE, OR INABILITY TO USE THIS PRODUCT OR FROM DEFECTS IN THE PRODUCT. Some states do not allow the exclusion of incidental or consequential damages, so the above limitations may not apply to you.

Garmin retains the exclusive right to repair or replace the unit or software or offer a full refund of the purchase price at its sole discretion. SUCH REMEDY SHALL BE YOUR SOLE AND EXCLUSIVE REMEDY FOR ANY BREACH OF WARRANTY.

To obtain warranty service, contact your local Garmin Authorized Service Center. For assistance in locating a Service Center near you, call Garmin Customer Service at one of the numbers shown below.

Products sold through online auctions are not eligible for rebates or other special offers from Garmin. Online auction confirmations are not accepted for warranty verification. To obtain warranty service, an original or copy of the sales receipt from the original retailer is required. Garmin will not replace missing components from any package purchased through an online auction.

Garmin International, Inc.
1200 East 151st Street
Olathe, Kansas 66062, U.S.A.
Phone: 913/397.8200
FAX: 913/397.8282

Garmin (Europe) Ltd.
Unit 5, The Quadrangle, Abbey Park Industrial Estate
Romsey, SO51 9DL, U.K.
Phone: 44/0870.851241
FAX: 44/0870.851251

2 INSTALLATION OVERVIEW

2.1 Introduction

This section provides the necessary information for installing the GTX 320/320A Transponders, and where required, optional accessories. Installation of the GTX 320/320A Transponder should comply with the aircraft Type Certificate (TC) or Supplemental Type Certificate (STC). Cabling will be fabricated by the installing agency to fit each particular aircraft. The guidance of FAA advisory circulars AC 43.13-1B and AC 43.13-2A, where applicable, may be found useful for accomplishing retro-fit installations that comply with FAA regulations. This section contains interconnect diagrams, mounting dimensions, and information pertaining to installation.

2.2 Unpacking and Inspecting Equipment

Carefully unpack the equipment and make a visual inspection of the unit for evidence of damage incurred during shipment. If the unit is damaged, notify the carrier and file a claim. To justify a claim, save the original shipping container and all packing materials. Do not return the unit to Garmin until the carrier has authorized the claim.

Retain the original shipping containers for storage. If the original containers are not available, a separate cardboard container should be prepared that is large enough to accommodate sufficient packing material to prevent movement.

2.3 Antenna Installation

2.3.1 Location Considerations

A. The antenna (Garmin P/N 010-10160-00) should be well removed from any major protrusions, the engine(s), propeller(s), and antenna masts. It should also be as far removed as practical from landing gear doors, access doors, or other openings that could alter its radiation pattern.

B. The antenna should be mounted on the underside of the aircraft and in a vertical position (relative to the position of the aircraft in level flight).

C. Avoid mounting the antenna within three feet of the ADF sense antenna or any other communication antenna and six feet from the DME antenna.

D. To prevent RF interference, the antenna must be mounted a minimum distance of three feet from the GTX 320/320A.

NOTE

If the antenna is being installed on a composite aircraft, ground planes may be required. Conductive wire mesh, radials, or thin aluminum sheets embedded in the composite material provide the proper ground plane allowing the antenna pattern (gain) to be maximized for optimum transponder performance.

2.3.2 Antenna Installation

Install the antenna according to the antenna manufacturer's instructions and FAA AC 43.13-2A.

2.3.3 Installation Approval Considerations for Pressurized Aircraft

Antenna and cable installations on pressurized cabin aircraft require FAA approved installation design and engineering substantiation data whenever such installations incorporate alteration (penetration) of the cabin pressure vessel by connector holes and/or mounting arrangements.

For needed engineering support pertaining to the design and approval of such pressurized aircraft antenna installations, it is recommended that the installer proceed according to any of the following listed alternatives:

1. Obtain approved antenna installation design data from the aircraft manufacturer.

2. Obtain an FAA approved Supplemental Type Certificate (STC) pertaining to and valid for the subject antenna installation.

3. Contact the FAA Aircraft Certification Office in the appropriate Region and request identification of FAA Designated Engineering Representatives (DERs) who are authorized to prepare and approve the required antenna installation engineering data.

4. Obtain FAA Advisory Circular AC-183C and select (and contact) a DER from the roster of individuals identified there under.

5. Contact an aviation industry organization such as the Aircraft Electronics Association and request their assistance.

2.3.4 Antenna Cable Installation

When routing antenna cables, observe the following precautions:

- All cable routing should be kept as short as possible and as direct as possible.
- Avoid sharp bends.
- Avoid routing cables near power sources (e.g., 400 Hz generators, trim motors, etc.) or near power for fluorescent lighting.
- Avoid routing cable near ADF antenna cable (allow at least a 12-inch separation).

The table below lists the recommended 50 ohm double shielded coax antenna cable vendor and the type to be used for specific lengths of cable. Adherence to this table will ensure that the coax installation will not exceed the maximum allowable 1.5 dB attenuation at the transmitter operating frequency of 1090 MHz.

Table 2-1 Antenna Coax Cable, Vendor & Type

Max. Length (feet)	ECS Type	MIL-C-17 Type	RG Type
8.8		M17/128	RG400
10.0	3C142B		
12.5		M17/112	RG304
17.0	311601	M17/127	RG393
21.0	311501		
27.0	311201		
41.0	310801		
Supplier Information	Vendor: Electronic Cable Specialists 5300 W. Franklin Drive Franklin, WI 53132 Tel: 800-327-9473 414-421-5300 Fax: 414-421-5301	MIL-C-17 types: See current issue of Qualified Products List QPL-17.	RG types: See current issue of Qualified Products List QPL-17.

2.3.5 Antenna Cable Connectors

One of two rack connectors is provided (item 6 or 12 in the installation drawing, figure B2). RF Adapter item 12 (P/N 330-00326-00) requires the cable to be terminated to an appropriate type BNC plug (provided by installer), which is then attached to item 12. Any 50 ohm, double shielded cable may be used, provided it introduces less than 1.5 dB attenuation at 1 GHz including the connector.

Connector item 6 (P/N 330-00198-00) requires the cable to be terminated directly to it and can accommodate only M17/128 (RG-400) cable. The completed cable including connectors must introduce no more than 1.5 dB attenuation at 1 GHz. Instructions for installing the item 6 are shown in Figure 2-1 and detailed in the following steps A-G.

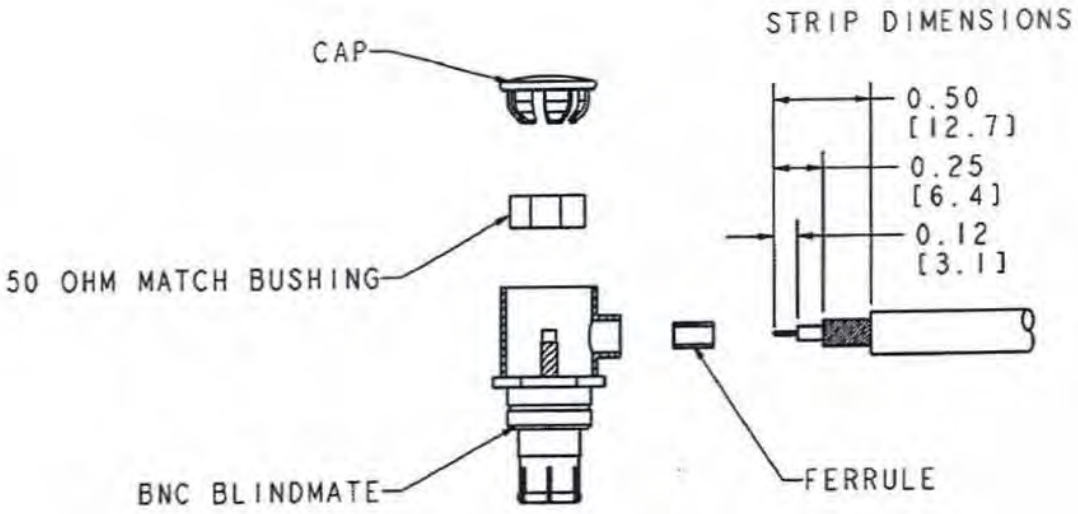


Figure 2-1 BNC Connector Assembly Drawing

A. Trim coax outer insulation back 0.50"

B. Trim braid (not center conductor or insulation) back 0.25".

C. Strip Insulation back 0.120".

NOTE

Place the ferrule over the coax braid, flush against the coax outer insulation before performing the next step if the outside diameter of the coax braid is smaller than the inside diameter of the center connector sidewall opening.

D. Insert cable (center conductor, dielectric and shield braid) through the sidewall of the connector and solder the center conductor to the center pin of the connector.

NOTE

When using low loss cable it may be necessary to flatten the solid wire center conductor slightly so it can fit the slot on the RF connector center pin. When soldering, avoid applying excess heat to the connector body, and center conductor insulator.

E. Heat the outside of the connector sleeve and at the same time apply solder between the braid and the sleeve. Continue to apply heat until the solder flows evenly.

F. Install 50 Ω Matching Bushing.

G. Insert connector cap and tack solder in two places.

2.4 GTX 320/320A Installation

NOTES

Avoid installing the unit near heat sources. If this is not possible, ensure that additional cooling is provided. Allow adequate space for installation of cables and connectors. The installer will supply and fabricate all of the cables. All wiring must be in accordance with FAA AC 43.13-2A.

GTX 320 units that are at Mod Level 1 must use the Mod Level 1 Rack Assembly. After Mod Level 1, GTX 320 installations are 0.170" (4.31 mm) deeper in the panel.

A. Assemble the connector/rack kit according to figure B2. Install the rack assembly according to the dimensions given in figures B1. Mounting brackets are not supplied due to the wide range of mounting configurations available. Suitable mounting brackets may be fabricated from sheet metal or angle stock. To ensure a sturdy mount, rear support for the unit should be provided.

B. Do not insert screws through the rear plate of the mounting tray, into the transponder. These holes are only for use with the adapter described in paragraph 2.8.

C. Looking at the bottom of the transponder, make sure the front lobe of the locking mechanism is in a vertical position. This can be accomplished by using a 3/32" Allen wrench through the face plate.

D. Slide the unit into the rack until the front lobe of the unit touches the rack. Guide pins on the back plate will help in the proper alignment of the unit in the rack.

E. Turn the Allen wrench clockwise until unit is secured in the rack. Continue turning until tight. Do not overtighten the screw.

F. To remove the unit from the rack, turn the 3/32" Allen wrench counterclockwise until it disengages from the rack.

2.5 Electrical Connections

All electrical connections, except for the antenna, are made through a single, 25 pin, D subminiature connector. Figure 2-1 defines the electrical characteristics of all input and output signals and identifies the cable requirements for each signal. Required connector and associated hardware are supplied in the installation kit (P/N 010-10160-00). See figures B4 and B5 for interconnect wiring diagrams.

Larger pins are supplied for the connector to provide power and ground at pins 13, 14, 15, and 25 when required. Refer to Figure B4, Note 3.

Table 2-2 Pin Contact Part Numbers

Manufacturer	25 pin D-Subminiature connector (P102)	
	18 AWG (Power Only)	22-24 AWG
Garmin P/N	336-00023-00	336-00022-00
Military P/N	N/A	M39029/63-368
AMP	N/A	205090-1
Positronic	FC6018D	M39029/63-368
ITT Cannon	See Note 3	031-1007-42

Table 2-3 Recommended Crimp Tools

Manufacturer	Hand Crimping Tool	18 AWG		22-24 AWG	
		Positioner	Insertion/ Extraction Tool	Positioner	Insertion/ Extraction Tool
Military P/N	M22520/2-01	N/A	M81969/1-02	M22520/2-08	M81969/1-02
Positronic	9507	9502-11	M81969/1-02	9502-5	M81969/1-02
ITT Cannon	995-0001-584	N/A	N/A	995-0001-604	980-2000-426
AMP	601966-1	N/A	N/A	601966-5	91067-2
Daniels	AFM8	K774	M24308/1-02	K13-1	M24308/1-02
Astro	615717	N/A	M81969/1-02	615724	M81969/1-02

NOTES

1. Insertion/extraction tools from ITT Cannon are all plastic; others are plastic with metal tip.
2. Non-Garmin part numbers shown are not maintained by Garmin and consequently are subject to change without notice.
3. Alternate contacts for 18 AWG wire: As an alternative to the Positronic contacts listed (and provided in the installation kit), the installer may use contacts made by ITT Cannon under P/N 031-1007-001. These contacts require the use of a different crimp tool positioner than shown in the table, with the part numbers as follows: Daniels P/N K250, Astro P/N 616245, or ITT Cannon P/N 980-0005-722.
4. All wires must be passed through the backshell before being assembled to connector.
5. In aircraft equipped with a dropping resistor for +28 VDC buss voltage, make sure the dropping resistor is bypassed.

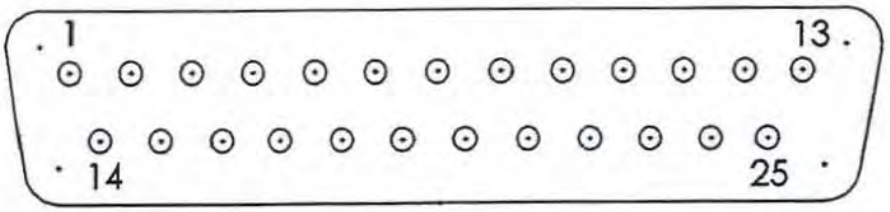


Figure 2-2 25 Pin D-Sub Connector Drawing

Table 2-4 25 Pin D-Sub Pin-Out Definitions

Pin	Description
1	Not Used
2	Do Not Connect
3	Altitude A1
4	Altitude C2
5	Altitude A2
6	Altitude A4
7	Altitude C4
8	External Ident
9	Altitude B1
10	Altitude C1
11	Altitude B2
12	Altitude B4
13	Ground
14	Switched Power Output
15	Aircraft Power (+11 to +33 VDC)
16	External Standby
17	External Suppression (Suppress I/O-GTX 320A)
18	Altitude D4
19	Not Used
20	Not Used
21	Not Used
22	Not Used
23	28 V Lighting
24	14 V Lighting
25	Ground

2.6 Check Existing Coax and Antenna Before Using a GTX 320/320A Adapter in an Existing Installation

CAUTION

Before using a Narco or Bendix/King Adapter to install a GTX 320/320A into an existing installation, the RF coaxial cable, its connectors, and the antenna must be checked to ensure the following:

- There must be no corrosion or damage on the coax or its RF connectors that would adversely affect operation.
- The RF attenuation of the coax from the installation rack to the antenna must not exceed 1.5 dB at 1090 MHz.
- The antenna must not have corrosion, damage, or loose connections.

2.7 Installation Using Existing Narco AT 150 Installation Rack

The GTX 320 and GTX 320A can be used with an existing NARCO AT 150 Installation Rack by using the NARCO AT 150 Installation Adapter (P/N 011-00292-00). See figure B6 for the NARCO AT 150 Adapter assembly drawing.

NOTES

GTX 320 units that are at Mod Level 1 must use the Mod Level 1 NARCO Installation Adapter. After Mod Level 1, the GTX 320 sits 0.17" (4.3 mm) closer to the instrument panel. Also, when installing the GTX 320 in an existing NARCO AT 150 rack (using the AT 150 Adapter) and when the aircraft has a bus voltage of +28 VDC, make sure the +28 VDC dropping resistor is bypassed.

A. Slide the adapter into the rack installation until the jackscrew mates with its nut.

B. Turn the jack screw with a 3/32" Allen wrench until the adapter is secure.

C. Looking at the bottom of the transponder, make sure the front lobe of the locking mechanism is in a vertical position. This can be accomplished by using a 3/32" Allen wrench through the face plate.

D. Slide the unit into the rack until the front lobe of the unit touches the rack. Guide pins on the back plate will help properly align the unit in the rack.

E. Turn the Allen wrench clockwise until unit is secured in the rack. Continue turning until tight. Do not overtighten the screw.

F. To remove the unit from the rack turn the 3/32" Allen wrench counterclockwise until it disengages from the rack.

2.8 Installation Using Existing Bendix/King KT 76A/78A Installation Rack

The GTX 320 and GTX 320A can be used with an existing Bendix/King KT 76A/78A installation rack by using the KT 76A/78A Installation Adapter (P/N 011-00289-00). See figure B7 for the Bendix/King KT 76A/78A Adapter assembly drawing.

NOTES

GTX 320 units that are at Mod Level 1 must use the Mod Level 1 Bendix/King KT 76A/78A Installation Adapter. After Mod Level 1, the GTX 320 sits 0.17" (4.3 mm) closer to the instrument panel. Also, when installing the GTX 320 in an existing Bendix/King KT 76A/78A rack (using the KT 76A/78A Adapter) and when the aircraft has a bus voltage of +28 VDC, make sure the +28 VDC dropping resistor is bypassed.

A. Attach the KT 76A/78A installation adapter to the rear of the GTX 320 using the two captive screws on the adapter.

B. Looking at the bottom of the transponder, make sure the front lobe of the locking mechanism is in a vertical position. This can be accomplished by using a 3/32" Allen wrench through the face plate.

C. Slide the unit into the rack until the front lobe of the unit touches the rack. Guide pins on the back plate will help in the proper alignment of the unit in the rack.

D. Turn the Allen wrench clockwise until unit is secured in the rack. Continue turning until tight. Do not overtighten the screw.

E. To remove the unit from the rack, turn the 3/32" Allen wrench counterclockwise until it disengages from the rack.

Blank Page

3 POST INSTALLATION CONFIGURATION & CHECKOUT PROCEDURE

3.1 Aircraft Station Licensing Requirements

The Telecommunications Act of 1996, effective February 8, 1996, provides the FCC discretion to eliminate radio station license requirements for aircraft and ships. At the present time, you do not need an individual license to operate the GTX 320/320A aboard your private aircraft in many circumstances. To find out the specific details on whether you are exempt from licensing, please see FCC Fact Sheet PR 5000 or contact the FCC at (800)-322-1117.

If an aircraft license is required or desired, contact the FCC at (800)-322-1117 to request form 404, Application for Aircraft Radio Station License. The FCC also has a fax-on-demand service to provide forms by fax at (202)-418-0177.

The GTX 320/320A owner accepts all responsibility for obtaining the proper licensing before using the transponder.

3.2 Operation

NOTE

The coverage you can expect from the GTX 320/320A is limited to "line of sight". Low altitude or aircraft antenna shielding by the aircraft itself may result in reduced range. Range can be improved by climbing to a higher altitude. It may be possible to minimize antenna shielding by locating the antenna where dead spots are only noticed during abnormal flight attitudes.

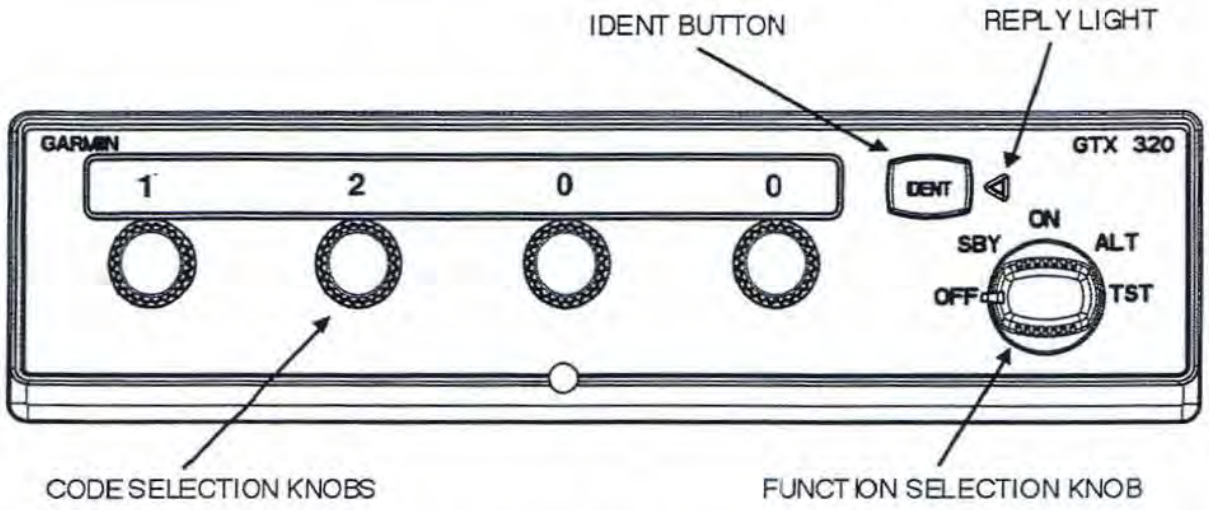


Figure 3-1. Transponder Front Panel (GTX 320 Shown)

NOTE

The Transponder should be turned off before starting aircraft engine(s).

3.2.1 Function Selection Switches

The function selector switch is a five position rotary switch. The five positions are:

- OFF — Turns off all power to the GTX 320/320A.
- SBY — Turns the transponder on, but when in SBY the transponder will not reply to any interrogations from the ground radar system.
- ON — Places the transponder in Mode A, the identification mode. In addition to the aircraft's identification code, the transponder will also reply to altitude interrogations (mode C) with signals that do not contain altitude information.
- ALT — Places the transponder in Mode A and Mode C, the identification and altitude reporting modes to respond to ATC aircraft identification interrogations and altitude interrogations with standard pressure altitude (29.92 inches Hg.) received from an external altitude digital encoder. The ALT position may be used in aircraft that are not equipped with the optional altitude encoder, however, the only response will be discreet signals that do not contain altitude information.

NOTE

Any time the function switch is in the ON or ALT position the transponder becomes an active part of the beacon system. Select ON or ALT as late as practical prior to takeoff and to OFF or SBY as soon as practical after completing landing roll unless the change to SBY has been accomplished previously at the request of ATC.

- TST — Turning the switch to the TST position tests the reply indicator. The TST position is spring loaded and must be held momentarily. When released, it will automatically return to the ALT position.

3.2.2 Code Selection

The code selector consists of four, eight position switches that provide 4,096 active identification codes.

NOTE

When making routine code changes, you should avoid inadvertent selection of codes 7500, 7600, or 7700 thereby causing momentary false alarms at automated ground facilities. For example when switching from code 2700 to code 7200, switch first to 2200 then 7200, NOT to 7700 and then 7200.

This procedure applies to nondiscrete code 7500 and all discrete codes in the 7600 and 7700 series (i.e., 7600-7677, 7700-7777) which trigger special indicators in automated facilities. Only nondiscrete code 7500 will be decoded as the hijack code. An aircraft's transponder code (when available) is utilized to enhance the tracking capabilities of the ATC facility, therefore you should not turn the transponder to SBY when making routine code changes.

See the Aeronautical Information Manual (AIM) for a detailed explanation of the identification codes.

3.2.3 IDENT Button

On occasion, the controller will request "SQUAWK IDENT". Respond by momentarily pressing and releasing the IDENT button. Pressing the IDENT button activates the Special Position Identification Pulse (SPI) for approximately 20 seconds identifying your transponder return from other aircraft on the controller's scope.

3.2.4 Reply Light

The reply light will blink each time the transponder replies to ground interrogation. The reply light also remains lit during the IDENT time interval.

Blank Page