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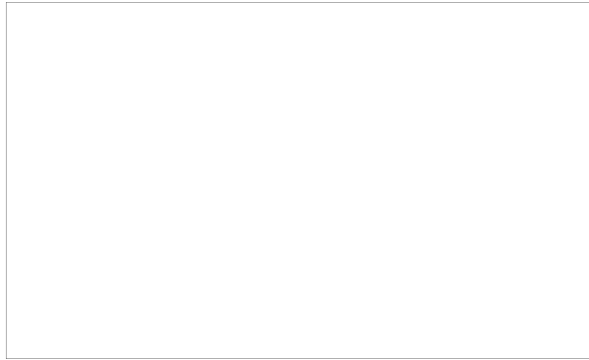
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CHAPTER I.

PRE-FLIGHT PREPARATION OF AIRCRAFT.

A. Preparation of Aircraft for Pre-Flight Inspection.

For the preparation of aircraft to pre-flight inspection it is necessary to:

1. Remove the coverings from the engines, wings, wheels, pressure head, the pilot's canopy and the tail plane.

Remove the clamp from the rudder. Check whether wheel chocks are placed under the wheels of the landing gear leg and whether the lower locks of the landing gear main legs are secured by pins.

2. Check whether ignition is switched off and the landing gear cock handle locked in position "Extended".

3. Install board storage batteries after preliminary examination for: spilled electrolyte on their surfaces and make sure that the terminals leading out are covered with technical grease.

4. Check the aircraft charging with fuel and oil. Replenish the aircraft in dependence upon the task and flight endurance, if necessary. When refilling check the presence of gaskets and the cleanness of filters.

5. Fill the small tank with antifreeze fluid and the wash-basin tank in the lavatory.

6. Check the hydraulic system for proper charging with oil and the pneumatic storage bottle for charging with air.

7. Check the loading of aircraft and make sure that the loading does not surpass the permissible values.

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After accomplishing the above mentioned procedures proceed to the pre-flight inspection.

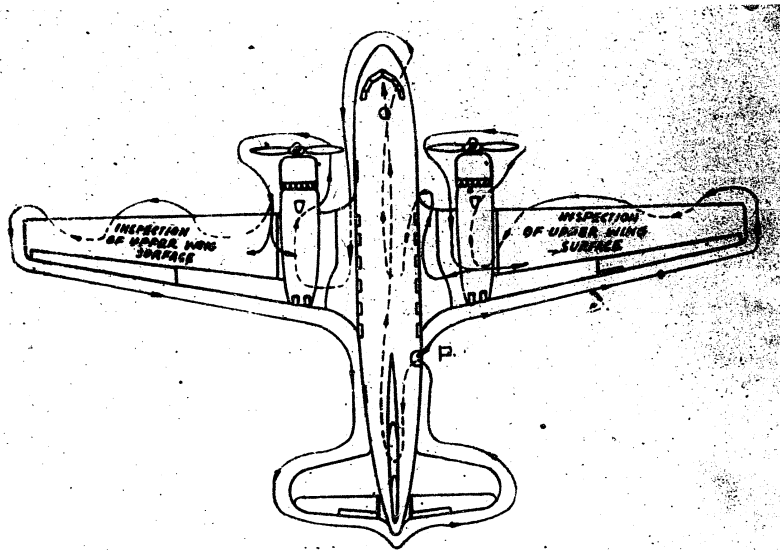


Figure 1. ROUTE SHEET OF PRE-FLIGHT INSPECTION.

B. Pre-Flight Inspection of Aircraft and Engines.

The purpose of the pre-flight inspection is the examination of the readiness of aircraft for flight, and revealing the defects which might occur during the aircraft parking. The inspection route is shown on figure 1.

1. Inspect the condition of skin for mechanical damages on the right side of the fuselage from the main door to the wing.

2. Check the right-hand wing flap and make sure that the skin is not damaged. Check the condition of bolts of the wing flap attachment, clean the slots and hinges from dirt. Check the tight fitting of the wing flaps when retracted.

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3. Inspect the lower surface of the right-hand wing. Check the condition of the aileron skin and of the hinge bolts of the aileron and trim tab attachment, check the trim tab neutral position and proper condition of the hot air release tube flap, of the glasses of position lights, the extendible landing light and make sure that the fuel tanks drain-pipes are not jammed.

4. Inspect the condition of the wing leading edge.

5. Inspect the landing gear right main leg. Check the condition of tyres, the inflation and charging of lubricating nipples. In case that doubt might arise with respect to the inflation of tyres, check the pressure by aid of the 11-700-2-8 appliance. The normal pressure should equal 4.8 - 5.2 kg per sq.cm. Parking compression of the tyres at normal flight weight is 55-65 mm.

Check the attachment of the brake hoses and make sure that no leak occurs from the unions. Make sure that shock absorbing strut compression is correct - at normal flight weight the compression should be 180-230 mm. Open the access door providing access to the landing gear extended position lock and check the condition of lock, springs, the free part of cable and the end switches /UP and DOWN switches/. Make sure that the springs closing the lock are correctly attached to their bolts.

6. Open the landing gear doors prior to which it is necessary to screw down the stud and pull down, check the condition of doors and of their locks. Inspect the condition of accessories and pipe-lines making sure that no leakage of oil and petrol and escape of air occurs.

Check the correctness of lockings, the condition of the

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power plant control cables, check the presence of petrol in the priming tank and of working fluid in the multiplier by means of metering pins.

The priming tank should contain 3.5 litres of petrol and the multiplier charging should correspond to 10-15 mm submerge of the metering pin.

Remove the deposits from the mesh filter. Turn by 2-3 turns the handles of the hydraulic system filters and drain the deposits by 100-200 cc from each filter through its draining cock and thereafter set the handle into the direction of flight and lock it. Make sure that the landing gear retracted position lock is open and check the condition of springs, the free parts of cable and of the end switch.

Special care should be exercised at the inspection of the booster pump rheostat handle locking. The rheostat handle should be in extreme position and safely locked. Close the door.

7. Inspect the correct condition of the cowlings and make sure that their covers are safely attached and that there is no oil and petrol leak from the cowlings and that all cowling locks are safely latched.

8. Inspect the oil radiator and make sure that the oil radiator flap is correct and the honeycomb clean.

9. Inspect the propeller blades of the starboard engine. Check them for cracks, nicks and bends, check the condition of the anti-ice ring of the propeller and the proper condition of the bolt-joint lockings and make sure no oil leak occurs.

10. Check the condition of the fuel tanks filler necks and fuel gauges transmitters.

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11. Inspect the condition of the right wing upper surface, the fitting of the access hole covers and the heating unit access door, and check the condition of the fillet.

12. Inspect the bottom of the centre section. Make sure that the access doors and panels locks are safely locked. Check the condition of the draining holes.

13. Inspect the condition of the landing gear nose leg. Check the charging of the lubricating nipples, the condition of the folding brace and of the wheel tyre. In case of doubt with respect to the inflation of tyres check the pressure by aid of the Il-700-2-8 appliance. Normal pressure of the inflation should be 4.0 kg per sq.cm.

The parking compression of the tyre at normal flight weight should be 45-55 mm.

14. Inspect the condition of the shimmy dampers and their attachment. Check the correct charging by inspecting the indicator pins. The indicator pin of the shimmy damper should protrude above the damper casing nut by 6.5 - 12.5 mm.

Check the compression of the shock absorber strut and the air-tightness of the actuating cylinders - /main and emergency/, of the pipe-lines and hoses. The compression of the shock-absorber strut should be 170-260 mm.

Inspect the condition of the landing gear extended position lock. the condition of springs, cables and of the end switch.

15. Inspect the fuselage nose part. Ensure the proper condition of the pressure head support and its attachment, check the antenna system and the heating system intake for damage, and the fire-extinguishing bottles for the presence of the signal eye.

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Check the taxiing lights glasses for damages and the nose access door for tight closing.

16. Inspect the port power unit assembly and the left wing in extent and sequence according points 12, 5, 6, 7, 8, 9, 10, 11, 4, 3, 2.

17. Inspect the skin from the left side of the fuselage and check it for mechanical damages.

18. Check the condition of the tail plane, fin and elevator and rudder. Check the neutral position of elevator and rudder trim tabs. During this pay attention to the condition of fabric skin of the rudders, of the hinge assemblies, hinge brackets and check the rear light glass for damage.

19. Inspect the skin from the right side of the fuselage up to the entrance door. Check the skin for mechanical damage. Make sure that the access door of the parachute containers and the w.c. bowl are closed.

20. Inspect the condition of the units inside the tail section for damage, foreign matter, condition of the aircraft control cables and the attachment of the container of the signal rockets.

Check the rear cargo department of the aircraft. Check the locks of the aircraft entrance door for safe locking. Check the safe locking of the emergency windows-doors and the correctness of locks. Check the correctness of the illumination. Check the cabin for cleanness and foreign matter and the presence of the detachable fire extinguishers.

22. Check the hydraulic section for foreign matter and correct illumination. Check the hydraulic system tank charging and inspect it for leak and damages of pipe-lines.

23. Inspect the crew cabin. Check the condition of the

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access door for astronomic observation and its attachment, Check the charging of the bottles for landing gear nose leg emergency extension, and for the emergency braking by means of pressure gauges. The charging should equal 120 - 150 kg per sq. cm. Make sure that the cock of the hydraulic system hand pump switch is set into position "Operational system" and the detachable handle of the hand pump is in movable position.

Check the feeding of the electric devices and their operation.

Check by short-termed engagement the operation of the oil radiator doors, cowling gills, dust filters, RCN-1 booster pumps, electric mechanisms of the anti-icer and heating systems. Check the functioning and displacement of the rudders and ailerons, the correct operation of brakes /when displacing the pedals, the pressure gauge should indicate a pressure of 28 - 32 kg per sq.cm./

24. Check the effect of the power plant installations control: control the throttle, propeller pitch, governor and fuel cocks.

Check the condition of glasses, movable peep windows and their locks.

Check the pilot seats and the operation of the regulating mechanisms and locks of the seat.

25. Make sure that the landing gear cock handle is locked in the position "Extended" and the handle of the wing flaps cock in the position "Retracted".

Before the testing of the engines make sure that the pressure in the hydraulic accumulator of the brakes is not below 75 kg per sq.cm and thereafter shift the handle of the

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parking brakes upward to the position "Engaged".

After completing the inspection of the aircraft and removing of the revealed defects prepare the engines for starting.

C. Preparation of the Engines for Starting.

When preparing the engine for starting it is necessary to effect the following procedures:

1. Drain the petrol and oil deposits from all fore-seen points if it was not carried out before.
2. Make sure that the aircraft is normally charged with the conventional petrol and oil.
3. Open slightly the cowlings, unscrew the plugs from the lower fittings of the collector and drain the oil.
4. Remove all objects in front of the aircraft which might cause damage to the propeller after starting.
5. If for any reason the engine was left in varned-up condition, i.e. at the cylinder heads temperature of 185°C and more, then it is necessary before next starting of the engine to inject through the sparking plugs ports into the cylinders No 2 and 5 per 75-100 gr. of pure, warm aviation oil at the position of the piston in the lower dead centre and thereafter turn the propeller by 2-3 revolutions.
6. Immediately before the engine starting it is necessary to swing the crankshaft by the SKD-2 starter "directly" without running-in first the flywheel.

Prior to revolving of the crankshaft by the SKD-2 starter it is necessary to turn off the ignition and set the lever of the NV-82 pump hand control into position "off". Then without turning-in the starter flywheel switch on the

starter, turn on the switch for flywheel running-in and keep it ON for 6-7 sec.: during this the crankshaft should turn approximately by 5 revolutions.

In case that the crankshaft of the engine does not turn by the action of the starter electromotor at normal tension /of 24 volts/ it is necessary to turn off the starter running-in and to disengage the starter from engine mesh, then to unscrew per one spark plug from the cylinders No 6, 7, 8, 9 and swinf the crankshaft by hand by means of the propeller for 3-4 revolutions to drain from the cylinders the gathered petrol and oil.

The interruption between the revolving of the crankshaft by the starter and the engine starting should not exceed 15 min. Otherwise it is necessary to repeat the revolving.

Caution: It is forbidden to revolve the crankshaft of the engine by the starter with preliminary revolving of the flywheel as in case of presence of petrol and oil in the combustion chambers of the cylinders a hydraulic stroke might occur resulting in the damage of the engine.

7. At repeated starts it is necessary to revolve the crankshaft in case that more than 30 minutes passed after the engine has been stopped.

8. Inspect the fire extinguishing means for proper condition and make sure that wheel chocks have been placed under the landing gear main wheels.

9. Check:

- the pressure in the hydraulic accumulator of the brakes, in case, that the pressure in the hydraulic accumulator does not reach 70 kg per sq. cm. it is necessary to build up the pressure.

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- the locking of the landing gear cock handle in the extended position,

Prepare the engines for starting and for this purpose:

- brake the aircraft by parking brakes and check on the pressure gauges the pressure in the wheel brakes /normal pressure should be 18 - 22 kg per sq.cm./

- switch on the storage batteries / the tension in the system should not be below 24 volts./

- set the lever of the NV-82 mixture regulator into position "normal",

- set the throttle lever into position corresponding to 800-900 rpm.

- set the r.p.m. governor control into position "Fine pitch",

- set the cowl flaps into position "open",

- set the oil radiator flaps into position "closed",

- open the fire cock by pushing the handle forward,

- close the cross feed valve and switch off the heating by setting of the thumbler "2" into position "into atmosphere".

10. Run-in the flywheel of the starter. The duration of the started flywheel running-in should not exceed 18 seconds when the tension in the system is 24 volts, at tension over 27 volts - 10 seconds.

Caution: 1/ The starter may be engaged maximum 5 times subsequently with a two minutes interruption, then it is necessary to leave it for minimum 10 minutes to cool down. One starting for combined action of the starter in duration of 23 seconds /not taking into account the running-in, the other startings for 7 seconds of combined action /not taking into account the running-in./

3/ When running-in the flywheel of the starter the propeller should not rotate, otherwise stop the turning and turn the propeller over in the direction of rotation to disengage the ratchet wheel of the starter from coupling with the engine crankshaft.

11. At the end of the starter running-in switch on the booster fuel pump and build up a pressure of 1.5 - 2.0 kg per sq. cm in the manifold.

12. After running-in engage the ratchet wheel of the starter /"coupling"/ and turn on by the PM-45 switch the magneto and the priming valve.

The priming should be effected by separate impulses within 3-4 seconds until the engine fires.

Do not keep the starter switch in engaged position for more than 7 seconds.

13. As soon as the engine fires, disengage the electric starter and follow the reading of the pressure gauges of the oil pressure. In case that the oil pressure in the rear oil pump does not reach 3 kg per sq.cm within 5-8 seconds after the engine starting, stop the engine and find out the cause of the failure and remove same.

14. When the engine operates smoothly shut off the priming and by a smooth motion of the throttle lever adjust the rotational speed to 900-1000 r.p.m.

15. If the engine does not fire after 3 attempts, stop the starting, investigate the cause of the starting failure and remove it.

When starting the engine it is necessary to follow the following instruction:

a/ do not open the throttles by sudden and sharp motions,

b/ do not overprime the engine.

The warming-up, testing and stopping of the engines should be effected according to the "Engine Service Manual".

PREPARATION OF ELECTRICAL EQUIPMENT BEFORE FLIGHT.

1. Make sure of the presence of batteries on the board of airplane. If there are no batteries, place them and connect them to the electric mains.

2. Test each battery when loaded by the current of 6 A. The voltage must be of minim. 24 V. The battery the voltage of which has been diminished must be replaced. Switch on both batteries.

Check the presence of the reserve fuses and bulbs in the cabin of the radio-operator.

3. Join and connect the source of the aerodrome electric feeding to the airplane /at which the signal lamp must start lighting/.

Switch on the tumbler switches and carry out the tests of the electric equipment of the airplane under current.

TEST OF ELECTRICAL EQUIPMENT UNDER CURRENT.

1. Test the operation of electric mechanisms; gills, cowls, folds of oil radiator, filters of dust, ailerons, trimmer of rudder, trimmer of elevator /only signalisation/, flaps of calorifers, flaps block, anti-icing unit and heating system of passenger cabin, pilot cabin, accuracy of the work of the relays of the switch automatic mechanisms in all circuits and accuracy of the reading of the light

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signal indicators,

2. Test the light and signal outfit:

a/ illumination equipment of the instruments and of the working places of the air crew, ceiling lamps of the cargo cabin, auxiliary locations, door signalisation and also unimpairment of the lamps and protective glasses, their clearness and accuracy of the work of switches, rheostats and buttons and their circuits.

b/ Work of the extendible landing head-lights

c/ Lighting of the landing run head-lights.

d/ Switch on the tumbler switch of position lights ANO, on the pilot's right switchboard while the lamps, RANO-45, on the wings, and the tail position lamp ChS-39 must start lighting.

3. Test the heating of the Pitot static tube PVD 6, for which the circuit breaker from central distribution board of the radio-operator must be switched on by putting the tumbler switch of the left and right pitot static tube into the position "heating".

The test of the good condition of the Pitot static tube circuits is carried out by putting the tumbler switch into the position "test". This doing, the signal lamps must start lighting.

4. The test of the work of the propeller feathering pump timing automat AVP-4 is carried out in the following way:

a/ Switch on the circuit breaker on the radio-operator's central distributing switchboard "propeller feathering control". Making sure that the oil in the engine is heated up to the temperature of 60 - 70°C and with the per-

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mission of the board technician, test_run the motors of the pumps.

For this purpose, press the knob, KU-5, placed on the central desk of the pilots, while the timing automat AVP-4 will be engaged and will connect the circuit to the motor, D-3500A, which will drive the feathering pump; the propeller will come into the feathered position. The recovery from the feathered position is carried out by means of the same knob, KU-5, it will be only necessary to pull it to oneself till the propellers will recover completely from the feathered position.

5. The test of the running-in of the starter can be carried out as follows:

a/ Clean beforehand the place around the propeller /remove all step-ladders and stairs/, then, give a command "out of the air screws" and after the receipt of the corresponding command, press the starting switch of the starter. Then, the relay, KM-400D, will be engaged and the signal lamp begins lighting on the central panel of the pilot, the starter begins rotating; without switching on the magneto press the clutch, owing to what the coupling of the starter with the ratchet will take place and the air screw will have a move.

6. Test the good condition of the light and of the sound signalisation of the undercarriage.

7. Jointly with the board mechanician, after the filling of the de-icer tank with the liquid, test the work of the pumps and the feeding of the liquid on the glass and on the screws and also test the accuracy of the work of the switches and rheostats in the circuits of the pumps.

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8. Test the automatic mechanism of the heating of the glass, for which it is necessary:

to switch on the circuit breaker on the radio-operator's central distributing board, to switch on the tumbler switch on the left or right electric panel of the pilot, at which the card of the compass, KI-11, will turn a little to the right or to the left what is dependent on which glass is switched on. When regulating the automatic mechanism it is necessary to use a mercury thermometer. At the heating of the glass, the mercury thermometer is put to the glass, and at the temperature from 35 to 40° C the automatic mechanism will be engaged and will switch off the electric circuit of the heating.

It is not advisable to regulate the automatic mechanism for the temperature of more than 40° C in order to avoid burning through or spoiling of the glass.

9. Test the work of AGK-47b and GPK-48 under current. For this purpose it is necessary to switch on the tumbler switch on the left as well as on the right electric panel of the pilots, then, the electric motors of the instrument will start rotating 2-3 minutes, uncage them for the test, at that time the airplane silhouette will deviate a little up or down, depending on the horizontality of the position of the airplane.

10. Test the work of DGMK-3 under current, for that reason, switch the tumbler switch on the left electric panel of the pilot and after 2-3 minutes, press the adjusting knob, then the indicators must occupy their corresponding position according to the magnetic meridian.

11. Test the work of the lighting armature in the pilot's

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cabin:

a/ lighting of the instrument board of the main control desk, constant lighting. Work of all lights: ultra-violet, KLSRK, extendible lamps, left and right desk hinge lamps, lighting of the navigator and radio-operator's cabin.

b/ Test the work of the ceiling lamps of the service compartment.

12. During engines test run, test the work of generators GSR-6000, voltage regulator, R - 25 AM, and the reverse current relay, DMR 400, in the following order:

a/ Make one engine run at 800 - 900 r.p.m. /give low power to the second engine/, switch on the accumulators.

At the working generator, increase smoothly revolutions of the engine, watching the signal lamps of the under-arrange of of the lighting. Normal switching on of the generator into work must be carried out at 1300 - 1400 r.p.m. of the engine. That the generator is running we can know by the bright light of the lamps.

b/ Retire smoothly gas. Normal switching off of the generator must be carried out at 800 - 900 r.p.m. of the engine. /The lamps light wanly/.

c/ Make the engine run at 2200 - 2400 r.p.m. Switch on accumulators, inverters of the wireless, command post etc. and set the switch of the voltmeter into the position " generator", press the throw-over switch of the voltmeter and make sure that, at the reading of the ammeter, the consumers are loaded by the current of the order of 40 - 45 A, the voltage is of 28,5 V. The generators GSR - 6000, work normally, if, at the revolutions of 2000 - 2400 r.p.m. the generator with -

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stands the loading by the current of 260 A during 5 minutes, and the loading by the current of 200 A for a long period at the adequate cooling as of the generator as also of the carbon regulator, the voltage must be of minimum 26,5 V at that time.

When both engines are running at the revolutions of 1800 - 1850 r.p.m., switch on both generators, switch on the consumers of a great power e.g. extendible landing lights, ARK-5, RSB etc.

The whole consumed current for the test of the generators, GSR-6000, must be of minim. 180 A, i.e. from 85 - 90A for each generator. Test the indications of the ammeter. The differences in the reading must not exceed 15 A.

Press, one after another, the tumbler switch of the voltmeter, mounted on the panel of the generators, right and left, make sure that the voltage indicated by the voltmeter is of 28,5 V, the difference between the generators must not exceed of 0,3 - 0,4 V. If it is necessary, regulate the voltage by means of the carbon regulator, P-25AM.

Test the value of the reserve current; for this purpose it is necessary to refire gas of one motor down to 1100-1250 r.p.m.; the pointer of the ammeter of the generator will sharply go in the back direction i.e. under the zero and then, it must return to zero.

That convinces that DMR-400 has had a work, and has switched off the generator from the electric mains.

The reverse current which engages the DMR-400 relay must not exceed 15-35 A. The test of the switching off of the second generator, GSR-6000, from the mains must be carried

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out analogically.

PREPARATION OF THE INSTRUMENT EQUIPMENT BEFORE FLIGHT.

1. Examine the Pitot static tubes, make sure there are no mechanical damages.

Test the cleanness of the input openings Pitot static tubes and the state of the fastening of the mast of the Pitot static tubes.

Test the work and signalisation of the heating of the Pitot static tubes.

2. Test the accuracy of the reading of the air - speed indicators and the good condition of the emergency and main static and dynamic lines by means of the tester, KPU-3.

3. Test the good condition of the damping of the instrument board and the clearances between the instrument board and aggregates GA-8o, and UT-252/4.

4. Carry out the external examination of all instruments and test if the cases of the instrument and glasses are not damaged, if the pointers are not bent or displaced from the zero position or if they do not stick, or if the fluorescent mass has not strewed from the scales and pointers of the instruments.

5. Adjust the scale of the pressure of the altimeters, VD-12, to the pressure corresponding to the atmospheric pressure of the place.

6. Test the indications of the over- and underpressure gauges, 2 MV-18-11.

7. Using the aerodrome source of feeding, test the work of the electric and gyroscopic instruments / AGK-47b, GPK-48,

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DGNK-3/ and also the good condition of the work of the other electric instruments.

8. Test the reliability of the fastening of the transmitters and of the fastening claps of the electric instruments and their locking.

9. Carry out the external examination of the automatic pilot, AP-45:

a/ Test the state of the rope system /power and back coupling/, of the fixing places of the ropes, and rotation of the textolite rollers.

b/ Test the reliability of the fastening of the aggregates, AP-45.

10. Measure the compressed air charge of the hydraulic accumulators of the automatic pilot AP-45, by means of the appliance IL-704 /the air pressure must be of 5 - 3,8 kg/cm²/.

11. Test the readiness of the automatic pilot AP - 45, at the running engines:

a/ Test by means of the two pointers pressure gauge of the automatic pilot the overpressure in the gyro instruments /90 ± 10 mm of mercury column/ and the pressure of the oil in the hydroaggregate and in the hydro-system of the AP-45 /9 ± 1 kg/cm²/.

b/ Bring in line the indices of the back coupling with the indices of the gyro assembly of the bank automatic system, bring in line the card of the back coupling with the card of the course automatic system, and switch on the servo-unit of the automatic pilot; turning the control knob, make sure that the control rudders move in the corresponding direction.

c/ Remove the air from the cylinders of the servo-unit,

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moving the piston rods from 5 - 6 times from one end of the cylinder to the other.

12. Making sure that AP-45 is in good condition, switch off the automatic pilot.

The examination being over, make a report on the flight readiness of the instrument equipment of the airplane to the technician of the airplane.

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CHAPTER II.

AIRCRAFT FLIGHT OPERATING INSTRUCTIONS.

Checking Before Taxying.

Prior to engine starting before taxiing carry out the following procedures:

- disconnect the ground storage battery,
- remove from the aircraft all ground equipment /chocks, ladders, etc./,
- remove the safety pins from the lower locks of the landing gear main legs,
- close all doors and access hole covers of the aircraft,
- check on the pressure gauge the pressure in the hydraulic accumulator of the brakes /the pressure should be minimum 75 kg per sq.cm., in case that the pressure is below 75 kg per sq.cm restore the pressure by aid of the hand hydraulic pump to the required value,
- check the correct function of the landing gear and wing laps signal system indicators; green lights should glow, the pointers of the indicators should be in the extreme upper position and the mechanical indicator of the nose landing gear strut should be in its upper position,
- check the position of the trim tabs of the elevator, rudder and of the ailerons and adjust them into neutral position /green lights should glow/,
- check on the fuel gauges the quantity of fuel,
- check the air pressure in the emergency system of the landing gear nose leg extension and in the emergency braking

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bottles /the pressure should be minimum 120 - 150 kg per sq. cm./

- check the rudder, elevator and ailerons for ready motion.

After the air-crew and the passenger have occupied their places start the engines.

Taxying.

Start the engines. Warm up the engines at fine pitch of the propeller up to the cylinders head temperature minimum 120° C and to the temperature of the entering oil minimum 40° C. Throttle down the engines to minimum r.p.m., make sure that the way for the aircraft is free, unfix the parking brakes. The taxying of concrete runway is to be carried out at the engine rotational speed of 950 - 1000 r.p.m. and the direction when taxying is to be maintained by aid of the brakes. To perform turns on one pair fully braked wheels - is FORBIDDEN.

Taxying on sandy ground as well as on soft ground requires increased attention as resulting from the free swinging of the nose wheel, the aircraft shows tendency to pitching. The maintaining of the direction and performing of turns in these cases have to be accomplished by the use of engines together with the brakes. The wheel brakes are effective and consequently it is necessary to apply them smoothly by pulsating motions.

Do not admit continuous lengthy depression of the brake and avoid so the overheating of the brakes.

When taxying at low r.p.m. and frequent use of brakes it is necessary to watch the pressure of the brakes hydraulic accumulator. In case of pressure drop below 30 kg per sq. cm it is

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necessary to build up the pressure by increasing the engine rotational speed up to 950 - 1000 r.p.m.

The flight engineer has to follow the engine temperature conditions and may not permit the overheating or cooling down of the engines. At night it is necessary to taxi with board navigational lights and with flood lights on. It is permitted to use a hand electric torch through the open window and also the landing flight lights / the duration of the landing flood lights continuous use should not exceed 5 minutes/.

The lighting of the taxiing lights is not limited. The illumination in the cabin of the aircrew has to be reduced to minimum.

In case that the canopy front glasses get damped, it is necessary to switch on the electric heating of the glasses. The co-pilot must be prepared for any command of the aircraft commander and has to watch the right-hand view and look over the runway on which the aircraft is taxiing and warn the commander of the aircraft against the noticed obstacles.

Prior to take-off extend the wing flaps to 20° /into take-off position/.

Pre-flight Test.

Before take-off switch on the booster pump BCM-1, set both engines rotational speed to 2300 r.p.m. Leave the engines running for 15 - 20 seconds to burn through the spark-plugs and then switch off each magneto, one after the other, for not more than 10 seconds and check the engine operation.

Set the oil cooler shutters and cowl flaps into position - full open.

Adjust the normal friction of the throttle quadrant levers.

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Take Off.

Prior to take off the commander of the aircraft has to check the function of all surface controls of the aircraft. After receiving the permission render the order "Take - off permitted - we start". Increase the rotational speed of the engines to 1700 r.p.m., release the brakes and run up the engines smoothly to the take-off power. The take-off must be performed at the take-off conditions of the engines /P-2600 r.p.m., Pk-1225-1250 mm rt.st. /Hg/, Ppetr. = 1.5 - 2.0 kg/sq.cm. P.oil front min. 4 kg per sq.cm, P.oil rear min. 5.5/ to increase the safety of the take-off.

The aircraft commander may apply the brakes for maintaining of the take-off direction until the nose wheel has been raised.

The landing gear nose wheel has to be raised at the airspeed of 100 - 110 km per hour and the contact with ground should be broken at the airspeed of 140-145 km per hour.

In case of oscillation of the nose wheel unload immediately the nose leg of the landing gear by moving the control column toward yourself not permitting further development of the oscillation.

After having made sure beyond any doubt that the aircraft has broken contact with ground, the aircraft commander is obliged to order to the flight engineer, at the airspeed of minimum 160 km per hour by day and at minimum 165 km per hour at night, to retract the landing gear.

At night it is permitted to take off with the taxiing lights on.

During take-off the flight engineer is obliged to:

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- after the pilot has accelerated the engines lock the throttle levers and watch it to prevent their motion towards the closed position,

- watch the correct reading of the instruments indicating the operation of engines,

- be prepared in case of fuel pressure drop to open the isolating valve and in case of failure of one engine during take-off after contact breaking to feather the propeller of the failed engine,

- after the contact breaking of the aircraft and achieving of the airspeed of 180 km per hour according to the order of the aircraft commander "Retract landing gear" to retract the landing gear checking the signal system and the landing gear position according to the red lights and to the indicator on the instrument panel of the pilots.

- after the overcoming of obstacles and according to the order of the commander of the aircraft "Retract wing flaps" to move the wing flaps cock handle into upper position and check on the indicator whether the wing flaps are fully retracted. Then reduce the engine power to rated conditions $n = 2400$ r.p.m. $Hg = 1020$ mm/ and switch off the booster pump BCF-1.

Note 1. The arising pitching moment at the retraction of the wing flaps should be balanced by the control column and by the elevator trim tab.

2. The maximum continuous use of the take-off conditions for the A3-82T engine is permitted for 5 minutes.

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Climb.

After attaining of the indicated airspeed of 170-180 km per hour get the aircraft smoothly to climbing during which the airspeed increases to 220 - 230 km per hour.

During climbing the rate of climb should be 5 - 6 m per second. The best air-speed for climb up to altitude 2000 m is the indicated airspeed of 220 - 230 km per hour, above 2000 m with each 1000 meters the air-speed is lowered by 10km per hour.

ATTENTION! In case that buffeting of the tail plane occurs during climbing /or gliding/ at the I.A.S. /indicated air speed/ of 220 - 230 km per hour, it is necessary for the elimination of the buffeting to:

a/ open the doors of the left-hand cowl by 5 - 10° more than neutral position, or

b/ to perform the flight with the wing flaps extended to the angle of 5°.

Table of Optimal Airspeeds at Rated Conditions of Engines:

	Altitude	Indicated Airspeed
1	1000	220
2	2000	220
3	3000	210
4	4000	200
5	5000	190
6	6000	180

The cylinder heads temperature during flight and climb is recommended to be 180 - 225° the maximum permissible for

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for take-off and climb for 15 minutes, including the five minutes at + 240°C.

The entering oil temperature is recommended to be 65° C. max. permissible for not more than 10 minutes 90° C, maximum permissible for continuous operation + 80°C.

The oil outlet temperature is recommended to be not more than 115° C. The maximum permissible for the period of not more than 10 minutes - 125° C.

When changing the power /conditions, rating/ of the engines it is necessary to follow the following sequence:

a/ when decreasing the engine power, it is necessary to reduce first the supercharging and then the rotational speed to the required value,

b/ when increasing the power of the engine it is necessary to increase the rotational speed and then the supercharging.

This sequence is necessary to avoid the overloading of the engines, that is to prevent high value of supercharging at low rotational speed, which would not correspond to this supercharging.

For reducing of the fuel consumption at the operation at conditions of 0.65 of nominal rating / = 2000 r.p.m., Hg -835/ and less it is necessary to adjust the mixture adapter to position "Automatic poor".

When advancing the throttle from cruising to higher conditions / P= 2200 r.p.m. and more/ it is necessary to reset the mixture adapter into position "automatic normal", and only then to increase the engine power.

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Horizontal /Level/ Flight.

After having attained the given flight altitude adjust the altitude meters to the atmospheric pressure of 760 mm Hg and check the longitudinal balance of the aircraft in flight following the following table data:

Indicated Airspeed in horizontal flight	Displacement of the elevator trim.tab. degrees	Center Adjustment p.c. MAC
270	- 1.00	18
270	- 0.180	17
270	- 0.50	16
280	- 1.30	18
280	- 1.00	17
280	- 0.75	16
290	- 1.56	18
290	- 1.20	17
290	- 1.00	16
300	- 1.75	18
300	- 1.40	17
300	- 1.20	16
310	- 2.00	18
310	- 1.70	17
310	- 1.40	16
320	- 2.20	18
320	- 1.90	17
320	- 1.60	16
330	- 2.40	18
330	- 2.10	17
330	- 1.80	16

It is permitted to switch on the automatic pilot at an altitude of not less than 500 m over the country. Prior to switching on the autopilot it is necessary: to balance the aircraft by means of trim tabs, match the indices on the artificial horizon, set the sensitiveness-governor to middle sensitiveness and switch the autopilot by turning the knob of the servo-units. When flying with autopilot switched on it is necessary by adjustment of the sensitiveness to eliminate the unnecessary flutter of the rudders.

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At long range flights at the indicated airspeed of 280 - 290 km per hour the autopilot takes away the aircraft from its flight path by $2 - 3^{\circ}$ within 15 minutes of flight.

To attain the maximum range of flight it is necessary to perform the flight at the optimal flight conditions, that is:

at the flight in H = 3000m: P = 1890 r.p.m., Hg = 660 mm

V = 297 km per hour. Fuel consumption 145 kg/hour.

at the flight in H = 2000 m: P = 1850 r.p.m., Hg = 660 mm

V = 278 km per hour, Fuel consumption 140 kg/hour

After the aircraft has levelled off it is necessary to adjust the cowl flaps and the oil cooler shutters so as to ensure the normal recommended temperatures of oil intake and outlet and of the cylinder heads, taking into account that the full opening of the cowl flaps and the oil cooler shutters reduces the flight speed even at cruising conditions by 5 - 10 km per hour.

During the whole flight it is necessary to pay special attention to the readings of the instruments indicating the operation of engines and to the fuel consumption of the fuel quantity gauges. The fuel warning light indicating the critical rest of fuel will glow when the fuel rest will be 200 litres in each group. NOTE: When switching on the anti-icer equipment, adjust the temperature at the cabin intake by the flap of the air cooler.

Gliding.

Gliding with the engines fully throttled down should be

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accomplished by steps to warm up the engines or at the engine rotational speed of $P = 1800$ r.p.m. and the supercharging /manifold/ pressure $Hg = 500 - 600$ mm with closed cowl flaps. The recommended speed at descent with the engines running, in good atmospheric conditions are maximum 400 km per hour and under conditions of middle rough air at 300 km per hour.

The rate of descent should be 1.5 - 5 m per second.

When approaching for landing after reaching the airfield area and according to the aircraft commander order extend the landing gear cock mechanical lock /on the instrument panel should start glowing the green signal light/.

The landing gear extension should be accomplished at the indicated airspeed of 230 - 290 km per hour before the third turn. The landing gear lowers within 5 - 6 seconds.

The fourth turn is accomplished at the indicated airspeed of 210 - 230 km per hour.

After the fourth turn according to the aircraft commander order extend the wing flaps and the indicator air-speed of the glide flight adjust in dependence upon the landing weight in the limits of 170 - 190 km per hour.

After the extension of the wing flaps adjust the propeller into position of fine pitch and switch on the BCF / booster pump/ to secure good acceleration of the engines in case that it should be necessary to fly a second circuit.

When gliding with one engine running, the turn and approach for landing /the aircraft is balanced by the rudder trim tab/ is, with reference to piloting technique, accomplished practically in the same way as when flying with both engines.

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Landing.

The flattening out of the aircraft has to be begun at the height of minimum 7 - 8 m. The distance for floating when gliding at the airspeed of 170 km per hour makes out 100 - 150 m. The pulling of the control column /to yourself/ ensures a normal landing on the main wheels and the retaining of the nose wheel in the raised position during the first third of the ground run at all possible service center positions.

The landing of the aircraft with fully extended wing flaps should be accomplished at the airspeed of 125 - 135 km per hour.

The braking of the landing gear wheels is to be effected after the touch-down of the nose wheel. In case of failure of the main braking system, apply the emergency braking system.

After landing retract the wing flaps.

When approaching for landing with one operating engine it is necessary to extend the landing gear on the straight line and the wing flaps only after making perfectly sure that the calculation is correct.

The aircraft permits to return for a second circuit with one engine operating when the landing gear is extended and the wing flaps - in retracted position.

A second circuit with one operating engine is the last means and is possible only when the flight speed did not drop below 200 km per hour.

Peculiar Cases of Flight /Emergencies/.

A. Flight with single engine.

It is possible to accomplish a long flight with a single

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operating engine in the Il-14 aircraft with full gross-weight.

In case that one of the engines fails during ground-run it is necessary to throttle down both engines immediately and stop the take-off.

In case that one of the engines failed after the aircraft broke contact with the ground and the landing gear is in the position "retracted" and the take-off distance is minimum 1200 m it is necessary to accomplish the following:

a/ The aircraft commander renders the order to the flight engineer: "feather left" /or: "feather right"/ for the immediate feathering of the failed engine propeller.

The aircraft commander determines the failure of the engine according to sudden turn of the aircraft to the side of the failed engine.

After the engine failure the aircraft commander pilots the aircraft with simultaneous increase of airspeed. The optimal piloting in this case is with a slight bank to the side of the operating engine /cca 3°. The optimal airspeed of climb to H = 1.500 m with single engine in operation is the indicated airspeed of 200 km per hour.

b/ the flight engineer, according to the order of the aircraft commander feathers in the shortest possible time the propeller of the failed engine by means of pushing the press-button KU-5. He reports the accomplishing of the feathering to the commander of the aircraft.

c/ Close the fire cock of the inoperative engine.

d/ According to the order of the aircraft commander the flight engineer retracts the wing flaps, closes the cowl flaps and the oil cooler shutters of the inoperative engine.

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B. Horizontal Flight with One Operating Engine.

The horizontal flight with one operating engine and feathered propeller of the inoperative engine is up to the ceiling possible in the limits of indicated airspeeds from 200 km per hour to 280 km per hour. With the landing gear extended the single engine flight is possible without descend at the nominal power of the operating engine with the indicated airspeed of 200 km per hour.

The aircraft permits turns to the side of the operating as well as to the side of the inoperative engine with the bank of 3 degrees at the indicated airspeed of 230 - 240 km per hour.

When continuing the trip with one engine running it is recommended to maintain the indicated airspeed of 240 km per hour, the rotational speed of 2000 r.p.m. and the manifold pressure 850 mm Hg, to set the mixture adapter to "Automatic normal", to switch off the autopilot and to transfer the air supply of the gyroscopic instruments to the vacuum system of the operating engine.

C. Flight in Ice-Forming Conditions.

In flight when ice forming is foreseen it is necessary to let out a small quantity of the anti-freeze fluid on the glasses of the flight compartment and on the propellers to prevent thus the corking up of the anti-icer systems holes by the ice.

When the marks of the ice forming occur, it is necessary to:

1. Take measures for getting out of the ice-forming area.
2. Switch on the heating of the pressure head /PVD/.

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3. Switch on the anti-icer of the wing and tail unit.

4. Switch on the anti-icer equipment of the front glasses of the flight compartment and the anti-icer of the propellers.

The breaking through of the clouds upward under heavy ice conditions is to be accomplished at the nominal rating of the engines.

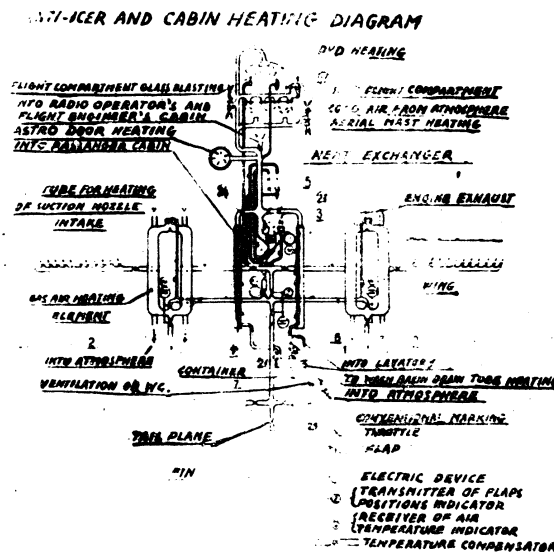


Figure 2. Diagrammatical Lay-out of the Heating and Anti-icing Equipment of the Aircraft.

Operation of the Aircraft Systems in Flight.

AV 50 Propeller Feathering Control.

For the feathering of the propeller blade it is necessary to accomplish the following:

1. Push the KU-5 press-button and release.

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2. As soon as the engine stops shut off the ignition, close the fire-cock, close the cowl flaps and oil cooler shutters.

The whole feathering operation lasts 4 - 5 seconds.

Unfeathering of the Propeller Blades.

1. Open the fire cock.
2. Pull the KU-5 button and keep in this position until the blades unfeather /through the action of the counter - airflow the propeller starts windmilling up to 500 - 600 r. p.m./ and then release the KU-5 button.
3. Switch on the ignition.
4. Open the engine throttle and adjust the necessary rotational speed to warm up the cylinder heads and oil to the required temperature.
5. After the cylinder heads and the oil have warmed up it is possible to accomplish the flight at the given conditions. The unfeathered propeller starts operating through the R-50 constant speed governor.

Operation of the Aircraft Fuel System.

On the Il - 14 aircraft are provided two groups of fuel tanks, which are united into one general system by means of the isolating /cross-feed/cock.

In case that fuel pressure drop occurs during flight at one of the engines, it is necessary to switch on the BCN booster pump of this group.

In case that the pressure does not increase after the BCN pump has been engaged and also in case that uneven fuel consumption has been revealed during flight, it is necessary to open the isolating /cross-feed/cock to supply the engine

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from one, no matter which group of fuel tanks and engage the BCU pump of this group. At this the non-return valves of the opposite group close by means of fuel pressure and the fuel is supplied from one group to both engines.

Normal pressure of the fuel system should be in the limits of 1.5 - 2 kg per sq.cm.

The warning light signalling the critical rest of fuel in the group will glow when the rest will do 200 litres.

Operation of the Oil System.

Each engine has a separate oil-supply system.

The checking of the oil system operation is effected from the flight compartment. When only 40 litres of oil are left in the oil tank a warning light will glow.

Engagement of the Heating and Ventilating Systems.

Under the air flow pressure during the flight of the aircraft cold air enters the cabins. This air is preliminarily warmed up in the air heat exchanger by the hot air supplied from the gas-air heat exchanger.

For the engagement of the system it is necessary to /figure 2/ accomplish the following procedures:

1. Open fully the flap 2 /see diagram/ at the ventilating air intake by turning on of the switch 3 on the control panel.
2. Open fully the flap 4 at the hot air inlet to the same heat exchanger. The opening of the flap is to be checked on the flap position indicator.
3. Let hot air into the system and open by one fourth of its travel the flap 2 at the heating elements.
4. Adjust according to the temperature gauge 5 the ne -

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ecessary temperature at the cabin inlet, which should, however, not exceed 9c° C.

Disengagement of the System.

1. Stop the hot air supply into the system by closing the flap 2.
2. Close the flap 4 at the hot air inlet in the air-to-air heat exchanger.
3. Within 2 - 3 minutes after the closing of the flap 4 close the flap 3 at the intake of cold air into the air heat-exchanger.

The hot air supply into the cargo compartment should be controlled by the flap 3.

Operation of the Anti-icer System.

Use of the Anti-icer Equipment of the Wing and Tail Unit.

Anti-icer equipment is provided to protect the wing and tail unit against ice forming.

For the engaging of the anti-icer equipment at flight with both engines running it is necessary to accomplish the following procedures:

1. Open the flaps 6 of the hot air supply into the anti-icer equipment by switching on the upper thumbler. The opening of the flaps is to be checked on the indicator pointer.
2. Open the flaps 2 after the heating elements, i.e. the system of hot air supply from the gas-air heat exchangers, by switching on the two lower thumbblers on the control panel. The opening of the two flaps is to be checked according to the indicator pointers.

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5. Follow the temperature of the hot air entering the system on the indicators of the thermocouples 1 and 7. The maximum permissible temperature at the system inlet should not exceed 200° C.

The temperature of the entering hot air is controlled by the flaps 2. When flying in ice forming conditions, the outlet into the atmosphere should be adapted to the meteorological conditions. If ice growing would be observed on the leading edges, stop fully the outlet to the atmosphere.

If sudden temperature increase has been determined on the temperature gauge 1 / above 220 degrees / release by the switch 2 partly the air into the atmosphere. In case that this would not bring about the drop in temperature, increase the air outlet to the atmosphere up to full closing of the corresponding flap.

Such heating element should be carefully inspected after the flight and the cause of the exhaust gas intruding into the heating element cavity must be removed.

In order to disengage the anti-icer equipment it is necessary to accomplish the following procedures

1. Close fully the flaps "2".
2. Close fully the flaps "6".

In single engine flying engage the anti-icer equipment by the flap "2" of the operating engine /the flap 2 of the inoperative engine should remain closed/. During this the heating system of the aircraft should be switched off.

Use of the Glass Electric Heating.

The engaging of the electric heating is effected by two switches installed on the switch-board in the flight com -

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partment /one switch for the right-hand, the second for the left-hand glass/. When the glass-heating automat works normally, the temperature of the glass outside surfaces should not exceed plus 40 degrees Cent. in the most warmed up place / in the middle of the glass/.

When checking the electric heating of the glass, it has to be engaged for the duration of the automat's one cycle, which may be determined according to a characteristic click, or for the period of maximum 5 minutes when the temperature is as low that the automat does not switch off or the working cycle of the automat would require a longer period.

In flight. When approaching the ice-forming conditions and also when ice occurs on the glasses or on other protruding parts of the aircraft, switch on the glass heating and check the warming-up of the glasses by touch.

At single engine flying, switch on only the electric heating of the left-hand glass. In case that the ice-forming is only slight it is recommended not to engage the electric heating and apply only the de-icer equipment of the canopy and the glass cleaners.

Use of the Propeller and Canopy De-icer Equipment.

In order to protect the engine propellers and the front glasses of the flight compartment canopy against ice formation, there is a fluid anti-icer system provided on the aircraft.

To supply alcohol to the propeller blades it is necessary to turn clockwise the handle of the rheostat, installed on the control panel on the right side of the flight compartment. At engaging a green signal light located beside the rheostat will glow. In the first moment of engagement the SM-1 pump operate

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with the maximum supply. In order to reduce the supply turn the rheostat handle farther in the clockwise direction.

When the rheostat handle reaches its stop, the pump operates with minimum supply. The rheostat dial has the following positions: "OFF", "Max.", and "Min."

The engagement of the canopy anti-icer is to be accomplished by the same way as stated for the propellers.

If alcohol supply is desirable only to the left-hand glass, it is necessary to close the cock installed on the right side of the instrument panel.

Engaging of the glass cleaner is accomplished by opening of the dosing cocks.

The quantity of the fluid entering the mechanism is determined by the extent of the dosing cock opening and it changes the frequency of the mechanism rocking.

CAUTION: Do not apply the glass cleaners on dry glass.

USE OF THE REMOTE CONTROL GYROMAGNETIC COMPASS, DGMK-3, DURING THE FLIGHT.

Electric remote control gyromagnetic compass, DGMK-3, is destined for the indication of the compass course and the angles of the turns of the airplane.

Switching on of the compass is carried out not less than 30 seconds before the run to the start.

Immediately before flight in order to bring in accordance the indications of the magnetic transmitters and the reading of the indicators it is necessary to press the adjustment button, keeping it till the pointers of the indicators stop.

The stopping of the pointer of the indicators shows that the accordance has taken place. The time of adjustment at the

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difference in the position of the potentiometer of the magnetic transmitter and the gyroaggregate by the angle of 180° must not exceed 9 seconds. Afterwards, releasing the adjusting knob, the compass, DGKM-3, can be used for the indications of the compass course, and for performing the turns of the airplane.

After sharp turns not sooner than 20 seconds after the beginning of the straight flight it is necessary to press the adjustment button and to bring the indication of the magnetic transmitter and indicators into accordance.

The indicator, DGKM-3, indicates the so-called compass course, i.e. the angle between the compass meridian and the longitudinal axis of the airplane.

For aeronavigation it is necessary to know the true course of the airplane, i.e. the angle between the geographical meridian and the longitudinal axis of the airplane.

In order to come from the compass course to the true one it is necessary to take into account two corrections:

a/ Magnetic variation, i.e. the angle between the magnetic and geographic meridians of the place in question,

b/ Deviation, i.e. the angle between the magnetic and the compass meridians.

For the convenience of the use of the compass during the flight it is advisable, turning the toothed gearing which is placed in the lower part of the front side of the indicator, to bring the sign on its scale, corresponding to the necessary direction of the flight under the vertical line of the immovable marker of the course.

The direction of the pointer divergence of the indicator

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from the vertical mark of the course marker shows the direction of the necessary turn of the airplane in order to correct the course.

Use of the Artificial Horizon, AGK-47b, during the Flight.

Electric combined artificial horizon, AGK-47b, is destined for the blind flying and for carrying out of the coordinated turns, and indicates the position of the airplane in the space with regard to the true horizon, and also the direction and the value of the angular velocity round the vertical axis and its side slipping.

Before the run on the start the horizon must be switched on. Before the start of the artificial horizon or immediately after the start it is necessary to bring the airplane silhouette in the normal position. For this case it is necessary to pull on the handle of the caging to oneself and put the caging on the catch. Then it is necessary to bring in line the movable index of the horizon line with the immovable indices on the cover of the instrument and to uncage the artificial horizon, pressing the button of caging.

At the level flight and at the normal centre position the airplane silhouette must be brought in line with the index of the horizon line. The measurement of the pitch angle of the airplane e.g. in consequence of the change of the c.g. position the instrument will indicate the climb or glide. If it is ascertained at the same time that the airplane flies horizontally, then, it is not necessary to remember the constant displacement of the airplane silhouette with regard to the index of the horizon line. Turning the handle, placed on the left side of the instrument, it is necessary to bring in line the movable

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index of the horizon line with the airplane silhouette, and further on, to determine the position of the airplane according to this position of the index like to the horizon line.

Use of the Electric Gyrocompass, GPK-48,
during the Flight.

The electric gyrocompass, GPK-48, is destined for the leading of the airplane along to the given course and for the carrying out of the accurate turns.

The gyrocompass, GPK-48, must be switched on before the run to the start.

In order to make possible to use the instrument during the flight it is necessary to adjust the card according to the magnetic compass. For this purpose, press the handle of the caging as far as it will go, and by the smooth rotating bring in line the corresponding point of the card with the course index of the instrument. Then uncage the instrument pulling on the handle to yourself.

When the instrument is uncaged, it is not possible to turn the handle for the danger of the distortion of the instrument indications. Adjusting the card on the given course it is necessary to turn the handle smoothly and slowly in order not to excite a great gyroscopic moment round the horizontal axis of the frame, because this moment can damage the ball bearings and outbalance the instrument.

After the adjusting on the given course, the instrument can be used as steady indicator of the course during 15 - 20 minutes.

Periodically after every 15 - 20 minutes the indications of the instrument must be compared with the indications of the

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magnetic compass and if there are difference, it is necessary to adjust it according to the magnetic course.

The instrument can be used during 5 - 6 minutes after the start of the gyromotor.

Use of the Automatic Pilot during the Flight.

The automatic pilot, AP-45, is destined for the automatic control of the airplane according to the course, height and bank in the straight level flight, and also for the climbing, gliding and turns.

1. Test the oil pressure and the overpressure before engaging of the automatic pilot.

2. Adjust the airplane by means of the trimmers so that the loading on the control organs should be removed.

3. Turning the control handles, bring in line the indices of the follow-up system with the index of the gyroscope / at the horizon gyro control unit/ and the card of the Follow-up system with the card of the gyroscope / at the course gyro unit./

4. Engage the automatic pilot without leaving the hand control till it is made feel that the automatic pilot is engaged.

5. During the time of the flight along to the given course, check periodically /after every 15 - 20 minutes/ the course of the airplane according to the magnetic compass. Being necessary to give back the airplane on the given course, turn the handle "turn" in the corresponding side.

6. When changing the course, turn slowly by the handle "turn".

7. When carrying out the turn, incline the airplane to the

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desired angle by means of the handle "bank" and at once begin turning the handle "turn".

At a correct turn the ball of the ball bank indicator must be placed in the centre. If at the time of the turn the airplane tends to the descending or climbing, then it is necessary to correct its position by means of the handle "height".

8. In order to let the airplane glide it is necessary to reduce the revolutions of the engines, then to turn the handle "height" in the direction shown by the pointer "descend" up to the desired pitch.

In order to let the airplane climb it is necessary to let increase the number of revolutions of the engines, then, to turn the handle "height" in the direction shown by the pointer "climb" till the airplane resumes the necessary position for the climb.

In case of superfluous sensitivity of the automatic pilot or its insensitivity it is necessary to choose the desired sensitivity by means of the regulator of sensitivity.

10. If at the time of the horizontal flight with engaged automatic pilot the airplane for any reason /e.g. change of the c.g. position/ changes the position of the longitudinal axis, then this fact can excite the repeated oscillations of the airplane. In order to remove these oscillations, disengage the automatic pilot for several seconds and remove the loading from the rudders of the airplane control by means of the trimmers.

Brief Instructions on the Use of the Fire Extinguishing System.

Fire breaking out at any engine / at that time the siren

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If the fire signalisation hoots, the red light begins lighting right or left, according to the engine where the fire has broken out/ it is necessary to discharge the cylinders with the carbon dioxide into the space of the burning engine.

The CO₂ cylinders are discharged by means of pressing of the corresponding electric button switching on the feeding of the CO₂ on the burning engine from one group of the cylinders.

The discharging of the CO₂ is signaled by the lighting of the lamp of milk colour. The buttons and lamps of the signalisation are mounted on the central board of the pilot.

After the receipt of the signal of broken out fire by the crew the siren must be switched off.

If the fire on the engine is not stopped after the spending of the two cylinders it is necessary to press the second button of the burning engine as to put into action the group of the two left cylinders. At a great intensity of fire it is possible to switch on all four cylinders at the same time by means of pressing of both buttons at once.

In case of the failing of the remote electric switching on of the cylinders it is possible to open them by turning the handles of the pyroheads of the cylinders towards oneself.

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CHAPTER III.

AFTER-FLIGHT INSPECTION OF THE AIRCRAFT.

The after-flight inspection is the principal inspection of the aircraft.

A. Preliminary Procedures.

1. After taxiing to the parking area check the engine operation when test running them prior to stop. Check the operation of the GA - 77, the correct reading of the instruments, indicating the operation of the engines, burn through the spark plugs and stop the engine.
2. Make sure that the storage batteries and the magneto are switched off, that the landing gear cock handle is locked in the position "Extended" and that the handle of the parking brake control, of the locking of rudders ailerons and the throttle lever are in the position "OFF", the fire and isolating cocks are closed.
3. Open the access door for the access to the locks of the landing gear extended position and make sure that the lock latches are fully closed. Install safety pins into the locks and check by touch the brakes for even temperature.
4. Place wheel chock under the landing gear main leg wheels, fit the clamp on the rudder, cover the pressure head and ground the aircraft.
5. Open the doors of all the three landing gear compartments, the lower cowlings, the engine cowlings and the access doors on the aircraft, and then proceed to the after-flight inspection.

The after-flight inspection should be carried out in the

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some sequence as it is required for the pre-flight in -
inspection /figure 1./

B. After-flight Inspection of the Aircraft and Engines.

1. Right wing of the aircraft.

Check:

- The condition of the skin and the hinge assemblies of the wing flap: the wing flap skin for damage, for play in the hinge assemblies of the wing flap /not more than 3 mm/, for the locking of the bolts.
- The condition of skin and hinge assemblies of the ailerons for play, locking and lubricating in the hinge joints, make sure of the normal displacement of the ailerons /without seizing, squeaking etc./
- The trim tab of the aileron: for neutral position, condition of the skin, play in the hinge joint.
- The condition of the ailerons cable control tautening, of the bell-crank control, make sure that there is no damage or play and that the locking is in proper condition /having opened the aircraft access doors - figure 3.
- Make sure that the removable panels and fillets screws are not loosened.
- The condition of the inspection doors, the correctness of their locks and make sure that there is no sign of corrosion on the door bolts.
- The condition of the BANO glasses /navigation lights/
- The condition of skin for damage /loosening of rivets, cracks, deformation/ and proper condition of the protective coating.
- Inspect the fuel tanks and pipe-lines as well as cocks

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for leak of fuel / it is determined by outside inspection of the wing lower surface/.

- The outlets of the draining tubes of the fuel tanks for damage and fouling.
- The attachment of the exhaust pipes and the hot air release tube for reliable attachment and correct operation of the flaps after the heating element.
- The filler necks of the fuel tanks for damage of cover and filters and the rubber diaphragms for general condition.
- The charging of the fuel tanks. After the charging clean the filters of the fuel tanks filler necks.

2. Installation of the Main Landing Gear.

Check - the wheel tyres for cuts and pin-holes, for tread wear and local inflation and also for displacement of the tyres with reference to the marks/ in relation to the wheels. Make sure that there is a cap on the nipple and check by means of Il-700-2-8 appliance the inflation of the tyres. The pressure should be 4.8 - 5.2 kg per sq.cm. Inspect the wheels for cracks and nicks on the rims and for leak from the draining tubes of the brakes.

- Check on the indicator the charging of the shock absorber struts, the compression should be in the limits of 180 - 230 mm.

According to the traces on the shock absorber rods determine the maximum stroke of the shock absorbers at the given landing, the stroke of the shock absorbers should not exceed 290 mm. In case that the stroke exceeded the stated value, check the air charging of the charging of the shock absorber with fluid, if necessary.

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- Check the mirror surface of the shock absorber strut for grease and its cleanness, for corrosion, scratches and notches on the rod surface.

Special attention should be paid to the checking of the torque link bolts, which should turn with little effort by hand.

It is forbidden to tighten the bolts of the torque link to avoid seizing.

- Inspect the shock-absorbing strut, the hydraulic hoses, the actuating cylinder and the hydraulic switches for leakage. Make sure that the charging fitting and the filler port of the shock-absorbing strut do not leak, have no damages and are closed and sealed.

- Inspect the landing gear structure members, the actuating cylinders, the shock absorber strut and their attachment for mechanical damages.

- Inspect the flexible hoses of the retraction and extension systems of the landing gear and of the braking system for general condition.

- Inspect the condition of the landing gear locks for the presence and cleanness of grease /in case of necessity replace/, the tension of springs and their reliable attachment and the correct condition of the lock control cables.

- Inspect the charging of the lubricating nipples of the landing gear cross-beam journals.

The grease in the lubricating nipples of the landing gear should be replenished regularly according to consumption. The consumption of grease in the lubricating nipples may be determined by the position of the lubricating nipple pin in rela -

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tion to the face of this lubrication nipple body nut. The normal protruding of the pin is 14±15 mm.

3. Starboard Engine Nacelle.

1. Inspect the condition of the engine nacelle doors and of their locks for cracks, damages, seizing and play.

When closing the doors check their tight closing and fitting to the contour of the skin.

In the engine nacelle check:

- The air-tightness and safe attachment of all pipe-lines and couplings,
 - Condition of the fire cock and its cable control,
 - The precise click at operation of the fire cock,
 - Open the fuel draining cock and check the airtightness of the fire cock in closed position,
 - the condition of the engines cable control,
 - the condition of the hoses and pipe-lines of the fuel, pneumatic and hydraulic systems, paying special attention to their airtightness, inspect them for wear and other mechanical damage,
 - the condition of electric devices, electric leads and the reliability of their attachment,
 - the charging of the priming tank and of the multiplier.
3. Drain the deposits from the draining cocks of the sump-filters.
4. Check the oil tank, hoses and pipe-lines for cracks deformation and the tanks attachment strips for breaks. Inspect the durite hoses for exfoliations, deep cracks and buckling.
5. Make sure that no leakage occurs and inspect for damage of locking and bonding strips,

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- inspect condition of the fire-proof bulkhead,
- inspect the body of the mesh and silk fuel filters and be sure of their reliable attachment and safetying.
- inspect the EKR - 3 valve for damage of hoses and loosening of attachment. Be sure that no leakage occurs.

4. Starboard Engine and Accessories.

1. Check the condition of the cowling for cracks, nicks and loosening of rivets. Inspect the brackets, push-pull rods and the cowl flaps control.

2. Inspect the condition of the oil pump M³ and check the reliable attachment, the safetying of nuts and of the reduction valve cap. Inspect the fittings and pipe-lines of the oil pumps, their durit couplings and be sure of their reliable attachment, and absence of cracks, nicks, wear and oil leak.

3. Inspect the attachment of the M³ - 13 hydraulic pump, the coupling of the fittings with the base, the condition of the safetying and occurrence of leak.

4. Inspect the PV - 82 pump and its fitting and check for leak, reliable attachment of the pump, mixture adapter and the limb indicator transmitter, check the smooth travel of the pump limb lever /the lever should freely move by effort of hand/, the reliable attachment of the high pressure pipes and their mutual interference and interference with other details /the clearance between the pipes and the engine details should be minimum 5 mm/ and examine the general condition of the flexible hoses.

5. Check the attachment of the throttle housing, the valve turn limiting screws and check the throttle spindles and linkage

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- inspect condition of the fire-proof bulkhead,
- inspect the body of the mesh and silk fuel filters and be sure of their reliable attachment and safetying.
- inspect the BKR - 3 valve for damage of hoses and loosening of attachment. Be sure that no leakage occurs.

4. Starboard Engine and Accessories.

1. Check the condition of the cowling for cracks, nicks and loosening of rivets. Inspect the brackets, push-pull rods and the cowl flaps control.

2. Inspect the condition of the oil pump M⁵ and check the reliable attachment, the safetying of nuts and of the reduction valve cap. Inspect the fittings and pipe-lines of the oil pumps, their durit couplings and be sure of their reliable attachment, and absence of cracks, nicks, wear and oil leak.

3. Inspect the attachment of the M⁵ - 13 hydraulic pump, the coupling of the fittings with the base, the condition of the safetying and occurrence of leak.

4. Inspect the PV - 82 pump and its fitting and check for leak, reliable attachment of the pump, mixture adapter and the limb indicator transmitter, check the smooth travel of the pump limb lever /the lever should freely move by effort of hand/, the reliable attachment of the high pressure pipes and their mutual interference and interference with other details /the clearance between the pipes and the engine details should be minimum 5 mm/ and examine the general condition of the flexible hoses.

5. Check the attachment of the throttle housing, the valve turn limiting screws and check the throttle spindles and linkage

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coupling for loosening.

6. Inspect the electromagnetic valve of the engine priming for safe attachment.

7. Inspect the draining pipe-line from the engine carter to the tank durit couplings, and check them for cracks, nicks and oil leak.

8. Check the sections, nozzle, telescopic joints and assemblies of the elastic suspension of the exhaust collector for cracks, burnt-through spots, loosening of couplings and attachments, and for damage of locking.

9. Inspect the condition of the generator blasting tube and check for cleanness, safe attachment and damages.

10. Inspect the condition of the ring and braces of the engine mount and check for cracks, deformation and damage of safetying. With special care should be inspected the engine attachment assemblies to the engine mount and the attachment assemblies of the engine mount to the engine nacelle.

11. Inspect the oil pump, the fittings, plugs and pipe lines for cracks, wear, loosening of attachment, damage of safetying and for leak.

12. Inspect the draining fittings of the exhaust pipes, the draining pipes of the accessories and the draining pipes for the deposits in the supercharger and make sure that the drains are not fouled, the tubes not damaged and the attachment reliable.

13. Inspect the cowling cover with the intake channel for cracks, cuts of rivets and check for loosening the locks of the cover attachment to the engine. Inspect the mesh of dust filter and check for fouling and damage.

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14. Check the charging of the oil tanks on the metering pipe.

15. Inspect the oil cooler and the hinge bracket for cracks, loosening of attachments, damage of safetying, leak and fouling of the honeycomb.

16. Inspect the separator tank for cracks and loosening of attachment. Drain the collected oil from the tank.

Inspect the mechanism of the doors control. Check the reliability of couplings, attachment, and the bonding strips.

17. Inspect the power generating unit, the telescopic starter and check the reliability of its attachment.

18. Inspect the units of the feathering system: the electric motor D - 2500A, the oil pump - unit 431 and the nozzles of the hose terminals, check for reliable attachment and leak.

19. Detach the WFS - 19 filters, remove the sockets from them, inspect the filtering meshes and check for cleanness and metallic chips.

20. Check the engine control /one of the air-crew members should be present in the flight compartment and change the position of the levers according to the commands of the inspecting person/.

When checking the engines control it is necessary to pay attention to the following:

- the correct condition of the linkage coupling and cables of the engine control and of their safetying,

- the condition of attachment, smooth travel, plays in the levers motion, the condition of the bellcranks, push-pull rods and cables of the throttle control, of the constant speed governor /R-50/ and of the priming pump NV - 82.

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- the reliable attachment of the stops of the coarse and fine pitch on their - 50 constant speed governor, the condition of the turnbuckles and their safetying as well as the tautening of the cables.

- Special attention should be paid to the condition of the damper installed on the first frame.

- The control of the dust filter, the free motion of the flap and the tightness of its fitting.

- The condition of the cowl flaps, the linkage for linear direction, seizing and mechanical damages,

- The condition of the oil cooler shutters for nicks, cracks and seizing under pressure.

The member of the air-crew has to check during the operation of the sectors according to the command of the inspecting member of air-crew, the smooth motion of the sectors, the elasticity in the extreme positions, makes sure that there is no seizing and squeaking.

21. Check the attachment of the propeller on the reduction shaft,

- the correct adjustment of the blades and collar of the propeller according to the marks; inspect the blades for cracks, nicks, hollows, deep scratches and for damage of the protective coating.

- inspect the condition of the anti-icer ring with the tubes and the pipe of the anti-freeze fluid supply and check for cracks, hollows and nicks, check the tubes for fouling, the attachments for loosening and the safetying for any damage.

- inspect the general condition of the engine front part.

- inspect the thrust bearing and the plugs on the carter

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front part for leaks.

- inspect the attachment of the carter nose part to the front transition body of the central carter,

- inspect the condition of the front oil pump and check for leak, for reliable attachment and for safetying of the nuts and caps of the reduction valve and the nut of the air - release fitting,

- inspect the durite couplings for cracks, loosening of the tightening collars and check for leak.

- inspect the condition of the R - 50 constant speed governor as well as the condition of the roller and the stops on the roller.

- inspect the fittings and pipe-lines of the selector valves and check for leaks of oil, inspect the collector of the ignition leads, the screening and attachment of the terminals of the removable leads.

- inspect the magneto, the reliable attachment of the low tension leads and of the starting ignition.

- inspect the starting coils, the engine cylinders and check the bolts for breaks /and damage of the safetying/ and check the ribs for cracks and ruptures.

- inspect the defletors for wear, reliable attachment and correct safetying of the intake tubes, of the exhaust nozzles and the high pressure pining,

- inspect the adapters of the spark plugs. By turning the adapters ensure proper distance between them and the exhaust nozzles, which should be 20 - 25 mm.

5. Installation of the Nose Gear and its Section.

Inspect the condition of the nose gear doors and check

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for cracks, damages, seizing, plays. In closed condition of the doors check the tightness of their closing and their fitting to the contour of the fuselage,

- check the nose wheel for damage, local swelling or excessive wear of the tyre,

- check by the aid of the Il-700-3-8 appliance the inflation of the tyre, the pressure should be 4 kg per sq.cm. In case of damage of the tyre or in case of its excessive wear it is necessary to replace this tyre.

- inspect the wheel drum, the shock absorber strut, its attachment, the condition of the cross-beam, braces and fork exercising special care when inspecting the welded seams.

- Special attention should be paid to the checking of the torque link bolt to avoid its seizing.

- Inspect the shock absorber strut for damages on the filler neck and plug of the filling port and make sure that the sealing is not damaged. Special attention should be paid to the leaks from below the sealing of the rod and filler necks and also to the lubrication of the mirror-like surface of the shock absorber strut and to the cleanness of the lubricant and make sure that there are no corrosion signs on the rod.

- Check the indicator of the shock absorber strut compression. The compression should be 170 - 260 mm.

- Inspect the hinge shackle, the torque links and the coupling of the shimmy damper with the movable collar and check for cracks, deformation, loosening of the hinge joints, loosening of attachments and correctness of safetying.

- Check the charging of the shimmy damper by means of the metering pin and make sure that no leakage occurs. The metering

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pin should protrude above the nut of the damper housing by 6.5 - 12.5 mm.

- Check the charging of the lubricating nipples of the landing gear cross-beam journals. The lubricant in the lubricating nipples of the landing gear cross-beam journals should be replenished regularly according to its consumption. When replenishing grease be sure that the pin of the lubricating nipple should not come out more than 15 mm as in case of charging of the lubricating nipple more, the pin might be broken by the boom of the seventh former of the fuselage.

The consumption of lubricant might be determined by the position of the lubricating nipple pin in relation to the face of the lubricating nipple housing.

- Inspect the locks of the extended and retracted position of the landing gear and check for damages of springs and free portions of the cables, for loosening of the attachment of end switches and for the cables, for loosening of the attachment of end switches and for the clearance /which should be 1.5 mm/ between the face of the shackle bolt of the nose gear upper locks control cable and the faces of the lock.

- Check the safetying of the turnbuckles and couplings. Make sure that the locks are not fouled and that they are lubricated by a thin layer of grease.

- Inspect the accessories, pipe-lines, hoses and the couplings of the hydraulic and pneumatic systems for leaks, wear or loosening of attachment.

CAUTION: The defect of any of the units or details of the nose gear may have serious consequences. It is necessary to keep in good condition the landing gear nose strut and especially the tyre.

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6. Nose Part of the Fuselage and the Centre Section

Bottom.

Inspect the condition of the masts and static pressure tubes and check them for outside damage.

Inspect the skin, the air intake and the draining pipe of the heating system for corrosion and damage. Check the fuselage nose for leaks.

Inspect the centre section and check the skin and fillets for external damages,

Inspect the condition of the wing flaps.

Check the control of the wing flaps. Operating the wing flaps check the smooth motion without seizing, jerks and squeak. Inspect the fitting of the wing flaps in the retracted position.

7. Port Power Unit.

Inspect the extent and sequence shown for the inspection of the starboard power unit.

8. Aircraft Left Wing.

Inspect in the extent and sequence shown for the inspection of the right wing of the aircraft.

9. Aircraft Fuselage.

Check:

- the condition of the aeriels of the radio stations
- the condition of skin and riveted seams of the fuselage and check for mechanical damages,
- the condition of fairings, fillets and their attachment,
- the condition of access doors and the tightness of their closing.

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1c. Tail Unit.

Inspect the rudder and trim tabs and check their free motion without seizing,

- inspect the rudder and trim tabs for mechanical damages of the skin framework or attachment assemblies,

- inspect the condition of skin and of the riveted seams of the fin and tail plane,

- inspect the attachment of the hinge assemblies of rudders and trim tabs, check them for general condition and for safetying and sufficient lubrication,

- inspect the proper condition of the ANO tail position light and check for damage of the protecting cap.

Fuselage Inside Equipment.

1. In the tail section and rear cargo compartment check:

- the cables and rollers of the aircraft control for general condition tautening and safetying,

- the condition of the rudder motion limiter,

- inspect for foreign matter,

- inspect the correct condition of the cargo compartment access door and its lock.

2. In the cargo compartment:

- inspect the correctness of the doors locks, the tightness of the closing of doors and the correctness of the signal system as well as the condition of the floor,

- inspect the condition of shackles and hinge joints,

- inspect the emergency exits and windows and check for damage,

- make sure that the locks of the emergency exits are

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closed and that the celluloid cover is on the lock,

- check the presence of the board fire extinguishers and their sealing.

3. In the air-crew cabin and in the service compartment:

- check the level of the fluid in the tank of the hydraulic system to make sure that it corresponds with the marks on the table and check the pressure on the bottle of the emergency extension pneumatic system of the nose gear, which should be minimum 120 kg per sq. cm.,

- inspect the access door for astronomical observation and its attachment,

- inspect the condition of the glasses, movable peep windows and of their locks,

- inspect the setas of the pilots and the operation of the adjustment mechanisms,

- inspect the quantity of fuel and oil,

- inspect the function and displacement of rudders, ailerons and trim tabs and check for seizing and tight motion.

Set the trim tabs into neutral position.

- Check the effect of controls of the power units by displacing one after the other the throttle levers into the extreme positions, the control of the propeller pitch, the mixture adapter and the fuel selector valves. The handles should move smoothly without seizing and their elasticity should be 5 - 8 mm.

- check, by engaging the switches, the operation of the electric devices actuating the opening and closing of the flaps of anti-icer and heating and ventilating systems, the cowl flaps and the oil cooler shutters,

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- check the presence and proper attachment of the board fire extinguishers and the sealing of them,
- depress the braking pedals and make sure that the pressure in the braking system equals 28 - 32 kg per sq.cm.,
- check the operation of the rudder trim tab and the spring compensator by means of depressing one after the other the pedals with an effort of minimum 20 kg,
- make sure that the landing gear cock handle is locked in position "Extended" and the handle of the parking brake control is in position "Engaged",
- make sure that the fire cocks and the distributing cocks are closed,
- inspect the instruments and the instrument panel for general condition,
- switch off the storage batteries.

After the after-flight inspection it is necessary to inspect the MFS-19 filters after each five hours of the engine run.

After the the remedy of all defects revealed during the after-flight inspection and during flight fit and fasten the engine cowlings and cover the aircraft.

Fasten the aircraft and remove the air-field ground equipment.

After-flight Inspection of the Electric Equipment.

1. Trace out in the log book of the flight engineer all notices of the air-crew referring to the operation of the electric equipment of the aircraft in flight and then proceed to the inspection.
2. Carry out the outside inspection and check the attach-

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ment of all parts of the electric installation, which are accessible through the opening of the main access doors.

Check the condition of the electric equipment attachment on the engines and on the engine mounts and namely:

a/inspect the reliability of the attachment of all objects of the electric installation,

b/inspect the condition of the electric braids and cables of the electric leads and check the reliability of their attachment, see that there is no variable contact of the screened electric braids between themselves or with the metallic parts of the aircraft and check the electric braids and accessories for oil spots,

c/ check the reliability of the connections of plug-and-socket joints of the electric system cables,

tighten the nuts and bolts of the electric equipment attachment which have been loosened; when revealing signs of wear of the screening bridging of the cables of electric system, cover the cables on these spots by leatherette,

braids, cables, accessories which came into contact with oil wipe dry.

3. With the electric system on check by switching on and off the efficiency of the functioning of switches, press buttons, contact breakers paying attention to the attachment of the checked units and checking the knobs and press buttons for seizing in extreme positions.

4. Check in the central switch-board of the radio-operator and the switch-boards of the pilots the correctness of all circuit breakers and be sure that there are spare fuses and spare lamps for illumination.

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When revealing thrown-out circuit breakers determine the cause for the short circuit resulting in throwing out of the circuit breaker and remedy the defect.

5. Check the tension of the storage batteries when under load of the outer circuit by the double current value of the 10 hours discharging conditions.

Carry out the outside inspection of the storage battery and make sure that the outside surface is clean and that there are no cracks or softening, oil spots, make sure that there is no break in contact of the inter-element connections, check for cleanness and damage of terminals on the storage batteries.

Check the ventilation plugs for fouling and the monoblock for damage.

Wipe the storage battery from dust and moisture.

When disclosing traces of electrolyte slashes on the surfaces of the storage batteries, or cracks or swelling of the mastic unscrew the plugs and check their cleanness and the clearance between the valve cone and the seat in the plug /the clearance should be minimum 1 and maximum 2 mm/.

Prior to reinstallation of the plugs to their places check the electrolyte level in the elements of the storage battery.

In case that an excessive damage of the mastic surface has been revealed or traces of considerable splashes of electrolyte disclosed from the elements, send the storage battery for repair.

Check the reliability and cleanness of the contacts of the minus lead with the body and the reliability of the

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contacts of containers with the supports of the backlead pins.

Check the condition of the container.

When revealing defects which have arisen in the container during flight as leaks of electrolyte or damage of the leads it is necessary to remedy them.

Check the correctness of the electric signal systems both sound and light one, of the landing gear, wing flaps and trim tabs position.

Inspect all the end switches of the landing gear main legs - right and left - , on the landing gear nose leg and check their attachment, correctness of the safetying of the regulating rods, reliable attachment of the feeding electric leads, clean the end switches from fouling and by hand depressing check the smooth motion of the VK-44 rod and make sure that no seizing occurs and that the spring is not broken.

When depressing the VK-44 the lights should start glowing for both extension and retraction.

Check the operation of the signal lights switch-off and of the u/c indicator.

8. Check the correctness of the outside and inside means of illumination /integrity and cleanliness of the light filters, BANO and of the protecting glazing of the landing and taxiing lights, the correctness of the cabin illumination, armature and UFO-4 lights as well as the correctness of the lights of illumination and of the signal system/.

9. Check the push-pull rods of the UZP-48 position indicator transmitters of the heating system, check the locking of shafts in the eyes, the safetying of the regulating push-pull rods to the transmitters.

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10. After the outside inspection proceed to the checking of the electric equipment and of the electric mechanisms under the tension of the airfield source of energy. For this purpose switch on all - one after the other - electric consumers for a short period /for 3 - 5 seconds/.

During this check: the efficiency of operation of the switches, press buttons, rheostats, relays, the consumption of current by the electric mechanisms and the proper function of the control signal system, the illumination of the common cabin and the illumination of the instrument on the instrument panel of the pilots and of the radio equipment; the correctness of reading of the landing gear and heating system indicator pointers.

After the checking of the electric equipment and remedying of defects check the integrity proper condition of the safety fuses in the central distributing board and distributing mechanism, junction boxes of the engine nacelles, the switch boards of the pilots and on the panel of the storage batteries.

Supplement the spare fuses and lamps for the illumination and signal system to full set number.

By short engagement check the operation of the whole illumination and signal system electric equipment under tension. Check the operation of the electric mechanisms. The electric mechanisms of the heating system flaps, of the oil cooler shutters, of the dust filter cowling flaps, the signal system of the dust filters has to be checked in the presence of the flight engineer or engineer.

11. After completing of the inspection and checking of the electric accessories be sure that all consumers and the

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Aircraft storage battery are switched off and the driven mechanisms of remote control units /trim tabs, doors, flaps/ are in the position designed for the parking of the aircraft on ground are disconnected and then remove the ground source of energy.

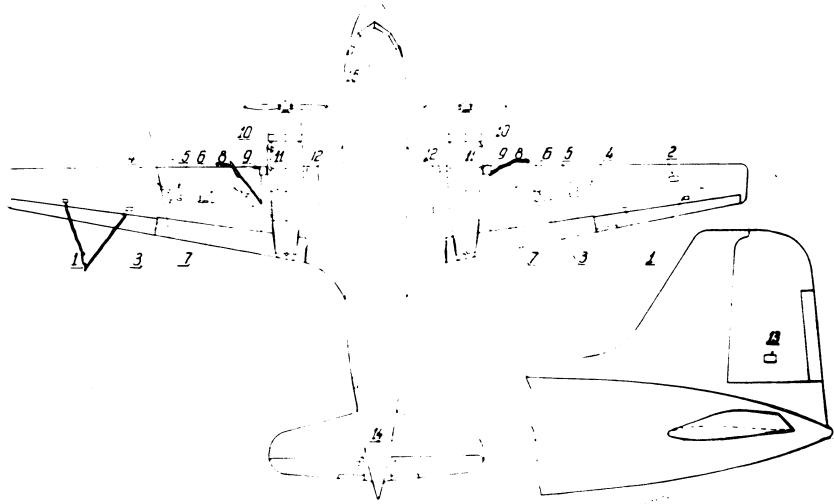


Figure 3a. Inspection Doors on the Upper Surface of the Aircraft.

1. aileron sector, 2. PDK-3 transmitter, 3. draining,
4. non-return valve of the drain, 5. filling, 6. fuel quantity gauge, 7. drain, 8. wing joint, 9. oil filler, 10. attachment of heating members, 11. oil gauge, 12. union of pipelines and electric leads, 13. spring trim, 14. elevator trim tab, 15. door for astronomical observations.

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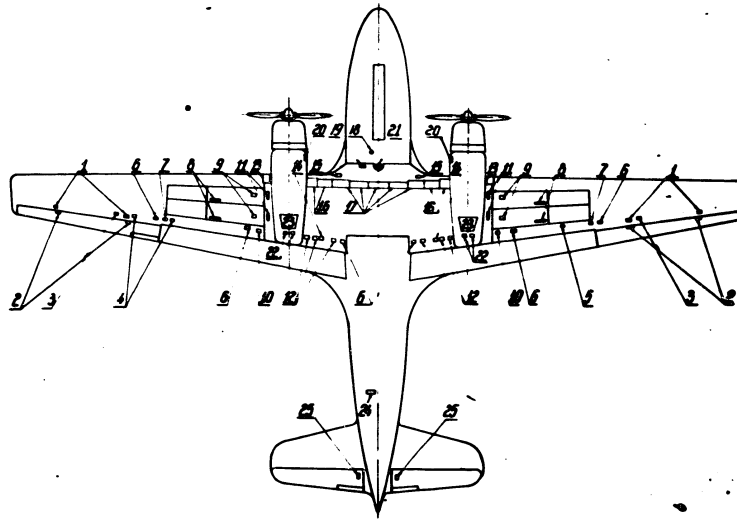


Figure 3b. Inspection Doors on the Lower Surface of the Aircraft.

1. control sector, 2. aileron control sector, 3. turnbuckles of the ailerons control, 4. connection of the electric leads, 6. roller of aileron control, 7. drain, 8. non-return valve between fuel tanks, 9. drain, 10. wing-joint, 11. fuel line, 12. bellcrank of wing flaps control, 13. wing joint, 14. anti-icer tubes, 15. fuel cock, 16. pipe-lines unions and electric leads connections, 17. pipe-lines electrical leads, 18. air-field feed, 19. landing gear lock, 20. heating elements, 21. storage batterie, transformer, air cooler, 22. heating elements attachment, 23. landing gear lock, 24. container, 25. trim tab control.

After-flight Inspection of the Instrument Equipment.

1. Write out from the log book of the flight engineer all notes of the air-crew referring to the operation of the instruments of the aircraft in flight and then proceed to the

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inspection of the instrumental equipment. Before completing of the aircraft inspection it is forbidden to carry out works for remedying of the defects or to effect the servicing procedures.

2. Check for exact readings the airspeed indicators and the correctness of the static and dynamic ducts by aid of the KFU-3 appliance and check also the displacement of the instrument pointers.

Displacement of the instrument pointer from the zero point of the dial indicates residual deformation of the feeler element of the instrument or incorrect adjustment of it mechanism. Therefore such instruments have to be repaired or replaced by correct ones.

3. Check the correct condition of the instrument panel damping, the condition of durite and electric connections and their safetying behing the instrument panel. At this special attention should be paid to the tightness and reliability of durite unions between the tubing and instrument fittings.

4. Check the condition of the attachment of transmitters of engine operation control and of the outside air temperature gauge as well as the reliability of the connection to the transmitters, of the electric leads and safetying of connectors and of the transmitters themselves.

5. Check the condition of the DGMK-3:

a/ carry out the outside inspection of the following accessories: transmitter, hydraulic unit, rectifier, transformer and junction box,

b/ check the condition of the attachment and damping of all accessories,

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c/ open the junction box and check the reliability of the terminals connections,

6. Inspect the pressure heads, be sure that there are no mechanical damages on them. Inspect and check for cleanness the inlet and outlet hole of the pressure heads and the condition of the pressure heads mast attachment. After completing the inspection put the covering on the pressure heads.

7. Inspect the automatic pilot AP - 45:

a/ carry out the outside inspection of the following accessories: bank automat, course automat, hydraulic unit, mounting bracket, servo-unit block and draining tank.

b/ check the durite connections, pipe-line, cock and stuffing box of the servo-unit and in cases of leak remove the cause of this defect,

c/ inspect the whole cable system / of the force line and of the return line/ and their attachment,

d/ check whether the springs did not get loosened in the rollers of the return line on the mounting bracket of AP-45.

e/ check the plug gaskets on the rollers of the return line on the course and bank automats of the AP-45 for wear.

8. Remedy all defects which have been revealed in flight or during the after-flight inspection.

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CHAPTER IV.

Servicing of the Aircraft on Ground.

Filling of Aircraft by Fuel.

For the aircraft Il - 14 with the AŠ - 82T engines is used as fuel the B-95/130 aviation petrol with octane number minimum 95.

The filling of the aircraft is effected through the cut-board tanks of each group at full capacity of the petrol filling station.

Prior to starting the filling of the aircraft with petrol it is necessary to check the following:

- a/ grounding of the aircraft and of the petrol filling station,
- b/ compliance of the petrol delivered for filling /according to certificate/,
- c/ sealing of the petrol filling station and the condition of the mesh filters on the nozzles.

2. Closing of the fire cocks.

When refuelling the fuel tanks fully it is necessary to leave sufficient space for the expansion of the fuel, i.e. to stop the filling when the distance from the fuel level to the edge of the filler neck is approximately 40 mm.

The quantity of the filled fuel is checked separately in each group by means of fuel quantity gauge of metering rod of the fuel filling station, or by the fuel meter and metering pin on the aircraft.

After filling of the aircraft close tightly and seal the fuel tanks filler necks and within 15 minutes after the filling

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drain from the fuel tanks and fuel filters per 0.5 - 1 litre in order to remove the deposits.

- CAUTION:
1. Prior to filling of the aircraft cover the leading edge and the upper part of the wing by the protecting covering.
 2. The checking of fuel quantity in fuel tanks exceeding 1600 litre has to be carried out only by means of the metering rods.

Filling of the Aircraft by Oil.

On the Il-14 aircraft is used the MS-20 or MK-23 mineral aviation oil, The total capacity of the oil tanks is 288 litres.

Prior to the filling of the oil tanks it is necessary to check according to the certificate the kind of oil and inspect the nozzles to make sure that they are clean and provided with filters, and to drain the sediments from the oil filling station.

In case that the oil has been fully drained from the fuel system then it is necessary at the beginning of filling of the oil tank to unscrew the plug of the fitting installed on the left side of the front oil pump on the nose part of the carter and release the air from the oil system. After doing this fit and safetic the plug.

Fill the oil through the filler neck of the oil tanks located on the outer side of the engine nacelles.

It is recommended to fill each oil tank with 105 litres / but maximum 110 litres/ of oil. The quantity of the oil may be determined by means of the metering rod and oil meter.

The oil filled into the oil tank has to be filtered through the filters of the oil filling station.

Draining of fuel and oil:

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The draining of the fuel from the fuel system is accomplished through two drain cocks on the mesh filters in the engine nacelles. In order to speed up the draining of fuel it is necessary to engage the BCN booster pumps.

Draining of the sediments from the fuel system is to be effected:

- a/ from the sumps of the four tanks / 4 drain points/
- b/ from the mesh filters / 2 drain points/
- c/ from silk filters / 2 drain points/
- d/ from the priming tanks / 2 drain points/
- e/ from the BCN pumps / 2 drain points/

The draining of oil from the oil tank and the feeding pipe line is carried out through the drain cock of large cross-section and two drain cocks of minor cross-sections / one cock for draining of the section for propeller blade setting and one for draining of the tank rear part/.

The draining of oil from the engine is effected through two draining cocks: one cock on the front oil pump and one on the oil sump.

The draining of oil from the oil cooler and pipe is effected through the drain plug on the oil cooler.

Filling of the Empty Hydraulic System with Oil.

General Instructions.

The hydraulic system of the Il-14 aircraft will reliably operate only in the case that it is filled with pure well filtered MVP oil.

Principal characteristics of the MVP oil:

- a/ acid number 0,14
- b/ viscosity after Engler at 50 ° C 1,5 - 1,7

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- | | |
|---|----------------|
| 3. flash point after Martens-Penski | 120° C. |
| 4. mineral acids and alcalis | - |
| 5. thickening temperature in degrees of C. max. | 60° below zero |

Fill or replenish the hydraulic system always with the same MVP mineral oil. It is FORBIDDEN to mix different kinds of mineral oils and hydraulic fluids or to replenish the hydraulic system by other sorts of mineral fluids.

110 litres of fluid is necessary to fill the hydraulic system completely.

The fluid destined for the filling into the hydraulic system of the aircraft should be carefully filtered through 2 - 3 layers of cambric and stored in clean, air-tightly closed containers.

The filling of the aircraft hydraulic system is to be carried out by means of the mobile ground hydraulic station.

It is forbidden to use fluid from a tank of hydraulic station, which is open for more than a day and from air-tightly closed tank, which is staying for more than 15 days.

Poured off fluid which has been in open vessels for more than 10 hours can not be used.

Preparatory Procedures Prior to Filling of

Dry Hydraulic System with Oil.

1. Charging of the pneumatic system of aircraft with air.

Prior to the charging of the aircraft hydraulic system with oil it is necessary to fill the air compartment of the hydraulic accumulators with 300 - 400 cc. of pure MVP oil to ensure reliable air-tightness of sealing gaskets of the hydraulic accumulator float and to charge the hydraulic accumulators and

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aircraft air bottles by air. For this purpose it is necessary to carry out the following procedures:

a/ make sure that in the airfield bottle is no water, incline the bottle by 10 - 15 degrees to the side of the head and then open the bottle valve.

b/ place the airfield bottle with slight inclination with the bottom downward.

c/ make sure that the fitting of the filling hose is clean, fit the sealing gasket, connect to the fitting the charging hose and blow it through.

NOTE: The hose for the charging of the airfield bottle should be provided with filters for the absorption of oil, dust and water.

CAUTION! Water, oil or dust in the pneumatic system of the aircraft might result in the failure of the system operation.

Charge the pneumatic system of the aircraft with compressed air in the following sequence:

a/ open the valve of the airfield bottle and keep a check on the pressure gauges for the pressure of air proceeding to the emergency bottles of the landing gear and brakes.

When the pressure reaches the highest value and ceases to increase, make sure that the value of the air pressure on the pressure gauges of the emergency panel is minimum 120 kg per sq.cm. and maximum 150 kg per sq. cm.

b/ close the valve of the bottle.

c/ check the charging of the hydraulic accumulators with compressed air by the aid of the Il - 704 appliance for checking of the pressure in the landing gear shock absorbers, screwing on this appliance on the charging neck of each hydraulic accu -

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accumulator in its upper part. Depress the valve of the charging neck by means of the large wheel of the appliance and the pressure gauge of the appliance will indicate the air pressure in the hydraulic accumulator.

The pressure of air on the hydraulic accumulators should be as follows:

of the main system	33 - 75 kg per sq.cm.
of the brakes	39 - 47 kg per sq.cm.
of the automatic pilot	3.8 - 5.0 kg per sq.cm.

After checking of the pressure screw the hand wheel into the initial position and remove the appliance from the filling neck.

3/ disconnect the hose from the charging neck of the aircraft and fit the plug on the charging neck, then close the access door.

NOTE: In case that the pressure in the airborne air bottles did not reach the value of 120 kg per sq.cm, then it is necessary to replace the airfield bottle by another one charged up to 150 kg per sq.cm.

Sequence of Filling Empty System and Expulsion of Air.

The nozzles of hoses of the ground hydraulic station must be, prior to their connecting to the intake fittings of the hydraulic system of aircraft, scavenged and filled completely with PVP oil to prevent air from getting into the hydraulic system of the aircraft which would result in failure of the hydraulic system operation caused by air locks.

Make sure that the sealing gaskets are on their places in the fittings of the ground station hoses and connect them to the intake fittings of the aircraft to the line "compression"

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both engine nacelles.

Put the aircraft on jacks to enable the retraction of the landing gear.

Disconnect the rods of the actuating cylinders from the main and nose gear.

Fill the tank of the ground hydraulic station with MVP oil and connect it to the suction line of the ground hydraulic station pumps.

Set the cock of the wing flaps control into neutral position.

Set the landing gear cock into position "Extension". One person must stand at the hydraulic station and according to commands engages for short periods the pumps adjusting them to low delivery of 10 - 20 litres per minute.

According to the consumption of fluid from the ground station fill fresh fluid from cans.

When filling the separate parts of the hydraulic system with oil it is necessary to expulse the air by loosening of union nuts of the pipe lines and the drain plugs until the fluid will come by an even flow without foaming. The fluid is to be released subsequently in a prepared vessel at the following places:

- a/ through the cocks at the hydraulic system filters on the hydraulic panels on both right and left engine nacelles,
- b/ through the cocks at filters before the main cocks in both right and left engine nacelles,
- c/ by loosening of union nuts of the pipe-lines at both hydraulic accumulators of the general system and at the hydraulic accumulator of brakes.

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d/ by loosening of union nuts of pipe lines of the static pressure line at the relief automats of the GA - 77 pumps on the hydraulic panels in both right and left engine nacelles.

Charge the hydraulic accumulators by fluid to the pressure of 75 kg per sq.cm. and maintain the stated pressure periodically engaging the ground hydraulic station.

Set the landing gear cock handle to "Retraction". In order to release air loosen the union nuts of the following pipe-lines: the lines for switching over the main cocks for retraction - at the main cocks in the right and left engine nacelles and the retraction line of the landing gear - at the cylinders of the landing gear nose leg and the upper locks control as well as the special plugs in the upper covers of the actuating cylinders of the main legs in the right and left engine nacelles.

Move the landing gear cock handle for extension.

In order to release the air loosen the union nuts of the following pipe-lines: the lines for switching over the main cocks for extension - at the main cocks in the left and right engine nacelles and at the cylinders of the landing gear nose leg.

After releasing of the air connect the rods of the actuating cylinders of the nose and main gears to the struts and perform 3 - 4 times the retraction and extension of the landing gear.

Shift the wing flaps cock handle to extension.

In order to release the air loosen the union nut of the pipe-line for wing flaps extension - at the wing flaps control cylinder.

After releasing the air extend the wing flaps fully.

Move the handle of the wing flaps control cock to retraction.

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In order to release the air loosen the union nut of the pipe-line for the wing-flaps retraction - at the cylinder of the wing flaps control.

Depressing the brakes pedals one after the other fill the braking line.

The releasing of the air is to be accomplished by unscrewing the plugs on both brakes of each wheel in the moment when the brake pedals are depressed and the pressure on the pressure gauges is equal to 28 - 32 kg per sq.cm.

Opening one after the other the dosing valves of both the right and the left glass cleaner, accomplish an intensive pumping of the fluid through the system of the glass cleaners.

CAUTION: Do not permit the operation of the glass cleaners on dry glass, pour water when operating.

Disconnect the pressure hose of the ground hydraulic station from the board intake fitting of the right engine nacelle. Supplying fluid only through the intake fitting of the left engine nacelles charge the hydraulic accumulators up to the pressure of 110 ± 10 - 5 kg per sq.cm.

After the relief automat of the pump switches over, effect the release of air from the automatic pilot system, by opening the drain cock of the automatic pilot system filter in the nose of the fuselage.

Switch on the automatic pilot, make sure that the handle of the hand pump cock is set to "normal system". Move the slide valves of the hydraulic unit into their extreme position from the ground vacuum station.

The releasing of the air is to be accomplished by unscrewing the union nuts of the pipe-lines at the servo-units.

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After releasing of the air from the automatic pilot line connect the pressure hose of the ground hydraulic station to the intake fitting of the right engine nacelle.

Switch off the pumps of the ground hydraulic station.

Set the handle of the hand pump selector valve to the position "Emergency system".

Operating the wing flaps release the pressure in the hydraulic system to "0".

Operating the aircraft hand pump release the air from the emergency hydraulic system of the landing gear extension. For this purpose it is necessary to loosen the union nuts on the fittings of the emergency extension, on the fittings of the selector valves installed on the landing gear nose leg and also on the drain valves on the fittings of the emergency supply - on the hydraulic panels in the right and left engine nacelles.

Set the handle of the hand pump selector valve into position "normal system".

Charge the emergency brake lines from the multiplier to the selector valves. The releasing of air has to be accomplished by loosening of union nuts of the pipe-lines at the emergency braking at the wheel switches, switch on for a short period the emergency braking cock / at this the air pressure in the system should not exceed 10 - 12 kg per sq.cm.

After releasing the air check the level of the fluid in the multipliers, when normally filled the fluid should be by 10 - 15 mm above the lower edge of the metering pin.

Release the air locks in the suction line from the hydraulic tank to the aircraft hydraulic pumps. For this purpose loosen slightly the union nuts of the suction hoses at the

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reducing fittings on the pumps of the right and left engines. The hoses have by their other ends to be connected to the joint valves on the former No 1 of the right and left engine nacelles.

By a short term engagement of the ground hydraulic station build up a pressure of 15 - 20 kg per sq.cm according to the control pressure gauges on the hydraulic panels.

Release the air from the pressure lines - from the board filling necks to the pumps on the engines by loosening the union nuts of the pressure hoses, the reducing fittings at the pumps on the right and left engines.

After filling up the system with fluid check the level of fluid in the tank as stated above. In order to remove completely the air locks it is necessary to connect the pressure and suction hoses of the ground hydraulic station to the intake fittings of the right and left engine nacelles and carry out the following procedure by the accessories and disconnected hydraulic tank of the ground station:

- a/ retract and extend the wing flaps 5 - 10 times,
- b/ retract and extend the landing gear through the main system 4 - 6 times and by the hand pump through the emergency system 2 - 3 times.
- c/ brake and unbrake the wheels through the main system 10 - 20 times to full extent and through the emergency system 2 - 3 times.
- d/ switch on the snow cleaners for 2 - 3 minutes,
- e/ switch on the servo-units of the automatic pilot and operate the rudders by displacing them to both sides to the stop 5 - 6 times.

During the procedures stated above check periodically the level of the fluid in the hydraulic tank and in the multipliers and, if necessary, replenish fluid /connect for thus period the suction line to the tank of the ground station/.

After filling and after completing the operation of the accessories check the cleanness of all filters, turning the handle of the filtering part and draining the sediments from the filters through the batist filter.

Take out and inspect the filter of the hydraulic tank. In case that the drained sediment and the filter of the hydraulic tank are fouled, it is necessary to remove the filtering parts and wash them as well as the filter of the hydraulic tank and the multipliers.

After this carry out, as stated above, alle the procedures with the accessories and check again the cleanness of the filters.

The system is considered to be fit for operation in case that all filters will be clean.

After completing these procedures keep the hydraulic system in quiet condition under pressure for 1 - 2 hours in order to release definitely all air from the fluid paying attention to leaks and removing them in time. After this carry out the following procedures:

a/ check the brake system to make sure that all air has been released by unscrewing the plugs at the wheel braking discs in the moment when the braking pedal is depressed and the pressure on the pressure gauges on the panel equals 28 - 32 kg per sq.cm.

Make sure that there is no air in the system of the lan-

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ing gear and wing flaps at charged condition of the hydraulic accumulators with the pressure of 70 - 80 kg per sq.cm unscrewing the nuts at the cylinders of the landing gear and wing flaps at the following positions:

- a/ landing gear and wing flaps extended and
- b/ landing gear and wing flaps retracted,
- b/ check the fluid level in the tank at released state of the hydraulic accumulators and multipliers,
- c/ inspect the unions and check them for air-tightness, safety the union nuts, plugs and drain cocks, which have been unscrewed for the purpose of the air releasing. The handles of the hydraulic system filter and of the landing gear filter have to be locked between themselves in the direction of flight.

Replenishing fluid into the hydraulic tank.

The replenishing of system is accomplished through the filler neck of the hydraulic tank, the fluid must be filtered through 2 - 3 layers of batist filter installed in the funnel used for filling.

The necessity to replenish the system in service might arise only as a result of insufficient air-tightness of some unit or union of the hydraulic system and therefore prior to replenishing it is necessary to reveal the untightness and to repair the defect. Owing to the expansion of the fluid caused by elevated temperature in the hydraulic system the level in the hydraulic tank changes. Therefore different levels are shown on the metering rod of the hydraulic tank for the fluid temperature of + 70 degrees and + 20 degrees of Cent.

For temperatures other than stated the corresponding level

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ing gear and wing flaps at charged condition of the hydraulic accumulators with the pressure of 70 - 80 kg per sq.cm unscrewing the nuts at the cylinders of the landing gear and wing flaps at the following positions:

landing gear and wing flaps extended and

landing gear and wing flaps retracted,

b/ check the fluid level in the tank at released state of the hydraulic accumulators and multipliers,

c/ inspect the unions and check them for air-tightness, safety the union nuts, plugs and drain cocks, which have been unscrewed for the purpose of the air releasing. The handles of the hydraulic system filter and of the landing gear filter have to be locked between themselves in the direction of flight.

Replenishing fluid into the hydraulic tank.

The replenishing of system is accomplished through the filler neck of the hydraulic tank, the fluid must be filtered through 2 - 3 layers of batist filter installed in the funnel used for filling.

The necessity to replenish the system in service might arise only as a result of insufficient air-tightness of some unit or union of the hydraulic system and therefore prior to replenishing it is necessary to reveal the untightness and to repair the defect. Owing to the expansion of the fluid caused by elevated temperature in the hydraulic system the level in the hydraulic tank changes. Therefore different levels are shown on the metering rod of the hydraulic tank for the fluid temperature of + 70 degrees and + 20 degrees of Cent.

For temperatures other than stated the corresponding level

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ould be between the marks.

Replenishing of the Hydraulic System when the Aircraft Hydraulic Tank is Empty.

1. When replenishing the hydraulic system tank with fluid the procedures given in the section 1 of this instruction should be carried out.

The quantity of fluid required for replenishment of the tank should be determined in each case separately according to necessity.

2. Connect to the intake fitting "pressure" of one of the engine nacelles the ground hydraulic station switching its suction line to the tank.

Switch on the ground hydraulic station.

Charge the hydraulic accumulators until the relief automat switches off. Pump the fluid into the aircraft hydraulic tank to the level "At charged hydraulic accumulators" / according to the label at the metering glass of the aircraft hydraulic tank/.

The pumping should be completed at the minimum supply rate of the ground hydraulic station pumps to avoid the overfilling of the aircraft hydraulic tank with oil.

REMEMBER, that the overfilling as well as the lack of fluid in the tank is harmful to the normal operation of the aircraft hydraulic system.

When checking the fluid level in the hydraulic tank, the accessories should be in the following positions:

- landing gear extended,
- wing flaps retracted,

- wheels unbraked.

The permissible variation of the fluid level in the tank is shown on the label at the oil metering glass. It is advisable to raise the fluid level to the upper limits of the permissible levels.

Relieve the hydraulic accumulators and check the level of fluid.

The checking of the fluid level at the hydraulic accumulators relieved should be carried out in the following manner:

At inoperative pumps operate the wing flaps brakes and automatic pilot and release the fluid from all hydraulic accumulators to "O". When the landing gear is extended, the wing flaps retracted, the wheels unbraked and the emergency systems in the initial position, the fluid level in the hydraulic tank should be in the limits shown on the label of the oil metering glass /at discharged hydraulic accumulators/.

In case of insufficient quantity of fluid in the tank add fluid through the drain cock of the hydraulic tank.

After replenishing disconnect the ground hydraulic station from the aircraft, fit the covers of the intake fittings to their places paying attention to the presence of the sealing gaskets.

Put on coverings on the nipples of the hydraulic station hoses.

Close airtightly the tank of the hydraulic station, close airtightly the tank of the aircraft hydraulic system, safety the drain cock of the hydraulic tank. Close and lock the cocks at the pressure gauges on the hydraulic panels of the left and right engine nacelles.

Exchange of Oil in the System Owing to its
aging or When Effecting of Periodical Servicing Procedures.

1. Lift the aircraft on jacks,
2. Relieve the pressure in the hydraulic accumulators to "0".
3. Drain the fouled oil from the aircraft hydraulic system.
4. Detach the tank of the hydraulic system, scavenge it carefully and then mount to its place, connect the pipe-lines and fill with pure oil following the general instructions of this manual
5. Drain the oil from the pipe-lines running from the hand hydraulic pump, from the pipe-lines and cylinders of landing gear retraction and extension through the normal and emergency systems, from the pipe-lines and cylinder of the wing flaps retraction and extension. For this purpose carry out the following procedures:

- unscrew the plugs in the front and rear parts of the landing gear and wing flaps actuating cylinders,
- move the handle of the hydraulic pump cock into position "Emergency system" and swing the handle of the hydraulic pump until clean oil comes from all holes of plugs of the landing gear actuating cylinders from the side "landing gear extension" and then set the cock handle into position "normal system". Move the landing gear cock handle into position "extension" and carry out 8 - 10 swings of the hand hydraulic pump in order to fill with clean oil the pipe-lines from the hand pump to the control cock of the landing gear retraction and extension.

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6. Connect the ground hydraulic station to the intake fittings for charging of the hydraulic system on the aircraft right side.

At the neutral position of the wing flaps and landing gear cocks fill the hydraulic accumulators with clean oil up to the pressure of $110 \pm \frac{10}{5}$ kg per sq. cm. The end of the hydraulic accumulators filling may be followed according to reading of the control pressure gauge provided on the hydraulic panel in the right engine nacelle in the section of the main landing gear.

During the charging the pressure on the central pressure gauge will rise and after charging it will drop to zero / at this the pressure gauges of the hydraulic accumulators should indicate the pressure of $\pm \frac{10}{5}$ kg per sq. cm./ As soon as the control pressure gauge indicates the drop of pressure /which proves that the pressure governor has disengaged the pump/ it is necessary to fill with clean oil the pipe-lines of the landing gear and wing flaps retraction and extension system. For this purpose it is necessary, without stopping the operation of the ground hydraulic pump, to set the handle of the landing gear and wing flaps cocks one after the other into position "extended". In this case the oil from the pipe-lines will fully flow out through the openings of the cylinders and clean oil will start flowing /newly filled in the hydraulic tank of the aircraft/. Move the landing gear /wing flaps/ cock into neutral position and close the plugs.

Carry out the same for the main line of the landing gear and wing flaps retraction, setting the handles of the landing gear and wing flaps cocks one after the other into position

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"retraction".

7. Disconnect the hydraulic hoses of the brakes at the landing gear wheels and exchange the oil in the brakes system by depressing the brake pedals.

As soon as clean oil will start flowing from the brake line stop the depressing of the brake pedals and connect the pipe-line to the switches - / the pressure in the hydraulic accumulator of brakes should be minimum 45 kg /sq.cm.

8. Disconnect in the engine nacelles on the fireproof bulkheads the pressure pipe-lines from the hydraulic pump and turn the propellers by several revolutions until clean fluid will appear /MVP oil/ from the pressure pipe lines.

CAUTION: When effecting the stated procedure it is necessary to follow the oil level in the aircraft hydraulic tank and to prevent the oil level from dropping below the red mark.

9. Exchange the fluid in the emergency braking system.

For this purpose carry out the following procedures:

- drain the oil from the multiplier /check to make sure that there is no pressure left in the multiplier/ and fill clean oil.

- unscrew the hoses of the emergency braking system at the emergency switches at the wheels and drain the fouled oil from the hoses, having engaged for a short period the cock of the emergency braking, raising the pressure according to the emergency braking pressure gauge to 3 - 4 kg per sq.cm.

- connect the hoses of the emergency braking and replenish, if necessary, the multiplier with fluid.

10. Switch on the automatic pilot.

Set the selector valve of the hand pump to "normal

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system".

Fill the system of the automatic pilot shifting the slide valves in the hydraulic unit of the automatic pilot by aid of syringe of vacuum pump of the ground station.

Accomplish the draining of the fouled oil until clean oil will appear by unscrewing the union nuts at the servo - units. Remove and wash out the filter of the automatic pilot.

After finishing the filling of oil into the hydraulic system of the aircraft it is necessary to check the correct operation of the hydraulic system. For this purpose carry out, without letting down the aircraft from the jacks, 4 - 6 retractions and extensions of the landing gear and wing flaps through the ground hydraulic pump and 10 - 15 brakings. When revealing air locks expulse them effecting this procedure as shown above for the expulsion of air from the accessories of the hydraulic system which need it.

Checking the Operation of the Hydraulic System

and the Operation of the GA-77 B.

The checking of operation of the hydraulic system and of the GA - 77 B operation on ground is effected in order to check the airtightness of pipe line unions and to check the correct operation of the accessories.

For checking of the GA - 77 B operation when the aircraft is placed on jacks use the ground hydraulic station by means of building up the maximum pressure in the hydraulic system until the relief automats switch over.

After attaining the maximum pressure of $110 \pm \frac{10}{5}$ kg per sq.cm check whether no MVP leak occurs in the unions of the pipe-lines, check the air-tightness of the operation of non-

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return valves of the brakes hydraulic accumulator and the hydraulic accumulator of the automatic pilot. For this purpose increase the pressure in the hydraulic accumulators of the main system to the pressure of $110 \pm \frac{10}{5}$ kg per sq.cm and switch off the ground hydraulic station. Then relieve the pressure in the main system by the operation of wing flaps to "0".

At this the pressure in the hydraulic accumulators of the brakes and of the automatic pilot should remain unchanged.

Check the operation of the relief automats during the operation of the ground station hydraulic pumps, checking the pressure on the control pressure gauges situated on the hydraulic panels of the engine nacelles in the section of the main landing gear.

The signal flags of the shut - off valves of control pressure gauges before checking turn anti-clockwise.

At the operation of the ground hydraulic station pumps the pressure on the control pressure gauges should increase to $110 \pm \frac{10}{5}$ kg per sq.cm. and after switching over of the relief automats drop to "0".

The pressure might increase again on the control pressure gauges only when the pressure in the main system drops below 80 ± 5 kg per sq.cm. Then the relief automat engages the hydraulic pumps for charging of the hydraulic accumulators.

Check this adjustment of the relief automats in the following sequence:

a/ without switching off the ground hydraulic station when the pressure on the control pressure gauges will equal "0" owing to action of the automat.

b/ release the pressure in the main system by operating

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the wing flaps until pressure appears on the control pressure gauges, which should occur when the relief automat /pressure regulator/ engages the hydraulic pumps for charging of the hydraulic accumulators of the general system at the pressure drop in the general system below 80 ± 5 kg per sq.cm. At this time the signal light of the pressure regulator working under load should glow.

In case that the signal lamp of the automat glows and the pressure in the general system equals $110 \pm \frac{10}{5}$ kg per sq.cm. and does not increase when the ground hydraulic station is in operation, then it is necessary to replace the signal indicator by a correct one.

In case that the pressure in the hydraulic accumulator rises to 130 kg per sq.cm. and when achieving this value the pressure regulator does not switch off the pump, it is necessary to replace such automat by a correct one.

After finishing the checking procedures of the GA-77B, it is necessary to turn the signal flags of the shut-off valves of control pressure gauges clockwise to the stop nad to safety same.

Charging of the Shock Absorbing Struts.

Charging of the shock absorbing struts with mixture.

The shock absorbing struts should be filled with mixture of the following components according to their weights:

pure glycerine	70%
rectified alcohol	20%
distilled water	10%

The shock absorbing atruts are checked for leaks of mixture or air according to the static compression.

The quantity of mixture to be filled into one shock absorbing strut of the main landing gear is 5800 cc and for the shock absorbing strut of the nose gear - 4600 cc. The checking of the mixture level in the shock absorber strut is to be effected by depressing the strut in vertical position to full travel - for the main gear, and for the nose shock absorbing strut to the piston stroke equalling 150 mm having prior released slowly the air. For this purpose put on the piston of the shock absorbing stru / on its working part/ a special joint clamp limiting the shock absorber stroke to the given value / the height of the clamp should be 170 mm./

The depressing of the shock absorber struts is to be effected by means of jacks or press.

The checking of mixture level for the shock absorber struts mounted on the aircraft carry out by means of leaving down the aircraft with aid of hoisting jacks, releasing simultaneously the air through the filling neck.

The air has to be released slowly to prevent at the shock absorber depression the possibility that part of the fluid would be taken away together with the air.

As soon as the rod enters the cylinder of the shock absorber strut to the shown position, open the filler port of the shock absorbers and check to make sure that the mixture level in the shock absorber is at the lower edge of the filler port.

The excessive mixture should flow out, in case of necessity replenish.

It is forbidden: to fill into the shock absorbing struts fouled, turbid mixture, mixture containing crystals of gly -

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erine or containing chlorine.

Use a clean vessel for the filling of the mixture.

After checking the mixture level close the filling parts and tighten the plugs paying special attention to the air-tightness of the unions and proceed to the charging of the shock absorbers with air.

Charging of the Shock Absorber Struts with Air.

General Instructions.

Air pressure in the shock absorber struts in dependance upon the piston stroke /at the temperature of plus 20° C./

T a b l e No 1.

Piston stroke in mm	0	100	150	200	250	300
Air pressure in kgs per sq.cm in the shock absorber strut of the main landing gear	32±1	46±1.5	58±2	78±3	120±4	177±6
Air pressure in kgs per sq.cm in the shock absorber strut of the nose gear	7±0.5	10.5±0.8	13.5±1	18±2	29±3	63±6

In case that the depression of the shock absorbing struts increases owing to the temperature drop of the outside air when there is no leak of mixture taking place from below the sealing it is not necessary to replenish the shock absorber strut with air or mixture.

When the aircraft is taxiing, owing to the motion of the mixture and to the compression of air in the shock absorber struts the air warms up and the normal compression of the

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struts will be restored.

CAUTION: After sudden changes of temperature of the ambient air check the pressure in the shock absorber struts and increase it to the required value if necessary.

Low pressure in the shock absorber struts as well as the high pressure makes their operation worse. In case that during inspection of aircraft will be revealed that the depression of the shock absorbing struts is not within the limits it is necessary to accomplish inspection of the mixture quantity and then inflate to the standard value.

When there is not trace of leakage and at normal compression of the shock absorber struts it is necessary to check the value of their pressure by means of the IL -700 - 1 MV-10 appliance and in case of necessity charge the shock absorber struts with air or in reverse case to release the pressure in accordance with the table 1 /figure 4a/.

Carry out the charging of the landing gear shock absorber struts with air without removing them from the aircraft and without placing supporting jacks below the aircraft.

Supply the air through the IL-700-1 MV-10 appliance from the airfield bottle.

Sequence for Charging of the Shock Absorbing Struts

with Air.

1. Remove the plug from the charging valve on the shock absorber strut.

2. Remove from the distributing valve of the appliance the pressure gauge for 10 kg per sq.cm. and fit to its place a plug.

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3. Screw up the union nut of the appliance for charging on the charging valve of the shock absorber strut. The small hand wheel of the charging valve should be tightened.
4. Check whether in the airfield bottle is compressed air and connect to the bottle hose tube of the charging appliance. The distributing valve should be closed.
5. Open the bottle valve.
6. Open the charging valve on the shock absorber strut for which purpose screw in the large hand wheel of the charging appliance.
7. Open the distributing valve; during this observe on the charging valve pressure gauge the pressure of air inflating the shock absorber strut.
8. When the pressure in the shock absorber strut attains the necessary value or by 1 - 2 kg per sq.cm more close the distributing valve and the valve of the airfield bottle.
9. Check on the pressure gauge the pressure in the shock absorber strut.

For the shock absorbing struts of the main landing gear it should be 32 ± 1 kg per sq.cm, for the nose gear 7 ± 0.5 kg per sq.cm.

When the aircraft is not hoisted on jacks the pressure should correspond with the compression of the shock absorber struts in accordance with the table No 1 of this instruction.

In case that the pressure will prove higher than the required value, it is necessary to relieve it by turning the small hand wheel.

10. After receiving the required pressure close the charging valve by means of unscrewing the large hand wheel

of the II-700-1 IV-10 appliance.

11. Remove the appliance from the shock absorbing strut and from the bottle.

NOTE: 1. Do not charge the shock absorber struts without the above mentioned appliance as it is impossible to build up pressure in them without the appliance owing to the fact that part of the pressure required for the charging is wasted for the overwhelming of the spring tension of charging valve.

2. When charging with air and checking the pressure do not admit dirt and dust into the charging valve.

The checking of the air pressure in the shock absorber struts effect in the same way as the charging at the aircraft position hoisted on jacks or without it. The pressure on the pressure gauges should correspond with the value given in the table No 1 or exceed it by 1 - 2 kg per sq.cm.

Recharging of the Shimmy Damper.

For the full recharging of the shimmy damper with mixture it is necessary to carry out the following procedures:

1. Remove the shimmy damper from the landing gear leg.
2. Unscrew the upper cover of the shimmy damper and take out the piston with springs from the reserve tube.
3. Turn over the shimmy damper with the terminal pin of the butterfly vane upward and by slow turning of the working lever to its full travel release from the shimmy damper all spent mixture.
4. Turn up the shimmy damper back with the butterfly vane terminal pin downward, fill the reserve tube with liquid and then turn slowly the working lever / in the whole range of its travel/ until filling up with mixture the whole working chamber

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of the shimmy damper until all air bubbles will be removed.
REMEMBER: The lever turn should be accomplished with effort but without elasticity, which proves that there is no air in the working chamber. In case that the working lever will be elastic then there is still air in the working chamber and it is necessary to carry on its releasing by operating the working lever / in full range of its travel./

5. After filling up the working chamber establish the mixture level in the reserve chamber, fit the piston with the springs and screw in the upper cover of the shimmy damper without tightening it.

6. Turn the shimmy damper /by the charging neck upward/, insert a needle into the neck and keep it until all the air left in the reserve chamber will be released.

7. In this position replenish again the shimmy damper as much that the indicator pin should protrude above the cover by 12 mm. Then insert once more the needle into the charging neck and release the pressure so that the pin-indicator should come down to the normal level equalling 9.5 ± 0.5 mm.

REMEMBER: For charging of the shimmy damper use only pure filtered fluid GMC-2.

The filling of the shimmy damper should be effected so carefully that there should definitely remain no air in it. - The mixture, when filled, should be warmed up to 15 - 30 degrees C.

Draining of Fluid from the Shock Absorbers of the Landing Gear Legs and Wshing Out of the Shock Absorbers.

Drain the fluid in the following sequence:

1. Hoist the aircraft on hoisting jacks to enable the retraction of the landing gear.

2. Release the air slowly in the shock absorbers to pressure not exceeding 2 kg per sq.cm.

3. Disconnect the doors of the main and nose landing gear legs.

4. Retract by means of the hydraulic system the landing gear. The handle of the landing gear selector valve control should be reliably fixed in the position "Landing gear retracted".

ATTENTION: When draining the fluid from the shock absorbers of the landing gear a man should be in the cabin to prevent an accidental opening of the locks of landing gear retracted position.

5. After stopping the draining^{of} fluid screw on the plug and extend the landing gear by means of the hydraulic system.

6. Unscrew once more the filling plugs.

7. Fill the shock absorbers with clean mixture filtered through a fine filter /two layers of "ALL" linen/.

Composition of mixture:

- rectified alcohol 60% according to weight
- boiled water filtered through a fine filter - 40% according to weight.

The quantity of mixture for the washing out of the nose leg shock absorber should be minimum 2.5 litres, for each shock absorber of the main leg 3 litres.

The mixture has to be warmed up prior to filling up to 50 degrees ± 10 degrees of Cent.

Screw on the filling plugs and extend and retract the

anding gear minimum 5 times by means of the hydraulic system.

After maintaining the landing gear in extended position for 30 minutes charge the shock absorbers with clean air to a pressure not exceeding 2 kgs per sq.cm and then retract the landing gear legs, open the filling plugs and drain the fluid of the shock absorbers.

When the fluid stops pouring out keep the landing gear in retracted position for 10 - 15 minutes and then extend the landing gear.

Connect to the filling neck of each shock absorber a bottle of compressed air /on the appliance should be installed an IV-10 pressure gauge/.

Admit the air from the bottle throttling its outlet by the needle of the filling port. Dry by this air the inner cavities of the shock absorber for 3 - 5 minutes. The air should be supplied under the pressure of 5 - 10 kg per sq.cm.

After doing so carry out the filling of the shock absorbers following the section "Charging of the shock absorbers" of this instruction.

Injection of Mixture into the Cylinder for Emergency Extension.

When injecting the alcohol-glycerine mixture into the cylinder for the emergency extension of the landing gear nose leg in compliance with the periodical servicing procedures it is necessary to supply the mixture through the fitting of the air duct only into the upper cavity of the cylinder. Thereafter deliver pressure and drive the piston several times to expulse the mixture from the system. It is not necessary to

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screw the stuffing box nut during this operation.

Inflation of the Wheel Tyres.

The wheel tyres should be inflated with air from the airfield bottle, in which the pressure should not exceed 160 kg per sq.cm.

Carry out the inflation of the tyres on the parking area of the aircraft, if necessary, without dismounting the wheels and placing the aircraft on jacks.

During inflation place the airfield bottle in vertical position or with inclination under an angle not less than 20 degrees to the horizon by the valve upward.

Carry out the inflation by aid of the Il-700-2-8 appliance up to pressure as follows /figure 4b/:

1. In the nose leg tyre 4.0 kg per sq.cm.
2. In the tyres of the main legs 5 + 2 kg per sq.cm.

Rules for use of the appliance:

a/ by a short opening of the airfield bottle valve blow through the neck of the bottle.

b/ after having made sure that the sealing gasket is on its place in the fitting of the Il-700-2-8 appliance, connect same to the airfield bottle,

c/ close the Il-738 distributing valve,

d/ open the valve of the airfield bottle and check on the MV-250 pressure gauge the pressure in the airfield bottle.

e/ connect the Il-717 hose to the filling valve of the tyre.

f/ open slowly the distributing valve Il-738 supply air into the tyre up to the necessary value of air pressure.

CAUTION: Do not build up a pressure exceeding 7 kg per sq.cm. according the MV-10 pressure gauge during inflation.

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g/ after inflating the wheel tyres to the required pressure close the distributing valve and disconnect the II-717 hose from the filling valve of the tyre.

5. Check the pressure in the tyre by aid of the II-724 appliance.

4. Remove the II-700-2-8 MV-10 appliance of the airfield bottle and making sure that the slide valve of the tyre filler neck is air-tightly closed fit on the filler neck of the tyre the protecting cap.

After having charged the tyres check their depression.

At normal take-off weight of the aircraft the depression of tyres of the landing gear wheels should be as follows:

- for the tyres of the landing gear nose wheel 50 ± 5 mm
- for the tyres of the main landing gear wheels $63 \begin{smallmatrix} + 2 \\ - 8 \end{smallmatrix}$ mm.

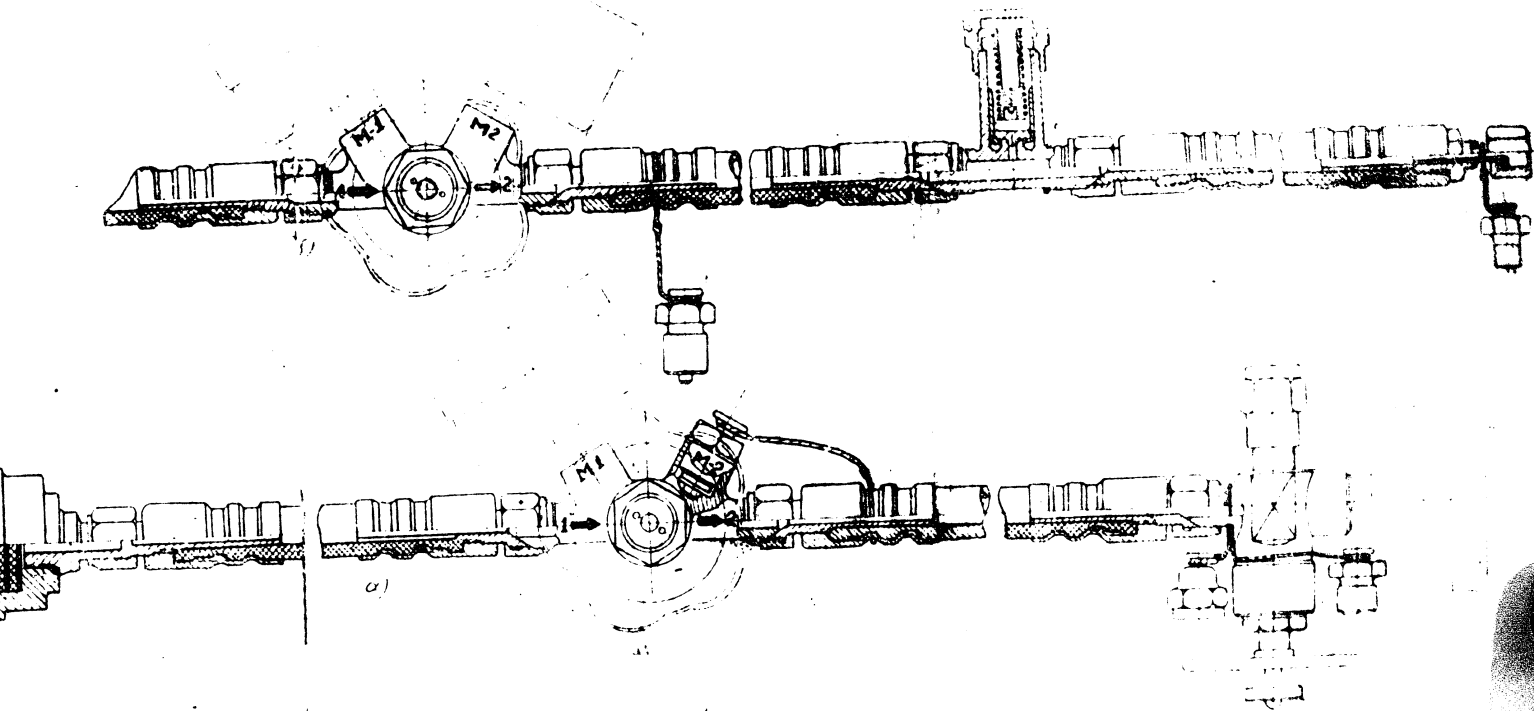
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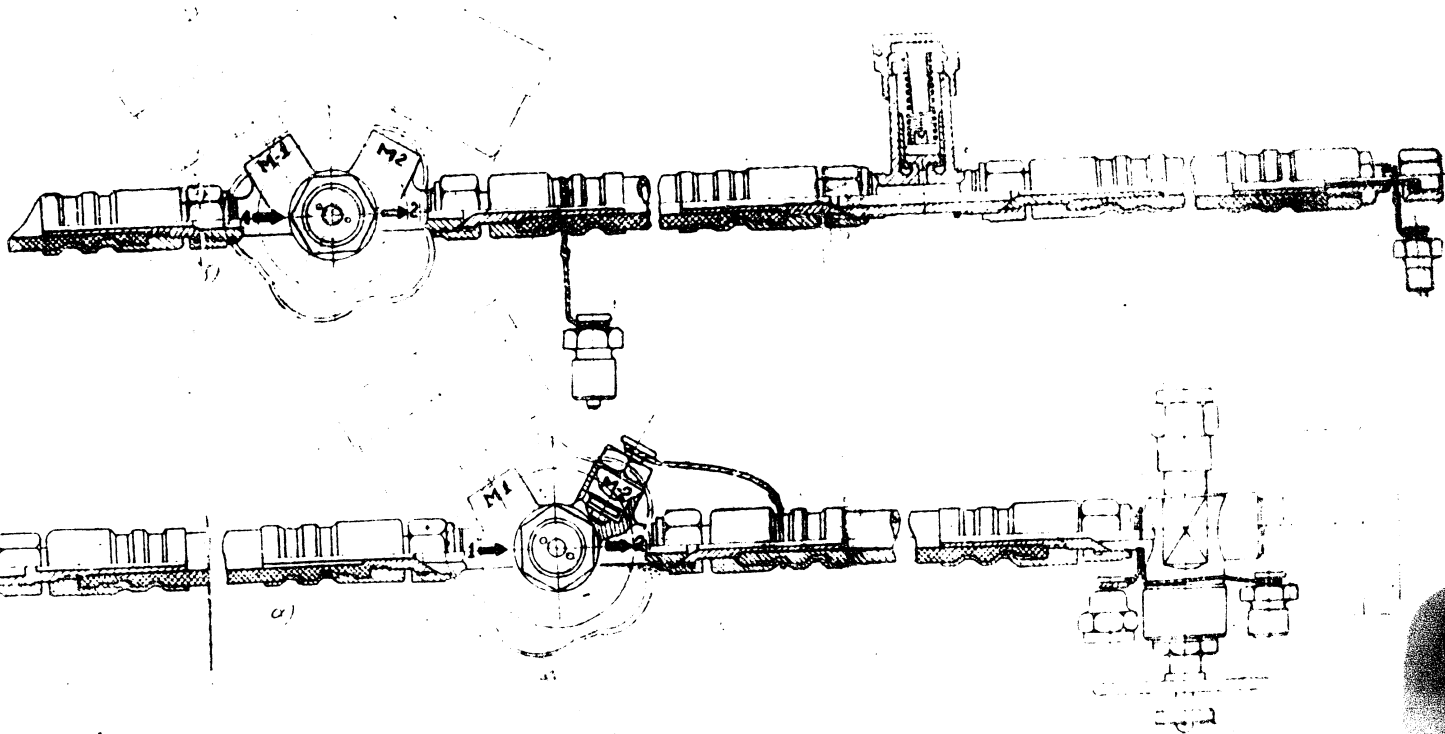
explanations to fig.4.:

I. Charging of the shock absorber:

For charging of the shock absorber with air it is necessary to carry out the following procedures:

1. Take the appliance for the charging of the shock absorbers and replace the pressure gauge M-2^o on the distributing valve by the Il - 701 plug.
2. Unscrew the plug of the filler neck and screw on the union nut "A" of the Il - 704 filler valve of the appliance on the filler neck. The small hand wheel "B" of the filler valve should be tightened and the Il-738 distributing valve closed.
3. Connect the hose of the appliance to the airfield bottle with compressed air and then open the bottle valve.
4. Screw in the large hand wheel "C" of the filler valve /through which the filler neck is opened/.
5. Open the distributing valve and admit air into the shock absorber continuously observing the air pressure on the pressure gauge of the filler valve M3.
6. When the air pressure in the shock absorber attains the required value or slightly exceeds it /by 2 - 6 amp./, close the distributing valve.
7. Check finally the pressure on the pressure gauge on the filler valve and if there is an excess of pressure, release this excess by unscrewing the small hand wheel of the filler valve.
8. After attaining the required pressure unscrew the large hand wheel of the filler valve /at this the filler neck of the shock absorber will close/.





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Water Supply System of the Aircraft.

The aircraft is equipped by a water supply system of the W.O. compartment operations under pressure. The pressure in the system is built up by compressed air from a bottle of 12 litres capacity. The consumption of compressed air is regulated by a reductor and dosing device.

The initial pressure in the system is 150 -10 kg per sq. cm.

The water supply system serves the wash basin and the W.O. bowl. The necessary pause between two scavengings minimum 2 min.

When carrying out the after-flight inspection check the outer surfaces of the system details for corrosion and drain also completely the water leaving the drain valve and the valve of the wash basin open in order to dry the inner surfaces of the pipe-lines and containers.

When revealing marks of corrosion on the inner surfaces detach the pipe-lines, fill them with ALG-8 prime coat and rack. The drain the prime coat and dry the pipe-lines. Carry out the same procedure with the water containers. The valves have to be dismantled and the condition of details checked. When revealing corrosion remove the spots and lubricate the affected areas with technical vaseline.

Further on such valves have to be overhauled after each 50 hours of flight. In case of considerable corrosion replace the valve.

When revealing marks of fouling disassemble the water supply system and clean it one unit after the other.

When connecting the hoses of the ground station to the

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ive into the operating position marked by the corresponding description and charge the pneumatic system by air under the pressure of 150-10 atmospheres. Charging with air should be effected through the special charging neck on the right side of the fuselage.

When depressing the draining button air-water mixture proceeds intensively from the injector into the body of the W.C. bowl.

Consumption of water by one depression of the button is 500 gr. The system is designed for 18 normal wash-downs. The dosing of the compressed air pressure bottle is effected by aid of a dosing device and air reductor installed below the floor at the former No 31.

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no visible traces of wear on the hose itself/.

Check the operation of the pressure regulators of pumps during engine operation.

Check the cleanness of the fluid in the hydraulic system.

For this purpose with the engine in operation or with pressure supply from the ground hydraulic station drain the sediments from the filters provided in the engine nacelles and in the nose part of the fuselage. Drain the sediments through a cloth and make sure that the drained fluid is clean. In case that the sediments are fouled then after stopping the engines /or the ground hydraulic station/ remove and wash the filtering part of each filter on the hydraulic panels and also the filters of the automatic pilot provided in the fuselage nose part. After washing the filters and refitting them to their places check the fluid level in the hydraulic system tank and perform by means of the ground hydraulic station per 2-3 retractions and extensions of the landing gear and wing flaps, 10-15 two-side brakings, and engaging also the hydraulic system of the automatic pilot perform 5 - 6 full runs of all the three servo-units of the automatic pilot.

After that check again the cleanness of the filters. In case that at the repeated inspection the fouled sediments will be still found, it is to be understood that the hydraulic system is fouled and it is necessary to scavenge it and replace fully the fluid in the system.

Check the cleanness of the fluid in the hydraulic tank.

Drain 3 - 5 litres of fluid through a cloth, having first opened the drain valve of the hydraulic tank. Make sure that the fluid is not fouled. In case that fouled sediments are found,

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himself, remove the cause of damage and replace the pipe-line by a new one. The pipe-line has to be replaced by a new one also in case that the tightening of the unions does not remedy the leak.

REMEMBER! Excessive tightening of the pipe-line unions is harmful as it might cause the damage of thread and of the rolled part of the pipe-line.

Especially carefully inspect the pipe-lines in the vicinity of the coupling of the hoses and pipe-lines with ring threads passing to the cylinder of the emergency extension of the nose gear.

Inspection of Accessories of the Pneumatic and Hydraulic Systems.

Inspect the accessories of the pneumatic and hydraulic systems and make sure that they are not damaged and that no leaks of fluid occur from the accessories and their unions with the pipe-lines.

Make sure that the coating protecting against corrosion is not damaged and that the attachment of the accessories is not loosened and also that the safetying of the unions and attachment belts is intact.

Especially carefully inspect: the tank of the hydraulic system, the hydraulic accumulators, the air-storage bottles and the multipliers. Make sure that the attachment assemblies are not deformed, that the felt padding of the attachment strips and the strips themselves are not damaged or deformed etc.

Check the charging of the hydraulic accumulators with air.

Check the charging by the 11-704 appliance for checking of

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Aircraft Control.

1. Check the aircraft controls by means of displacement of rudder, elevator, ailerons and trim tabs.
2. Inspect the hinge joints and brackets of the suspension of rudders and ailerons. Check the safetying.
3. Inspect the wing flaps, check the hinge assemblies and ball-cranks of the wing flaps control.

Heating and anti-icer systems.

1. Check the control of the heating elements /right - left/
2. Check the condition of flaps of the anti-icer and heating systems.
3. Check the function of the glass cleaners and be sure that they evenly clean the whole surface. Check the adhesion of the glass cleaner brushes.
4. Check the anti-icer equipment of propellers and windows by a short engagement.

Airframe and General Equipment.

1. Inspect the doors and check them for reliability of closing, carry out the same for the access doors and inspection holes and check the integrity of the airtightening rubber.
2. Inspect all accessible places in the fuselage and below the floors and check them for corrosion of details, which, if revealed, has to be removed.
3. Inspect the condition of the joint bolts at the joint of the outer sections with the centre section, check the riveted and bolted seams of the skin attachment to the spars, ribs and also the riveted attachment of the rim angle of engine nacelle to the wing centre section and of the former No 1 to the skin.

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Special Equipment.

Instruments.

Instrument Board Panel.

1. Make the cleanness behind the instrument board.
2. Examine the state of the piping, of the durite junctions and of the electric lines behind the instrument panel.
3. Test the good condition of the damping of the instrument panel and the clearances between the instrument panel and the immovable elements of the airplane structure / the clearances must be of minimum 8 mm for the motion of the instrument panel up and of minimum 12 mm for the motion of the instrument panel down and of minimum 5 mm for the motion in the horizontal plane/.

If any uncorrectness is revealed, remove it.

Air-speed Indicators, US-800, Rate of Climb Indicators, VR-12, Altimeters VD-12, Pressure Vacuum Gauge, 2MV-12-11.

1. Test the displacement of the pointers from the zero position. If the displacement exceeds the permissible error, the air-speed indicator must be replaced and the rate of climb indicator must be set on zero indication by means of the correcting device. If this is not possible, then it must also be replaced by a new one.

2. Test the accordance of the indicators of the scale of the barometric pressure of the altimeter with the pressure on ground at the given moment.

The difference for the pressures must not exceed 3 mm of the mercury column, otherwise, the error must be removed by means of the toothed gearing. Check the smoothness of the rotation

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and the reliability of the toothed gearing of the altimeter.

5. Test the accordance of the indication of the pressure vacuum gauge with the atmospheric pressure on ground at stopped engines. If the difference between the indications of the pressure vacuum gauge and atmospheric pressure on the ground exceeds 10 mm of the mercury column, it is necessary to adjust the pointer of the gauge in accordance with the atmospheric pressure on ground by means of a special spanner through the adjusting window, placed on the rear part of the instrument. When it is not possible to adjust the corresponding pressure, the instrument must be replaced by a new one.

Pitot Static Tube.

1. Clean by means of a brass wire the openings for the outlet of water from the Pitot static tubes.
2. Clean the caps of the Pitot static tubes from dust, moisture and mud.
3. Test the heating system and the light signal of the heating system of the Pitot static tubes.

Magnetic Compass, MI-11.

1. Test the fastening of the compass.
2. Check the presence of ligroin in the compass.
3. Test the illumination of the compass.
4. Test the airtightness of the filling plug.

Electric Combined Artificial Horizon, AGK-47b.

1. Examine the external view of the instrument.
2. Test the fastening of the instrument, and cables and the reliability of the junction of the electric connectors.
3. Test the smooth turning of the movable index knob of

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the horizon line.

4. Test the smooth work of the caging system.
5. Check whether no air-bubble is in the ball bank-indicator.

Electric Directional Gyrocompass, GPK-48.

1. Examine the external view of the instrument.
2. Test the fastening of the instrument and cables, and the reliability of the junction of the electric connectors.
3. Examine the cables /if they are not damaged on the surface and the screening sheath.
4. Test the smoothness of turning of the caging knob.
5. Test the work of the caging system.

Electric Remote Control Gyromagnetic Compass, DGMK-3.

1. Examine the external condition of the following accessories:

- a/ magnetic transmitter PDK-3 /master compass/
- b/ indicator of the remote gyromagnetic compass
- c/ gyro-unit /directional gyro/
- d/ amplifier

2. Test the reliability of the fastening of the accessories.
3. Test the reliability of the junction of the electric connectors.

4. Open the terminal box and test the reliability of tightening of the nuts on the terminals. Test the strength of the fastening of the terminals in the box and shut the box.

5. Test the working ability of the complete of DGMK-3. The working ability is tested at the adjusting push-button.

6. Test the speed of self-orientation of the compass.

Turnal speed of self-orientation must be from 1 to 4° in minute.

Electric Tachometers, 2TE4-1.

1. Carry out the external examination of the transmitters /generators/ and indicators.
2. Test the fastening of the transmitters /generators/ and of the indicators.
3. Test the cables, electric connectors, and their locking.

Electric Fuel quantity Gauge, SEBS-1357, and

Electric Oil Gauge, EBS - 1107A.

1. Carry out the external examination of the indicators and transmitters.
2. Test the fastening of the indicators and of the transmitters to the petrol and oil tanks, and the fact that the cork washers between the mouths of the tanks and the transmitters do not dry in.
3. Make sure of the airtightness of the floats of the transmitters.
4. Test the good condition of the light signalisation of the fuel rest /for petrol 300 litres, for oil 40 litres/.
5. Test the cables and the good condition of the electric connectors.

Electrical Resistance Thermometers, Electrical Remote Control Pressure Gauges, Indicators of the Position of the Undercarriage, of the Landing Flaps, Cowls, Gills and shutters of the Oil Radiators.

1. Carry out the external examination of the indicators and transmitters.

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2. Test the fastening of the indicators and transmitters.

3. Test the position of the pointer of the indicators of the electric thermometers and pressure gauges at a switched off feeding. When the pointer is displaced from the mechanical zero, adjust the zero position by means of the correcting device to the mechanical zero and replace the instruments which have no correcting devices by the correct instruments.

4. Test the quality of the junction of the electric connectors and their locking. When revealing of oil on the surface of the electric connectors, open them and make sure of the cleanness of the junction or wipe the junction /terminals/ by means of a piece of material moistened somewhat in clean petrol.

5. At the switched on feeding, test the instruments UŠ-48, UPZ-48 and UPZ-47 whether the readings of the indicators correspond with the position of controlled members.

Electric Thermometers, TCT-9 and 2 TCT-47.

1. Carry out the external examination of the transmitters and indicators.

2. Take down the indicators and test the reading of the indicators, the indicators must indicate the temperature of the external air; if the instrument does not indicate the temperature of the external air, it is necessary to place it for 1 - 1.5 hour into the room with a constant temperature, and then, to adjust the pointer of the instrument by means of the correcting device to the temperature of the surroundings.

Hydraulic Automatic Gyropilot, AP-45.

1. Carry out the external examination of all accessories.

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2. Carry out the examination of the whole gyro-system of the automatic pilot, and in case of revealing of leakage, remedy same.

3. Carry out the examination of the vacuum system of the automatic pilot on the strength of junction.

4. Carry out the examination of ropes, and pulleys of the follow up system, and also the strength of the fastening of the ropes of the airplane control with the piston rods of the servo-units.

5. Test the easiness of the turning of the control knobs of the automatic pilot, and of the caging device of the directional gyro control unit /sticking of the knobs is not admitted/.

6. Test the easiness of servo-unit cock engaging handles, and of the vacuum pumps control cock handle.

7. Test the charge of the hydro-accumulators of the automatic pilot by means of the air with the help of the appliance II-704, the pressure must be of 5 - 3,8 kg/sq.cm.

8. Test the discs of the automatic pilot sensitivity regulator for easy turning.

Turn and Bank Indicator, UP-2.

1. Carry out the external examination of the instrument and check the strength of its fastening.

2. Test the durite junctions and the presence of the filter net on the vacuum reducer.

Electric Equipment.

Aircraft Accumulator Batteries Type 12-A-30.

1. Once in a month, independently on the quantity of the

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light hours of the airplane, recharge the battery with current of the second grade of the normal charge till the appearance of all symptoms of the end of charging, wash and test the vent plugs.

Carbon File Regulators, Relays, DMR-400.

After every 25 hours of flight of the airplane, but not less than one in three months:

1. Open the places of connections of bounding strips of the objects, clean the contact surfaces to the glitter and renew the connection.
2. Disconnect the electric lines from the carbon pile regulator, R-25AM, remove the carbon pile regulator from the stand, test for adherence and cleanness of the contacts of the stand, make better the tightening of the terminal screws, wipe the dirt from the terminal screws on the R-25 AM, and mount the R-25 AM on its place and connect according to the wiring scheme the electric cables to the R-25 AM.

Relay DMR 400. Open the protecting cover on the relay and on the contactor, clean the contacts from the burning, test the connection of the cable ends of the control preparing relay whether there are no cracks and no tearing; tighten the tightening nuts of the contact screws, wipe from them dust, cover by protecting covers and seal same.

3. At engines running, listen to the work of the carbon pile regulators of the voltage in the telephone.

Make sure that no sparking occurs between the carbon plates of the regulator.

If there is a noise in the telephone /frequent clicks/ or the regulator works without stability /shaking of the pointer

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of the voltmeter/, remove the voltage regulator from the airplane and replace by a new one which is in good condition.

Vibrator, PK - 45.

1. Test the currents consumed by the starting vibrators on the airplane. If the value of the consumed currents exceeds the admitted rates, carry out the adjusting of the clearances of the vibrator, cleaning the contacts of the vibrator at the same time.

2. Test the external state of the insulation and the screening sheath of the cables of the starting ignition.

Test the constancy and the reliability of contact of the wires of high tension with the terminal of the secondary winding.

3. After every 25 hours of flight of the airplane but not less than once in three months, open the places of junction of the bonding strips of the objects, clean the contact surfaces to glitter and renew the junction.

Electromagnetic Switches and Contactors of the Relay Box, Working in the Schemes of the Electric Equipment of the Airplane II-14-30D.

After every 25 hours of flight of the airplane, but not less than once in three months, uncover the places of junction of the bonding strips of the objects, clean the contact surfaces to glitter and renew the bonding.

Electric Mechanisms of the Remote Control, UR-7M, UT-3, D-2500A, UR-2M, MG-1, D-100, PNR-45B.

Test the correctness of the adjustment of the end switches,

working with the mentioned objects but not mounted in the
 cases of the electric mechanisms /flaps of the dust filters/.
 Test the cleanness and reliability of the contact in the
 electric connectors of the electric cables of the mechanisms.
 Make sure of a good condition of bonding of the objects.

Electric Motor D-2500A.

Open the protecting band of the electric motor, test the
 state of the commutator, brushes and brush springs. Measure
 the height of the electric motor brushes. Replace the wrong
 and worn brushes by new ones which are in good condition, grind-
 ing them carefully to the commutators.

Means of External Lighting and Signalisation.

Test the reliability of the electric contact of the cables
 leading to the head lights, position lights, code and formation
 lights. Test the reliability of the electric contact between
 the bodies of the lamps and the body of the airplane. After
 every 25 hours of flight, but not less than once in 3 months:

Open the protecting glasses of the position lights, code
 and formation lights, wipe corrosion and dust from the glasses
 by rags, extend the landing head lights, test the airtightness
 of the head-lights in the places of junction, wipe dirt from
 the head-lights and lubricate the headlight extension segment
 by means of the lubricant KV.

- Airplane Electric Mains, Electric Cables, Central
 Distributing Systems, Electric Panels, Protecting
 Commutation and Electrical Mounting Accessories, End
 Switches Not Mounted Into the Cases of the Mechanisms.
1. Test the fastening, good condition and accuracy of the

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of the commutations of the accessories: the switches selector switches /incl.also VK-44/, rheostats and buttons. Make sure of the reliability of the electric contact of the leading cables, cleanness of the junctions, compactness of the logs, strength tightening of the terminal bolts and nuts.

WARNING! When testing the rheostats, pay attention that no short circuit occurs in the circuit, switched off by means of the rheostats.

2. Check fastening of main suppressors and reliable connection of electrical leads. Tighten the contact screws.

3. Open the central distributing systems, electric panels, remove moisture, dust, mud and traces of corrosion.

4. At dry weather let all the electric panels opened during 2 - 3 hours and then remove the dust by blowing off.

Open the connecting and branching boxes, mounted on the places accessible for dust and mud.

5. Examine the screening sheath of the part of the electric mains, make sure of the compactness of screening braid, cleanness and reliability of the junction of the parts of the screening with each other and with the mass of the airplane.

Remove the revealed defects.

Static dischargers,

Test the presence of the mixture of glycerine with water in the static dischargers and when it is necessary add the mixture: Glycerine 80%, water 20% according to weight.

According to the wearing of the filter of the static dischargers, replace the dischargers by new ones from the individual complete of the airplane.

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After Each 50 Flight Hours.

Power Plant.

Additionally to the periodical servicing procedures after 50 flight hours carry out the following procedures:

1. Inspect the intake nozzles, the meshes of the dust filters and the attachment of the electric mechanisms of the flaps control.
2. Wash the meshes of the dust filters by pure petrol and lubricate them by a thin layer of oil.
3. Inspect the gills of the cowling and check for cracks, nicks and wear in the hinge joints of their control.
4. Inspect the attachment of the oil coolers, the oil coolers themselves and be sure that there is no play in the oil cooler shutters and that they are not damaged.
5. Scavange the honeycomb of the oil coolers.
6. Check in the engine nacelles the attachment of the pipelines and their unions.
7. Inspect the attachment of the oils tank.
8. Check in the central board the condition of the control assemblies of the engine accessories, of the fire cocks and the isolating valve. Lubricate the couplings of push-pull rods, levers and the ball bearings.
9. The periodical servicing procedure for the engines and propellers carry out according to the instruction for service and maintenance of the engine and propeller.

Hydraulic and Pneumatic Systems.

Additionally to the servicing procedures after 25 hours of operation carry out the following procedures:

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1. Check the operation of the main braking system through the ground hydraulic station accomplishing 10,-15 two - side brakings, and the operation of the emergency braking system accomplishing 5 - 5 brakings at unchanged position of the rudder control pedals.

2. Inspect the hoses and their unions.

3. Inspect the condition of the pipe-line and accessories of the pneumatic and hydraulic systems in all accessible places without opening the channels of the fuselage and centre section. Inspect the unions and check for leaks.

4. Check the operation of the wing flaps main system through the ground hydraulic station. Accomplish 2 - 3 extensions and retractions of the wing flaps.

5. Check the fluid level in the hydraulic tank.

6. Inject alcohol-glycerine mixture into the cylinder for the emergency extension of the nose leg and expulse the mixture from the system.

Aircraft Controls.

1. Inspect carefully the condition of the hinge assemblies of rudder elevator, ailerons and wing flaps.

2. Inspect the cables and check for smooth surface. In case of untwisted strands it has to be replaced.

3. Rub the cables by cloth slightly dipped in MVP fluid and then by a dry clean rag.

4. Lubricate all hinges.

5. Inspect the condition of the spring compensator.

6. Check the correct deflection of the control surfaces

/fig.5./

a/ check the correct deflection of the elevator.

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When pushing the control column the elevator should deflect downwards by 17 degrees - 1.0 or 160 - 9.5 mm. When pulling the control column the elevator should displace upwards by 30 degrees - 1 of 380.2 - 9.5 mm. The measuring of the linear displacement should be effected at the nose part of the elevator trim tab.

b/ Correct displacement of the rudder. The rudder should displace to both sides by 25 degrees - 1 of 587 - 23mm. The linear dimension should be measured at the front part of the rudder trim tab.

c/ correct displacement of the ailerons. When turning the control column clockwise the aileron on the right plane should be lifted upward by 25 degrees \pm 1 degr. or by 221 \pm 15.5 mm and the aileron of the left plane should drop down by 15 \pm 1 degr. of 135 \pm 9 mm.

d/ the trim tabs of the elevator should displace upward by 10 degrees \pm 2 degrees or by 32.3 \pm 6.5 mm. In direction forward they should displace by 17 degrees \pm 2 degrees or 54.7 \pm 6.5 mm.

The measuring of the linear dimensions should be effected on the rear edge of the endrib.

e/ When displacing the rudder trim tab by means of the UT-2 servo-unit, the tab should displace to both sides by 9 degrees or 31.2 \pm 1 mm.

When displacing the trim tab by means of the pedals it should displace by 14°36' to both sides / 49.6 \pm 2 mm/.

When displacing the trim tab simultaneously by means of both the servo-unit and the pedals the tab should displace to both sides by 23° 30' / 81 \pm 3 mm./

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f/ check the correct displacement of the oil-iron trim.
The trim tab should displace upward and downward by
1.5 mm - 1.5 / 45.8 mm - 2.5 / /figure 8/.

Heating System and Anti-icer Equipment.

1. Inspect to be sure^{of} the reliable attachment of all pipe-lines and check for traces of wear and nicks.
2. Inspect the hinge joints and the flaps of the heating system and check for corrosion, deformation and loosening of attachments.
3. Check the filter of the alcohol tank.
4. Check the condition of the heating elements - inspect their attachment and the control of flaps.

Special equipment.

a) Instruments.

Air-speed indicators, altimeters and climb indicators.

Once in the period of three months, independently of the flight time.

1. To remove the air-speed indicators, altimeters and rate-of-climb indicators from the aeroplane and to check their case-tightness and indication -accuracy over the whole scale..
2. To construct the airspeed and altimeter position error curves.
3. To mount the instruments into the aeroplane and to check the static pressure and total head pipe-line tightness together with the airspeed head (Pitot-static tube) and instruments.

Berd clocks AVR and ACzCH

Once in the period of a month, independently of the flight-time of the aeroplane, to check their motion precision.

Pitot-static tube system.

After 50 hours of the flight, but not less than once in three months:

1. To carry out the 25-hours periodical servicing.
2. To disconnect the static pressure and total head pipe- line systems from the Pitot-static tubes and instruments, and to blow these systems through by dry compressed air (under pressure of 1 to 2 kg per sq.cm.
3. To connect the static pressure and total head pipe- line systems with the Pitot-static tubes and instruments, to check the accuracy of the connections and the tightness of the systems; the tightness of the static pressure system must be so good, as not to allow a pressure drop on the air-speed indicator greater than 40 km per hour in course of 1 minute at 700-800 km per hour.
4. To check the correct function of the electrical heating of the Pitot- static tube and of the signal device of the heating, and also the value of the required current.

Magnetic compass KI-11 and distant gyro-magnetic compass DGwK-3.

Once in the period of three months, independently of the flight time of the aeroplane:

1. To check the lagging and damping of the compasses on the aeroplane.

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about the aeroplane on to the deviation circle, and to write down the deviation.

Electric combined artificial horizon AGK-47B.

Every 30 hours of the flight, but not less than once in six

months:

1. To carry out the 25-hours periodical servicing.
2. To remove the horizon from the aeroplane and to check on a special device:
 - a) the error of the index and of the miniature aeroplane from the horizon line. The miniature aeroplane can deviate from the index of the horizon line not more than 1 mm.
 - b) the time, necessary to steady the gyro unit of the horizon for the first time.
 - c) the time, necessary to steady the gyro unit from the stops, equal 20 deg.
 - d) the time of the inertia rotation of rotors of the gyro horizon and of the turn indicator.
3. To check continuity of the motion and accuracy of the needle deviation of the turn indicator.
4. To remove the covering from the converter PAG-1F, which covers the commutator with carbon brushes, and to inspect the commutator. If it is covered with carbon deposits, it is necessary to wipe the commutator by a clean rag moistened with clean petrol, and to clean the commutator by glass paper No 00.
5. To check the carbon brushes; if they are worn-out, to replace them by new ones.

Convertors.

1. To carry out the 25-hours periodical inspections.
2. To remove the cover, which covers the commutator with carbon brushes, and to inspect the commutator. If it is carbon-contaminated, it is necessary to wipe the commutator by a clean rag, moistened with petrol. To clean the commutator by glass paper No 00.
3. To check the carbon brushes; if they are worn out, to replace them by new ones.

Directional gyro GIK-4B.

1. To carry out the 25-hour periodical inspection.
2. To remove the instrument and on special device to check the slip of the index at 0° , 90° , 180° and 270° of the scale (the slip of the index at every 90° of the scale shall not be greater than $3''$ after 15 minutes).

I. Magnetic transmitter FDK-3.

1. To carry out the 25-hour periodical servicing.
2. To disconnect the plug sockets from the transmitter and to check the value of the resistance between the pins of the plugs:
 - a) two-pin plug - the resistance between the pins (+) and (-) must be from 300 to 450 ohms;
 - b) three-pin plug - the resistance between the pins 1 and 2, 1 and 3 and 2 and 3 must be from 257 to 400 ohms.
3. To check the resistance of the supply insulation.
4. To check the lagging of the transmitter rose which is to be deviated by the aid of a permanent magnet by 30 deg. and then the magnet removed quick way.
5. To check the error of the distant transmission by the comparison between the reading of the transmitter and that of the indicator.
6. To check the time necessary for silencing the compass rose deviate the compass rose by a permanent magnet to 90 deg. Not more than 20 seconds after the magnet has been removed, the compass rose must smoothly come back into the original position with accuracy of ± 1 deg., the transmitter being gently tapped.

II. Gyro unit.

1. To carry out the 25-hour periodical servicing.
2. To measure the resistance between the plug pins. This resistance must be:
 - a) between the plug pins Z and K - from 100 to 130 ohms;
 - b) between the plug pins Z and M - from 300 to 450 ohms;
 - c) between the plug pins G and E - from 33 to 41 ohms;
 - d) between the plug pins G and D - from 33 to 41 ohms;
 - e) between the plug pins D and E - from 33 to 41 ohms;
 - f) between the plug pins D and H - from 63 to 77 ohms;

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- e) between the plug pins I and L - from 117 to 143 ohms;
 - h) between the plug pins A and B - from 267 to 400 ohms;
 - i) between the plug pins B and V - from 267 to 400 ohms;
 - j) between the plug pins A and V - from 267 to 400 ohms;
3. To check the slip of the gyro axle in azimuth. The slip at every 90 deg. shall not be greater than 3 deg. during 5 min.
 4. To check the current intensity, required in every phase of the gyro-motor.

III. Amplifier.

1. To carry out the 25-hours periodical servicing.
2. To check, if the lamps are faultless. In case of unsatisfactory operation, the lamp shall be changed.
3. To check the amplifier sensitivity. The sensitivity shall not be greater than 50 millivolts.

IV. Indicator.

1. To carry out the 25-hours periodical servicing.
2. To check the needle oscillation. The oscillation shall not be greater than $\pm 0,5$ deg.
3. To check the accuracy and variation of the indicator. The error of the indicator shall not be greater than 1,25 deg. The variation of the indicator reading shall not be greater than 2,5 deg, at temperature 20 ± 5 deg of Centigrade.

Tachometers 2TE4-1.

1. To carry out the 25-hours periodical servicing.
2. To remove the tachometer indicator and transmitter from the aeroplane and on a special device to check the following parameters:
 - a) the error of the indicator in the range from 400 to 4000 rpm.
 - b) the magnitude of the transmitter voltage at 3000 rpm and loaded by one indicator.
 - c) the needle oscillation of the indicator.
 - d) the position of the indicator needle at zero rpm.

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Fuel-meter BES -1357 and oil-meter MES-11071.

1. To carry out the 25-hours periodical servicing.
2. To check the transmitter boxes for tightness
3. To make sure, that there cannot get any fuel into the potentiometer cases (boxes) if it is not possible to get sure, that there is no fuel in the potentiometers through the glass lids or sight holes in the fuel-meter transmitter, to which the technical approval has been prolonged, it is necessary to remove the lids).
4. To make sure, that the glass lids of the oil-meter transmitter are not convexed and that they are flown over.

Resistance thermometers, distant manometers, position indicators.

1. To carry out the 25-hours periodical servicing.
2. To remove the instruments and transmitters and to check their reading accuracy in the laboratory.

Thermoelectric thermometers TCT-9 and 2TCT-47.

1. To carry out the 25-hours periodical servicing.
2. To check the reading accuracy of the instruments on a special device.

Autopilot AP-45.

1. To carry out the 25-hours periodical servicing.
2. To remove the oil filter, to wash it through in dehydrated kerosene, to inspect the oil in the oil-tank, and if the oil is dark, to exchange it.
3. To check the resistance of the group dust filter GFT-50, and if is clogged up, to blow it through by dry compressed air of pressure $0,5 - 1 \text{ kg/cm}^2$.
4. To check, if the handwheels of the return-connection on the gyro instruments can be easily revolved.
5. To check, if there are not lost the cork packings at the handwheels of the return - connection on the gyro instruments.
6. To check, if the slide valves and air relays of the hydraulic unit do not get jammed.
7. To check, if there did not get oil into the air relays of the hydraulic unit.
8. To check, on an assembly bracket if the springs in the rollers of the returnconnection are lubricated.

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9. To check, if the dampers of the bracket are not damaged.
10. To check the tightness of the stuffing boxes of the rudder servo-motors and after identifying of the passage, to tighten up the stuffing boxes of the rudder servo- motors.
11. To carry out ground tests of the autopilot at running engines:
 - a) to be sure, that there is no air in the cylinders of the steering machine.
 - b) to check the oil pressure and vacuum by a two-pointer manometer.
 - c) to check the possibility of the overloading of the control surfaces at the operating autopilot, and if it is necessary, to set up the overloading safety valves.
 - d) to check the correct deflection of the control surfaces.

Turn indicator UP-2.

After every 50 hours of flight, but not less than once during

6 months:

1. To carry out the periodical servicing.
2. To measure the overpressure in the system (it shall be 60 ± 70 mm Hg).
3. To check the inertia rotation of the rotor (it shall turn at least 8 minutes).

Electric equipment.

Storage batteries.

Once in the period of every three months, independently of the flight time of the aeroplane:

1. To carry out the 25-hours periodical servicing
2. To carry out the check charge and discharge of the battery according to instructions concerning the maintenance of aircraft storage batteries in a charging room.
3. To dry the containers, to remove the corrosion from the protection blocks and from the plugs of the storage battery.
4. To clean the plugs and plug sockets from corrosion.

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Brush regulators, relay DMP-400.

1. Carry out 25-hours periodical servicing.
2. Check the stability of voltage regulators on the aeroplane in agreement with standard values of voltage which is regulated at normal load and unload run of generator.

Check that there are no vibrations of armature of electro-magnet in brush - voltage regulator. If during the check it is indicated that the vibration regulator does not maintain normal value of voltage it is necessary to open the group of automatic devices and to adjust the run of voltage generators.

Only the adjusted portable voltmeter is used for this purpose.

If during the check appears that brush voltage regulator does not give sufficient voltage and by means of rheostat of regulator does not achieve the voltage up to the given value or if the brush regulator runs unstably (greater change of voltage gives the oscillations of pointer of voltmeter or ohmmeter) it is necessary to remove this brush regulator from the aeroplane and to send it into the workshop for adjustment on the stand or for repair.

3. On the aeroplane to check the function of DMP-400 for the value of reverse current in order to disconnect the generator from the board - electric wiring.
4. Check the function of DMP and P-25 AM for parallel run of generators. Give attention to the voltage of generators at unload run and on the distribution of nominal load between generators.

The difference of indication of voltage between generators shall not be greater than 1,5 volt, the distribution of load between generators shall not be greater than 1,5 ampere.

Electro - magnet switches.

1. Carry out 25-hours periodical servicing
2. Inspect the parts which are subjected to check for correct connection of contacts and clean the contacts of switches with glass-paper of 000 spec.

Note: It is unnecessary to clean the metal-ceramics contacts.

Electric - powered systems.

1. Carry out 25- hours periodical servicing
2. Check the agreement of run of electric powered systems (give attention to value of consumed current and to value of overcome load.

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Electric motor D- 2500.

1. Carry out 25-hours periodical servicing.
2. Make the access to the ball bearings of electric motor, remove old lubricant, spritz out the ball bearings with clean petrol, blow the ball bearings through with compressed air at pressure of 1 - 1,5 kg/cm². Apply new lubricant of correct specification in to the ball bearings. Clean the commutator with rag wetted with petrol, lubricate the grooves between plates.

Note: Supplement of lubricant is done in these cases if it is required by technical requirements.

3. Adjust the electric motor on the aeroplane, re-establish the bonding parts, check the function of the unit as a whole set.
4. Remove the electric motor from the aeroplane, take off protective tape. Check the condition of commutator, if it is impossible to clean the commutator with rag it is necessary to remove the carbon deposits by grinding of it with glass - paper No.200, after grinding of commutator clean the grooves between plates with sharpened stick, blow the hollow of electric motor through with compressed air at pressure of 1 - 1,5 kg/cm², Clean the surfaces of contacts which connect cables to electric motor. Make sure of integrity of cable end terminals and examine the correctness of bolts by electric connection inside of motor.

External light and signal devices.

1. Carry out 25-hours periodical servicing
2. Check the value of current which is consumed by electric-powered system of rocking flood light and compare it with the standards.

Electric wiring and electric - instalation fittings.

1. Carry out 25 - hours periodical servicing.
2. Remove relay RPA-200 A, clean the commutators blow relay through with air and put in on its place.

After Each 100 Flight Hours.

Power Plant.

Additionally to the periodical servicing procedures after each 50 hours of flight carry out the following procedures:

1. Tighten the attachment nuts of the exhaust nozzles and the coupling clamps of the exhaust collector. Determine the degree of tightening according to the clearance.

2. Carry out the outside inspection of the exhaust pipes and check their attachment.

3. Tighten the clamps of all durite connections of the oil system.

4. Exchange the oil in the oil system of the aircraft and of the engines.

5. Inspect the cables of control.

6. Carry out the periodical servicing procedures referring to the engines and propellers according to the instruction for service and maintenance of the engine and propeller.

Landing Gear.

1. Clean and wash the hinge joints of the landing gear installation.

2. Lubricate the piston rod of the cylinder for emergency pneumatic extension of the nose landing gear by MK-30 grease or LV.

3. Inspect the control cables of the locks.

Hydraulic and Pneumatic Systems.

1. Carry out the procedures of section C - after each 50 flight hours.

2. Remove the filter of the hydraulic tank and wash it.

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If revealing considerable fouling of this filter wash it repeatedly after its washing and testing, as shown above, and wash also the filters on the panels and the filter of the automatic pilot.

In case that fouling occurs at repeated washing, it may be considered as indication that the hydraulic system is fouled and that it is necessary to rinse the system and exchange the whole fluid.

3. Check the operation of the automatic governors of the pumps pressure with running engines and repeat the checking through the ground hydraulic station.

4. After inspection and reinstallation of the wheels of the landing gear main legs connect the pipe-lines of the braking system and then release the air locks from the braking system.

5. Carry out the checking of the operation of hydraulic and pneumatic systems through the ground hydraulic station:

a/ check the retraction and extension of the landing gear by the main system 2 - 3 times,

b/ check the emergency extension of the landing gear by the hand hydraulic pump 1 - 2 times,

c/ check the emergency extension of the landing gear main legs by their own weight and the emergency extension of the nose leg by the emergency pneumatic system 1 - 2 times. It is permissible that the main leg should not get locked in this case but just reach the locks.

d/ check the operation of brakes effecting 8 - 10 brakings by the main system and 2 - 3 brakings by the emergency system. During this test check the pressure proceeding to the wheel brakes by installing on them pressure gauges with adap -

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6. Check the parking brake by each handle.

e/ check the extension and retraction of wing flaps 3 times by the main system and 1 - 2 times by the hand pump,

f/ check the operation of the glass cleaners during a period of 8 - 10 minutes at different conditions from the minimum number of swingings to the maximum one. During this test the glasses should be moistened by means of water or alcohol.

g/ check the operation of the automatic pilot.

6. Check the air pressure in the hydraulic accumulators.

7. Check the number of brakings which might be effected by means of all charged hydraulic accumulators without recharging.

Until the pressure in the hydraulic accumulators of brakes drops to 45 kg per sq.cm it should be possible to perform minimum 35 two-side brakings.

8. Repeat the checking shown in point 7 having prior to this discharged the hydraulic accumulators of the main system by operating the wing flaps.

Thus the operation of the brakes will be checked through the hydraulic accumulators of the brakes only.

Minimum 2 extensions and retractions of the wing flaps and minimum 17 brakings should be effected before the pressure in the hydraulic accumulator of brakes drops to 45 kg per sq.cm.

9. After having accomplished the above stated checkings of the operation of accessories, check the cleanness of the fluid in the hydraulic system and in the hydraulic tank by draining the sediments from the filters and from the hydraulic tank.

In case that the filters will be found fouled also after the second rinsing it may be considered that the hydraulic

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system is fouled and that it is necessary to rinse the hydraulic system and exchange the fluid.

10. Check the level of fluid in the hydraulic tank at charged and discharged hydraulic accumulators and check the level of fluid in the multipliers.
11. Remove and rinse the air filter installed in the air line for charging.
12. Drain the sediments from the sumps of the air-line for charging.
13. Engage the parking brake as stated for a continuous parking, i.e. with locking the rudders. When the hydraulic accumulators are fully charged, the pressure in the hydraulic accumulator should not drop after 14 - 16 hours below 40 kg per sq. cm.

Aircraft Controls.

1. Inspect the control cables. Check to make sure that cables run properly on the rollers, check the proper condition of the turn-buckles and of the bonding strips.
2. Inspect the rollers and their brackets for seizing, wear of rollers, cracks, corrosion, slackening of attachment and proper condition of the safetying.
3. Rub the cables by a cloth slightly dipped in MWP oil and then wipe with a dry rag.
4. Rinse the mechanism of the trim tabs control.
5. Inspect the shaft, push-pull rods and levers of the elevator control, the mechanism of the trim tabs control and check for corrosion, cracks, slackening of attachment and loosening of hinge joints.
6. Grease the mechanism of the trim tabs control by the

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MATIN - 2ol grease.

7. Check the tightening of cables.

Airframe and Accomodation Equipment.

1. Remove the fillets and inspect the condition of attachment assemblies of the wing centre section to the fuselage, check for cracks and corrosion.

2. Inspect the airframe skin and check for damage of the anodized and paint coatings.

3. Lift the panels and inspect the carrying system of the floor checking for corrosion.

When revealing corrosion rub clean the affected places and cover them by anti-corrosion lacquer.

4. Inspect the containers of the parachute rockets and check for nicks, cracks and slackening of attachments.

Be sure of presence of the cables and snap hook, check their correct condition and reliability of their fastening to the cover eye.

Special Equipment.

Instruments.

Pitot Static Tube System.

1. Carry out the 25 and 50 hours periodical procedures.

2. Test the good condition of the durite junctions.

Replace the durite hoses, having cracks.

3. Test the presence of the distinctive marks on the durite and on the tubing of the Pitot static tube system, and renew when necessary.

Petrol Quantity Gauge SEES-1357, and Oil Quantity

Gauges MBS - 1107 A.

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1. Carry out the 25 and 50 hours periodical procedures.
2. Test the accuracy of the indication of the set by means of a special tester and the accuracy of the light signalisation of the fuel rest /for petrol 200 litres and for oil 40 litres/.
3. Measure the electric resistance of the insulation of the transmitters, indicators and connecting cables.

Automatic Gyro Pilot AP-45.

1. Test the 25 and 50 hours periodical procedures.
2. Remove and test:
 - 1/ Gyro aggregate of the horizon stabilisation /horizon gyro control unit on:
 - a/ the time of the starting friction of the gyroscope at the start
 - b/ the time necessary for the gyroscope to resume the horizontal position from the right, left, front, and rear limit stops,
 - c/ the bevel of the movable index /airplane silhouette/ with regard to the horizon line at the first erection and at the resuming the horizontal position from the limit stops.
 - d/ the time of rotation of the gyroscope under its momentum,
 - e/ the deflection of the card,
 - f/ the value of air overpressure at the closed air nozzles of the collector,
 - g/ the mounting and the airtightness of the instrument,
 - h/ the play between the follow-up pulleys and the collector of the nozzles /it must be not more than 3° /.

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2/ Gyro-unit of the course stabilisation /directional
gyro control unit/:

a/ deflection of the gyroscope card on the four rhumbs
0°, 90°, 180°, and 270°.

b/ value of the divergence of the gyroscope card on the
courses 45° and 90° at the pitch position of the body, right
or left on the angle of 15°.

c/ time of rotation of the gyroscope under its momentum,

d/ value of air overpressure at shut air nozzles of the
collector.

e/ litre capacity and airtightness of the instrument case,

f/ clearance between the follow-up pulleys and the col-
lector of the air nozzles /it must not be more than 3° /.

3. Notice the rubber packing washers on the horizon gyro
control unit and the directional gyro control unit.

4. Remove the hydraulic safety valve of the control unit
and test its adjustment, if the adjustment is disturbed and
differs from 12 kg per sq.cm, adjust it.

5. Test the tensions of the ropes of the follow-up system.

6. Mount the tested aggregates on airplane.

7. After the mounting of all aggregates, carry out the test
of the automatic gyro pilot at the running engines on ground.

Electric Equipment.

Accumulator Batteries.

Once in Six Months Independently on the Number of

Flight Hours:

1/ Carry out 25 hours and the three months periodical pro-
cedures.

2/ Repair the heat insulation layer of the container, make

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the finishing work of the cover of the container.

3. Repair the electric cables in the container /replace the cables having damaged insulation/.

After every 100 hours of flight but not less than once in a year:

- 1/ Carry out the 6 months periodical procedures,
- 2/ Carry out the repair and coat the container with the lacquer protecting it against acids.

Carbon Pile Regulator, Relay DMR-400.

After every 100 hours of flight but not less than once in a year:

1. Carry out the 25 hours and 50 hours periodical servicing
2. Remove the carbon pile regulator, R - 25, from the airplane. Open the section of the regulator control units. Examine the internal mounting, make sure of absence of corrosion of the details. Test the state of the contacts of the regulator and of the relay, if necessary clean the contacts by means of the paper 000. Blow off by means of compressed air /at the pressure of 1.5 kg per sq.cm./ the internal cavity of the object in order to remove dust and mud.

3. Test the work of the carbon pile regulator on the tester, together with the generator and accumulator battery, removed from the same airplane. It is necessary to test the following parameters:

- a/ engaging Voltage of the command relay and the value of the reverse current,
- b/ range of the regulated voltage at the upper and lower limit of the r.p.m. of the generator, and the the full electrical load.

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c/ disengaging voltage of the command relay and the
line of the reverse current

d/ engaging of the maximum current breaker.

At the divergence of the parameters from the rates, take
measures to renew the initial state.

NOTE: The work according to the mentioned point can be carried
out on the airplane, however, also in this case the measurement
must be carried out by means of tested instruments with suf-
ficient accuracy. At the same time it is obligatory to test if
there is no slipping of the friction drive clutch at different
loadings of the generator up to 150% of the normal power.

4. Mount the carbon pile regulator and the DMR-400 on the
airplane, restore the bonding of the objects and test the good
condition of the scheme, feeding it from the source of the
electric current of the airplane. At that time it is obliga-
tory to test if there is no slipping of the frictional coup-
ling at different loadings up to 150% of the normal one.

Electric Mechanisms, UT-3, UT-2, UR-7M, SKD-2V,

GRS-6000, D-2500 A.

1. Carry out the 25 and 50 hours prescribed procedures.
2. Open the protecting band of the electric motors, test
the state of commutators, brushes, make sure that there are no
burnt spots of the commutator, make sure of the good condition
of the brush springs, of their compactness, sufficient height
of the brushes and the easiness of the motion of the brushes in
the rings of the brush holders.

If the commutator is covered with a scale layer or with
dirt, clean it by means of a clean piece of rag, moistened a
little in petrol B - 70 /the brushes must be raised a little/.

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If dirt from the commutator cannot be removed in this way, it must be removed by grinding the commutator by means of a glass paper, 00. After the grinding of the commutator, clean the grooves between the segments by means of a sharp wood chip, and blow off the internal cavity of the electric motor by means of compressed air of 1.5 kg per sq. cm.

Once in a year independently on the number of flight hours, fill up through the special holes the reducers of the electric mechanisms with the lubricant KV.

Landing Head Light.

1. Carry out the 25 and 50 hours periodical procedures.
2. Take out the head-light from the plane and carry out the following:
 - a/ Remove the cover of the contact box and clean the contacts of the end-switches by means of the glass paper, 00, after the cleaning of the contacts blow through by air,
 - b/ Test the reliability of the connection of cables to the mains, tightening the screws to the terminal piece.
 - c/ Examine and test the state of the electric motor of the mechanism, the wearing of the brushes, good condition of the brush springs, cleanness of the commutator, blow through the internal cavity of the electric motor and of the commutator by means of compressed air and grease the grooves between the segments
 - d/ Mount the head light on the airplane and test the adjusting.

Electric Mains.

1. Once in 6 months independently on the number of flight

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Open the connectors and the distributing equipment of the electric panel, branch and connecting pieces and connectors, remove the dirt, traces of corrosion, blow off the dust by means of compressed air; the pressure must not be more than 5 kg per sq. cm.

2. Test the fastening of the cable ends in the terminal boxes and blocks of the contact pieces. Coat with lacquer the places of junction, which have no covering against corrosion /lacquer/ or which have damaged surface. In the branch boxes special attention must be paid to the compactness and quality of fastening of the cable terminals and whether there is no tearing of the cable core wires.

3. Open the places of the minus contacts of the electric mains to the under-carriage of the airplane independently from the fact if they have an in-line coating or not. Clean to the glitter the contact surfaces, restore the contact and varnish with the anticorrosive lacquer the dressed places.

4. Examine the external state of the insulation of the discovered parts of the electric mains.

5. Measure the insulation resistance of the individual feeders and of the whole mains of the airplane as a whole, beforehand, it is necessary to switch off the consumers and to disconnect the minus leads from the mass of the airplane. Compare the received values with the permitted values for the airplane in question. Take measures for removal of defects.

WARNING: If there are no ohmmeters, measure the resistance of the insulation by means of the voltmeter method at the voltage of the source of feeding of 100 - 250 Volts, using the portable voltmeters of the type 2 MP-15-150-1500 or the instru -

nts, TT-1.

After every 100 hours of flight of the airplane but not less than once in a year:

1. Test the electric measuring apparatuses of the mains voltmeters, ammeters and other/ for the accuracy of the readings. Test the fastening of the cables to the shunts of the ammeters.

2. Remove the electric suppressors of the mains from the airplane. Open the covers of the suppressors, remove the dirt and moisture. Test the state of the mounting and the fastening of the details. Mount the electric suppressors of the mains on the aeroplane. Once in a year carry out the 6 months periodical procedures. Remove the safety pieces of the mains, examine their external view and test their working ability.

3. Remove from the airplane AOS-81 /the automatic mechanism of the glass heating/, open the cover of the automatic mechanism, test the contacts of the relay, clean them by means of the fine glass paper, test the function of relay of the automatic mechanism, if it is necessary, adjust, and after adjusting, test the time and the temperature of the switching off of the glasses. Adjust the glasses temperature according to the instructions AOS-81.

After every 100 hours of flight of the airplane, disconnect the plugs with the firing pins from the fire extinguisher cylinders, dismantle the firing pins, clean the corrosion and mount on its place, test the work of the firing pins /without switching on to the pyropatron/.

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After Each 200 Flight Hours.

Hydraulic and Pneumatic Systems.

1. Carry out the periodical servicing procedures according to sections for 25, 50, and 100 flight hours.

NOTE: When effecting the checking according to points 7 and 8 of the section after 50 flight hours it is permitted to reduce the number of brakings from 35 to 30 and from 17 to 15.

2. Carry out the full extent inspection of the pipe-lines and accessories with removing all necessary access doors, panels of the fuselage and wing centre section channels for careful inspection.

Check the airtightness of the pneumatic pipe-lines by means of soap foam at normal charging of the pneumatic system.

3. Inspect all hoses. Dismount during this inspection all fastenings of the pipe-line hoses and inspect the spots under the fastenings. When mounting be careful to ensure getting the same spots of hoses and pipe-lines on the spots of the panel attachment. Special attention should be paid to the position of the brake hoses on the shock absorbing struts of the landing gear.

4. When accomplishing the stated procedures release the air locks from all high points of the hydraulic system which should be dismantled. Then add fluid into the hydraulic tank to the required level.

Remove the board air storage bottles and drain the sediments.

5. Detach the tank of the hydraulic system and rinse the same by dehydrated kerosene.

6. Remove from the aircraft the air reductors and check their functioning on a testing stand. In case of attaining good

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results in the tests reinstall the reductors on the aircraft.

7. Drain completely the fluid from the hydraulic system, rinse the hydraulic system and fill again with pure filtered MVP fluid.

10. The rinsing of the hydraulic system as a whole and of the different accessories, with exception of the pneumatic ones, effect only by the MVP fluid or by dehydrated kerosene. Any fluid should be prior to rinsing carefully filtered.

11. After accomplishing the procedures with the hydraulic system it is necessary to check the charging of the hydraulic accumulators with air, to check the operation of the pressure governing automats with running engines and through the ground hydraulic station, check the level of fluid in the hydraulic tank and multipliers as stated above in the section A and then check the operation of the hydraulic and pneumatic systems as indicated in section D.

Airframe.

1. Clean the surface of the aircraft from dust, dirt and oil spots by a soft rag dipped in water /the water temperature should be from + 20 to + 40 degrees of Centigrade/.

2. Check the aircraft skin and the surface of the details and units for damaging of the paint or anodized coating and for corrosion. When revealing defects of coating restore same, fissures on the anodized coating should be in advance covered with orime coat ALG-5, then apply the lacquer.

3. Open the panels of the channels in the wing centre section and in the nose part of the fuselage and inspect the pipe-lines checking for corrosion, abrasion and leaks as well as for slackening of pipe-lines attachment.

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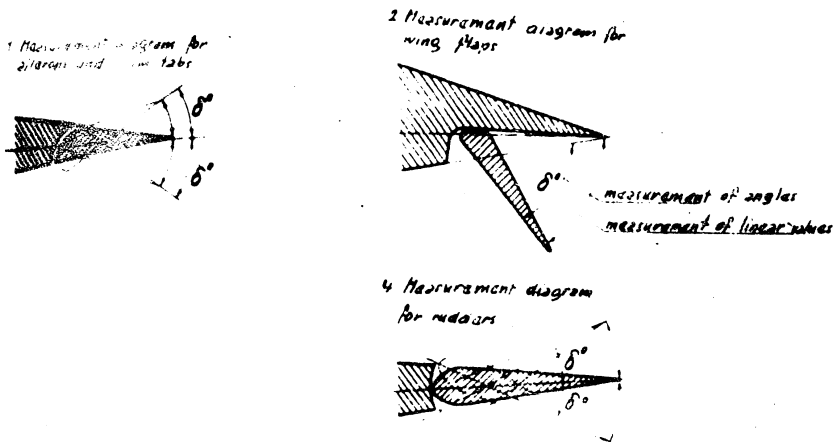


Figure 5. Diagram of the Displacement Measuring of the Surfaces of Aircraft Control.

Special Equipment.

Instruments.

Automatic Gyro Pilot AP-45.

I. After every 200 hours of the flight of the airplane:

1. Carry out the 25 - 50 and 100 hours periodical procedures.

2. Remove and adjust the hydraulic reducer, arranged in the return line of the automatic relief mechanism GA-77 and if the adjusting does not correspond to the pressure of 18 ± 1 kg per sq.cm, then, adjust it.

2. Remove, dismantle, and clean the reducers of the air pressure aggregate 373 - vers. 2.

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I. After every 400 flight hours of the airplane:

1. Carry out the 25, 50, 100, and 200 hours periodical procedures.
2. Remove, dismantle and test according to the technical specifications the following aggregates:
 - a/ horizon gyro control unit
 - b/ directional gyro control unit
 - c/ gyroaggregate
 - d/ servo-units
 - e/ drain tank
 - f/ all hydraulic non-return valves, reducing valves, and safety valve of the automatic pilot,
 - g/ group dust filter GPF - 50.

3. Mount the aggregates on airplane, carry out the on earth tests of the automatic pilot with running engines.

After every 1000 flight hours, but not later than after 12 months.

Hydraulic and pneumatic systems.

1. Carry out the procedures according to section E after 200 flight hours.
2. Inspect the condition of all rubber washers in the air non-return valves and in the filling air valves of the hydraulic accumulators. It is necessary for the purpose of inspection to disassemble the valves.

The surface of the rubber washers should not be damaged. A slight dip caused by the valve seat is permitted on the rubber surface /maximum depth 0,7 mm/ crumbling out of the rubber is not permissible. In case of damage of the rubber washer surface

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II. After every 400 flight hours of the airplane:

1. Carry out the 25, 50, 100, and 200 hours periodical procedures.

2. Remove, dismantle and test according to the technical specifications the following aggregates:

- a/ horizon gyro control unit
- b/ directional gyro control unit
- c/ gyroaggregate
- d/ servo-units
- e/ drain tank
- f/ all hydraulic non-return valves, reducing valves, and safety valve of the automatic pilot.

g/ group dust filter GPF - 50.

3. Mount the aggregates on airplane, carry out the on earth tests of the automatic pilot with running engines.

After every 1000 flight hours, but not later than

after 12 months.

Hydraulic and pneumatic systems.

1. Carry out the procedures according to section E after 200 flight hours.

2. Inspect the condition of all rubber washers in the air non-return valves and in the filling air valves of the hydraulic accumulators. It is necessary for the purpose of inspection to disassemble the valves.

The surface of the rubber washers should not be damaged. A slight dip caused by the valve seat is permitted on the rubber surface /maximum depth 0,7 mm/ crumbling out of the rubber is not permissible. In case of damage of the rubber washer surface

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place the stem together with the washer.

3. Let out from the hydraulic accumulators the fluid and pressure. Remove the hydraulic accumulators and unscrewing the air filling valves drain completely the fluid from the air chambers. When draining incline the hydraulic accumulator by - 45 degrees.

If less than 600 cc of fluid has been drained from the air chamber the hydraulic accumulator it to be considered as correct.

Place the hydraulic accumulator into vertical position / with the filling valve upward/, fill its air chamber with fresh carefully filtered MWP oil in quantity of 200 cc \pm 3 cc and fit to its place the non-return valve.

4. Check the airtightness of the air chamber of the hydraulic accumulator by air pressure indicated on the label of the hydraulic accumulator for 1 hour.

Servicing Procedures Depending upon the Number of Landings.

A. After every 10 Landings. Landing Gear.

1. Check the braking system of the aircraft. For this purpose charge fully the hydraulic accumulators of the hydraulic system. Disconnect the ground station from the aircraft hydraulic system and operating the brake pedals check how many full brakings /simultaneously with the right and left foot can be accomplished through the hydraulic accumulators. The number of full brakings should not decrease by more than 10% in comparison with the first check.

2. Check the opening of locks of the landing gear retracted position.

For this purpose /the aircraft is standing on wheels/
turn the handle of the emergency opening of the locks for re-
leasing and while keeping them in this position check that
the clearances between the lock latches /of the main and nose
landing gear/ and the corresponding tail portions of the hooks
remained in comparison with the previous check unchanged. If
there is a change of clearances accomplish the readjusting of
the locks control.

Control of the Landing Gear Locks.

1. Carry out the inspection in the extent of the after-
flight inspection.

2. Rub the cables with cloth, slightly dipped in KVR
oil and then wipe with dry clean rag. Then lubricate the
cables with CIATIM - 201 grease.

3. Inspect the cables of the locks control, paying spe-
cial attention to reveal the untwisting of cables. Untwisted
threads of the cables are not permissible

4. Prior to the installation of the new cable on the air-
craft prestress the cable by an effort of 50% of its ultimate
load for a period of 5 minutes. To the prestressing have to be
exposed also the thimble and the braiding /fitted to the cable
on a bench.

5. Check the safetying of the turnbuckles and the tautening
of cables.

B. After Every 25 Landings.

Landing Gear.

1 Check the condition of the safetying and the tightening
of bolts fastening the cover to the body of the inner hinge

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assembly of landing gear main leg cross-beam.

After rough landings and after first 50 normal landings inspect the bolts and check for cracks. Further on carry out this inspection after 100 landings.

3. Carry out the outside inspection of the attachment bolts of outer assembly of the landing gear main leg cross-beam to the lugs on the rib No. 11.

After rough landings carry out the outside inspection of the vertical /carrying the tensile stress/ bolts of attachment assembly of the main landing gear folding brace /on the rear spar in the axis of the landing gear/.

5. Carry out the outside inspection of the attachment assembly of the main landing gear actuating cylinder checking the condition of bolts and inspecting the assembly and profiles for cracks.

Hydraulic and pneumatic systems.

1. Check the operation of the main braking system through the ground hydraulic station accomplishing 10 - 15 two-side brakings and the operation of the emergency braking system, effecting 3 - 5 brakings at different positions of the rudder control pedals.

2. Inspect the hoses and their connections.

3. Inspect the pipe-lines at all easily accessible places without opening the panels of the fuselage and wing channels and without removing the access hole covers fastened by screws. The leakage of air check by touch and by listening, without applying soap foam.

4. Check the operation of the wing flaps main system through the ground hydraulic station, performing 2 - 3 exten-

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sions and retractions of the wing flaps.

5. Check the fluid level in the hydraulic tank.

C. After Every 30 Landings.

Landing Gear.

1. Remove the wheels from the legs of the main and nose landing gear. Wash the axles and the details of the wheels and brake mechanisms for cracks, corrosion, deformation, traces of overheating and chipping of the bearings, for weakening of springs, fouling, oil spots, and extensive wear of brakes, damage of obturators and for other defects. In case of revealing defects without the possibility of their quick repair, replace the wheels.

2. Check the pressure in the tyres.

The pressure should be: a/ in the wheels of the main legs 6±0.2kg per sq.cm, b/ in the wheel of the nose leg 4.0 kg per sq.cm.

3. Lubricate the bearings by NK-30 grease of KV and assemble the wheels on their axles.

4. Restore the greasing of all hinge joints having previously removed the old grease.

Fresh grease should be applied on the hinge joint only after kerosene will flow out from the face clearings of the rinsed hinge joint. The kerosene should be supplied to the hinge joint under pressure - from the syringe /in stream/.

The clearance between the cap of the oil nipple and the lower beam of the former No 8 should be minimum 6 mm.

5. Check the retraction and extension of the landing gear through the ground station minimum 3 times. At this, each time measure the time of retraction and extension of the landing

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gear and the pressure in the system necessary to accomplish this operation.

Maximum pressure in the system when retracting the landing gear should not exceed 65 kg per sq.cm and when extending the landing gear 12 kg per sq.cm. Increase of the extension and retraction time should /separately for the main and nose landing gear/ not exceed 1 second in comparison with the measurement accomplished when measuring for the first time, in case that the time increase should exceed the stated value or the necessary pressure should be more than the given above, it is necessary to find out the cause of this increase and remedy the failure.

When two NŠ - 15 pumps are in operation, the time of retraction and extension of the nose and main landing gear should be 5 ± 1 seconds.

Check the emergency extension of the landing gear through the MKK hand pump.

After 30 - 40 full cycles of operation with the hand pump the nose and main landing gear should extend and get locked by the locks.

In order to release by the emergency handle the locks of the landing gear retracted position it is necessary to apply on the end of the handle an effort equalling 17 - 20 kg.

6. Check the time required for the full braking and unbraking of the landing gear main leg wheels.

The duration of the full braking should be 0.8 - 1 second.

The duration required for the full unbraking should be 1 - 1.5 second.

7. Check the reserve of travel of the actuating cylinders

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of the nose and main landing gear.

The reserve of travel should be:

a/ nose landing gear:

for retraction minimum 4 mm,

for extension minimum 6 mm

b/ mainlanding gear:

for retraction minimum 2 mm,

for extension minimum 3 mm.

D. After Every 50 Landings.

Hydraulic and Pneumatic Systems.

1. Carry out the procedures according to the section "25 landings".

2. Check the cleanness of the fluid by draining the fluid from the filters of the hydraulic system and from the drain cock of the hydraulic tank as stated in section "A".

3. Remove the filter of the hydraulic tank and rinse it.

In case that the filter is considerably fouled after the rinsing and testing the system as stated above, rinse it again and rinse also the filters on the panels and the filter of the automatic pilot. Revealing of fouling after the repeated rinsing indicates the fouling of the system and necessary to rinse the whole system and refilling with fresh fluid.

Check the operation of the relief automats of the pumps at inoperative engines and repeat the checking through the ground station. Place the aircraft on hoisting jacks.

4. Carry out the inspection of the hydraulic and pneumatic systems operation through ground station:

a/ check the retraction and extension of the landing gear through the normal system, accomplish 2-3 retractions and extensions.

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b/ check the emergency extension of the landing gear through the hand pump / 1 - 2 times/.

c/ check the emergency extension of the main landing gear by its own weight and the emergency extension of the nose leg through the pneumatic emergency system /1-2 times/. When extending the main legs, they might not get secured by the locks, but may only reach the locks.

d/ check the operation of the brakes by performing 8 - 10 brakings through the main system and 2 - 3 through the emergency system, During this test check the pressure proceeding into the wheel brakes by installing on them pressure with adapters.

e/ check the extension and retraction of the wing flaps 2 - 3 times through the main system, 1-2 times through the hand pump.

f/ check the operation of the glass cleaners for a period of 8 - 10 minutes at different conditions from the minimum number of swingings to the maximum one. During this checking the glasses should be moistened by water.

5. Check the number of brakings which may be accomplished through all charged hydraulic accumulators without recharging.

Minimum 25 two-side full brakings should be accomplished before the pressure on the hydraulic accumulator of brakes drops to 45 kg per sq.cm.

6. Repeat the test having previously discharged the hydraulic accumulators of the main system by operating the wing flaps. By this way the operation of the brakes will be tested only through the hydraulic accumulator of the brakes. Minimum 3 extensions and retractions of the wing flaps and minimum 12

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g/ check the emergency extension of the landing gear through the hand pump / 1 - 2 times/.

e/ check the emergency extension of the main landing gear by its own weight and the emergency extension of the nose leg through the pneumatic emergency system /1-2 times/. When extending the main legs, they might not get secured by the locks, but may only reach the locks.

d/ check the operation of the brakes by performing 8 - 10 brakings through the main system and 2 - 3 through the emergency system, During this test check the pressure proceeding into the wheel brakes by installing on them pressure with adapters.

e/ check the extension and retraction of the wing flaps 2 - 3 times through the main system, 1-2 times through the hand pump.

f/ check the operation of the glass cleaners for a period of 8 - 10 minutes at different conditions from the minimum number of swings to the maximum one. During this checking the glasses should be moistened by water.

5. Check the number of brakings which may be accomplished through all charged hydraulic accumulators without recharging.

Minimum 25 two-side full brakings should be accomplished before the pressure on the hydraulic accumulator of brakes drops to 45 kg per sq.cm.

6. Repeat the test having previously discharged the hydraulic accumulators of the main system by operating the wing flaps. By this way the operation of the brakes will be tested only through the hydraulic accumulator of the brakes. Minimum 3 extensions and retractions of the wing flaps and minimum 12

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Brakings should be accomplished until the pressure on the hydraulic accumulator of brakes will drop to 45 kg per sq.cm.

7. Check the fluid level in the hydraulic tank and in the multipliers.

8. Remove and rinse the air filter /unit 218 / installed in the air line of charging.

9. Drain the sediments from the sumps of the air charging line.

B. After Every 100 Landings.

Landing Gear.

1. Check the fluid level in the shock absorbing struts of the landing gear according to the section "Charging and filling" of this instruction. The aircraft has to be placed on jacks.

2. Check the plays in the journal of the cross-beam of nose landing gear. For this purpose press the strut /by the lower end of the leg/ to the right side of the fuselage along the wing span. Then press the leg into opposite direction / to the left side of the fuselage/ and check the value of the wheel axle end displacement from one extreme position /right/ to the other /left/ extreme position. This displacement should not exceed 1 mm. In case that this displacement would be more than the stated value then it is necessary to remove the landing gear and to accomplish the repair of the bearings in the cross-beam attachment.

3. Check the plays in the couplings of the nose landing gear race. For this purpose displace by the wheel axle the left fork in the direction of flight and then back against the flight direction and measure the value of displacement of the wheel axle centre from one extreme position to the other extreme position. This displacement should not exceed 1 mm. In case that the dis-

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placement would be more than the stated value then it is necessary to remove the brace and perform the necessary repair.

4. Inspect the bolts and attachment openings of the torque links /the upper, middle, and the lower hinges/ of the main and nose landing gear.

When inspecting the torque links pay special attention to the wear of the front surfaces of the middle hinge intermediary washer. Permit by no means the removing of the revealed clearances between this washer and the eyes by tightening the nut of the central bolt. For the removing of the above mentioned clearances it is necessary to replace the intermediary washer.

5. Inspect carefully the welded seams of brace of the nose landing gear, of the shock absorber of main landing gear and the shock absorber of the nose landing gear, paying special attention to revealing of cracks in the area of welding. In case of revealing cracks, the part has to be replaced.

6. Check the clearances between the latch and the lock hook of the landing gear nose leg brace and between the latch of lock and the hook of the landing gear main leg extended position.

The clearances stated above should be minimum 0.5 mm and should not exceed 1.5 mm.

Inspect the contact surfaces of the hook and latch to make sure that they have no scratches and crazings.

In case of damage of the stated surfaces it is necessary to replace the respective details.

7. After 150 landings check the wear of the bronze bushes in the hinge assemblies of the main landing gear cross-beam.

Hydraulic and Pneumatic Systems.

1. Carry out the procedures according to the sections

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25 and 50 landings".

NOTE: For checking according to the points 5 and 6 of the section "50 landings" a reducing of the number of brakings to 20 instead of 25 and to 10 instead of 12 is permitted.

2. Inspect the pipe-lines and the units in full extent including the removing of all necessary access doors and panels of the fuselage and wing channels/. The unions of the pneumatic pipe-lines should be checked by soap-suds.

3. Inspect all hoses. During this dismount the fastenings of the hoses and inspect the areas beneath the fastenings.

B. After Every 100 Landings, but Not Later

than after 3 Months.

1. Rinse the filters of the hydraulic system: filters on the panels, the filter of the automatic pilot, the filter of the hydraulic tank and the filters of the multipliers.

2. Release the air locks in all high points of the hydraulic system. Then add fluid into the tank of the hydraulic system to the required level.

3. Check the air pressure in the hydraulic accumulators.

4. Drain the sediments from the air storage bottles.

Control of the Landing Gear Locks.

1. Check the proper running of the cable on the rollers. The cable should not run down of the roller under an angle exceeding 10°.

2. Inspect the rollers to be sure that they revolve when the cable is moving. The sliding of the cable in the groove of the roller is not permissible.

3. Check the safetying of the turnbuckles and the hinge

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pins. Inspect the brackets and check for corrosion, cracks, slackening of the tightening of attachment bolts and for excessive wear of rollers.

4. Perform a test-extension of the landing gear releasing the locks of the retracted position through the emergency system,

E. After 200 Landings but not Later than After

6 Months.

Hydraulic and Pneumatic Systems.

1. Carry out the procedures according to sections "25, 50, and 100 landings".

2. Inspect the condition of the rubber washers in the air non-return valves and in the air charging valves of the hydraulic accumulators. It is necessary to dismantle the valves for inspection. The surface of the rubber washer should not be affected. Slight dimples caused by the valve seat on the rubber surface /not deeper than 0.7 mm. is permitted. Crumbling out of rubber is not permissible. In case that the washer surface is damaged it is necessary to replace the stem with the washer.

4. Remove the hydraulic accumulators and after unscrewing the air filling valve drain completely the fluid from the air chamber /when draining incline the hydraulic accumulator by 30 - 45 degrees/. In case that from the air chamber has been drained less than 600 cc of fluid, the hydraulic accumulator might be considered as faultless. Place the hydraulic accumulator into the vertical position /with the filling valve upwards/, fill its air chamber with fresh carefully filtered MFP fluid in quantity of 200 ± 20 cc. and reinstall the filling valve. Check the air-tightness of the air chamber of the hyd -

hydraulic accumulator by air pressure indicated on the label of the hydraulic accumulator for a period of 1 hour.

In case that from the hydraulic accumulator was drained more than 600 cc of fluid it may be considered as evidence of considerable leakage through the sealing of the float. For this purpose it is necessary to dismantle such hydraulic accumulator and replace the rubber ring of the float.

After the hydraulic accumulator has been reinstalled check its charging with air and check the operation of the hydraulic system.

F. After 300 Landings but Not Later than After 12 Months.

Hydraulic and Pneumatic Systems.

1. Carry out the procedures according to sections "25, 50, 100, and 200 Landings".

2. Remove the tank of the hydraulic system and rinse it by dehydrated kerosene.

3. Remove from the aircraft the selector valves of the landing gear, and wing flaps, the main draining cocks, filters of main system, landing gear system and of the automatic pilot, the non-return valves and the safety valves, the reduction valves of the automatic pilot, emergency switches and other hydraulic units. Dismantle and replace the worn-off rubber sealing rings. Assemble again, check their operation and reinstall in the aircraft.

4. Drain completely the fluid from the hydraulic system, rinse the hydraulic system and refill with pure filtered fluid.

5. The rinsing of the hydraulic system in the whole as well as of its different units /with exception of the pneumatic ones/

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should be carried out only with FVP oil or eith dehydrated kerosene. Any fluid, prior to the rinsing, should be carefully filtered.

G. After every 500 Landings.

Landing Gear.

1. Drain the fluid from the shock absorbers of the landing gear nose and main legs. Rinse the inside cavities of the shock absorbers by pure alcohol, dry them fairly and refill by fresh fluid following the section "Charging and Filling" of this instruction.

H. General Instructions of the Periodical Servicing Procedures.

1. In all units comprising rubber details it is necessary to replace same after expiring of the term for the service of the rubber. After replacing the rubber details carry out full extent test operation of the respective units.

Use for the replacement of the rubber details only details made of the same mark of rubber as were the removed. Make sure according to the certificates of the newly installed details that their service period is sufficient. Do not install into the unit new rubber details the time limit for storage of which has already expired.

2. After the time limit for service of the rubber hoses has expired, carry out their replacement following the requirements stated in the point No 1. All applied hoses must be oil-proof. The construction of the newly installed hoses and their fittings should be identical to the removed hoses.

3. Note the completing of the periodical servicing procedures in the aircraft log book.

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4. In case of replacement of hydraulic units effect the corresponding note in the aircraft log book.

CHAPTER VII.

OPERATION OF THE CONTROL SYSTEMS OF LANDING GEAR,
WING FLAPS AND BRAKES .

General Instructions.

The hydraulic system of the Il -14 aircraft is designed for the operation of landing gear, wing flaps, brakes, the automatic pilot and the glass cleaners.

The system operates under the maximum pressure 110 ± 10 kg
- 5
per sq.cm.

The aircraft is also provided with emergency pneumatic system for extension or for finishing of extension of the landing gear nose wheel and with air-hydraulic system for emergency braking.

To prevent an accidental movement of the handles of cocks of the landing gear and wing flaps control as well as for securing the landing gear handle in position "Landing gear retracted" "Landing gear extended" the handles are provided with a lock and according to necessary it may be set into three positions.

Besides the locks on the handles of the landing gear and of the wing flaps there are provided safety catches closing the locks to prevent an accidental depression of the locking device and moving of the handles.

During parking of the aircraft, the handle of the landing gear selector valve /in position "Landing gear extended" and the

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handle of the wing flaps selector valve /in position "Retracted/ should be locked and the lock safetied.

The checking of the main hydraulic system operation and of the operation of emergency pneumatic system should be performed according to the control pressure gauges.

The pressure of fluid in the hydraulic system and in the hydraulic accumulators of the main system is indicated by one pressure gauge on the instrument panel of the left pilot.

The pressure in the emergency pneumatic system for extension of the landing gear nose leg is checked on two pressure gauges provided on the panel of the emergency units on the floor of the radio-operator's cabin. One pressure gauge with label "Emergency bottle of nose leg" indicates the pressure of compressed air in the bottle. The second pressure gauge, "Pneumatic system of nose leg" indicates the pressure on the emergency system after the cock and reducing valve.

The pressure in the pneumatic system of the emergency braking is checked on two pressure gauges. One pressure with the label "Bottle of emergency braking" - indicates the pressure of compressed air storage bottle of the emergency braking and is located on the panel of the emergency units. The second pressure gauge with the label "Emergency brake" on the instrument panel of the left pilot indicates the pressure after the valve of emergency braking.

When extending the landing gear by means of the hydraulic hand pump, the pressure in the emergency system is indicated by the pressure gauge of the hydraulic hand pump located on the panel of emergency units.

The emergency cock for the extension of the landing gear nose leg and the selector valve of the hand pump are located

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on the panel of emergency units in the radio-operator's cabin.

For checking the operation of the hydraulic pumps are provided above the panel of emergency units two lamps of the light signal system, which start glowing when the pumps run under load and die out when the pumps are idle.

In case that during the operation of the units only one lamp is glowing it may be taken for proved that inly one corresponding pump builds up pressure.

The extension and retraction of the landing gear and wing flaps as well as the extension of the wing flaps to the take-off angle should be accomplished with the hydraulic pumps of the hydraulic station or of the aircraft hydraulic system in operation /when checking on ground/.

Readings of the Control Pressure Gauges of the Hydraulic System and of the Emergency Pneumatic System at Their Normal Charging.

1. During the operation of engines after the relief automats have disengaged the pumps the pressure on the pressure gauge of the main system should be

410
110 kg per sq. cm
- 5

2. The pressure in the main braking system after the relief automats have switched over should be

410
110 kg per sq. cm
- 5

3. The pressure on the pressure gauges "Left brake" and "Right brake" should be at fully depressed brake pedals. The pressure of these pressure gauges

32-38 kg per sq. cm

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- when applying the parking brake should be with the rudders locked 22-18 kg per sq.cm
10-12 kg per sq.cm
4. The pressure on the pressure gauge with the label "Emergency bottle of nose leg" should be 120-150kg per sq.cm
5. The reading on the pressure gauge with the label "Pneumatic system of landing gear nose leg" should indicate in the moment of opening the air valve maximum 50kg per sq.cm
6. The reading on the pressure gauge with the label "Bottle of emergency brakes" should indicate the pressure 120-150kg per sq.cm
7. The reading on the pressure gauge "Pneumatic system of emergency braking" should indicate in the moment of depressing of the handle of the PU-7 valve a pressure of 10-12kg per sq.cm
8. The reading on the pressure gauge of the hydraulic hand pump should indicate in the moment of its operation with the selector valve handle in position to emergency system maximum 100kg per sq.cm.

Initial Position of the System.

During aircraft parking, taxiing and during the operation of the engines the valves and the units of the system should be in the following positions:

A. Position of the Valves / Cocks/.

The handle of landing gear control set for /Extension" -
lowered down and locked by latch and safety catch.

The safety catch sleeve is closed by clamp and the clamp
by pin.

The handle of wing flaps control set to "Retracted" -
upward and closed by latch and the latch by safety catch.

The emergency cock of the nose leg extension - closed.
The cock handle for engagement of the servo-units in position
"Off" and locked. Handle to the valve "Emergency braking" not
depressed.

The handle for the control of the RKG-1 operation in po-
sition "Normal system".

B. Position of Accessories.

The filler neck of the pneumatic system - closed by plug.

The intake necks of the hydraulic system ground supply -
closed by plugs.

Handle of the hydraulic hand pump detached and located on
the rear bulkhead of the radio-operator's cabin.

The hydraulic reservoir filled with HVP and the level rea-
ching the marks for charged hydraulic accumulators.

C. Position of the Signal System.

The indicators of the landing gear position - indicate
"Extended".

The mechanical indicator of the nose leg fully raised.

When moving the throttle control quadrants into position
"idle run" the horn does not sound.

D. Parking Braking.

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For braking the wheels during parking the normal braking system is applied, though actuated not by depression of the brake pedals but by turning upward the handle for locking of the rudders of the handle for parking braking.

Both handles are located on the central panel of the pilots, the first one on the right side panel down, the second one on the left side panel down. The handles are provided with locks for fixing them in operative or inoperative position.

The handle of the parking braking is applied when the engines are running as well as when they are inoperative. By this only the wheels are braked.

In case of a lengthy parking with braked wheels it is necessary:

a/ prior to applying the parking brake, with the engines running, rise the pressure in the brakes hydraulic accumulator to 110 + 10 kg per sq.cm. and at this pressure apply the parking brake.

b/ during parking follow the pressure in the hydraulic accumulator of brakes, which should be minimum 50 kg per sq.c.

For unbraking the wheels it is necessary to lower down to stop the handle of rudders locking or the handle of the parking brake by which the wheels have been braked.

CAUTION: Prior to taxiing out check the rudders locking handle and be sure that same is lowered and locked.

Applying of Brakes.

A. Normal Braking.

The normal system of braking may apply the aircraft commander as well as the second pilot /co-pilot/. The brake steps are provided on the rudder control pedals of both pilots.

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The braking system excludes the possibility of the simultaneous braking by means of the main and emergency systems and also the simultaneous braking by both pilots.

When passing the control of main braking system by one pilot to the other, the pilot taking over the control has to effect the first braking by each step intensively to reset the brake switches.

The value of the braking effect is in proportion to the depression of the brake steps.

The checking of pressure in the brakes is effected on two pressure gauges installed on the instrument panel in the light compartment:

- The left pressure gauge for the left wheels.
- The right pressure gauge for the right wheels.

The adjustment of the brake valves should be effected to the pressure, according to these pressure gauges, 28 - 32 kg per sq.cm, when the brake steps are fully depressed.

When applying the brakes during taxiing of the aircraft it is necessary to follow on the pressure gauge the indications of pressure in the brakes hydraulic accumulator. In case that the pressure drops below 75 kg per sq.cm, recharge the hydraulic accumulator by increasing the engines revolutions to 1.500 r.p.m.

Normal pressure in the hydraulic accumulator of brakes is 120 - 75 kg per sq.cm.

Pressure drop in the hydraulic accumulator reduces the reserve of energy in it. The main hydraulic system of the brakes does not operate at pressure 40 - 50 kg per sq.cm - the hydraulic accumulator is discharged.

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The braking system excludes the possibility of the simultaneous braking by means of the main and emergency systems and also the simultaneous braking by both pilots.

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When applying the brakes during taxiing of the aircraft it is necessary to follow on the pressure gauge the indications of pressure in the brakes hydraulic accumulator. In case that the pressure drops below 75 kg per sq.cm, recharge the hydraulic accumulator by increasing the engines revolutions to 1.500 r.p.m.

Normal pressure in the hydraulic accumulator of brakes is 120 - 75 kg per sq.cm.

Pressure drop in the hydraulic accumulator reduces the reserve of energy in it. The main hydraulic system of the brakes does not operate at pressure 45 - 50 kg per sq.cm - the hydraulic accumulator is discharged.

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For braking the wheels during parking the normal braking system is applied, though actuated not by depression of the brake pedals but by turning upward the handle for locking of the rudders of the handle for parking braking.

Both handles are located on the central panel of the pilots, the first one on the right side panel down, the second one on the left side panel down. The handles are provided with locks for fixing them in operative or inoperative position.

The handle of the parking braking is applied when the engines are running as well as when they are inoperative. By this only the wheels are braked.

In case of a lengthy parking with braked wheels it is necessary:

a/ prior to applying the parking brake, with the engines running, rise the pressure in the brakes hydraulic accumulator to 110 ± 10 kg per sq.cm. and at this pressure apply the parking brake.

b/ during parking follow the pressure in the hydraulic accumulator of brakes, which should be minimum 50 kg per sq.c.

For unbraking the wheels it is necessary to lower down to stop the handle of rudders locking or the handle of the parking brake by which the wheels have been braked.

CAUTION: Prior to taxiing out check the rudders locking handle and be sure that same is lowered and locked.

Applying of Brakes.

A. Normal Braking.

The normal system of braking may apply the aircraft commander as well as the second pilot /co-pilot/. The brake stops are provided on the rudder control pedals of both pilots.

The braking system includes the possibility of the simultaneous braking because of the main and emergency systems and also the simultaneous braking by both pilots.

When passing the control of main braking system by one pilot to the other, the pilot taking over the control has to effect the first braking by each step intensively to reset the main switches.

The value of the braking effect is in proportion to the depression of the brake steps.

The checking of pressure in the brakes is effected on two pressure gauges installed on the instrument panel in the light compartment:

- The left pressure gauge for the left wheels.
- The right pressure gauge for the right wheels.

The adjustment of the brake valves should be effected to the pressure, according to these pressure gauges, 28 - 32 kg per sq.cm, when the brake steps are fully depressed.

When applying the brakes during taxiing of the aircraft it is necessary to follow on the pressure gauge the indications of pressure in the brakes hydraulic accumulator. In case that the pressure drops below 75 kg per sq.cm, recharge the hydraulic accumulator by increasing the engines revolutions to 1.500 r.p.m.

Normal pressure in the hydraulic accumulator of brakes is 100-75 kg per sq.cm.

Pressure drop in the hydraulic accumulator reduces the reserve of energy in it. The main hydraulic system of the brakes does not operate at pressure 45 - 50 kg per sq.cm - the hydraulic accumulator is discharged.

landing gear will partly lower under the action of its own weight, which is easily to be checked on the indicators of the landing gear position. Then start to operate the hand pump until the landing gear will fully extend and the locks get closed. According to the signal lamps, the horn, and according to the indicators check the landing gear position. When extending the landing gear by means of hand pumps, the air speed of the aircraft should be 200 - 250 km per hour for the extension of the nose leg.

In case that it is necessary to extend only the main legs then it is possible to use pressure drag for aiding the extension of the main legs for which purpose it is necessary to increase the airspeed of the aircraft to 300 km per hour. In this case it is possible after opening the upper lock to extend fully the main legs without operating the hand pump.

REMARKS: When operating the hand pump, swing it smoothly without haste performing slow swings of the handle.

D. Completing of the Landing Gear Extension by Means of the Hydraulic Energy System.

If it is necessary to extend the nose leg to extended position, then it is possible to accomplish this by means of the pneumatic energy system.

For the extension of the nose leg by the pneumatic system it is necessary:

1. Turn the selector valve to "extension".
2. Turn the hand pump handle to "extension".
3. Turn the selector valve to "extension".
4. Turn the hand pump handle to "extension".

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Landing gear will partly lower under the action of its own weight, which is easily to be checked on the indicators of the landing gear position. Then start to operate the hand pump until the landing gear will fully extend and the locks get closed. According to the signal lamps, the horn, and according to the indicators check the landing gear position. When extending the landing gear by means of hand pumps, the air speed of the aircraft should be 200 - 250 km per hour for the extension of the nose leg.

In case that it is necessary to extend only the main legs then it is possible to use pressure drag for aiding the extension of the main legs for which purpose it is necessary to increase the airspeed of the aircraft to 300 km per hour. In this case it is possible after opening the upper locks to extend fully the main legs without operating the hand pump.

REMARKS: When operating the hand pump, swing it smoothly without haste performing long swings of the handle.

D. Completing of the Nose Legs Extension by

Means of the Pneumatic Emergency System.

If it is necessary to press the nose leg to extended position, then it is possible to accomplish this by means of the pneumatic emergency system.

For the completing of extension of the nose leg by the pneumatic system from the lowered position it is necessary:

1. the aircraft airspeed should be during the extension of the nose leg maintained on 200 - 250 km per hour.
2. Check that the air pressure in the bottle of the nose leg emergency extension is not below 90 kg per cm².
3. Set the landing gear cock handle to "Extension".

d. Fit into the socket of the hydraulic hand pump the handle and displace the same into extreme rear position in order to release the upper locks of the landing gear.

e. Open quickly the cock for the extension of the nose leg. Make sure according to the mechanical indicator and according to the indicator of the landing gear nose leg position that the leg is extending. When the landing gear is fully extended and locked in this position, the green light will start glowing.

When extending the nose leg, the indication of pressure on the emergency system pressure gauge should be 30 - 35 kg per sq. cm and at the end of extension 45 - 60 kg per sq. cm.

In case that before starting the extension by means of the pneumatic system the nose leg has been partly lowered, then applying of the hydraulic hand pump handle for releasing the upper locks is not necessary: the only thing to be done is to open fully the emergency cock of the landing gear nose leg extension.

Sequence of the Returning of Emergency System into Initial Position after its Operation.

A. General Notes.

After applying one of the emergency systems in flight or during taxiing of the aircraft as well as after testing the system on ground and in case of failure of the main hydraulic system it is necessary after the use of the emergency system first to reveal and remove the defects, which caused the failure of the main hydraulic system.

Within a short time set the emergency system of the aircraft into initial position on the parking area.

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F. After the Emergency Extension of the
Landing Gear.

After having extended the landing gear by emergency by means of hand pump it is necessary:

a/ The handle of the hydraulic hand pump move into position "Normal system".

In order to accomplish this carry out the following procedures: depress the latch of the hydraulic hand pump selector valve handle, set it into neutral position for 2 - 3 seconds and then move the handle onto position "Normal system". In this position the reading of pressure on the hydraulic hand pump pressure gauge should equal "0".

b/ Check the latches of the landing gear cock handle fixator in the position "Extension".

c/ Charge the hydraulic accumulators through the ground hydraulic station until the switching over of the relief automatics.

d/ throw back the hook locking the bellcrank of the control of locks of the landing gear retracted position.

e/ turn the handle of the hand pump into initial position forward in flight direction and make sure that the bellcrank of the landing gear retracted position locks control has been raised.

f/ remove the handle of the hand pump and put it into brackets of the route position.

After returning the system of the emergency extension of the landing gear into initial position it is necessary to retract and extend the landing gear by means of the main system 1 - 2 times, having placed the aircraft on jacks and applying the ground hydraulic station.

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C. After Extension of Nose Leg by the Emergency
Pneumatic System.

After extension of the nose leg by the emergency pneumatic system it is necessary to carry out the following procedures:

- a/ place the aircraft on jacks,
- b/ close the air cock of the landing gear nose leg extension,
- c/ make sure that pressure on the pressure gauge of the landing gear nose leg pneumatic system equals "0".
- d/ lock the outside rod of the cylinder for emergency extension of the landing gear nose leg,
- e/ retract and extend the landing gear by the main hydraulic system applying the ground hydraulic station, 2-3 times.

D. After Applying the Emergency Braking System.

After applying the emergency braking system it is necessary to carry out the following procedures:

- a/ make sure according to the position of the emergency braking and on the pressure gauge of the emergency brakes that the braking system is unbraked,
- b/ depress to stop for 2 - 3 seconds both brake steps on the pedals of one of the pilots at the pressure in the hydraulic accumulator of brakes 120 - 75 kg per sq.cm and make sure that the pressure according to the pressure gauges of the right and left brakes increased to 28 - 32 kg per sq.cm:
- c/ check the level of the MVP oil in the multipliers and add oil if necessary - in case of excess drain the excessive quantity having unscrewed the union nut at the lower angle of the multiplier.

After having returned the emergency braking system into

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initial position it is necessary to check the operation of the main braking system - to accomplish per 5 - 5 brakings depressing the brake stops at each pilot separately.

During this follow the value of pressure and readiness of pressure increase or drop on the pressure gauge of the brakes.

Make sure that after accomplishing of the test no fluid escape occurs through the draining pipes of the accelerators (the pipes come out on the left side of the fuselage/).

Maintenance of the Unions.

In case that leakage occurs at the unions with conical thread it is recommended to tighten slightly the elbow but not more than 1/4 of turn, or to replace it. Prior to installation of the new fitting it is necessary to lubricate its threaded part with a thin layer of grease.

In case that traces of abrasion have been revealed on the cover of hoses, remove the causes of the abrasions and replace the additional cover of the hoses.

In case that the hose cover is worn through it is necessary to replace the hose /even in case that there are no visible traces of abrasion on it/.

Before replacing the hoses hoist the aircraft on hydraulic jacks and release the pressure from the hydraulic system and from the hydraulic accumulator of brakes to zero.

In order to reduce the loss of oil it is recommended to effect the following:

1/ prepare beforehand a clean vessel for the draining of oil from the disconnected line,

2/ when replacing the hoses and pipe-lines of the landing gear and wing flaps retraction and extension set the handle of wing flaps selector valve into neutral position and the landing

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Dismounting of the instrument panel.

In operation it may be necessary to dismount the whole instrument panel. More often it is necessary to remove one or several parts of the instrumental panel.

The dismounting and removing of the parts of the instrument panel is done in the following manner:

- Remove the bolts at the periphery of the panel, when removing the last bolts it is necessary to hold the panel.
- Incline the upper end of the panel inside the cabin so that you may insert your hand behind it.
- Disconnect the durit hoses which connect some instruments with the pilot head.
- Disconnect the plug connections of the electric instruments and the electric connections placed on the panel (from top to bottom)
- Disconnect the pipes
- Remove the panel

Mark all disconnected ends so that you can easily identify them. The pipe ends, hose ends and electrical connections must be wrapped in cellophane or clean paper to protect them from dirt. If it is necessary to remove all instrument panels proceed from right to left.

Warning. The disconnecting of the pipes of the manometers or the hydraulic system and the automatic pilot may be done only after relieving pressure from the hydraulic accumulators (by means of the cock for the landing flaps and the brake pedals).

The frame of the instrument panel may be removed independently or together with the parts of instrument panel. For dismounting of the frame of the instrument panel it is necessary to disconnect the bonding cables from the brackets of the frame, remove the fastening bolts of the frame and remove the frame. The removed bolts must be inserted either into the brackets of the frame or the dampers.

Mounting of the instrument panel.

The mounting of the instrument panel is done in the opposite order to dismounting. After concluding the mounting of the instrument panel and connecting of all pipes, hoses and electrical cables check the deflection of the dampers of the instrument panel which must be 12 ± 1 mm (see fig.6.) Then check the deflection left in the dampers, and if the panel can deflect 5 mm in the horizontal plane, 8 mm upwards and 12 mm downwards without bumping on the adjacent structures. If the deflection of the dampers is less than 12 ± 1 mm it is necessary to put washers under the head of the bolt. The total thickness of the washers on one bolt must not exceed 5 mm. The instrument panel must be mounted

must be perpendicular to the longitudinal axis of the aircraft.

Tolerances: a) in vertical direction ± 1 deg.

b) in horizontal direction ± 2 deg.

Description of the system for feeding the gyroscopic instruments.

The gyroscopic instruments UP-2, the automatic course stabilization unit and the automatic bank stabilization unit of the automatic pilot with which the aircraft IL-14 is equipped are fed from the supercharger. The air from the engines' superchargers is led by hoses to a dirt trap, passes through non-return valves and then through tubes in the wing centre section. Then it passes through an air filter AF-50. From the air filters it is led to a pressure reducer 375 var. 2 and then through a collector to the gyroscopic instruments.

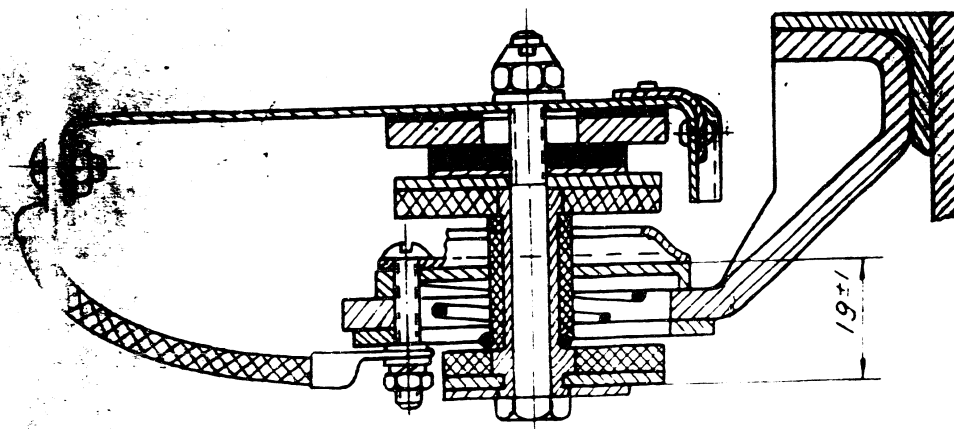


Fig. 3.

From the gyroscopic instruments the air is sucked into the vacuum system. This system is joined to the air scoops of the engines which give the necessary vacuum. The regulation of the pressure in the system is done by two pressure regulators which maintain a pressure difference of 100 ± 10 mm Hg. The feeding system of the gyroscopic instruments must be checked before every flight at the same time as checking of the engines. Normal pressure must be 90 ± 10 mm Hg when the engines are operating at $n = 1600 - 2400$ r.p.m. and $P_k = 700 - 1200$ mm Hg. If the pressure

too small it is necessary to check the air tightness of the system
and the adjustment of the unit 373 var 2.

operation and servicing of the pitot head system.

The pitot head system serves for feeding the air speed indicators, altimeters
and rate of climb indicators. The pitot heads PFD-6 are mounted on a special
rod placed under the fuselage in a fuselage frame No. 5. The static pres-
sure and dynamic pressure tubes are of 4 x 6 mm diameter. The tubes are
connected by means of airtight hoses of 4 x 11 diameter. The static pressure
line is common to both pitot heads and is joined to selector valve PP
mounted on the lower right-hand part of the instrument panel and to the
instruments on the navigator's panel. To the selector valve is also joined
another static pressure tube coming beneath the floor from the starboard of
the aircraft. The static air pressure in this tube is taken beneath the wing
surface. To this second static pressure tube is switched the selector valve
from the principal static pressure tap. The dynamic pressure supply
of the air speed indicators is individual: the left-hand pitot head is
connected to the left-hand US-800 and the navigator's air speed indicator,
the right-hand pitot head is connected to the right-hand US-600.

To ensure safe operation of the instruments connected to the pitot
heads it is necessary to attain the air tightness of the system. The
air tightness of the system must be such that when the pointers of the air
speed indicators indicate 700 - 800 km, per hour the decrease of the
reading during one minute must not exceed 40 km. per hour. For checking
of the air tightness of the system and the functioning of the air speed
indicators serves a special portable unit KPU-3. The checking of the sys-
tem is done in the following manner. Remove the streamlined end
of the pitot head and join the rubber tube of the KPU-3 unit to the dynamic
pressure opening (it is forbidden to remove the heating element). Compare the
pressure and compare the readings of the aircraft's air speed indicators
with the reading of the KPU-3 unit. The checking of the air tightness is done
for each of the pitot heads a special fitting with a hose connection against
the static pressure openings. Connect the fitting by a rubber pipe with
the KPU-3 unit. Put the selector valve on the instrument panel into the
position marked "PFD". Generate a vacuum on the KPU-3 unit. By means of a
valve connect the KPU-3 unit with the static pressure system and increase
the vacuum smoothly until the reading of the air speed indicators is
700 - 800 km per hour. Shut the valve and observe the decrease of the read-
ing of the air speed indicators.

For checking of the accuracy static pressure system it is necessary
to remove the floor and to slip over its open end the end of the rubber

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from the KPO-3 unit. Put the selector valve into the position marked "check". The further checking is done in the same manner as the checking of the principal system. If the air tightness is insufficient the fault must be detected and improved.

Disassembling of the mast of the pitot heads.

1. Disconnect the feeder line of pitot head heating from the terminal box
2. Disconnect the static and dynamic pressure tubes at the masts disconnection place.
3. Disconnect the heating tube.
4. Remove the fastening bolts of the mast.
5. Remove the mast.

Repair and checking of the system.

If the mast is damaged or distorted (bent, displaced or totally damaged during bally landing) it must be removed.

1. Remove the side covers of the the pitot head holders, disconnect the tubes and the electric leads to the heating and remove the mast.
 2. Remove the inner tubes and leads. If the mast is bent so that it cannot be straightened it must be replaced. The new mast must be prepared for mounting and adjusted. The position of the mast with respect to the vertical and longitudinal axes of the aircraft must be adjusted by means of inserts of different thickness, put under its flange. Then drill the opening for the screws. Remove the mast for mounting, the inner tubing and leads.
- Mounting. Place the mast into the correct position using the necessary inserts and fasten it by means of bolts.

Requirements:

1. The adjusting of the position of the mast is done with the aircraft standing in flying position.
2. Tolerances of the position of the mast with respect to the vertical, horizontal and flight direction ± 2 deg.

When checking the system check:

- a) the correctness of the pipe connections to the instruments.
- b) the reliability of the pipe connections by means of hoses.
- c) If the pipe bends have a greater radius than 50 mm.
- d) If there are no "pockets" in the tubing.
- e) If the tubes are safely fastened.

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from the KPO-3 unit. Put the selector valve into the position marked "check". The further checking is done in the same manner as the checking of the principal system. If the air flowness is insufficient the fault is detected and improved.

Disconnection of the mast of the pitot heads.

Disconnect the feeder line of pitot head heating from the terminal box
Disconnect the static and dynamic pressure tubes at the masts disconnection
place.

Disconnect the heating tube.

Remove the fastening bolts of the mast.

Remove the mast.

If in no checking of the system.

If the mast is damaged or distorted (bent, displaced or totally damaged during loading) it must be removed.

Remove the side covers of the two pitot head holders, disconnect the tubes and the electric lines to the heating and remove the mast.

Remove the inner tube and leads. If the mast is bent so that it cannot be straightened it must be replaced. The new mast must be prepared or mounted and adjusted. The position of the mast with respect to the vertical and longitudinal axes of the aircraft must be adjusted by means of inserts of different thickness, put under the wings. Then drill the opening for the screws. Remove the mast or mounting the inner tubing and leads.

Mount the mast into the correct position using the necessary hardware. Secure it by means of bolts.

Adjustment

The adjusting of the position of the mast is done with the aircraft standing in flying position.

Tolerances of the position of the mast with respect to the vertical, horizontal and flight direction ± 2 deg.

On checking the system check:

- 1) the correctness of the pipe connections to the instruments.
- 2) the reliability of the pipe connections by means of hoses.
- 3) If the pipe bends have a greater radius than 50 mm.
- 4) If there are no "pocket" in the tubing.
- 5) If the tubes are safely fastened.

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If the heating pipe is safely fastened to the rod.
 If the tubing is damaged (a flaw, a partly broken place etc.)
 this place is either covered by a Junit hose or a new connection of
 the same type as the original one is inserted there.

Checking the feeding system of the gyroscopic instruments after
 counting it and its testing.

The main factors guaranteeing the faultless work of the gyroscopic
 instruments are:

- a) Air tightness of the system
- b) The state of the valves of the system
- c) The state of filters
- d) Cleanliness of the system
- e) The state of the gyroscopic instruments.

1. The piping must not have deep indentations, places with elliptical
 cross sections, sharply bent places near the connections, bends of
 smaller radius than 100 mm and abrasions. The piping must be safely
 fastened by means of clips and brackets. The piping must be painted black
 and have blue identification rings of 15-20 mm width.

2. In non-return valves must be tight and mounted according to the
 markings on them: the arrow must be in the direction of air flow and the
 inscription "bottom" must be at the bottom. The flap of valve must
 easily open and shut under the action of its own weight. The gyroscopic
 instruments of the aircraft IL-14 can be fed from the barodrome supply,
 for the purpose there is a pipe connection in the nose part of the aircraft
 fitted with a non-return valve which prevents the air of the system from
 escaping into the atmosphere.

3. Because most faults of the gyroscopic instruments are caused by
 contaminations of axes of rotation, bearings and nozzles by dust the
 inlet air is cleaned from oil and dust by means of dirt traps and
 filter GFF-50. But in spite of this the lack of systematic servicing of
 the filter may cause the unstable operation of the gyroscopes due to pressure
 decrease and insufficient air supply and in some cases to icing of the
 filtering surface.

- It is therefore necessary to service the filter systematically especially
 before important flights. The air filter is a casing containing a set of
 folded specially treated cardboard sheets. When the filtering element

gets dirty, it must be replaced. The washing or blowing through of the filter is out of the question. The degree of dirtiness may be judged by the pressure loss which for a normal filter is 8 mm Hg.

Checking the air tightness of the system.

For checking the air tightness of the system for feeding the gyroscopic instruments are necessary: a pressure source with a reducing valve to 0,4 kg/cm², a valve for cutting off of the checked system from the pressure source after the system has been pressurized, manometers for checking the pressure.

The order of checking the pressure air system.

1. Disconnect from the filter the piping to the pressure regulators and mount on the filter connection a check manometer scaled to 0,8 - 1.
2. At fireproof wall disconnect the tubes going to the dirt traps.
3. In one engine nacelle blind the released fitting, at the other engine nacelle join to the same fitting a pressure source.
4. Create in the system a pressure of 0,4 kg/cm² and shut the valve.
5. Measure the time during which the pressure drops to 0,2 kg/cm². This time must not be under 10 minutes.
6. If the air tightness of the system is insufficient find out the leaks and remove them. The thread connections in the engine nacelles and in the nose which are not tested must be checked very carefully.

The order of checking of the vacuum system.

1. Disconnect from the collector the piping leading to the pressure regulators and the duct hoses to the instruments.
 2. Blind the openings of the collector from which the hoses were removed and join to the remaining free connection a pressure source.
 3. Disconnect at the fireproof wall the hoses leading to the air scoops of the engines and join instead of them manometers.
 4. Create in the system a stable air pressure of 0,4 kg/cm².
 5. Further checking is done in the same manner as the checking of the pressure air system.
- After the checking has been completed all connections must be removed.

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Ground checking of the gyroscopic instruments.

The ground checking of the gyroscopic instruments is done with aim of checking the correctness of mounting of the feeding system, the regulation of the reducing valves and the function of the instruments. Usually the checking of the gyroscopic instruments is done at the same time as the checking of the system of the automatic pilot. According to the flight equipment the gyroscopic instruments can be checked in various manners:

1. by means of ground pressure source.

2. taking use of the running engines.

The best results are achieved when taking use of the running engines.

If the system is correctly mounted, the pressure reducing valves correctly adjusted and the feeding source working, the reading on the manometer IP-3 must be 90 ± 10 mm Hg.

Instruments for checking the operation of the engines.

The coupled universal electrical resistance thermometer 2TUE-111

Principal technical data of the indicator 2TUE-111.

1. The indicator belongs to the 2TUE-111 set.

2. Possible errors of the indicator at normal temperature.

Checked points of the scale	allowable error
-6, -20, 0, +20, +40, +60, +80, +100 and +130.	± 3 deg. C

3. The indicator can withstand an acceleration of 1,5 g from a vibration at a frequency from 20 to 80 hertz.

4. The mentioned indicator can replace the indicator in any 2TUE-111 set.

Servicing.

The errors of the indicator must be determined:

a) prior to mounting on the aircraft.

b) after 100 hours of operation of the indicator, but not rarer than once in six months.

after the time of 300 hours has expired.

Transmitter P-1 of the electrical resistance thermometer.

1. The transmitter belongs to the set of electrical resistance thermometer which is fed from the electrical direct current net of $27 \pm 10\%$.
 2. The error of the transmitter ± 2 deg.
 3. The resistance of the winding of the transmitter without the connecting leads at 30° deg. must be $90,1 \pm 0,15$ Ohms and at 100° deg. ... $149,2 \pm 0,5$ Ohm.
 4. The transmitter can withstand an acceleration up to 10 g from a vibration of a frequency from 20 to 30 Hertz.
 5. The transmitter is interchangeable with transmitter in any set of the electrical resistance thermometer.
- The servicing is analogous to that of the ERE-1.

The set of ERE-111 thermometer.

In the set belong:

- indicator ERE-1 1 piece
- transmitter 11 1 piece

Electrical thermometer 101-2 of the engine cylinders.

Principal data of the thermometer:

1. The error of the thermometer in the range $100 - 250$ deg. must not exceed the following values:

ambient air temperature	$+ 20^\circ \pm 5^\circ$	$+ 50^\circ \pm 5^\circ$	$- 60^\circ \pm 5^\circ$
error of indicator...deg.	$\pm 8^\circ$	$\pm 11^\circ$	$\pm 13^\circ$
error of set deg.	$\pm 11^\circ$	$\pm 15^\circ$	$\pm 23^\circ$

In the remaining range the errors may be twice as great.

2. The oscillations of the pointer during the operation of the engine must not exceed ± 1 mm on the scale of the scale and the error due to oscillation must not exceed 1 mm.
3. The error due to the inclination of the indicator in any direction must not exceed the values given above.
4. The indicators, transmitters (thermocouple with connecting leads) and the thermocouples are interchangeable.

Servicing of TGT-9.

1. In order to avoid additional errors it is necessary to adjust the instrument. Prior to starting of the engine the pointer of the indicator must be set on the temperature of the ambient air. During the adjusting the circuit of the indicator must be disconnected. During mounting of the indicator on the aircraft the bolt connections of the indicator must be wrapped in asbestos and soaked with water-glass to prevent corrhing.
2. The connecting lead may be replaced only when coupled with the plug connection because the additional resistance wound on the plug socket is adapted to the connecting lead.
3. The indicator must be gauged and the influence of the oscillations on it must be determined in the following cases:
 - a) mounting on the aircraft after standing for more than three months.
 - b) in terms given in the servicing instruction.
 - c) after expiring of the time of guarantee.

To the set of thermometer TGT-9 belong:

1. Indicator 1 piece
2. Transmitter (thermocouple with connecting leads) 1 piece
3. Thermocouple 1 piece

Doubled electrical thermometer 2 TGT-47 for the engine cylinders.

1. Range of measured temperatures $-30^{\circ} - +300^{\circ}\text{C}$
2. The errors of the indicator of the thermometer must not exceed the values given in the following table.

Temperature				Ambient air temperature $20 \pm 5^{\circ}\text{C}$
100°	150°	200°	250°	
± 5	± 5	± 5	± 5	

The max. errors of the indicator at ambient temperature $20 \pm 5^{\circ}\text{C}$

3. The indicators, thermocouples and the thermocouples with the connecting leads are interchangeable.

Service:

a) The data given in the table must be measured after a vibration with an acceleration 0,1 - 0,3 g or vibration testing:

1. Prior to mounting on the aircraft
2. After six months of operation
3. After expiring of the guarantee time.

b) Before every flight it is necessary to check the fastening of the indicator, thermocouple and compensation leads, and the insulation of the bolt connections in order to prevent earthing on the aircraft structure.

Doubled range - vacuummeter ZAB-10-11.

1. The range of operating ambient air temperatures from + 50° to - 60°.
2. The allowable errors of the instrument are given in the following table:

Absolute pressure mm Hg.															
300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800
Allowable corrections at a temperature + 20 ± 5°															
± 15			± 10						± 15						

3. Hysteresis at normal temperature and barometric pressure is not greater than 10 mm Hg at all checked values.
4. The non-fluent pointer motion at normal temperature when the pressure is changed fluently does not exceed 1 mm on the scale arc.
5. The shifting of the pointers from the barometric pressure does not exceed 10 mm Hg.
6. The dynamic system of the instrument is air tight at an absolute air pressure of 1800 mm Hg.
7. The instrument can withstand overloading by absolute pressures:
 - a) Upper limit: not more than 1900 mm Hg.
 - b) Lower limit: not less than 144 mm Hg.
8. The instrument can withstand an acceleration up to 1,5 g from a vibration at a frequency 20 to 60 Hertz.

Servicing.

The checking according to 2,3,4,5,6, is done :

a) prior to mounting;

b) once in six month

Turning: The determination of errors and of ~~the~~ - fineness of the pointer motion is done under an vibration from 0,1 to 0,3 g.

The doubled electrical constant reading manometers 2 EDU-3 and

2EDU-10.

The doubled electrical manometers are for the remote measuring of fuel (oil) pressure in aircraft engine installations. The pressures are indicated by two pointers on a common dial of the indicator. The instrument contains in one casing two measuring elements each of which has an individual transmitter.

Set of the 2EDU-3.

To the set of the instrument 2EDU-3 belong:

- 1. Two - pointer indicator UK2-3
- 2. Two fuel pressure transmitters with range up to 3 kg/cm²
- 3. Mounting details

Set of the 2EDU-10.

To the set of the 2EDU-10 belong:

- 1. Two - pointer indicator UK2-10
- 2. Two oil pressure transmitters with a range up to 10 kg/cm²
- 3. Mounting details.

Principal technical data:

- 1. Range of measured pressures of 2EDU-3 from 0 to 3 kg/cm²
Operational range from 0,6 to 2 kg/cm²
Range of measured pressure of 2EDU-10 from 0 to 10 kg/cm².
Operational range from 2 to 6 kg/cm².
- 2. The instrument operates at ambient air temperatures range of + 50°
to - 60°

3. The allowable errors of the instrument (of the whole set).

Checked points	Allowable errors kg/cm ² at a temperature of		
	+ 20°	+ 50°	- 45 ; - 60
a) Instrument			
2EDMU-3			
0,6; 1; 1,4; 2;	± 0,09	± 0,12	± 0,15
0; 2; 4; 3;	± 0,18	± 0,18	± 0,22
b) Instrument			
2EDMU-10			
2; 4; 6; 8;	± 0,3	± 0,4	± 0,5
0; 10;	± 0,6	± 0,6	± 0,75

4. Hysteresis at normal temperature does not exceed:

For the instrument	checked points	Allowable errors
2 EDMU-3	0,6; 1; 1,4; 2;	0,09
2 EDMU-10	4 ; 6; 8;	0,3

5. The air tightness of the casings of the transmitters is such that at a pressure of 850 mm Hg the loss of pressure during one minute does not exceed 8 mm Hg.

6. The transmitter can withstand short time overloading by pressures.

- Transmitter of fuel manometer with a range up to 3 kg/cm² 10 kg/cm²
- Transmitter of oil manometer with a range up to 10 kg/cm² 15 kg/cm²

The damper is air tight at a pressure of 100 kg/cm².

7. The indicator can withstand an acceleration up to 10 g from a vibration at a frequency of 20 - 80 Hertz.

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The transmitters can withstand an acceleration up to 10 g from a vibration at a frequency of 40 to 80 Hertz.

- 9. The instruments are fed with direct current from the aircraft net at $27 V \pm 10 \%$.
- 9. The intensity of current required by the set does not exceed 0,2 A.
- 10. The resistance of the insulation of the instrument at normal temperature and a relative humidity of 30 to 80% is not less than 20 megohms.
- 11. The influence of a voltage change of the feeding current $\pm 10\%$ gives an error $\pm 1\%$ of the maximum reading at every point of the scale.

Mounting and servicing.

- 1. The indicator is mounted on the instrument panel in the group of instruments checking the operation of the engines and is fastened by means of a ring of 80 mm diameter.
 - 2. The transmitters of the manometers are mounted on the fireproof wall at such a place where the vibration does not exceed the limits stated for the given transmitters. The transmitters are fastened by means of a nut $M6 \times 1,5$.
 - 3. The measured pressure is led to the transmitters of the manometers by means of a hose $\phi 4 \times 12$ reinforced by wire netting and fitted with special fittings.
For ZEDMU-10 is used an oilproof hose and for ZEDMU-3 a petrolproof hose.
 - 4. The pulsation in the fuel and oil systems is damped at the entrance to the transmitter by a special plate damper which is inserted between the fitting of the transmitter and the fitting of the hose.
 - 5. The static pressure opening of the transmitter of the manometer is connected with the atmosphere by an aluminium pipe.
It is forbidden to connect the transmitters with the static pressure system of the flight instruments.
 - 6. The connection of the transmitter with the indicator and feeding source is done according to the electric scheme in the album of feeding schemes.
The wiring is done with BFVL leads of $0,83 \text{ mm}^2$ cross section.
- After the mounting it is necessary to check:
- a) The air tightness of all pipe connections of the transmitters.
 - b) The total current intensity required by all instruments.

the correct functioning of the instrument.
When the engines are not working and the feeding is switched on the pointers of the manometers must point to zero. When the engines are started the pointers must move on the scales in the direction of increasing pressure. When the feeding is switched off the pointers of the manometers must point below zero. When the checking of the mounting has been completed all nuts of the piping, of the plug connections and the fastening nuts of the indicators must be locked with locking wire.

Electrical distant reading tachometer 2TE4-1.

The electrical distant reading aircraft tachometer 2TE4-1 is intended for continuous measuring of the r.p.m. of the crankshaft of two aircraft piston engines.

To be used on the aircraft TI-14 belong.

- 1. transmitter - generator 2 pieces
- 2. indicator 1 piece

Principal technical data.

The tachometer has a range of measured rotational speeds 0 to 4000 r.p.m.

The scale is uniform, the value of one division is 50 r.p.m.

The errors of the instrument at normal temperature ($20 \pm 5^\circ\text{C}$) must not exceed the values given in the following table:

Interval of r.p.m.	Errors of the set of the tachometer r.p.m.		
	$+ 20 \pm 5^\circ$	$+ 50 \pm 5^\circ$	$- 60 \pm 5^\circ$
0-1000 excl.	± 35	± 55	± 60
1000-2000 incl.	± 25	± 45	± 50
2000-4000	± 40	± 60	± 65

Checking.

Prior to mounting of the instrument on the engine it is recommended to check the insulation of the indicator and the transmitter with the help of a megger and to determine the errors of the instrument at normal temperature.

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Prior to connecting the transmitter to the shaft of the engine it is necessary to check the correctness of the connections of the leads to the plugs. For this purpose the shaft of the transmitter is turned by hand in the direction of its rotation of the shaft of the engine. This must cause the pointer of indicator to turn in a clockwise direction.

If the pointer rotates in the anticlockwise direction it is necessary to check the correctness of the connections of the leads to the plugs.

Principal requirements on mounting:

1. The indicator is inserted from the back of the instrument panel and fastened by four screws. It must be mounted without bias with respect to the horizontal.
2. The transmitter has a flange which is fastened by means of four bolts to the engine bar. The quadrangular end of the shaft of the transmitter must enter into the quadrangular recess of the driving shaft of the engine and the centering shoulder of the flange must enter into the centering recess.
3. The electrical connection of the transmitter with the indicator is by means of SPVL leads with a 0,23 mm² cross section. The leads must be laid in places protected from atmospheric precipitations oil and fuel. They must be slick, so that they are not damaged by vibration.

Servicing.

1. The micrometers must be checked on the following occasions:
 - a) Prior to mounting on the aircraft
 - b) After six months of operation
 - c) After expiring of the time of guaranteed storing
2. Prior to every flight check:
 - a) The fastening of the indicator.
 - b) The fastening of the transmitter
 - c) The connections of the leads
 - d) The securing of the nuts of plug connections.

Indicator of the electric & aircraft fuel gauge. BBES-1357

The electrical aircraft fuel gauge indicator is intended for measuring of the quantity of fuel left in the tanks of the aircraft. It works in one set with the transmitter gauged together with it.

Principal technical data of the indicator.

1. The corrections of the set are not greater than:

Part of scale	Correction errors % of the reading.	
	Individual scale	Summing scale
for the zero mark	$\pm 2,5$	± 3
for the 1 st mark	± 5	± 5
in the remaining part of the scale	± 5	± 7

2. The correction errors of the indicator alone at normal temperature do not exceed $\pm 1,5\%$ of the maximum reading in the part 0-80% of the scale and $\pm 2\%$ in the remaining part of the scale.
3. The supplementary error of the indicator caused by every 10°C of temperature difference from normal ($+20^{\circ}\text{C}$) does not exceed $\pm 0,5\%$ of the maximum reading.
4. The supplementary error of the indicator caused by a voltage change of the feeding current $\pm 2,7 \text{ V}$ does not exceed $\pm 1\%$ of the maximum reading.
5. The electrical resistance of the insulation at normal temperature and a relative humidity of 50 - 80% is not less than 20 megohms.
6. The oscillation of the pointer during operation must not exceed $\pm 1 \text{ mm}$ on the scale arc.
7. The indicators of identical gauging are interchangeable.
8. The indicator is designed to withstand a vibrational acceleration of $1,5 \text{ g}$.

Note: The maximum reading is the value of the last mark on the scale.

Mounting and servicing.

1. The connecting of the indicator with the feeding source and the resistance transmitters must be done according to scheme .
2. The resistance of connecting leads must have the required value with a tolerance 0,5 - 1 ohm.
3. The readings of the indicator must be taken while the aircraft is in flying altitude.
4. One set EMB-1357 i.e. one indicator and two transmitters service one tank group. The group consists of four interconnected tanks. When the fuel rest in the group of tanks is equal to 200 litres, the signal light must burn. (The red signal light is placed on the instrument panel beneath the indicator in question).

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Indicator of the electrical aircraft oil gauge MES-1107A.

The two-pointer indicator of the electrical aircraft oil gauge is intended for measuring of the quantity of oil in the oil tanks of the aircraft. It works in one set with a transmitter gauged together with it.

Principal technical data and the basic requirements on mounting and servicing are the same as for the indicator SBES-1357. The signalled rest of oil in the oil tank is 40 litres.

The automatic pilot AP-45.

The automatic pilot AP-45 is intended for stabilisation of the aircraft with respect to the longitudinal, lateral and vertical axes. The sensitivity of the AP-45 automatic pilot can be adjusted in flight. The sensing part (the automatic course stabilizing unit and the automatic bank stabilizing unit) is used as visual observation instruments (artificial horizon and gyro half-compass)

Principal technical data of the automatic pilot AP-45.

1. Accuracy of stabilization $\pm 1^\circ$
2. Deviation of the aircraft from the given course during 15 minutes:
 - a) at normal temperature up to $\pm 5^\circ$
 - b) at temperature -35°C up to $\pm 7^\circ$
3. Oil pressure in the hydraulic system $9 \pm 1 \text{ kg/cm}^2$
4. Air pressure in the pneumatic system $90 \pm 10 \text{ mm Hg}$
5. Force developed by the steering machine at an oil pressure 9 kg/cm^2 not less than 72 kg.
6. Reading of the manometer when the nozzles are shut and with a special relay switched in parallel with the manometer $40 \pm 5 \text{ mm Hg}$.
In servicing the automatic pilot special attention must be paid to maintain the pneumatic and hydraulic systems clean. The hydraulic system may be filled only with MVP oil.
7. The tightness of the system must be absolute, except the stuffing boxes of the steering machines. The leakage of oil there may be five drops in fifteen minutes.

Checking of the mounting and servicing of the automatic pilot.

1. Check the easy motion of the control levers
2. Check the correctness of the connecting of the follow-up system.
When the right pedal is applied the rose of the follow-up system of the automatic course stabilizing unit must move to the left.

- When the control column is pushed the index of the follow-up system of the longitudinal inclination must move upwards.
- When the control wheel is turned to the right, the index of the follow-up system of bank must move to the right.
3. Check the sensibility of the follow-up system the smallest motion of the controls must cause the indices of the follow-up system to move.
 4. Check if the sheaves of the follow-up system turn smoothly. Seizing is inadmissible.
 5. The tension of the cables of the follow-up system must be such that when the piston rod of the steering machine is in the extreme position and the spring is being wound up it must be possible to make 1/4 turn.
 6. Check if the cock for switching on of the steering machine can be turned fully by 90 deg.

Ground checking of the automatic pilot with running engines.

It is necessary to ascertain that:

1. There is no air in the steering machines, for this purpose:
 - a) Put the controls into the neutral position .
adjust the indices and switch on the automatic pilot.
 - b) First, one after another and then all at once, move the control wheel and the pedals from extreme position to another and hold them in the deflected position for 20-30 seconds, so that the air can escape into the oil tank.
 - c) Try to move the controls by hand in both directions applying a small force. If they resist the motion and the indices of the follow-up system move together with them this is an indication of the presence of air in the cylinders of the steering machine.

Note: If the control cables are springing this does not cause a motion of the indices.

4. Adjust normal sensibility on the discs of regulators of sensibility - mark 4. The control levers must not have undamped oscillations. If the ailerons, elevator or rudder are oscillating decrease the sensibility of the automatic pilot by turning the disc of the sensibility regulator of the corresponding automatic stabilizing unit. If the indices (roses) are not harmonised increase the sensibility of the automatic pilot by turning the disc of the, sensibility regulator of the corresponding automatic stabilizing unit.

- Check the operation of the automatic pilot by turning the control knob. The control surfaces must deflect in a direction corresponding to the movement of the knob.
- Check the possibility of overriding of the operating automatic pilot by means of the control wheel and the pedals.

The set of the automatic pilot.

To the set of the automatic pilot belong the following units:

- a) The automatic pitch and bank stabilizing unit.
- b) The automatic course stabilizing unit.
- c) The hydraulic unit.
- d) The steering machine.
- e) The mounting bracket.
- f) The drainage tank.
- g) The oil and air manometer 852

Distant reading gyromagnetic compass DGMK-3.

To the set of the distant reading gyromagnetic compass DGMK-3 belong

the following units:

- a) Magnetic transmitter PLK-3
- b) Gyroscopic unit
- c) Selenium rectifier
- d) Amplifier
- e) Two indicators
- f) Converter
- g) Junction box
- h) Synchronizing button

Principal technical data.

1. Readiness of the compass for operation - one minute after switching on of the feeding.
2. Error of the compass course indication not more than ± 2 deg.
3. Error after a turn - not more than 4° for every minute of the duration of the turn.
4. The required power not more than 85 W.
5. The units of the compass are vibration proof and vibration stable in the range of frequencies from 20 to 80 Hertz at the following accelerations:
 - a) The hydraulic unit, the amplifier, the rectifier, the junction box, the converter - at 4g
 - b) The indicator - at 1,5 g.
 - c) The magnetic transmitter:
 - up to 4g at a frequency 20-40 Hertz
 - up to 5g at a frequency 41-80 Hertz.

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Mounting and dismounting of the compass

Transmitter PDK-3.

Dismounting is done in the following order:

- a) Open the door in the upper skin of the starboard wing between ribs No 18-19.
- b) Remove the locking and unfasten two plug connections.
- c) Remove the four fastening bolts of the transmitter and lifting the rear part of the transmitter take it out of the wing.

The mounting is done in the opposite order taking good care that:

- a) The arrow on the upper part of the casing with the inscription "Direction of flight" is directed towards the nose of the aircraft and is parallel to its longitudinal axis.
When the aircraft is in flying attitude the plane of the lugs of the transmitter must be horizontal.
- b) The fastening bolts of the transmitter, the plug connections and the locking wire must be made of an anti-magnetic material.

Warning:

1. Prior to joining the plug connections it is necessary to check carefully the resistance of the insulation between all plug sockets and between the plug sockets and the structure of the aircraft. The resistance must be at least 2 megohms.
2. The replacement of the leads must be done strictly according to the assembly scheme of DGMK-3 and the requirements of the DGMK-3 description.
3. When the transmitter is replaced or removed for checking it is necessary to copy the deviation.

Gyroscopic unit.

The gyroscopic unit is mounted on a special bracket beneath the command radio set in the radio operator's cabin.

For dismounting it it is necessary:

- a) Remove the locking of the plug connection and disconnect it.
- b) Unfasten the bolts of the dampers and remove the gyroscopic unit.

The mounting is done in the opposite order.

It must be remembered that:

- a) The lower plane of the base of the gyroscopic unit must be parallel within 2 deg. to the plane passing through the longitudinal and lateral axes of the aircraft. The aircraft must be in flying attitude.

- b) The gyroscopic unit is mounted on special damper, the use of supplementary dampers is forbidden.
- c) The unit must be mounted so that the dampers can deflect and the gyroscopic unit does not hit against other equipment or the aircraft structure.

The amplifier.

The amplifier is mounted beside the gyroscopic unit on its own dampers. The mounting and dismounting of the amplifier is analogous to that of the gyroscopic unit.

Electrical combined artificial horizon AGK-47B.

In the set of the artificial horizon AGK-47B belong:

- 1. Indicator
- 2. Converter PAC-12

Principal technical data:

- 1. The error of the artificial horizon in level flight does not exceed 1deg.
- 2. The error of the artificial horizon after a turn with a bank of 20° does not exceed 3-5 d.g.

The indicator is placed on the instrument panel. For dismounting it is necessary to:

- 1. Turn the nose fairing
- 2. Remove the locking of the plug connection and disconnect it.
- 3. Remove the four fastening bolts and remove the artificial horizon.
- Reassembly is done in the opposite order.

Warning.

During mounting and dismounting of the artificial horizon AGK-47B the microscope must be arrested. During mounting it is necessary to take care that there do not appear any air bubbles in the fluid of the back indicator. If there are any air bubbles it is necessary to turn the whole instrument to the left (in an anti-clockwise direction), so that the air bubbles escape into the compensation coil of the back indicator.

The navigator's board sight AB-32.

- The navigator's board sight AB-32 is intended for measuring in flight:
- 1. The true angle of drift
 - 2. The mean ground velocity
 - 3. The relation of the aircraft compass, which can, should it prove necessary be removed in flight.

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Set of navigator's board sight.

To the set belong:

1. Navigator's board sight 1 piece
2. Stipatch (on the cover of the sight) 1 piece

Principal technical data of the sight.

1. Range of measured angles of drift ± 50 deg.
2. Range of measured course angles ± 50 deg.
3. Range of measured ground velocity 100-900 km/h
4. Field of vision not less than 30 deg.
5. Base of range finder 0,5 H (H-height of flight m)
6. Voltage of illuminating light 27 V

Mounting of the sight.

The sight is mounted in the navigator's cabin on the port side of the fuselage. The mounting must fulfil the following requirements:

1. The plane of the lower surface of the slides of the sight's base must be horizontal.
2. When the zero markings of the board and of the window coincide the lines of the net of the sight must be parallel to the longitudinal axis of the aircraft.
3. The sight must be mounted at such a height that it is convenient to work with it and that fuselage skin does not appear in the field of vision.

- For mounting of the sight the gyroplane must be put into flying attitude (without back). The fastenings of the bracket are mounted and the brackets are adjusted so that the plane of the guides is horizontal. A rope is stretched on the ground under the aircraft parallel to the aircraft's longitudinal axis in the field of vision of the sight. When the zero of the scale coincides with the index the "lines of drift" must be parallel to the rope. The horizontal position of the plane of the guides of the bracket is checked again and it is observed if the skin of the fuselage or other parts of the aircraft do not come into the field of vision.

Pre-flight inspection and preparation of the sight.

Prior to every flight it is necessary:

1. To inspect the net, the ocular, the objective, and the mirror in the lens of the objective. If they are dirty clean them carefully with a soft linen napkin (they must not be cleaned with paper or chamois leather to avoid their damaging), clean the surface of the transparent disc under the pencil of the pantograph.

- 2. Check the illumination of the net and of the scale of the angles of drift.
- 3. Check the fastening of the sight.
- 4. Clean and fasten the pencil of the pantograph.
- 5. Check the stopwatch.

servicing

At least once after two or three flights oil the axle of the pantograph, the connecting rod and all other moving parts with MVP oil. After not more than 50 hours of flight :

- a) Check the pantograph. Bring the zero of the scale into coincidence with the index and draw with the pencil of the pantograph on the board the direction of one of the drift lines of the net. If the drawn line deflects from the parallel lines on the board by more than $1^{\circ} 30'$ (check by means of the scale) the sight is out of order and must be sent for repair.
- b) Check the mounting of the sight.

Chapter IX Servicing of the electrical equipment.

The servicing of the electrical equipment includes:

- a) Checking of the technical data of the electrical equipment with the aim of prolonging its life.
 - b) Replacement of the equipment the life of which has expired.
 - c) Checking of the electrical equipment for defects: visual inspection, trial of functioning under working conditions, inspection of the state of the insulation etc.
 - d) Preventive work with the aim to prevent premature wear and defects of electrical equipment (charging of storage batteries before they are completely discharged, restoring of the regulation, replacement of exchangeable parts, cleaning, protection against corrosion etc).
 - e) Noting of all technical data according to the instructions.
- The service instruction gives a list of the servicing works, their terms and sequences as a function of the hours of flight. The servicing of the electrical equipment of the aircraft is divided between specialists which service the following units: generators, electrical mechanisms (UR-7 m, UT-3, UT-2, MG-1, starter SkD-2V, electric motor of feathering pump D-2500 A. Electromagnetic cocks (KK-3), motors of the transfer pumps, electric motors D-150 etc.

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The electrician is responsible for the good condition and faultless functioning of the electrical part of the above mentioned units and their correct connection to the aircraft net. Together with the rigger and fitter he is responsible for the correct mounting, fastening and interconnection of the above mentioned units with the controls of the aircraft and the aircraft engines, mounts and dismounts of these units.

The checking of the operation of the above mentioned equipment under load (current) is done by the electrician together with the rigger or fitter or the flight engineer of the aircraft.

Before beginning the servicing of the electrical equipment of the aircraft the electrician must:

1. Get information in which range (according to the flight - hours) the servicing must be done.
2. Read the notes of the crew pertaining the operation of the electrical equipment during the last flight.
3. Check the history sheet of the electrical equipment and determine which units must be checked to prolong their life and which must be replaced because their life has expired.
4. Get and prepare the units of electrical equipment which must be mounted instead of those the life of which has expired.
5. Prepare the necessary instruments, tools, exchangeable parts, materials and ground equipment (aerodrome source of electric current, cart for transporting the storage batteries, ladder etc).

First of all is done the work connected with prolonging of the life of the electrical equipment and the replacement of equipment the life or time of guarantee of which has expired. Then is done the servicing during which the state of all electrical equipment is carefully checked. All defects are removed and preventive servicing is done.

When the prescribed time of servicing of an electrical unit coincides with the time of replacement or overhaul the servicing is omitted and only the work connected with the prolongation of the time of life is done. During servicing and the work connected with the prolongation of the time of life the following rules must be observed:

1. The electrical equipment must be checked under load (current) using the aerodrome supply. To use for this aim the storage batteries of the aircraft is forbidden.
2. All inspections of the electrical equipment must be done with switched off aircraft storage batteries and aerodrome supply. In cases when the service instruction requires inspection under load (current) (checking of the functioning of relays, the regulation of the indicators of electrical units etc.)

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Caution must be observed to avoid short connection from parts of equipment under load bus bars and clips, via metal tools onto the aircraft structure.

When checking the electrical equipment and looking for causes of defects use principal, feeding and mounting schemes of the net of the aircraft IL-14. If defect is found the cause of which is not understood - report at once to higher specialist and stop further work.

4. The circuit protection by circuit breakers must strictly correspond to the rated current intensity of the circuit. To install circuit breakers for a current intensity greater than that stated in the scheme or replace them by something else is forbidden.
5. The switching on of the aerodrome supply on the aircraft IL-14 is such that it does not exclude the possibility of accidental switching on of the aircraft storage batteries and their discharge, or the disturbing of the contact in the plug socket of the aerodrome connection. When the aerodrome supply is switched on and the contact at the plug socket is tight the signal light must burn. If there is no contact in the plug socket, this means that the aerodrome supply is not switched on and the aircraft net is loaded from the storage batteries.
6. While servicing the electrical equipment of the aircraft it is forbidden:
 - a) To check the presence of electrical current by means of sparking.
 - b) To leave without insulation the ends of leads.
 - c) To leave open the electric panels and various distributing devices in the radiooperators cabin and in the engine nacelles and terminal boxes while they are under load.
 - d) To open the covers of distributing boxes and devices, relays and electrical instruments while they are under load.
 - e) To switch on without need the aircraft net and go away leaving it under load.
 - f) To switch on or switch off the aerodrome supply and inspect the electrical equipment while the petrol tanks are refilled or emptied and petrol fumes are present in the cabin.
 - g) To place the aerodrome supply near the nose wheel or at places where there is leakage of oil or fuel.
 - h) To connect or disconnect the lugs of the cable of the aerodrome supply if it is connected to the aircraft net.
 - i) To solder on units or near them immediately after they have been washed in petrol.

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- a) To brush with petrol the collectors and brushes of generator, electric starters or boxes of relays.
- b) To use hand lamps which are not in order
- 1) To use bad tools and instruments: work on ladders soiled with oil, without using a special mat; to work inside the engine nacelle, on the wing centre section and near the fuselage nose while the engines are running.
- 2) To step on the aircraft skin without the use of special shoes or mats.
- 3) To stand near the propeller of an operating engine or in the plane of rotation of the propeller.

II. The resistance of the aircraft net insulation.

After every 100 hours of flight, but at least once in a month the resistance of the insulation of the plus feeding lead of the aircraft net or of some part of it must be measured by means of an ohmmeter.

For this purpose the measured part of net is disconnected from the minus lead and the feeded units. Then between this part of the net and the aircraft structure is inserted an ohmmeter and the resistance of the insulation of the lead is measured.

The measuring of small and passage resistances is done in case of need when the interference with the radio receiving is too large or the bonding of the moving parts is bad. For this purpose a microohmmeter is used. The allowable value of the passage resistance is determined according to the measured place.

III. Change of aircraft engines.

Check the history sheets of the electrical equipment and determine the instruments and units the time of guarantee or the life of which have expired, and perform the work necessary to prolong their life or replace them.

Dismounting of the electrical equipment of the engine installation.

Loosen the nuts and disconnect the plug connections of the following circuits:

- a) Of the generator, starter electrical mechanism UR-7a and the indicators UZP-48; disconnect the leads to the transmitters P-1; disconnect the plug connection of UPRN-1.

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Unfasten the thermocouples from the engine remove the edge and pull them into the engine nacelle. Disconnect the plug connection from the MG-1 air filters for removing the upper part of the engine cowl. Disconnect the minus leads of the generator and starter from the fireproof wall. Remove the cover of the terminal box on the fireproof wall, unfasten it and disconnect the minus leads. Disconnect the clips from the engine bed. Disconnect the leads from the starting vibrators, magneto, tachometers, transmitters P1. Remove the bundles of cables and send them to the worksop for preventive repair.

Mounting of the electrical equipment of the engine installation.

Before the engine is mounted.

1. Get from the worksop the repaired and checked bundles of cables and fasten them to the tubes of the engine bed and other parts of the engine.
2. Connect the plug connections on the fireproof wall, tighten the nuts and lock them connect the minus leads of the starter and generator to the fireproof wall.

Pass through the fireproof wall the bundles of cables leading to UR-7 m, cowling flaps, UZP-48 transmitter, P1- transmitter and temperature informer TI-11. Fasten them to the engine bed assemble the plug connections on the fireproof bulkhead. Fasten the tubes of the engine bed the leads of the P-1 transmitter and connect the leads to the transmitter. Connect the leads to the tachometer, the dilution valve, the temperature informer and fasten the leads to fireproof wall. Fasten the plug connections UPRN-1 to the fireproof wall and secure them. After lining the opening pass through the minus leads from the P-1 transmitters, fasten the terminal box on the fireproof wall and put on the cover. Connect the leads to the starting vibrators PK-45 and the magneto.

IV. Replacement of parts of the electric net.

If some lead is damaged (broken, short circuit or damaged insulation) it must be replaced. The damaged lead is unsoldered from the plug connection and extracted from the hose by the other end. Prior to extracting of the damaged lead a new lead is connected to it and is passed through the hose while the damaged is extracted. The new lead is connected to the unit and soldered to the plug connection.

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plug connection is disabled and locked.

Chapter X operation of the radio equipment.

All use of the radio equipment can be made only if the tuning and all other operation were correctly performed. The persons servicing the radio equipment must carefully study the descriptions and the instructions of all radio equipment installed on the aircraft. Prior to every flight it is necessary to inspect all units of the radio equipment - whether there are no indentations on the cases of the units and whether the dampers and the fastening is in order. There must be good contact in the plug connections, the fastening of the bundles of cables and the bonding cables must be in order. The cables and their connections must be undamaged. During the preparation of the aircraft for flight the checking of the radio equipment is done with the help of the aerodrome supply and only immediately before the flight when the engines are running with the help of the aircraft generators.

When checking the radio equipment on the ground the following rules must be observed:

1. Every unit must be checked strictly according to the service instructions.
2. The ground supply of direct current must have a voltage of 24,5 - 28,5 V.
3. The engaging of the ground supply is done in the following manner:
 - a) Connect the ground supply to the plug socket.
 - b) Switch on the emergency switch of the storage battery and ground supply on the right-hand switch board.
 - c) Put the switch on the generator's panel marked "Aerodrome supply storage battery" into the position "on".

Check according to the green signal light, placed near the plug socket, if the ground supply is connected to the plus bus bar of the aircraft.
4. Prior to switching on (during flight or on the ground) the radio compasses, the V.H.F. command radio set RBM-3 m, the receiver or the V.H.F. radio set BS-3B and the radio range finder SB-1, it is necessary to switch on besides the direct current sources also the alternating current sources i.e. the connector PO-1500 (main) or P-500 (emergency).

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Attention !

1. The converter PO-500 is used when PO-1500 has failed.
 2. For normal operation of the converter PO-1500 it is necessary that the feeding current has a voltage of 20V on the terminals at peak moments and a starting current intensity 680 A.
- The converter must be switched on in the following manner:
- a) Switch on the direct current supply
 - b) Put the switches on the radio panel of the pilots into the position "main" or "stand by".
 - c) According to the voltmeter for alternating current mounted on the panel of the generator the voltage must be 115 ± 3 V. If the voltage has not the prescribed value regulate the voltage of the converter PO -1500 with the help of the rheostat mounted on the upper part of the radio operator's switch board.
- The voltage of the stand by converter PO-500 is not regulated, but it must be checked prior to every flight and if the voltage is not equal to 115 ± 3 V the converter must be replaced.

Attention !

1. The arrangement of the converters ensures the automatic switching on of the emergency converter when the main converter fails.
 2. The failing of the main converter and the operation of the emergency converter is signalled by a red warning light mounted on the radio panel of the pilots.
 3. When the emergency converter is operating the radio compass ARK-5-P is automatically switched off. If the operation of both radio compasses is necessary the second radio compass may be switched on and the radio range finder switched off at the same time.
- This is done by means of a tumbler mounted on the radio panel of the pilots marked : " ARK-5-P - range finder".

Communication and command radio set introduction.

Full use of the advantages of the radio set namely of its power, high exactness of frequency setting etc. can be made only if the tuning and all other operations were correctly performed.

Use.

The communication radio set RSB-5/234 is receiving and transmitting set for the telegraphic and telephone communication with ground stations and other aircraft.

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the set belong:

- a) H.F. blocks with pedestals
- b) Feeding part with converter RUK-300B
- c) Aerial with quartz calibrator
- d) Control panel
- e) Receiver US-9
- f) Box with accessories "In flight"
- g) Portable indicator
- h) Stiff aerial.
- i) Connecting wires and cables
- k) Description

Note: To the set of the command radio belongs a receiver with remote control of the tuning. The command radio set RSB-5/230 is intended for communication with the commanding wireless net and may be used as a reserve in case of failing of the communication radio set.

Pre - flight preparation.

For the safe and faultless operation of the radio set is necessary:

- a) To keep the radio set clean. When out of operation, the transmitter, the receiver, the feeding part, the aerial must be covered with waterproof covers.
- b) The contacts of the radio set must be kept in order. The contacts of the relay of the telegraph key, of the connecting wires and cables, plugs, lamps, terminal boxes etc. must be free from corrosion, carbon and dust. The contacts of leads which are fastened by means of screws must be tight.
- c) Systematically check: the aerial - especially its outer part and the passage insulator; The ends of leads must not project from the terminals of the H.F. blocks because this may cause sparking at height.
- d) Watch the state of the dampers and bonding cables of the radio set.
- e) Check if the flexible leads to the anodes and nets are sufficiently far from the housing and the springs on the anodes sufficiently press (load) the caps of the tubes.
- f) Fasten tightly the cover of the tubes of the setting generator and of the buffer cascade.
- g) The case must sit firmly on the guides of the chassis and the fastening must be tight.
- h) There must be no indentations on the casing because this may lead to sparking at height.

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The tubes must be firmly fastened and the H.F. blocks firmly inserted and have tight fastenings.

The roll with the coat of spring and the winding of the varicoaster must be periodically cleaned during operation from carbon and dust by means of a rag soaked with petrol or alcohol.

Servicing of the converters and starting relay.

The converters are the most difficult accessible part of the radio set it is therefore necessary to pay special attention to their servicing. At least once in five days (if the converter is in operation every day) wipe the collector with a clean, dry or (slightly) moistened with B-70 petrol rag. If the collector is covered with carbon which cannot be removed with a rag it must be lightly (gently) cleaned with glass paper. Afterwards it must be carefully wiped with a rag in order to remove the copper dust which may otherwise cause a short circuit. The brushes must have good contact with the collector. Brushes of other (type) make must not be used because this may result in sparking and wearing. If the contact between the brushes and the collector is bad it is necessary to switch on the converter for several minutes without loading so that the brushes can adjust themselves by grinding. If the brushes have been removed then it is necessary after inserting them to check if the contact between them and the collector is good and if the spring is sitting without bias.

- It is necessary to prevent water from getting into the converter. The bearings must be clean and well lubricated with AF-70 or CIATIM-201 (lubricate once in three months). Special attention must be paid to the starting relay. When the relay is switched on there is sparking between them and they are burnt. The scale must be removed by means of glass paper. After cleaning the contacts the glass dust must be removed from the contacts because it can cause short circuits.

Receiver of the communication radio set

The receiver of the communication radio set is an universal superheterodyne receiver with 6 V tubes. It can be used for telephone and telegraph receiving and telegraph receiving with undamped oscillations.

Receiver of the command radio set.

Unlike the receiver of the communication radio set the US-9D receiver of the command radio set is fitted with remote tuning control.

attention! Prior to switching on of the US-9D receiver it is necessary to switch on the supply of alternating current 115 V, 400 Hertz otherwise the remote tuning control will not function.

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Pr. - flight checking of the receiver.

1. Check the state of the aerial passages and the contacts in the aerial net.
2. Check the presence and the state of all circuit breakers (including those in the circuit of the feeding with alternating current of the distant tuning control).
3. Check visually the connecting cables, minus leads and bonding cables.
4. Check the dampers of the receiver and the control panel.
5. Check all controls.
6. Check the operation of the receiver in several points of every subrange by receiving telephone and telegraphic messages from outer stations.

The servicing of telephones and laringophones.

Telephones and laringophones must be kept in a dry place and must be protected against shocks, which may cause disorganization of permanent magnets. It is necessary to watch the state of cables leading to the telephones and laringophones and of the contacts in the connections. Bad contacts and torn cables can cause the loss of communication.

V.H.C. command radio set RSIU-3 A.

The set belongs:

1. Transmitter block "A" with damping frame.
2. Transmitter block "B" with damping frame.
3. Selenium rectifier "V" with damping frame.
4. Aerial
5. Set of cables.
6. Set of quartz.

Pr. - flight inspection of the RSIU-3 radio set.

1. Check connecting cables between the blocks and the contacts in the plug connections.
2. Check the fastenings of the cables. Tighten where it is necessary. The clips, this prevents the wire cutting from damage and improves the bonding.
3. Check carefully the state of the aerial feeders, see that the contacts are not damp or oxidized.
4. Check the state of the earthing leads and their connection with the aeroplane structure.
5. Check the contacts of the aerial relay, of the relay of the rectifier block and of the pulse motors. If there is scale on them clean them with a rag moistened with petrol.

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6. Check the fastening of the tubes on the tube panels and their plugs.
7. Check the buttons of the control panel and the operation of the automatic control.
8. See that there is a thin film of lubrication on the surface of metallic parts which are not painted or zinc plated.
9. Check the presence and the state of the circuit breakers.
10. Tune the transmitter and receiver of the RSIU-3 m radio set according to block "I".
11. Shut all covers, check the tightness of all plug connections and of the fastenings of the casings.
12. Check the operation on working frequencies of the radio sets on the ground with running engines and the apparatus of all crew members operating by means of the radio station of the take-off place.

Aircraft automatic radio compass ARK-5.

The aircraft IL-14 is fitted with two radio compasses ARK-5 which have a common control panel. To the set of the radio compass belong: transmitter, control panel, indicator of the pilot, indicator of the navigator, internal loop aerial, H.F. cable of the loop, flexible shifts, T piece, passage insulator, dehydrator.

The aircraft is fitted with two radio compasses ARK-5 with independent controls.

Pre-flight inspection of ARK-5.

1. Prior to flight is necessary to check visually:
 1. The fastening of the aerial
 2. The masts of the ray aeriels
 3. The passage insulators
 4. The anti-icing shields
 5. The aeriels leads
 6. The suspension insulators
 7. The anti-icing covers
 8. The dampers of the ray aeriels
 9. The state of the emergency aerial
 10. The state of the internal loop aerial
 11. The state of the laminated glass cover of the internal loop aerial

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12. The presence of the set of spare tubes and circuit breakers.
13. The tightness of the nuts of the plug connections.
14. The connection of the flexible shafts to the control panel, receiver and T piece.
15. The state of the SUP and SUSH indicators
16. The state of the control panels the presence of the correct 5A and 2A circuit breakers and of the illuminating lights.

Checking of the operation of the radio compass.

1. Switch on the aerodrome supply
2. Switch on the automatic circuit breakers in the group "radio" on the radio operator's control switch board marked "radio compass".
3. Switch on by means of the switch on the radio panel the main power supply or the emergency converter.
4. Put the selecting switch into one of the required positions "Comp", "Aerial", or "Loop" and check if the indicator light and the illuminating lights burn (the regulator "illum" must be fully turned in the clockwise direction), or if the pointer of the tuning indicator deflects and there is noise in the phones (the regulator of volume of speech must be fully turned in the clockwise direction).
5. Turning the knob marked "tuning" from one extreme position to another make sure that the remote tuning control is operating (the flexible shafts are in order).
6. Put the selecting switch into the position "Aerial", turn the regulator of volume of speech fully in the clockwise direction, select the 1st, 2nd or 3rd subrange and by means of the knob "tuning" tune in on some radio station operating in this frequency range.
7. Put the selecting switch into the position "Comp." The pointer of the bearing indicator (the loop aerial) must point towards the radio station.
8. Check the operation of the frequency switch - when the position of the switch is being changed there must be no noise in the phones and after the position has been changed the character of the noise must change too.
9. Check the operation of "LIR" - "TLG" tumbler by the presence of noise when the tumbler is in the "TLG" position and the absence of noise in the phones when the tumbler is in the "LIR" position.

- 10. Check the operation of the illuminating lights and of their regulator. When the knob of the regulator is turned the intensity of the illumination must change.
- 11. Check the operation of the regulator "volume" under conditions "Comp.", "Aerial" and "Loop". by the change of noise in the telephones and the audibility of the signal of the radio station which has been used in.
- 12. Check the operation of the fast and slow rotation of the loop (pointers of the bearing indicator) by hand under condition "Loop". When the knob "Loop L-R" is pressed and turned to the left or to the right the loop (and the pointer of the indicator) must turn in the same direction. When the slow rotation is checked the knob must not be pressed.

Checking using the radio receiver.

- 1. Check the presence of the correct circuit breakers on the central switch board of the radio operator, in the alternating current net and on the control panel.
- 2. Switch on the direct and alternating current sources and the automatic circuit breakers on the central switch board of the radio operator.
- 3. Switch on the feeding of the APU.
- 4. On the peripheral's apparatus SPN put the switch into the position "Additional panel".
- 5. On the additional panel of the SPN switch over to the required ARK-5 (ARK-5-I or ARK-5-II).
- 6. Put the selecting switch into position "Comp." "Aerial" or "Loop" the feeding of ARK-5 is on and when the ARK-5 is switched on, the indicator's light must burn.
- 7. To switch off the radio compass the switch on the control panel of ARK-5 must be put into the position "off" and switch off the converter of the P3 type (if it is not necessary to feed other apparatus with alternating current).

The tuning of the receiver.

The tuning of the receiver is done in the following manner:

- a) Put the selecting switch into the position "Aerial".
- b) Put the "TR-TRG" switch into the "TR" position if the received station operates on modulated signals or into the "TRG" position if the received station operates on unmodulated signals.

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- c) Put the frequency switch into the position corresponding to the frequency of the received station.
- d) Turn the knob "Tuning" until the required frequency comes against the index. Wait 3-5 minutes from the moment of switching on of the receiver until the knob warms up.
- e) Adjust exactly the tuning, turning the knob in any direction until the deflection of in any direction until the deflection of the pointer of the indicator of the tuning to the right has the largest value the exactness of the tuning during prolonged continuous operation of the radio compass must be periodically checked.
- f) Check the calling and call signs that the radio set is tuned in on the required radio session.
- g) Put the selecting switch into the position "Compass", the pointers of both indicators SLP and CUSH must automatically turn and point on the scale of the instrument the course angle of the radio station which has been tuned in.

Regulation of the reading on the scale of the tuning indicator with the actual tuning of the receiver.

If the flexible shaft is for some reason disconnected from the receiver or the control panel then prior to connecting it again the following requirements must be satisfied:

1. The frequency set on the scale must correspond to the frequency to which the receiver is tuned in. For this purpose it is necessary:
 - a) Connect the flexible shaft to the receiver and to the control panel and by turning the tuning knob in the anticlockwise direction put the capacitors into the extreme position.
 - b) Disconnect the flexible shaft from the receiver, put the range switch into the third position (640-1300 Hertz) and by turning the tuning knob bring the index "stop" into coincidence with the index.
 - c) Connect the flexible shaft to the receiver and check if the index "stop" coincides with the index when the rotation stops.
 - d) Tune in on a known radio station and check if the reading on the scale corresponds to the frequency of the tuning.

Regulation of the sensitivity threshold of the receiver.

The regulation of the sensitivity threshold must be done only in the case that the noise level is noticeable and only after the interference of the ignition, sparking of the generators, converters etc have been minimized.

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regulation is done by turning the screw on the front panel of the receiver marked "Inc. receiv." During the regulation the receiver must be tuned in on some radio station, the engines must be running and the generators must be on.

1. Switch on the receiver by putting the selecting switch into the position "Aerial".
2. Put the range switch into the second position (310-540 Hertz)
3. Turn the knob "Volume" to the extreme right position,
4. Put the tuning into some position in the frequency range 300-700 Hertz where there is no radio station working.
5. Turn aside the cover of the regulating screw "Inc. receiv." and turn it by means of a screw driver to the extreme position in clockwise direction and then by turning it in the opposite direction regulate the sensitivity so that the noises are not too strong.
6. Tune in on several distant radiostations and check if the sensitivity is sufficient. If the sensitivity is insufficient turn the regulating screw "Inc. receiv." in the clockwise direction and increase the sensitivity.

Radio altimeter PV-2.

- On the set of the radio altimeter belong:
1. Transmitter-receiver with duplex frame
 2. Height indicator PV-45
 3. Converter RU-111A
 4. Transmitting and receiving aeriels
 5. Antenna and feeding cables

Pre-flight inspection of PV-2.

1. Prior to switching on the radio altimeter inspect visually and mechanically all blocks and cables.

During the inspection:

1. Check the correctness and reliability of all connections and of all plug connections.
2. Check the mounting and the reliability of all cables. The cables must be undamaged and have some spare length at places where they are connected to the units.
3. Check the fastening of the duplex frame to the bracket, the fastening of the transmitter-receiver to the frame and the deflection of its levers.

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Check the fastening of both serials, the state and the cleanliness of the insulating rings.

The switching on and off of the radio altimeter.

The switching on of the radio altimeter is done by turning the knob of the indicator marked "sw" in the clockwise direction. The radio altimeter is fed from aircraft net. 2-3 minutes after switching on the pointer of the indicator moves from the position of rest (extreme position to the left) fluently to zero of the scale. If the ambient air temperature is less than -30° deg. it is recommended to switch on the radio altimeter 15 minutes before using it. The radio altimeter is switched off by turning the knob of the indicator marked "sw." in the anticlockwise direction.

Remember!

The turning of the knobs of the indicator marked "Sw." and "Range" when switching the radio altimeter on or off or changing the range must be done smoothly otherwise the switches can break.

Electrical inspection of the radio altimeter prior to flight.

When the radio altimeter is switched off the pointer of the indicator must be in the extreme position to the left (beneath zero). When the first range of the radio altimeter is switched on (small heights) and the aircraft is standing on the ground the pointer must be on the zero mark of the scale with an accuracy ± 2 m.

Things placed below the aircraft or near to it at a distance smaller than 10 m (other aircraft, motorcars, barrels, buildings, ladders etc). may increase the deflection of the pointer to a value greater than ± 2 m.

People under the aircraft or near to it (especially near the serials of the radio altimeter) may also be the cause of greater deflection of the pointer from the zero mark of the scale. When the aircraft is taxiing the pointer of PRV-46 may oscillate between ± 5 m.

Prior to every flight it is necessary to check the zero setting of the radio altimeter. To prevent errors due to the causes mentioned above it is necessary to do the setting after the aircraft has taxied to the take-off place at engine revolutions equal to the landing r.p.m. The setting to zero is done by turning the axle of the potentiometer ("Setting of zero - small heights") only in the case when the pointer of the indicator deflects from zero by more than ± 2 m.

Prior to flight it is also necessary to check by means of the power indicator of the testing apparatus T-1 the radiation of the transmitting

series and then, connecting to the transmitter the feeder line of the receiving series, check the operation of the receiving aerial (by radiation).

The checking is done several minutes after the radio altimeter has been switched on - judge by normal burning of the electric bulb of the indicator.

The short time switching on of the radio altimeter in range II (large heights) on the ground with the aim of checking the operation of the range relays and the correctness of the marking II is done by turning the knob of the indicator marked "Range" in the clockwise direction. This usually causes the pointer of the indicator to deflect somewhat from the initial position i.e. an indication that the range relay is operating.

Marker beacon receiver AR-18P.

General data.

The marker beacon receiver AR-18P is intended for receiving signals of the marker beacons beacons and serves for indicating the moment at which the aircraft is passing over it. This moment is indicated by burning of the signal light marked AR mounted on the pilot's instrument panel and by the ringing of a bell.

Installation AR-18P.

1. Receiver AR-18P with a set of tubes and a damped frame.
2. Plug AR-20 or ARH 2.
3. General fuselage aerial.
4. 3V tubes.
5. Encoder of the aerial

Pre-flight inspection.

1. Check the correctness of the mounting of the receiver, the tightness of the nuts, the cables, the dampers and the frame of the receiver.
2. Check the contacts in the contact block of the signalling.
3. Check the presence and the state of the circuit breakers of the alternating currents circuits feeding the radio compasses (on the upper part of the central switch board)
4. Check the presence and the state of the signal light of the marker beacon receiver on the instrument panel.
5. Switch on the main or emergency converter.
6. Switch on ARK-5-I or ARK-5-II (or both)

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7. Send a signal on the receiver's aerial by means of a special testing unit (a small transmitter of the same type as the marker beacon which is placed at a distance 5-7 m from the aircraft).
8. Put the frequency switch of the testing unit's modulation into the position corresponding to the frequency of the modulation.
9. Connect to the socket marked "Checking" on the front panel of the receiver the direct current milliamperometer with a range of 1 or 5 mA (belongs to the set of the testing unit).

When there is a signal from the testing unit the milliamperometer will indicate a current passing through the receiver's relay. Changing the power of the signal of the testing unit (i.e. by changing the power of testing unit or its distance from the aerial of the receiver) it is necessary to make sure that the relay operates from a current intensity of $0,5 \text{ mA} \pm 10\%$ the signal light on the pilot's instrument panel burns and the bell rings.

At a current intensity of $0,4 \text{ mA} \pm 10\%$ the relay must release, the signal light extinguishes, and the bell ceases to ring.

10. If there is no current or it is too weak, then by means of a special screw driver belonging to the set of the receiver KRP-48P adjust the trimmer "I cont." and the trimmer "II cont." on the front panel of the receiver according to the maximum deflection of the milliamperometer. During the adjusting the receiver's casing must be on. After this the current intensity for operating and releasing of the relay is checked again.
11. The receiver is switched off together with the AKK-5.

Glide receiver GRP-2.

The receiver GRP-2 is part of the blind landing equipment and is intended for receiving the signals of the glide marker which determine the glide path of the aircraft.

To the set of GRP-2 belong:

1. Receiver
2. Converter U-18-1
3. Shock absorbing frame
4. Aerial
5. Control panel (in one piece with KRPF)
6. Indicator PSP-48 (in one piece with KRPF)

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7. Two lead H.F. cable RDB-72 with a two-pole junction box 2 pieces
8. Distributing box (in one piece with KRFF)
9. Set of spare tubes

Pre-flight inspection

It is only necessary to check the operation of the equipment. Prior to flight it is necessary:

1. To inspect visually: the aerial the receiver, the distributing box, the feeding and other cables, the control panel of the glide indicator PSP-48.
2. To check all connections and make sure that all connections are in order.
3. If the aircraft net has a voltage less than 25 V or greater than 30 V the equipment cannot operate
4. Switch on central switch board of the radiooperator the automatic circuit breaker marked: "blind landing".
5. Switch on the receiver by means of the switch mounted on the control panel, after this the converter must begin to rotate.
6. Set zero according to the zerocheck apparatus (KPPN). Insert the plug of the KPPN into the plug socket "Testing" placed on the front panel of the receiver, then loosen the stop nut^d the balance potentiometer (to the right under the cover marked "not to remove") and turn the knob of the potentiometer until the horizontal pointer of the indicator PSP-48 comes to stand exactly at the middle of the line of the scale (formed by the points). After regulating secure the axle of the potentiometer.
7. Set the frequency switch on the number corresponding to the wavelength the marker or imitator (GIRM-2) which is placed at a distance of 10-15 m from the aircraft. Turning the knob of the imitator make sure that the pointer of the indicator deflects and that the window of the accident blinker is shut by a black flag.

Warning : Do not forget to switch off the receiver by means of the switch on the control panel after the checking is finished.

Course receiving set KRP-F

The course receiving set KRP-F is part of the blind landing equipment and is intended for receiving the signals of the course marker (phase version) and indicating the middle line of the runway.

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To the set belong:

1. Receiver
2. Converter U-18-1
3. Shock absorbin, frame
4. Aerial
5. Control panel
6. Course indicator PSP-48
7. Distributing box
8. Tubes
9. Two H.F. cables

Pre-flight inspection

Prior to flight it is necessary:

1. To inspect visually: the aerial, the receiver, the distributing box, the feeders, cables, the control panel and the course indicator PSP-48.
2. Check all connections according to scheme.
3. Set the frequency switch on the number corresponding to the wave length of the course marker or imitator.
4. Switch on on the control switchboard of the radio operator the automatic circuit breaker marked: "Blind landing".
5. Switch on the switch on the control panel.
6. Give a signal by means of a special testing apparatus (imitator) KIRM-F which is placed at a distance of no more than 15 m from the aircraft.
7. Check the setting of the indicator's pointer exactly at the middle of the black spot at the middle of the scale. For this purpose press on the control panel the button "checking". If the pointer is not at the middle of the scale open the cover marked "not to remove" loosen by means of a special spanner the stop nut of the potentiometer "balance" and pressing the button "checking" turn the axle of the balance potentiometer until the pointer of the indicator coincides with the middle of the scale. Secure the axle of the potentiometer after regulating it and make sure that when the knob of the indicator is turned the pointer of the indicator deflects to the left or to the right and the window of the accident blinker is shut by a black flag.

Warning.

Do not forget to switch off the receiver by means of the switch on the control panel after the checking is finished.

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Aircraft range finder SD-1General data.

The aircraft range finder SD-1 is intended for:

1. Indicating the distance of the aircraft from the destination or some other aerodrome equipped with a retranslater marker RD-1.
 2. For flying circuits around the landing aerodroms.
- The aircraft range finder belongs to the near navigation and blind landing aids.

Set

The set of the range finder belongs:

1. Transmitters
2. Receiver
3. Range and landing circuits indicator
4. Control panel
5. Receiving aerial
6. Transmitting aerial
7. R.F. feeders

Pre-flight inspection.

Prior to every flight it is necessary:

1. To check the state of the aeriols, of their fastening to the aircraft and their connections with the cables. Rocking of the R.F. connections is inadmissible.
2. Inspect the blocks of the set, their fastenings, to the aircraft and their connections with the cables.
3. Put the switch "comp. channel" on the control panel of the unit into position "off".
4. Connect the aircraft to the ground supply.
5. Switch on the range finder.

Prior to switching on of the range finder the knob "range" must be put into the position corresponding to range 0-30 or 30-150 km according to the scale of the indicator. The knob "Kind of operation" is put into the position "Range finding". The position of the knob is determined by the inscription in the lower part of the indicator. In the considered case in the lower part of the scale must be visible the inscription "Km". After all these operations have been done the range finder can be switched on, this is done by turning the right knob on the control panel marked "off, 1,2,3".

From the position "Off" the knob is put into the position corresponding to the chosen communication channel (channels 1,2 and 3). The switching on of the range finder is signalled by burning of the signal light placed in the upper right - hand corner of the control panel marked "on". (The signal light must begin to burn several seconds after the turning of the knob)

5. Check the radiation of the transmitter of the range finder. For this purpose approach the transmitting aerial to a dipole indicator belonging to the set of the apparatus KIPD-1 and hold it parallel to the aerial. If the aerial is radiating the electric bulb (not a new one) of the indicator will burn. The checking of the range finder by means of apparatus KIPD is to be done according to the description and service instruction of the radio range finder.

Aircraft identification radio SRO.

The aircraft identification radio SRO answers the radio identification signals received from other aircraft or ground radio stations.

Set.

To the set of the SRO belong:

1. Transmitter receiver
2. Code panel
3. Transmitting receiving aerial.
4. Aerial feeder
5. Inertia closer of special circuit
6. Net filter 4-14A.
7. Button

Pre-flight inspection

1. Attention! Any checking of the SRO units can be done only after the plug of the special circuit has been extracted from the plug socket of the transmitter receiver
2. When the special circuit is not operating its plug must be inserted into a false plug socket mounted on the bracket of the transmitter receiver.
3. The plug of the special circuit must be inserted into the plug socket of the transmitter receiver only on special order of the command.

The pre-flight inspection is done in the following order:
Inspect the transmitter receiver, check its deaerons, bonding cables and the contacts of the connections.

Check the fastenings of the net filter, inertia closer and aerial.
Make sure that the ball of the inertia closer is in the centre of the window of the closer. If it is necessary set it into the required position by means of a screw driver.

Check the operation of the SRO under el. load. For this purpose:

- a) switch on the automatic circuit breaker marked "SRO".
- b) switch on the feeding of the SRO by means of the switch mounted on the bracket of the code panel.
- c) Check the operation of the SRO
- d) Press the button for closing the special circuit and check this circuit by burning of the electric bulb on the button of the check light which must be connected prior to that to the plug of the special circuit.

Aircraft intercommunication set SPU-10.

The aircraft intercommunication set enables:

- a) Intercommunication of the crew members
- b) Communication of the crew members with outward stations.
- c) Calling of the required crew member.

List

the set of the SPU belongs:

Participant's apparatus	5 pieces
Supplementary panels	5 pieces
Receiver starting buttons	5 pieces
Converter	1 piece
Net filter	1 piece
Junction boxes	5 pieces
Amplifier	1 piece

Pre-flight inspection

- Check the fastening of all SPU units
- Check the wire netting and the bonding cables of the bundles of cables of the SPU.
- Switch on the feeding of SPU on the radio operator's panel and check the operation of the SPU. When transmitting individual syllables from one

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apparatus the participant at the other apparatus must understand (read) correctly 80% of the syllables.

Note: The aircraft radio communication equipment gives the crew members the following possibilities:

A. Left - hand and right - hand pilots

The pilots can:

1. Communicate externally via:
 - a) The communication radio set RSB-5
 - b) The command radio set RSB-5
 - c) The command radio set RSIU-3m
2. Listen to the telephones of the radio compasses ARK-5-I and ARK-5-II.
3. Join the intercommunication net and call the radio operator.

B. Radio operator.

The radio operator can:

1. Communicate externally via:
 - a) The communication radio set RSB-5
 - b) The command radio set RSB-5
 - c) Listen to the work of the command radio set RSIU-3m
2. Listen to the telephones of the radio compasses ARK-5 and ARK-5-II.
3. Join the intercommunication net and call the pilots.

Attention

1. Should it be necessary the communication radio set can be switched on by the pilots. In this case a signal light is burning on the radio operator's panel which signals that this radio should not be used.
2. The work of the radio operator on the command radio set must be harmonized with the pilots.
3. The apparatus of all crew members must be constantly switched on on net No 2.

Table of the positions of the radio communication switches.

No	To join the	Position of the switch of participants apparatus	Position of the switch on the supplementary panel
1	Communication radio set RSB-5	SVE	indifferent
2	Command radio set RSB-5	RS KOM RS	indifferent

apparatus the participant at the other apparatus must understand (read) correctly 80% of the syllables.

Note: The aircraft radio communication equipment gives the crew members the following possibilities:

A. Left - hand and right - hand pilots

The pilots can:

1. Communicate externally via:
 - a) The communication radio set RSB-5
 - b) The command radio set RSB-5
 - c) The command radio set RSIU-3m
2. Listen to the telephones of the radio compasses ARK-5-I and ARK-5-II.
3. Join the intercommunication net and call the radio operator.

B. Radio operator.

The radio operator can:

1. Communicate externally via:
 - a) The communication radio set RSB-5
 - b) The command radio set RSB-5
 - c) Listen to the work of the command radio set RSIU-3m
2. Listen to the telephones of the radio compasses ARK-5 and ARK-5-II.
3. Join the intercommunication net and call the pilots.

Attention

1. Should it be necessary the communication radio set can be switched on by the pilots. In this case a signal light is burning on the radio operator's panel which signals that this radio should not be used.
2. The work of the radio operator on the command radio set must be harmonized with the pilots.
3. The apparatus of all crew members must be constantly switched on on net No 2.

Table of the positions of the radio communication switches.

To join the	Position of the switch of participants apparatus	Position of the switch on the supplementary panel
Communication radio set RSB-5	SVZ	indifferent
Command radio set RSB-5	KOM	indifferent
	RS	

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3.	Command radio set	UKV	RS	indifferent
	RSI-5 m		RS	
4.	Radio compasses		Suppl.	indifferent
	AK-5-I or II		Panel	AK-1 or AK-2
5.	Intercommunication		SPU	indifferent

Calling is done by pressing the button marked:
"Circ. call".

Tuning and operation of the communication radio set RSE-5 during flight.

1. Switching on of the radio set in flight.

Prior to switching on of the radio set the following tuning operations must be done:

1. Put the switch "receiving - transmitting" on the control panel into the position "receiving" and the switch "telegraph-telephone" into the position "telephone", the position of the switch "25-100%" is indifferent. The position of the frequency switch "1-2-3" is indifferent, but if it is intended to operate immediately after tuning on the tuned in block, then it is desirable to put the switch into the corresponding position.
2. Connect the helmet to the SPU apparatus.
3. Put the switch on the participant's SPU apparatus into the position "communication radio."
4. Pay attention to the aerial unit, the switch of this unit must be in position "off".
5. Put the switch of the aerial into a position corresponding to that aerial on which the tuning will be done and which will be operated. ("Stiff" or "Trailing"). The trailing aerial is used when the ray aerial fails.
6. Switch on the automatic circuit breakers on the central switchboard of the radio operator, marked: "commun. radio" and "control radio".
7. Switch on the feeding on the radio operator's panel.
8. Put the switch on the radio operator's panel into the position "commun. radio" and "control radio".
9. Determine the H.F. block in the range of which the required frequency lies.
10. Put the switch of the block into the position "Esh".
11. Remove the securing of the tuning knob of the block.

- 2. Put the frequency switch into the required position. When the position of the frequency switch is changed the value of the division of the scale and the figures in the window of the scale of the block must be doubled.
- 3. By means of the knob "frequency" adjust the required frequency.
- 4. According to the tuning tables put the tumbler "PS-PH" and the knobs "Tuning of aerial", "commun. roughly" "commun. continuously".
- 5. Press the key on the H.F. block into the extreme left position (position "A") and tuning the knob "Tuning of aerial" near the position determined with the help of the table, achieve the maximum deflection of the indicator on the panel of the radio operator, which is connected to the aerial unit.
- 6. Put the switch of the aerial unit into the position corresponding to the value of the scale of the H.F. block which is tuned in.

Example:

For frequency . . . Hertz	Position of the switch of the aerial unit.
from 2,15 to 3,6	- 10
from 3,6 to 6,0 and from 4,3 to 7,2	- 20
from 7,2 up	- 40

- 17. When the block is switched on by means of the key mentioned above adjust the frequency of the block by means of knob "frequency" according to zero pulsations in the telephones turning it to the right and to the left by no more than a third of a division. The exactness of the frequency setting according to zero pulsating is as high as 0,01 - 0,02 %.
- 18. To increase the volume of the signal during the frequency setting it is necessary to join to the terminal "S" of the aerial unit an insulated lead placed along the lead to the terminal "A" at a distance 1-3 cm. After setting the frequency the lead must be disconnected.
- 19. Put the switch ^{of} the aerial unit into the position "off".
- 20. Press the key into the right position and determine the deflection of the pointer of the instrument on the front panel of the block. When the switch is in the position "E3a" the pointer of the instrument must point to the middle of the green sector. If the pointer is outside the sector the following things must be done:
 - 1st case. operation with in-series scheme, switch in the "PS" position.

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When the pointer does not reach the green sector (too small voltage) it is necessary to increase the bonding of the tube (G-471) with the contour. For this purpose:

- a) Turn to the right by not more than a fifth of a turn the knob "Tuning of aerial" (Increase of self-induction)
- b) By means of the knob "commun." adjust the maximum indication of the check instrument.
- c) Repeat operations "a", "b" until the pointer is in the middle of the green sector and the deflection of the pointer of the check instrument is the maximum at the same time:

When the pointer is behind the green sector (voltage too large)

Do the operations "a", "b", "c" turning the knobs in the opposite direction, i.e. turn the knob "tuning of aerial" to the left (decrease the bonding of the tube with the contour) decreasing the self-induction and increasing the capacitance.

- d) In cases when the knob "commun. continuously" reaches one of the extreme positions and the normal position of the pointer of the instrument is not achieved, it is necessary to change the position of the knob "commun. roughly" to a smaller number (when the knob "commun. continuously" reaches position 0°).

The knob "commun. continuously" must then change its position to greater degrees - If on the contrary the knob "commun. continuously" has reached 110° then it is necessary to put the knob "commun. roughly" to a greater value. - This transfers the knob "commun. continuously" to smaller deg. when the deflection of the pointer is maximal. - When the knob "commun. roughly" has been put into a new position the tuning of the contour must be done with the key pressed into the left position "N". Having tuned the contour the key must be again put into the right position and the tuning is continued according to "a", "b", "c".

In all cases it is inadmissible to get the "correct" position of the check instrument and not to adjust the knob "commun. continuously" in the correct manner. This knob must always be put into a position corresponding to maximum deflections of the indicator and the check instrument. When changing the positions of the knobs the block must be switched off.

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Case .Operation with in parallel scheme, tumbler in the "PR" position.

When the output is engaged in parallel capacitor "commun. continuously" is switched over from the anode of the tube of the output cascade on the terminal "B" of the block i.e. in parallel to the aerial of the aircraft. The capacitors "commun. roughly" remain switched to the anode. Therefore during tuning the operations "a", "b", "c", "d" are done in the opposite direction. When the pointer of the check apparatus does not reach the middle of the sector (too small voltage), the knob "Tuning of aerial" is turned to the left, the knob "commun. continuously" to the right; when the pointer of the instrument passes beyond the green sector the knob "Tuning of aerial" is turned to the right, the knob "commun. continuously" to the left. When the knob "commun. continuously" reaches 0° the knob "commun. roughly" is put to a larger value and when the knob "commun. continuously" reaches 110° the knob "commun. roughly" is put to a smaller number.

The tuning may be done according to the harmonics it is therefore necessary for the position of the knobs to correspond approximately to the tables.

Tuning in of the radio set to aeriels not indicated in the tables.

In doubtful cases and when tuning in to an aerial not indicated in the tables, do the tuning in this way:

Switch the tumbler to the "PS" position, put the knob "commun. roughly" into the position 1, the knob "commun. continuously" into the position 25° and turn the tuning knob of the aerial to the extreme right position (which corresponds to maximum self - induction).

Switch on the block (position "N") and turning the tuning knob of the aerial to the left find the first maximum of the deflection of the indicator of the instrument. Further tuning is done as indicated in paragraph 20 and "a", "b", "c", "d".

If it is impossible to get the normal position of the pointer of the check apparatus it is necessary to change to position "PR" and put the knob into the position given in operation "e" and the in paragraph 20 "a", "b", "c", "d".

21. Having tuned in, switch off the block and secure the knobs carefully.
22. To tune in to the following required frequency perform the operations given above.

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Tuning of the radio set when using quartz stabilization.

If the required frequency must have quartz stabilization then after carrying out the operations indicated in par. 9. do the following things:

25. Pull out the K.F. block from its pedestal, remove the casing and the covers of the tubes. Insert the corresponding quartz into the box near the tube of the directing generator. Put on the cover and the casing and push in the block into the pedestal. Further tuning is done according to par. 9 to 21 excepting par. 16,17,18.

It is to be remembered that for stabilizing a frequency in the first sub-range (switch pulled) the frequency of the quartz must be equal to the required frequency, but when the required frequency lies in the second sub-range (switch pushed) the frequency of the quartz must be equal to one half of the required frequency.

Example. To stabilize a frequency of 12 M.Hertz the frequency of the quartz must be 6 M.Hertz and the scale of the block must be set at 12 M.Hertz (switch pushed). When the switch is pulled the same quartz 6 M. Hertz will stabilize a frequency of the block 6 M.Hertz.

24. The frequencies and tuning data write on the front panel of the tuned blocks.
25. Put the switch on the panel into the position "25".
26. Push the starting button of the radio set on the radio operator's panel and see to it that your conversation is checked.
It must be remembered: that the laringophones are connected in series to the starting button on the radio operator's panel, therefore when operating the microphone it is necessary only to press the button, the switch on the control panel must be in the position "PRM".
27. Put the switch into the position "TLG", "PRD" and operating the key check the telegraphing.
28. Put the switch into the position "PRM".
29. Put the frequency switch into the position corresponding to the next tuned block and repeat par. 26,27.
30. Put the switch into the position "PRM" and check the operation of the receiver.
31. The radio set is tuned and prepared for operation.

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Control of the radio set in flight.

Control of the radio set in flight is done from the control panel while: changing from telegraph to telephone, from 25% output to 100%, from one block to another, and from receiving to transmitting only when telegraphing. When telephoning the change from receiving to transmitting is done, by means of the button on the radio operator's panel.

The radio set must be switched on 1-2 minutes prior to operation. During operation checking of the transmitting part is done by observing the reading of the indicating instrument and listening to the transmission.

When the tumbler "checking of operation- operation of receiver during transmitting" on the radio operator's panel is in position "operation of receiver during transmitting" the low frequency listening is switched off and the transmission will be audible in the telephones if the receiver is tuned in on the frequency of the transmitter.

It is to be remembered that when the tumbler "checking of operation - operation of receiver during transmitting" is in the position "operation of receiver during transmitting" then the receiver operates independently from the transmitter.

Tuning and control of the command radio set RSB-5 in flight.

Prior to switching on of the radio set for tuning the required frequencies it is necessary:

1. To put the switch "receiving- transmitting" on the control panel into the position "receiving", the switch "Telegraph - telephone" into position "telephone" the position of the switch "25-100%" and of the frequency switch is indifferent.
2. To connect the helmet to the participants apparatus SPU-10.
3. To put the switch on the participants apparatus.
4. "SPU" into the position corresponding to the command radio set.
5. For the switch of the aerial unit to be in the "Off" position.
6. To put the aerial switch into the position "Stiff" or "Trailing" (The trailing aerial must be used only if the ray aerial fails).
7. To switch on the automatic circuit breakers on the control switchboard of the radio operator marked "Com. Rad" and "Contr. of radio".
8. To switch on the feeding on the pilot's panel.
9. To put the switch on the radio operator's panel marked "command. radio" into the position "checking of operation".

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The following operations including tuning are done analogical to those with the communication radio set RSB-5.

When the feeding of the communication or the command radio set are switched on by the pilot a corresponding signal light is burning on the radio operator's panel.

Operation of the radio altimeter RV-2 in flight.

Prior to taxiing to the take-off place it is necessary to switch on the automatic circuit breaker on the central switchboard of the radio operator in the radio group marked "RV". The radio altimeter is switched on by turning the knob of the indicator PRV-46 marked "on" in the clockwise direction. The indicator is mounted on the pilot's instrument panel.

Prior to take-off check the zero setting. If the pointer of the indicator PRV-46 is above or below zero it must be set with a tolerance $\pm 2m$. The setting of the zero is done by turning the axle of the potentiometer (setting of zero - small heights).

At take-off and climbing (from the moment of getting airborne) the pointer of the PRV-46 indicator deflects continuously corresponding to the increasing height, at heights over 120 m the pointer of radio altimeter's indicator stops at the right stop (if the first range is switched on). At heights over 240 m above ground it begins to return as the reflected signal weakens and may reach zero again. During flight at heights over 120m it is necessary to switch RV-2 to the second range by turning the knob of the PRV-46 indicator marked "Range" in the clockwise direction. During further climbing of the aircraft the pointer of the indicator PRV-46 will oscillate continuously. At heights over 1200 m the pointer of the PRV-46 indicator switched to the second range stops at the right stop and at heights over 1500 m above ground may leave the stop and oscillate over the whole scale due to the weakening of the reflected signal. The height of flight at which the pointer of the PRV-46 indicator begins to leave the right stop is called sensitivity supply of the radio altimeter.

During prolonged flights at heights exceeding the second range it is recommended to switch off the radio altimeter. When flying over rough country the radio altimeter will indicate the height over obstacles (hills, ravines, mountains, buildings etc). Over woods the radio altimeter indicates the height over ground and only over a dense wood the height over the crowns of the trees. Individual trees or groups of trees don't influence the radio altimeter. Heights or depressions in front of the aircraft are not indicated by the radio altimeter. When flying over mountains with sharp peaks the radio

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altimeter may indicate the distance of the aircraft from the slopes and not from the peaks. The reading may be incorrect and must not be used. During turns the readings of the radio altimeter are unstable and incorrect.

Errors of radio altimeter :

in the first range $\pm 2 \text{ m} \pm 5\%$ of the measured height.
 in the second range $\pm 20 \text{ m} \pm 5\%$ of the measured height.

Operation of the radio compass in flight

Tuning of the transmitter

1. The tuning of the transmitter is done in the following order :
 - a) Put the switch of the kind of operation into the position "AST".
 - b) Put the switch "TLF-TLG" into the position "TLF" if the received station is operating on a modulated signal, and into the position "TLG" if it is operating on a unmodulated signal.
 - c) Put the switch of the subranges into the position corresponding to the frequency of the received station.
 - d) Set by means of the knob "tunia," the required frequency.
 - e) Wait 3-5 minutes after having switched on until the tubes get warm.
 - f) Do the exact tunia, turning the knob in both directions until maximal deflection of the indicator's pointer to the right is achieved (during prolonged continuous operation of the radio compass the exactness of its tuning must be periodically checked).
 - g) Put the switch of the participant's SFU apparatus into the position "Supplementary panel".
 - h) Put the switch on the supplementary panel into the position corresponding to that ARK-5 which is being tuned in.
 - i) Listen in the telephone whether the calling is correctly reproduced, make sure that the required radio station has been tuned in and, after that, regulate the volume of speech.
- Put the switch of the kind of operation into the position "Comp".
 the pointers of both indicators of bearing will automatically turn and will point on the scale of the instrument the course angle of the radio station which has been tuned in.

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II. Operation in Flight.

When using the visual course indicator during flight set the pointer of the course indicator on the radio compass to zero turning the aircraft in the direction of the deflection of the pointer of the radio compass course indicator. Keep to that course according to the zero position of the pointer of the radio compass course indicator. The moment of passing over the radio station is indicated by the turning of the pointer in one direction when the aircraft has passed the radio station flying the same course the pointers SUP and StSh will point to 180°.

Flying in the direction of the radio station using visual indication taking into account the angle of drift, flying in the direction of the radio station using audio indication, flying away ^{from} the radio station, determination of the wind vector with the help of the radio compass, taking bearings, flying in the direction of a radio beacon operating a zone or a bearing must be done according to service instruction AK-5.

Operation of the glide indicating radio set GRP-2 during flight.

To put the GRP-2 set into operation :

- a) Switch on the automatic circuit breaker on the central switchboard of the radio operator in the group "radio" marked "blind landing". This automatic circuit breaker switches on the sets GRP-2 and GRP-F.
- b) Switch on the receiver by means of the switch on the control panel (it simultaneously switches on the sets GRP-2 and GRP-F).
- c) Put the frequency switch into position corresponding to the frequency on which it is intended to operate.
- d) Make sure by the deflection of the pointer and the operation of the blinker that the indicator is operating. Prior to landing it is recommended to press the button "checking of zero" on the control panel to check the balance. The pointer of the glide indicator must point to the middle of the black blot. When approaching the zone of the glide the pointer of the glide indicator PGP-48 will deflect as soon as the pointer reaches the white blot, it is necessary to begin the descent.

The piloting of the aircraft in the zone of the glide is done in two phases : keeping the pointer of the PGP-48 to the centre of the black blot. Keeping the pointer at the upper edge of the black blot then the aircraft is flying at the lower boundary of the gliding zone. This method excludes the possibility of the aircraft's escaping from the gliding zone.

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wards and the unavoidable increase of speed when the aircraft returns to the gliding zone.

When flying in the direction of a G.M. beacon the pointer of the glide indicator (horizontal pointer of the PSP-48 set) deflects upwards when the aircraft deflects downwards from the gliding zone and vice versa. If the aircraft deflects from the glide path by $0,25^{\circ}$ the pointer fluently deflects from its neutral position into the extreme upper or lower position. The glide indicator may thus be used for exact landing approach within an angle tolerance $\pm 0,25^{\circ}$. When using the indicator it is necessary to pay attention to the flag signalling crash. If during the gliding approach a white flag appears beside the pointer this is an indication that the set is out of order and cannot be used.

Warning:

When using the glide indicator it is inadmissible to allow the pointer to leave the black slot.

Operation of the course radio set KRP-F during flight.

If it is necessary to use the set in flight switch on the automatic circuit breaker on the central switchboard of the radio operator in the group "radio" marked: "blind landing". By means of the switch on the control panel K-50 switch on the course radio set, 30-40 sec. after switching on the course pointer of the set PSP-48 deflects to the extreme left or right position and the crash blinker is covered by a black flag. When the aircraft is flying in the direction of the runway towards it the pointer of the course pointer of the PSP-48 set indicates the direction in which the zone lies i.e. when the course pointer deflects to the right this means that the aircraft is to the left of the runway and it is necessary to turn somewhat to the right and vice versa.

When the aircraft is flying in the direction of the runway away from it the course pointer of the PSP-48 set indicates the direction opposite to that in which the zone lies. In this case the aircraft must be turned in the direction opposite to that which the pointer indicates. When the aircraft passes from one side of the zone to the other the course pointer of the PSP-48 set fluently passes from one sector to the other. When the pointer is passing the colour boundary this means that the aircraft is passing the mean line of the zone. When the aircraft is at one side of the zone the position of the course pointer of the PSP-48 set does not depend on the course of the aircraft.

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Landing in the bounds of the runway is safeguarded if during the approach the course pointer of the PSP-48 set does not leave the limits of the black blot. If the course pointer is kept at the left edge of the black spot the aircraft will land to the right of the runway axis. If the course pointer is kept at the centre of the black blot the aircraft will approach the runway along its axis. If the course pointer is kept at the right edge of the black blot the aircraft will land to the left of the runway axis.

Warning If the crash blinker of the course indicator of the PSP-48 set is covered by a white flag this is an indication that the aircraft or the ground equipment is out of order and must not be used. Prior to landing it is recommended to press the button "Checking of zero" on the control panel for purpose of checking the balance. The pointer of the course indicator must point to the middle of the black blot. If this is not so the pointer must be set to zero by means of the indicators' adjusting device.

Operation of the aircraft range-finder SD-1 in flight.

Attention : The switching on of the range finder must be done several (5-10) minutes prior to using it. This time is necessary for warming up of the tubes and other components. The aircraft radio range finder belongs to the near navigation and blind landing equipment. The aircraft range finder SD-1 operates together with ground retranslating beacons RD-1. If it is necessary to use the radio range finder during blind landing or other purposes it is necessary to order by means of the communication radio set the operation of the ground retranslating beacon and then switch on and check the operation of the aircraft range finder. If it is operating correctly set the range at 150 km. If the ground retranslating beacon is operating the receiver of the aircraft range finder must receive the retranslated signals of the beacon and the pointer of the indicator of the range finder must point the distance of the aircraft from retranslating beacon. The electric bulb "calling signal" must extinguish and flare from time to time according to the code of the retranslating beacon. As the distance changes the pointer of the range finder changes its position accordingly and is indicating at every moment the distance of the aircraft from the aerodrome on which the retranslating beacon is placed. The distance is measured along an inclined line joining the aircraft and the retranslating beacon. When the distance gets smaller than the maximum distance of the first range (50 km) it is necessary to switch over to the first range 0-50 km. This is done by turning the knob "Range" of the range

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finder. When the range finder and the responding retranslater are operating normally the pointer of the range finder must not oscillate. If the pointer is moving irregularly this is an indication that the instruments are out of order. When the distance of the aircraft from the retranslater is greater than the upper limit of the range the range finder begins to look for answering signals the pointer of the range finder oscillates regularly and the signal light "Code" is flashing constantly. If this happens while the first range is switched on it is necessary to switch over to the second range. If this happens when the distance exceeds 150 km and the aircraft is flying away from the retranslater the range finder must be switched off. While measuring distance the pointer of the indicator may leave the point of the scale corresponding to the measured distance, reach the end of the scale and return back. This is due to short time interruption of the communication between the range finder and retranslater. Such interruptions may occur for instance during sharp banks of the aircraft. They do not interfere with the range finding and are not an indication of a failure of the equipment. In order to make sure that the correct retranslating beacon has been chosen for the range finding determine its calling signal by observing the signal light "Code". Its flashes must correspond to the calling signal of the retranslating beacon the distance from which is measured. The calling signals are transmitted by the retranslater in equal time intervals about twice in a minute. If it is known that in the chosen channel are also operating other retranslating beacons and that their distance lies within the range of the range finder the distance from every of them can be measured. There may be no more than two or three such retranslating beacons operating on the same channel and situated at a distance of 250 - 300 km from one another but within the range of the range finder. The transition from the measuring of the distance from one retranslating beacon to another operating on the same channel is done by pressing the button "tuning over" on the control panel of the range finder for a short time. This interrupts the operation of the range finder with one retranslating beacon and it will go over to operation with another retranslating beacon situated at another distance from the aircraft. In this case after the button "tuning over" has been pressed the pointer of the distance indicator will leave its previous position and move to another point of the scale corresponding to the distance from another retranslating beacon.

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This beacon is identified by its calling signal by means of the code signal light as explained above.

If it is necessary to measure the distance from other retranslating beacons operating on other channel then put the knob "Channel of commu." on the control panel into a position corresponding to the communication channel on which this retranslating beacons are operating.

3. Using of the range finder for circling flight.

Circling flight about the retranslating beacon is done at the order of the dispatcher of the aerodrome on which the aircraft will land. In this case the dispatcher must tell the pilot of the approaching aircraft the number of the orbit on which he must stay while waiting for his turn to land. After getting this directions the knob "Orbits" on the control panel is put into the position corresponding to the radius of the given orbit. Prior to approaching the orbit gauging of the scheme of orbits is done. The knob "Kind of operation" is put into the position "Orbits" (the inscription in the lower part of the scale of the range finder changes from "In" to "Orbit" the button "Setting of orbits" is pressed. The pointer of the range finder must stop at the mark "0" of the orbit scale (at the middle of the scale) if it steps to the right or to the left from this mark then it is necessary to adjust the gauging of the scheme of orbits by turning the knob of this button to the right or to the left until the pointer occupies the required position. After this it is again necessary to change over to range finding in the first range 0-30 km and watch the approach of the aircraft to the distance corresponding to the radius of the required orbit.

At the moment of approaching the orbit it is necessary to switch the knob of the range finder marked "Kind of operation" to the position "Orbits". In the lower part of the scale of the range finder must appear the inscription "Orbit" and the pointer must occupy a position near the zero of the scale of orbits i.e. about at the middle of the scale if the aircraft has exactly entered the required orbit.

If the change from range finding to circling flight was done at a distance from the retranslating beacon greater than the radius of the required orbit the pointer of the indicator will deflect to the left of the zero mark of the orbit scale. Then it is necessary to fly nearer to the aerodrome. If the change was done at a distance smaller than the radius of the required orbit the pointer of the indicator will deflect to the right of the zero mark of the orbit scale. In this case it is necessary to fly away from the

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control.

When the aircraft is flying exactly at the required orbit the pointer of the range finder is keeping all the time near the zero mark of the orbit scale.

When using the range finder as "zero indicator" during circling flight it is necessary to remember that its sensitivity sharply increases. In this case the deflection of the pointer to the extreme left or right position corresponds to a deviation from the required orbit by approximately 100 - 1500 m. Exact flying along the orbit so that the pointer of the indicator does not deflect from zero requires good training. During circling flight it is also necessary to watch that the signal light "collided" is not burning. When there are response signals and the range finder is operating correctly this signal light must burn only at moments of receiving the response signals. Uninterrupted burning (when no response signals are received) is an indication that the communication between the range finder and the retransmitting beacon has been interrupted. The pointer of the orbit indicator will be in the extreme left or right position or will be oscillating in the middle of the scale. In this case it is necessary to operate the range finder in the first range and go over to orbit searching only after the response signals have been received. The moment of transition of circling flight and landing or of transition to another orbit is indicated by the dispatcher of the aerodrome. When going over to another orbit it is only necessary to change the position of the indicator "orbits" on the control panel.

III. Use of the range finder for determining the distance of the aircraft

from the landing point when flying in the direction of landing.

The range finder indicates the distance of the aircraft from the runway passing through the beginning of the runway it gives when the aircraft is flying in the direction of landing the distance of the aircraft from the beginning of the runway. When going over from circling flight to the landing course it is necessary to put the knob "field of operation" of the indicator of the range finder into the position "Range". The knob "range" into the position corresponding to small distances. If the aircraft is going to land then in order of increasing the accuracy of measuring of the distance from the landing point it is necessary prior to beginning the landing approach to check and, should it be necessary, adjust the setting to zero of the range scale.

For this purpose the pilot must press the button "Setting of zero" on the control panel (the pointer of the range indicator will move to the left) and wait until the pointer stops. If the pointer does not stop exactly at the zero mark then it is necessary without releasing the knob to turn it until the position coincides with the zero. Having done this the landing approach may be begun. At the moment of touch down (if the touch down has been executed exactly at the beginning of the runway) the pointer of range finder must point to zero. If for some reason the landing was not done, then after the aircraft has passed the beginning of the runway the pointer of the range indicator will go somewhat beneath the zero, that is an indication that the aircraft is inside the circle passing through the beginning of the runway. Then it will pass the zero mark again (the aircraft is again outside the mentioned circle) and the reading of the range finder will increase again according to the distance travelled by the aircraft.

III. Use of the range finder for determining the velocity of approaching the aerodrome and of the time necessary to reach it.

To determine the velocity with which the aircraft is approaching the aerodrome it is necessary to measure by means of a stopwatch the time during which the aircraft has flown a certain distance indicated by the range finder. The velocity is found by dividing the distance through the corresponding time. To determine the time during which the aircraft will reach the aerodrome it is necessary to divide the distance indicated by the range finder through the velocity found.

Serviceing.

1. After every 25 flight - hours.

1. Inspection of aeriads.
1. Check the fastenings of the aeriads
2. Check the insulators and anti-icing shields.
If it is necessary clean the insulators and shields from dirt.
3. Check the state of the dampers of the aerial.
4. Check visually the inspection doors of the internal aeriads.
5. Check the fastening of the V.S.F. units.
Make sure that the flanges of the aeriads seat tightly on the aircraft structure. Check if the porcelain rings of the radio altimeter aerial intact.
6. Tighten the nuts of the feeders of the aerial.
7. Tighten the nuts of the contacts of the passage insulators.

II. Inspection of the radio equipment in the rear part of the fuselage.

1. Check the mechanical condition, the fastening and cleanliness and the tightness of:
 - a) Dials, casings and bundles of cables
 - b) Casings, front panels, dippers, transmitter receiver of the radio altimeter, receiver and transmitter of radio range finder, transmitter of the DRC.
2. Check the contact of the lugs of the cables of the radio equipment. If it is necessary clean them.
3. Tighten the nuts of all cable connections.
4. Check if the correct size of circuitbreakers is used.
5. Check the intactness and the contacts of the bonding cables.

III. Inspection of the radio equipment in the radio compartment.

1. Check the mechanical strength, fastenings and cleanliness of:
 - a) Casings and front panels of all units of the radio equipment in the radio compartment.
 - b) Casings of loop aerials of the radio compasses RKR-5.
2. Check the colour of the crystals in the detectors.
3. Check the shielding of the cables and the bonding cables of all units of the radio equipment.
4. Check the shock absorbers and the fastening of all units of the radio equipment.
5. Check the aerial connections and the contacts of the aerial circuit.
6. Check the plug connections and clean the contacts if necessary.
7. Check the flexible shafts of the tuning mechanism. Clean them if dirty.
8. Check the tightness of the nuts of the plug connections and tighten them.
9. Check circuitbreakers and make sure whether they are of the correct size.
10. Check the paint of the glassfibre covers of the internal aerials.

IV. Inspection of the radio equipment in the radio-operator's cabin and in the cockpit.

1. Check the mechanical state, cleanliness and fastenings of:
 - a) Front panels of all radio equipment, casings, chassis, dials, other instruments.
 - b) Bonding cables, lugs of the cables, flexible shafts.

Check the shock absorbers of the units.
 Check for rust of the internal fuselage aerial.
 Pay special attention to the contacts of the aerial circuit at the
 insulators, switches, units.
 Check the circuit breakers and make sure that they are of the correct
 size.

Checking of the operation of the units of the radio equipment.

1. Check the radio altimeter PV-2 means ^{by} of the testing instruments T-1
 and T-2.
2. Check by means of SG-1 the operation of the MRP-48 receiver. If the
 relay does not operate at current intensity $0,6 \text{ mA} \pm 10\%$ and ceases
 operation at $0,4 \text{ mA} \pm 10\%$ it must be regulated in the radio laboratory.
3. Check the range finder SD-1 as to:
 - a) Frequency of the tuning of the generator of the transmitter.
 - b) Power of the generator of the transmitter.
 - c) Frequency of the tuning of the heterodyne of the receiver.
 - d) Total sensitivity of the receiver.
 - e) Total operation of range finder
 - f) Communication channels.
 - g) Range of search.
 - h) Setting of orbits.
 - i) Operation of the calling signals scheme.

For all checking are used instruments KIPD-1 and KIPD-3.

4. Check the tubes of the radio set RSIU-3a whether the incandescence thread
 is intact, whether there is emission current and check the steepness.
5. Lubricate the ratchet, pawl and the stop spring of the pulse motor
 RSIU-3a.
6. Inspect the channel switches of the radio set RSIU-3 a.
7. Check the operation of the receivers KRP-2 and KRP-F by means of the
 imitators of the glide and the course beacon GIRM-2 and KIAM-F
 respectively.

VI. Inspection of converters.

1. Check the collectors, panels, the easy rotation of rotors and the control
 of the brushes.
2. Remove the dust from the collectors of the converters by blowing with
 compressed air.

3. Wipe the collectors with a clean rag moistened with petrol B-7C or alcohol.
4. Check if the brushes move easily in the brush holders. If seizing occurs polish the brush with fine glass paper No 00 at the place of seizing.
5. If it is necessary exchange the brushes. The brushes must be exchanged if their height is less than :
 - for RU -11 AM less than 9 mm.
 - for PO-500 less than 16 mm (brushes of the collector)
less than 8 mm (brushes of the rings)
 - for PO-1500 less than 16 mm (brushes of the collector)
less than 14 mm (brushes of the rings)
 - for RUK-3ORB less than 14 mm (low voltage brushes)
less than 8 mm (high voltage brushes)
 - for U-18-1 less than 8 mm.

The new brushes must be carefully ground to the collector with fine glass paper No 00.

To use emery paper for grinding is strictly forbidden.

The new brushes must be of the same make as the old ones.

VII. Checking of telephones and laringophones.

1. Check the telephones and laringophones, make sure that: the cables are intact, their connection to the plugs in on order and their lugs are clean.
2. Check the tightness of the laringophones, measure their resistance. Check the regulation of the membranes of the telephones.

Servicing after 50 flight - hours.

1. Determine with the help of the history list which units of the radio equipment must be removed for prolonging their life.
2. Do the Servicing prescribed after 25 flight-hours.
3. Inspect all plug connections and clean them by means of a rag moistened with alcohol or ethylles petrol.
4. Inspect and clean with petrol or alcohol the contacts of the following relays : E 101, E 102, E 103, E 201, E 202, E 203, E 301, E 302 of the radio sets RSE-5.

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6. Check all thread connections and the tightness of all nuts and sleeve nuts.
7. Check all aircraft radio transmitters whether the following data correspond to the technical requirements: intensity of current in the aerial, deepness of modulation, exactness of gauging and the feeding. Check the mounting and the details.
8. Check the sensitivity, the exactness of gauging, the own noises the output voltage, the mounting and the details of all aircraft receivers.
9. Remove the flexible shafts of tuning mechanism wash them, wipe them dry, inspect the cover and the details and inject a not freezing and not corroding lubrication into them. Lubricate their outside lightly.
10. Check the spare tubes as to: intactness of incandescence thread, emission current and steepness.
11. Check and supplement if necessary the spares of the radio equipment.

servicing after 100 flight - hours.

1. Do the servicing required after 50 flight - hours.
2. Inspect the contact rings of the internal fuselage loops MK-5.
3. Check the shock absorbers and exchange them if necessary.
4. Fill the ball bearings of the converters with CIATIK-201 lubricant (as needed).

CHAPTER XI.

INSTRUCTIONS FOR DISMOUNTING OF AIRCRAFT COMPONENTS

1. Mounting and Dismounting of Power Unit Main Parts.
 - A. Detachment and Installation of the Power Unit.

Each power unit of aircraft may be removed from the aircraft as one general assembly. The dismounting is effected at the fireproof bulk head of the engine nacelle at the former No.1. Here are to be detached the engine mount and all pipe-lines are here disconnected, as well as the engine control and the electric leads.

Before dismounting the power unit, it is necessary:

- a/ remove the propeller from the engine according to this instruction.
- b/ remove the engine cowling
- c/ drain the oil from the oil tank, oil cooler and from the pump.
- d/ close the fire cock of the fuel system.
- e/ disassemble the following pipe-lines and hoses marked by two white strips.

For the Oil System.

- 1/ The hose of oil supply to the MS - 7SV
- 2/ Return pipes from the oil cooler and diluting hose
- 3/ The hose for draining the oil tank
- 4/ Two hoses of the decelerator tank
- 5/ The pipes of the propeller governor pump
- 6/ Two hoses of the oil pressure pick-ups

For the Fuel System.

7. The hose of the fuel supply to the unit 704.

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- 8/ The return line of fuel from the unit 704
- 9/ The hose of return fuel from HV-82.
- 10/ The hose to HV-82.

For the Servicing Systems.

- 11/ The pipes of the Propeller anti-icer equipment
- 12/ Two hoses of the PŠ-13 hydraulic pump
- 13/ Two hoses of the supercharging system.
- 14/ Pipe for measuring of output pressure of impeller Pk.
- 15/ The pipes of the air intake of anti-icer equipment.

For the Engine Control.

- 16/ Disconnect the push pull rod of the throttle control.
- 17/ The push pull rod of the automatic corrector control.
- 18/ Cables of the constant speed governor control.

For the Electric Leads.

Disconnect the plug-and-socket connections and all instrument covers interfering with the dismantling of the engine.

Disconnect the minus lead from the generator and starter.
 CAUTION: All holes on the engine and all pipe-lines, which have to be opened during the dismantling should be immediately closed by plugs or wrapped into cellophan and bound with wire.

f/ Disconnect the two clamps of the exhaust collector joint with the pipes.

g/ Transport to the power unit of the aircraft a crane of lifting capacity of minimum 1,5 tons.

h/ Fasten to the engine the cables for suspending of the engine.

For this purpose it is necessary to unlock and unscrew

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the nuts of bolts of release valve levers of the cylinders No. 1, No. 13, No. 3, and No. 14. Put the hinge plates on the cylindrical surfaces of the nuts and screw on the nuts on the lever bolts. The front hinge has to be attached to the bolt of the cylinder No. 2 release valve lever and to the bolt of the cylinder No. 14 valve lever and rear hinge is to be attached to the bolt of the cylinder No. 13 release valve lever and to the bolt of the cylinder No. 3 release valve lever.

Unscrew four nuts of the engine mount assemblies and remove by aid of the crane the power unit.

The mounting of the power unit has to be accomplished in the reverse sequence.

CAUTION: Before dismounting the power unit from the aircraft, place under the former No. 48 of the fuselage the tail support /see fig. 273/.

B. Dismounting and Installation of the Fuel Tanks.

For dismounting the fuel tanks, it is necessary:

- 1/ Drain the fuel from the whole group and close the connecting cock.
- 2/ Remove the corresponding access door on the lower skin of the wing.
- 3/ Disconnect the fuel supply and draining hoses and pipes.
- 4/ Disconnect the banding strips.
- 5/ Release the rubber covers on the filler neck.
- 6/ Disconnect the attachment straps and remove the tank.

The installation of the tank is to be carried out in the reverse sequence.

CAUTION: After installation of the fuel tanks, refit to their places the bolts of the panels attachment painted in blue paint.

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c. Dismounting and Installation of the Oil Tank.

For dismantling of the oil tank, it is necessary to:

- 1/ Drain the oil from the oil tank.
- 2/ Disconnect the supply and return hoses of oil, the main hoses and the hose to the feathering pump.
- 3/ Disconnect the bonding strips.
- 4/ Remove the oil level gauge receiver.
- 5/ Disconnect the two attachment straps and remove the oil tank.

The installation of the oil tank is to be carried out in the reverse sequence.

III. Dismounting and Mounting of the Aircraft

Main Components.

a. Dismounting and Installation of the Detachable

Part of Wing / Outer Section/.

The dismantling of the wing detachable part is to be effected in the following order:

1/ Remove the upper and lower fillets of the centre section joint with wing outer section.

2/ Drain the fuel from the corresponding groups of fuel tanks; the cross-feed should be closed.

3/ Through the access hose in the centre section, disconnect the fuel and electric ducts from the side of the centre section.

4/ Remove the clamps of the anti-icer equipment pipeline.

5/ Disconnect the plug-and-socket connections.

6/ Disconnect the turn buckle of the aileron control cables.

7/ Unscrew the attachment bolts of the wing flap hinge bearings.

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8/ Disconnect the push pull rod running to the assembly of the wing flaps control.

9/ Unlock and unscrew the nuts of the wing flaps hinge eye bolts.

10/ Remove the wing flaps and ailerons.

11/ Bring supports and place them under the detachable part of wing.

12/ Unscrew the plugs and screw in the eyebolts for the wing transport and attach to the hoisting installation.

13/ Unscrew nuts and remove the bolts of the joint upper spar, leaving per 10 bolts in the area of spars. Remove the bolt in the direction from the front to the rear spar.

14/ Stretch lightly by means of the hoisting crane the slings and remove the remaining bolts.

15/ Remove the detachable part of wing.

CAUTION: When hoisting the wing, it is forbidden to stand below the detachable part of wing.

16/ Unscrew the attachment bolts of the joint rib and remove the same.

17/ Carry out the installation of the wing detachable part in reverse sequence. When mounting and assembling the detachable part of wing with the centre section, use torque wrenches with the effort of 200 ± 20 kg per sq.cm. After the installation of the new wings, effect the rigging with the corresponding note in the aircraft logbook.

B. Dismounting of the Tail Cone and the Elevator.

1. Unscrew and remove the bolts of the fillets attachment.

2. Disconnect the electric leads of the tail cone at the former 48 /plug-and-socket connection/

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3/ Dismcrew and remove the bolts of the tail cone attachment and remove the cone.

C. Dismounting of the Tail Plane.

- 1/ Remove the tail cone and the fillets.
- 2/ Remove the bolts of the tail plane attachment to the outline of fuselage.
- 3/ Disconnect the pipe of the anti-icer equipment.
- 4/ Remove the elevator.
- 5/ Disconnect the half of the former No 48 having first removed the vertical profiles of the tail plane.
- 6/ Disconnect the inlets of the radio altimeter aerials.
- 7/ Remove the tail plane.

D. Installation of the Tail Plane.

- 1/ Fit the tail plane to the fuselage outline, fasten it by means of four bolts and effect the rigging.
- 2/ Fit and tighten the bolts of the tail plane attachment to the fuselage outline.
- 3/ Mount the vertical profiles to the former No 48 and to the tail plane.
- 4/ Mount the fillets, tail cone and the elevator.
- 5/ Connect the leads to the RV-2 aerial.
- 6/ Connect the pipe of the tail plane anti-icer equipment.

E. Dismounting and Mounting of the Elevator.

When carrying out the dismantling it is necessary to maintain the following order:

- 1/ Remove the tail cone.
- 2/ Disconnect the cables of the elevator and trim-tab

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control in the tail section, by undoing the turnbuckles.

3/ Disconnect the bonding strips at the hinge assemblies.

4/ Remove the thiokol putty and unscrew the thrust screw on the end portion of the tail plane.

5/ Unscrew the attachment bolts of brackets of hinge assemblies on the tail plane /three hinge assemblies/ holding the elevator.

6/ Remove the elevator.

When reinstalling it is necessary to maintain the following order:

1/ Fasten the brackets of the elevator hinge assemblies on the tail plane.

2/ Screw in the thrust screw in the end portion of the tail plane, and fill the holes with thiokol putty. Before installing the thrust screw apply prime paint.

3/ Connect the bonding strips in the hinge assemblies.

4/ Connect the cables of the elevator and trim tab control.

5/ Adjust the cables and check the operation of the elevator and trim tab.

6/ Accomplish the mounting of the tail cone paying attention to the clearance between the elevator and the tail cone which should be 10 ± 4 mm.

F. Dismounting and Mounting of the Rudder.

When dismounting the rudder it is necessary to maintain the following order:

1/ Disconnect the cables of the rudder control in the tail section.

2/ Disconnect the electric leads of the trim tab control

3/ Fit the support abutment.

4/ Unscrew the support screw in the upper part of the fin.

5/ Disconnect the hinge assemblies of the main wing section fin.

6/ Remove the rollers.

When mounting the roller it is necessary to install in the following order:

1/ Connect the hinge assemblies to the fin.

2/ Screw in the support screw in the upper portion of the fin.

3/ Fit the support abutment by means of four screws in the tail section.

4/ Connect the cables of control and accomplish the adjustment.

5/ Connect the electric leads of the trim tab control.

8. Dismounting and Mounting of the Ailerons and Wing Flaps.

Dismounting and installation of the ailerons and wing flaps is to be effected in an analogous way. When dismounting maintain the following order:

1/ Unscrew the bolts and remove the fairings of the kingpins brackets.

2/ Open the access doors of the aileron sectors.

3/ Disconnect the push-pull rod connecting the control sector with the aileron block.

4/ Remove the cotter pins and unscrew the nuts of bolts of the aileron attachment to the brackets, remove the bolts, having first disconnected the bonding.

5/ Remove the ailerons.

3/ Remove the rudder support abutment.

4/ Unscrew the support screw in the upper part of the fin.

5/ Disconnect the hinge assemblies of the rudder from the fin.

6/ Remove the rudder.

When mounting the rudder it is necessary to maintain the following order:

1/ Connect the hinge assemblies to the fin.

2/ Screw in the support screw in the upper portion of the fin.

3/ Fit the support abutment by means of four screws in the tail section.

4/ Connect the cables of control and accomplish the adjustment.

5/ Connect the electric leads of the trim tab control.

8. Dismounting and Mounting of the Ailerons and Wing Flaps.

Dismounting and installation of the ailerons and wing flaps is to be effected in an analogous way. When dismounting maintain the following order:

1/ Unscrew the bolts and remove the fairings of the brackets.

2/ Open the access doors of the aileron sectors.

3/ Disconnect the push-pull rod connecting the control sector with the aileron block.

4/ Remove the cotter pins and unscrew the nuts of the aileron attachment to the brackets, remove the bending first disconnected the bending.

5/ Remove the ailerons.

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- 3/ Remove the rudder support abutment.
- 4/ Unscrew the support screw in the upper part of the fin.
- 5/ Disconnect the hinge assemblies of the rudder from the fin.
- 6/ Remove the rudder.

When mounting the rudder it is necessary to maintain the following order:

- 1/ Connect the hinge assemblies to the fin.
- 2/ Screw in the support screw in the upper portion of the fin.
- 3/ Fit the support abutment by means of four screws in the trail section.
- 4/ Connect the cables of control and accomplish the adjustment.
- 5/ Connect the electric leads of the trim tab control.

G. Dismounting and Mounting of the Ailerons and Wing Flaps.

Dismounting and installation of the ailerons and wing flaps is to be effected in an analogous way. When dismounting maintain the following order:

- 1/ Unscrew the bolts and remove the fairings of the hinge brackets.
- 2/ Open the access doors of the aileron sectors.
- 3/ Disconnect the push-pull rod connecting the control sector with the aileron block.
- 4/ Remove the cotter pins and unscrew the nuts of bolts of the aileron attachment to the brackets, remove the bolts, having first disconnected the banding.
- 5/ Remove the ailerons.

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and the installation of the ailerons in reverse.

II. Dismounting and Mounting of the Rudder and Aileron Trim Tabs.

The dismounting and mounting of trim tabs of the control surfaces / with the exception of the rudder/ and of the aileron is to be effected in an analogous way.

1/ Disconnect the push-pull rod of the trim tab control having first removed the nut and bolt.

2/ Extract the hinge pin connecting the trim tab with the elevator or aileron. The installation should be effected in the reverse order.

For the mounting of rudder trim tab it is necessary to:

1/ Disconnect the control push-pull rod from the assembly on the trim tab.

2/ Open the access doors of the trim tab hinge assemblies by aid of a special wrench.

3/ Unscrew the nuts of the hinge bolts of the trim tab suspension by aid of a special wrench.

4/ Remove the trim tab.

The mounting of the trim tab is to be effected in the reverse order.

III. Replacing of Wire Rope Lines.

During service it is necessary to check regularly the condition of the control cables, especially in the area of rollers and guides, as at the points of bends the possibility of wear or damage of the cables is most probable. When inspecting it is necessary to check the cables for damages, make sure that the rollers are in proper condition, check the condition of the cable

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building of the thimbles, the setting of turnbuckles, make sure that the cables do not brush against the aircraft details and that they are correctly placed on the rollers.

If revealing damage of the paint and oil coating of the cables, which may be determined after the metallic glitter, it is necessary not only to inspect carefully the condition of the cable in this place, but also to find out the causes for the damage of coating and to provide measures for their removing. Rusted cables have to be wiped with rags dipped in dehydrated arsenic and then wiped dry. The cables have to be replaced in case of the following defects:

untwisting of the threads and strands of the cable, tears and wear of the cable threads, reduction of the cable diameter, tears of the cable and corrosion of different portions of the cable.

When replacing the cable it is necessary to follow the below stated instruction:

- 1/ When assembling or replacing parts apply only NK-30, KV or CIATIB - 201 grease.
- 2/ When assembling and installing the parts it is necessary to remove the preserving grease, to dry and grease by the indicated greases.
- 3/ When assembling achieve the minimum possible value of friction.

4/ After fitting the new cables and prior to their installation on the aircraft the cables should be prestressed for a period of 5 minutes by effort equalling 50% of the ultimate load, which for the cables /figure 7/ 7-19-4 makes out 640kg. for the 7-19-3 380 kg, for 7-7-2 190 kg and 7-19-5 900 kg.

3/ Prior to the installation of the cable roak seats in
 mixture consisting of 50% 171 lacquer and 50% linseed oil.
 Duration of soaking 15 - 20 minutes and then dry at the tempe-
 rature of 40 - 45 degr. for the period of 4 - 5 hours.

4/ When adjusting the cables it is necessary to make
 use of the table 2.

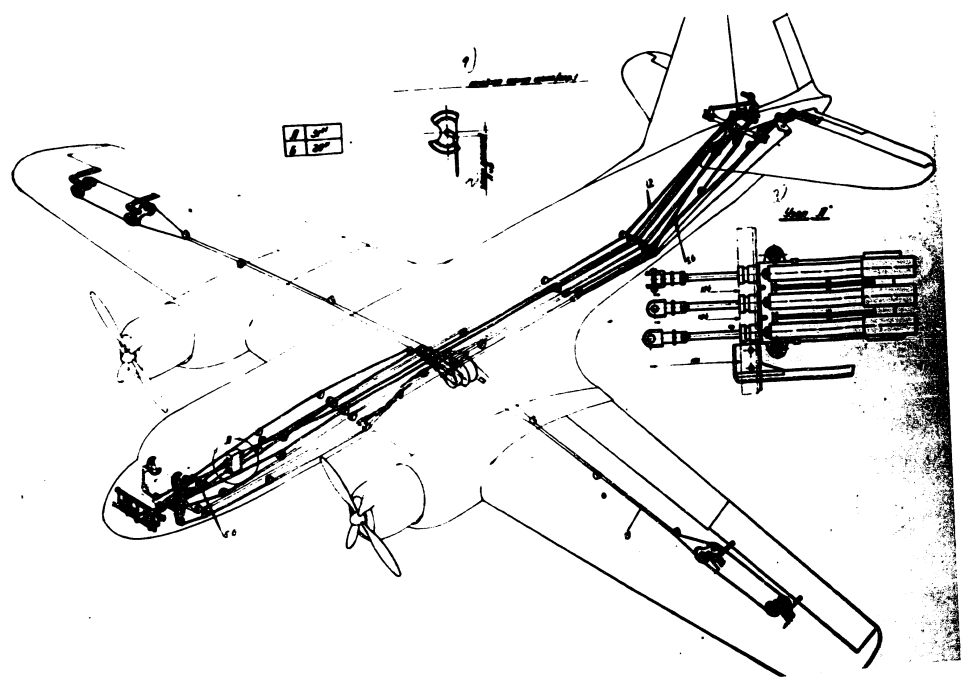


Figure 7. Aircraft Control Diagram.

Table No. 3. of the Required Tension of Cables
of the Adjustment /Permissible Divergence of the
Cables Tension Maximal 20 % /

Denomination	Cable diameter	Cable tension: in kg
Elevator control	4	40
Ailerons control	4	40
Ailerons control	5	50
Trim tab control	3	20
Lock control	3	50
Lock control	3	20
Lock control	5	10
Rudder control	4	40

The tensile stress is given for the temperature of
+ 20 degr. Centigrade.

For the tension of cables in dependance on the temperature
use the diagram /figure 9/.

CAUTION: When adjusting the cables tension by means of turn-
buckles follow strictly the instructions of figure 10.

The clearances between the cables and their limiters on
the rollers should be in dependance from the diameter in the
limits of 0.5 - 1 mm.

Friction factor in control /fully assembled/ should not
exceed the following values:

a/ for the control of the elevator /in the centre of the
steering wheel rotation/:

in direction of flight beginning 2.5 ± 0.5 kg
end 1.5 ± 0.5 kg

against direction of flight: beginning 5 ± 0.5 kg
end 3 ± 0.5 kg

CABLES TENSION DIAGRAM IN DEPENDANCE UPON THE TEMPERATURE.

Fig. 8.

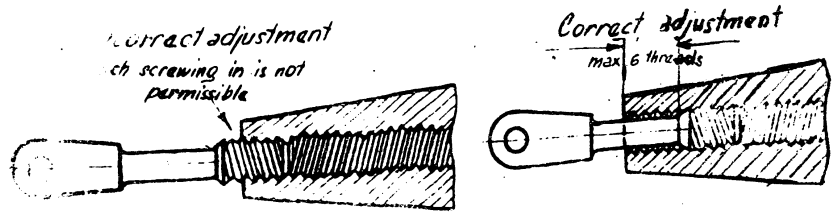
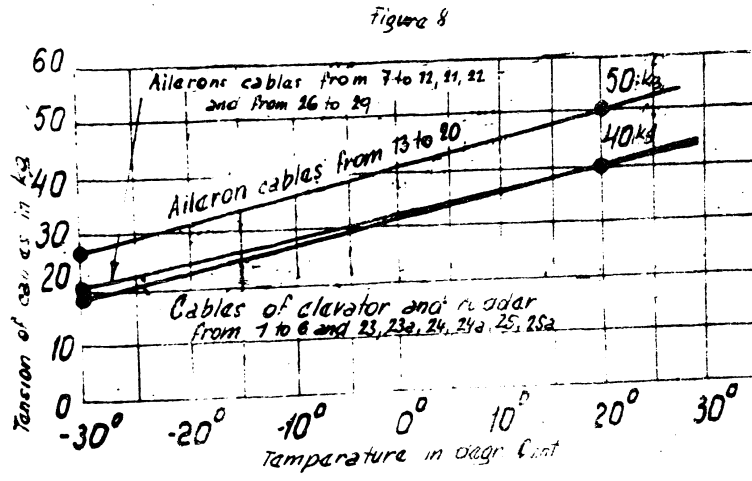


Figura 9.

Fig. 9.

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a/ for the control of the ailerons on the radius of the steering wheel / on the handle axis/:

left - beginning	3 ± 0.5 kg
end	4.5 ± 0.5 kg
right - beginning	3 ± 0.5 kg
end	5.5 ± 0.5 kg

c/ for the rudder /in the centre of the step/:

left - beginning	6 ± 0.5 kg
end	10 ± 1 kg
right - beginning	4 ± 0.5 kg
end	8 ± 1 kg

At this:

The effort required for the turning of steering wheel of the elevator trim tab control should not exceed 4 kg.

The effort required for the locking of the rudders and ailerons should not exceed 9 kg at the beginning of locking and 15 kg at the end of travel of the locks control handle.

The effort required for the simultaneous setting of the parking brakes and of the locking system should not exceed 40 kg.

IV. Instructions for the Adjustment of the Control.

A. Elevator.

a/ loosen the turnbuckles in the tail section and at the former No 8.

b/ set the control column under the angle of 7 degrees to the vertical axis of the aircraft.

c/ set the elevator into the neutral position.

d/ set the rods of the automatic pilot servo-unit so as to maintain the distance of 170 mm / figure 7/.

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a/ adjust the tension of the cables by means of the turnbuckles keeping the tension in dependence upon the temperature.

B. Rudder.

a/ Loosen the turnbuckles of the cables in the tail section and at the former No.8 in the fuselage.

b/ lock the rudder in the neutral position,

c/ set the pedals into neutral position and fix them by means of clamps,

d/ set the rod of the AP-45 /automatic pilot/ servo - unit so as to maintain the distance from the exit of the rod to the axis of the bolt for the cables attachment at the value of 154 mm,

e/ adjust the length of the cables / in case of their replacement/ and tend the cables by means of the turnbuckles keeping the cables tension in dependence upon the temperature of the ambient air.

C. Ailerons.

a/ Loosen the turnbuckles of the ailerons cables,

b/ lock the central drum,

c/ set the ailerons sector at the rib No 14 maintaining the distance A /figure 7/,

d/ set the sector at the rib No.20 maintaining the distance B /figure 7/,

e/ adjust the lengths of the push-pull rods,

f/ set the steering wheels of the control columns into central position,

g/ set the rod of the AP - 45 servo-unit so that the distance of the protruding part of rod from the axis of the cable attachment bolt should equal 154 mm,

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adjust the tension of the cables by means of the turn -
buckles taking into account the temperature of the ambient air.

D. Trim Tabs.

a/ set the pointer of the corresponding trim tab indicator
to "0" /zero/.

b/ adjust the length of control push pull rod of the cor-
responding trim tab so that it should adopt the neutral position.

At this it is necessary to pay attention to the following
clearances:

Between the elevator trim tab and the tail cone 10 ± 4 mm

Between the elevator trim tab and the elevator itself

4 ± 1.5 mm.

Between the rudder trim tab and the tail cone 10 ± 4 mm.

Between the rudder trim tab and the rudder itself 4 ± 1.5 mm.

Between the aileron trim tab and wing flap.

Between the aileron trim tab and the aileron itself

4 ± 1
 4 ± 2.5 mm.

E. Wing Flaps.

a/ disconnect the push pull rods at the wing flaps.

b/ retract completely the rod into the cylinder by way
of engaging the hydraulic system.

c/ check thr dimension A and the dimension B /figure 10/.
Both dimensions should be equal.

d/ extend fully by way of the hydraulic system the cylinder
rod and check again the stated dimensions, which should be equal.
In case that these dimensions are not equal it is necessary to
attain their equality by adjusting the bolt on the cylinder rod.

e/ set the intermediary rocker arm so that the dimension
from axis of the rocker arm attachment at the rib No 5 of the

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center section to the attachment axis of the same rocker arm.
to the push-pull rods should equal 133 mm / in the horizontal
view/.

f/ set the end rocker arm so that the dimension from the
attachment axis of this rocker arm at the rib No 9 on the center
section to the attachment axis of the push-pull rod to the men-
tioned rocker arm coming from the intermediary rocker arm should
equal 140 mm / in the horizontal line/.

g/ repeat the same adjustment on the other side,

h/ with the fully extended rod on the cylinder connect
the push-pull rods to the wing flaps,

i/ adjust by shortening or elongating the push-pull rod
running to the wing flap, the clearance between the wing trail-
ing edge and the wing flap $2 - 3$ mm,

j/ by adjusting the bolt of the push-pull rod running to
wing flaps ensure that the wing flaps should form one whole
with the wing. The wing flap should not lean against the wing
structure.

k/ adjust the push-pull rod to the wing flap position in-
dicator,

l/ check the operation of the wing flaps, ensure the fully
synchronous operation of the wing flaps; full angle of wing
flaps displacement should be $45^\circ \pm 1^\circ$,

m/ inspect the correct mounting of the wing flaps control
assemblies.

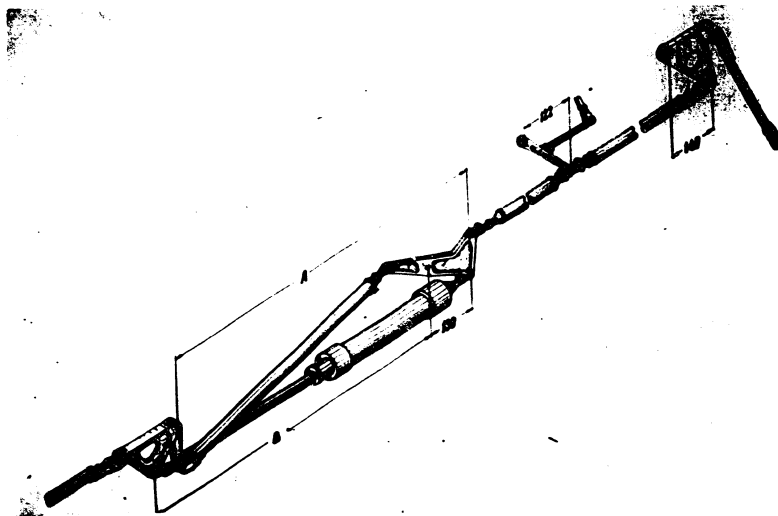


Figure 10. Wing Flaps Control Installation.

F. Adjustment of the System of Engine Control.

a. The control of the normal throttle should correspond with the following requirements:

a/ when the throttle control quadrant on the panel is in the position of low throttle - rearward to top but without tension: the tang of the throttle body should reach to the adjusting stop and the throttle flap should be closed,

b/ when the throttle control quadrant on the panel is in position fully open / take-off conditions/ the push-pull rod of the tang on the throttle body should reach to the stop of take-off and the throttle flap should be exactly in vertical position.

The throttle control quadrants on the panel should in their extreme positions leave to the end of the panel cut-out a distance of 5 - 8 mm.

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a. The automatic mixture control should fulfil the following requirements:

a/ When the automatic mixture control on the panel is set to the stop "auto-normal" and "auto-poor" the tang of the control of the automatic mixture control of the NV-82 governor should be in corresponding position "auto-normal" - "auto-poor",

b/ when the quadrant of the automatic mixture control on the panel is in its extreme positions, the tang of the automatic mixture control should rest on its stops.

The control quadrants of the automatic mixture control on the panel should in their extreme positions leave a distance of 5 - 8 mm to the end of the cut-out in the panel,

c/ the position of the pointer on the indicator of the pump limb should correspond with that of the UPRN-1. The difference should not exceed 2 degrees.

When the control quadrant is pulled to its extreme position, the pointer on the limb of the NV-82 should be on "0" and the pointer of the UPRN-1 should be on "0" too.

In opposite case effect the adjustment to the stated value.

CHAPTER XII.

USE OF GROUND EQUIPMENT.

1. Parking of aircraft.

When parking, for the case of wind, especially cross-wind, the aircraft has to be moored and wheel checks have to be placed under the wheels.

The nose leg of the landing gear is to be moored by means of two cable braces, which are fastened by one end / with snap

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to the landing gear struts and the other end runs through the mooring rings or through the rings of the anchor rods and is drawn through the openings of the plate.

For mooring of the landing gear main legs, a special yoke with four rope braces is put on the legs, the ends of the ropes are pulled through the rings of the rings of the anchor rods or through the mooring rings and are drawn through the openings in the plate.

Exceptionally it is possible to moor the aircraft by means of rope halyards of 20 - 25 mm.

On provisional parking places which are not equipped with mooring rings, the aircraft is moored by anchor rods, secured into the ground.

When parking, especially in bad weather, it is necessary to cover the aircraft. The covering protects the units against moisture, and fine sand, by which their life-time is increased.

The following parts of the aircraft have to be covered: the wing, the horizontal tail surfaces, nose part of the fuselage, cowlings, propellers, emergency aerial of the radio-combustion, aerial of the responder, the pressure head and the wheels.

For covering of the aircraft an extensible ladder is used. When effecting the covering of the aircraft it is necessary to pay attention that no metallic details of the coverings come in direct contact with the aircraft skin, as this might damage the outer coating of the aircraft and cause corrosion.

When the aircraft is parking, the control surfaces have to be locked by aid of locking system from the flight compartment. Besides this the rudder is fixed by means of a clamp.

When the aircraft is parking for a longer period or when parking with removed engines it is necessary to place a tail

Article under the Number No. 49.

2. Towing of aircraft.

For the transportation of the aircraft within the limits of the airfield a towing appliance is used. It is possible to tow the aircraft by means of the towing appliance by motor-car or by any other towing vehicle, possessing sufficient towing power.

The towing appliance consists of a truss, of the assembly for the attachment to the aircraft and of the damper with towing ring and control pin.

The towing appliance is connected by one end by means of a special pin to the nose leg of the landing gear, on which is provided the hole for the pin. The other end of the towing appliance is connected to the towing vehicle. The safety pin is designed for the shearing strength of 4500 - 5000 kg, which protects the landing gear nose leg against breaking in case of improper towing. In case the shear pin has been sheared during towing it is necessary to inspect the nose leg, to put the wheels of the landing gear main legs on a plane ground, replace the control pin and only then carry on the towing.

It is strictly forbidden to use pins made of other material or any other bolts.

For the protection of the landing gear nose leg during towing against excessive torque moment the towing appliance is provided /besides the safety pin/ with two safety bolts designed for the shearing strength of 8500 - 9000 kg.

When replacing these bolts use only specially marked safety bolts made by the producer.

When the towing appliance is used, the towing of the air-

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ward is permitted with the nose as well as with the tail forward.

When towing the aircraft by aid of the towing appliance it is necessary to maintain the following instruction:

a/ The towing of the aircraft is permitted: with the nose forward at the speed up to 15 km per hour, with the tail forward at the speed up to 5 km per hour.

b/ during towing the permissible turn of the main wheels is 30 degrees to each side from the aircraft axis.

c/ The towing may be accomplished at the gradients of the terrain not exceeding 5 degrees.

d/ During towing of the aircraft an engineer should sit in pilot's cabin to control the brakes in case of necessity.

e/ When towing it is necessary to exercise care and work deliberately, to move off smoothly without jerks and slowly increasing the speed. When it is necessary to interrupt the towing, decrease the speed slowly.

It is necessary to bear in mind that the aircraft possesses a considerable inertia force when moving and this force is to be damped only by smooth slackening of the motion.

For the transportation of the aircraft within the limits of the parking area or for the towing by hand only by the effort of the servicing personnel serves the hand towing bar.

When towing the aircraft by hand it is necessary to exercise care and to prevent the nose wheel from turning at an angle exceeding 45 degrees.

3. Trestling of the Aircraft by Means of Hydraulic Jacks.

When it is necessary to exchange the wheels, check the

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operation of the landing gear or at rigging, the aircraft is mounted on hydraulic jacks. Two hydraulic jacks are placed under the wings and one under the nose part of the fuselage. For the setting of jacks under the wings of the aircraft adapters are applied, which are fitted by the seat on the ball-head of the hydraulic jack and by the pins into the openings in the central spar of the wing close to the joint of the wing with the centre section.

When fitting the adapter with the inscription " for the right wing" fit same under the right wing and the adapter with the inscription "for the left wing" under the left wing, not permitting their exchange as it might result in the damage of the wing skin.

On the former No.8. is provided the third seat in which the ball supporting head of the under-fuselage jack is inserted.

Exchange of the Landing Gear Wheels by Aid of the Telescopic Jacks.

The telescopic jack serves for the replacing of the wheels. When it is necessary to replace the wheel of the landing gear main leg it is necessary to place the telescopic hoisting jack under the assembly provided on the landing gear strut.

The telescopic hoisting jack enables the replacement of one wheel only. In case that both wheels are flat it is necessary to apply for the exchange of wheels big hydraulic jacks and hoist the whole aircraft.

Prior to its use the jack has to be inspected and in case that whatever defects have been revealed it is necessary to replace same by a faultless one.

The hydraulic jacks may be applied only on concrete or

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ground.

When replacing the wheels it is necessary to maintain the following order of procedure:

1. Check the fluid level in the tank according to the marking on it. The fluid level should be between the minimum and maximum mark of the measuring rod. In case that the level of the fluid is below the minimum mark - it is necessary to refill with it.

2. When screwing up the filler plug leave same not tightened by 3 - 4 threads to ensure the draining.

3. It is permitted to effect at the same time the exchange of the wheel of one landing gear only when telescopic jack is used. Under the remaining wheels wheel chocks are placed.

4. Set the hydraulic jack strictly perpendicularly securing full fitting of the supporting surface.

5. Wipe by a rag the seat for the ball-head of the hydraulic jack and unscrew the adjustment screw to stop in the part of landing gear strut.

6. Set the chocks into position for "lift" and swing the pump handle until the wheel parts from the ground by 20-40 mm.

7. Remove the old wheel and install the new one.

When lowering the aircraft it is necessary to bear in mind that the speed of lowering is adjusted by the extent of the chocks opening and therefore when lowering it is necessary to shift the cock to "for lowering" slowly and carefully. In case that the rods did not retract sufficiently under the action of weight and it is not possible to remove the jack from under the strut, it is necessary to set the cocks for lowering to stop and by operating the pump lower the big rod. In this case

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When the small rod might remain not retracted.

For the retraction of the small rod it is necessary to set on the jack the transportable handle. In the lower part of the handle is provided a seat against which rests the head of the setting screw of small rod. Unscrew the setting screw of the small rod to step into the seat and continuing the unscrewing retract the fine screw pitch. Then screw in the setting screw.

Provide the upper part of the hydraulic jack with covering.

Maintenance of the Telescopic Jack.

The hoisting jack should be stored in dry room and protected by covering.

All external frictioning parts and the screw should be lubricated with NE-30 grease. The exchange of grease should be accomplished according to its fouling.

The GMC-2 hydraulic mixture should be refilled only in closed rooms and the mixture should be filtered. It is recommended to remove the filter from the hydraulic reservoir only for its rinsing.

The exchange of the GMC-2 fluid should be accomplished with the exchange of the sealing gaskets.

When dismantling the hydraulic jack effect the rinsing of details, valves and of the hydraulic reservoir only by means of dehydrated kerosene. Rinsing by means of petrol or alcohol is not permissible.

After assembling and filling of the jack with GMC-2 hydraulic mixture it is necessary to effect minimum five times the extension and retraction of the rods.

6. Board Ladder.

The board ladder is destined for entering and leaving of the aircraft by the crew and passengers.

When the ladder is in use it is necessary to see that the details of the ladder structure do not show signs of cracks, nicks, and other deformation.

The ladder should look tidy.

Not more than one man is permitted to use the ladder at the same time and the ladder should be placed so that the angle between ground and ladder should be minimum 70 degrees.

7. Telescopic Ladder.

The telescopic ladder is designed for the inspection and effecting of works on the vertical tail surfaces of the aircraft.

The ladder is calculated for work of two men or one man with a load of maximum 100 kg.

When in service position the ladder should be unconditionally set on supports. It is strictly forbidden to work on the ladder without securing same by supports leaning against the ground.

The ladder is transported in folded condition behind a motor-car at the speed of 25 - 30 km per hour.

When in use it is necessary to see that all frictioning parts of the ladder and especially the locks of the upper ladder are carefully lubricated with the CIATIM-201 grease or with MK-50 grease.

It is permitted to use for the inspection of the vertical tail surfaces the TS - 8 ladder.

8. Extensible Ladder.

The extensible ladder is destined for various works

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the aircraft, for example: for covering of the aircraft, for rigging of the windows, inspection of the stabilizer, etc.

In all cases of use of the extensible ladder the rear guide wheel should be retracted, and the front supporting screws unscrewed. The ladder should lean against the ground by the supporting rear struts and the front supporting screws.

When using the ladder it is necessary to see that the latch and stop should readily turn on the axle. For this purpose it is necessary to lubricate them with the GIATIM-201 or MI-30 grease.

The guide rollers should be systematically cleaned from fouling and lubricated.

9. Exchange of Engine.

For the hoisting of engine covers a sling consisting of four ropes with one spreader. The links provided on the ends of the ropes serve for attachment to the cylinders of the engine.

In order to attach same to the cylinder it is necessary to unscrew the nut of the valve axle bolt and screw on its place the nut provided on the rope link.

The links of the longer ropes have to be attached to the intake valves of the No.3 and No.13 cylinders, the short ropes to the exhaust valves of the No.2 and No.14 cylinders.

The hoisting is effected by aid of PPK-48 hoisting crane with hoisting capacity of 1800 kg or by aid of any other crane of the same or greater hoisting capacity. For hoisting of the engine are admitted only completely faultless cranes which have passed tests according to requirements for hoisting gears.

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10. Replacement of Propellers.

For the replacement of the propellers serves a special sling. The sling is provided with a spring, which enables during mounting of the propeller on the shaft to adjust the height by a slight effort of hand. When hoisting the propeller it is necessary to pay attention to the spring which should be correct and properly mounted on the rings with ropes.

When the spring is not in proper condition or when more than 14 threads are torn in each wire cable the use of the sling is forbidden.

For the hoisting of the propellers are applied the same cranes as for the hoisting of engines.

11. Sleeve for Checking the Fluid Level in the Shock Absorber of the Landing Gear Nose Leg.

The sleeve consists of two semi-rings, which are coupled by means of a locking pin.

The sleeve is put on the lower part of the piston, after which the air from the shock absorber is slowly released. The depression of the shock absorber is to be carried on until the sleeve does not rest on the edge of the cylinder.

at this position the fluid level should reach the lower edge of the filler orifice.

12. Fixator Clamp for the Rudder.

The No. 9205 fixator clamp is applied in following cases:

1/ When the controls are unlocked /during test-running of the engines and in other cases/.

2/ When the controls are locked but the aircraft is parked for a longer period /more than 2-3 hours/.

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The fixator clamp is to be applied so that the rudder trim tab should not be clamped.

Do not forget to remove the fixator clamp before taxiing.

13. Filling Syringe.

For filling grease into the lubricating nipples and dampers a filling syringe is applied.

When filling the lubricating nipples an adapter with fly nut is used.

In case that the access with this adapter /terminal/ will be difficult to any of the lubricating points then it is necessary to replace the fly nut by a hand nut.

For refilling of the shimmy damper a direct terminal is used. A plug is screwed into the terminal to prevent dust, dirt and foreign matter to get into same.

14. Remover of Tyres.

The SSh-04 remover is used for removing tyres from the nose and main wheels. The remover is to be mounted on the wheel and tightened by screws. Then the handle of the remover is to be turned till the tyre is pressed from the drum edge. After this the cross-bar is to be turned in a further position and the mentioned operation is to be repeated.

The same procedure is to be repeated all along the circumference of the wheel. Then press away the dismountable rim of the wheel, take out the spring ring and remove the rim. After the rim has been removed turn the wheel to the other side, reset the remover and press away the rubber from the fix rim, after which the tyre will freely come off the wheel drum.

15. Charging of the Board Air Storage Bottles.

The charging of the air storage bottles is to be accomplished through the ground bottle of 40 litres capacity by way of an appliance which has to be connected to the board filler neck.

The appliance consists of a hose with terminal and of a sump-filter. The appliance is stored in the tool case.

16. Filling and Testing of the Hydraulic System.

For filling and testing of the hydraulic system it is necessary to connect to the board intake neck the hydraulic unit with the output of minimum 70 litres per minute at the pressure of 150 kg per sq. cm.

The unit should be provided with two pressure hoses and two suction hoses.

The hoses have to be filled full prior to their attachment to the intake fittings of the hydraulic system in order to prevent air from getting into the system.

For the procedure of testing the aircraft hydraulic system are admitted only correct hydraulic units, filled with MVP oil and provided on the ends of hoses with plugs.

17. Filling of Aircraft with Oil and Fuel.

The filling with fuel is accomplished by the BZ-3-150 refuelling unit through the filler necks on the tanks.

For the refuelling are admitted only refuelling units, which are provided with correct filters, sumps, pistolets, flow-meters and earthing. Besides of this the pistolet should be provided with an earthing pin and should be covered with a tarpaulin cover.

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In order to prevent the damage of the wing surface by the wire mesh of the distributing hose it is necessary to bind the hose by a soft material at a length of 1.5 - 2 meters from the distributing pistollet.

Prior to refuelling it is necessary to drain the condensed water from the sump of the refuelling unit, to switch off the electric system of the aircraft, to earth the aircraft by the earthing pin, which is located in the nose leg section, to earth the refuelling unit and to equal the potentials of the static electricity insert the earthing pin of the pistollet into the seat of the wing. This seat is located in the near from the filler neck.

Only when meeting all these requirements it is permitted to accomplish the refuelling of the aircraft.

When filling it is necessary to see that the fuel should not splash out from the filler neck. Leave 40 - 50 mm space to the filler neck for the dilatation of fuel resulting from warming up.

It is permitted to perform the refuelling also by means of other refuelling units meeting the above mentioned requirements.

The filling with oil is accomplished by the MZ-51 oil filling unit through the filler necks of the oil tanks.

For charging are admitted only correct oil filling units, provided with clean and covered pistollets.

The quantity of the filled oil is checked on the indicator of the oil quantity gauge in the flight compartment.

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CHAPTER XIII.

STORAGE AND MAINTENANCE PROCEDURES OF THE
AIRCRAFT.1. Maintenance of the Anti-corrosion Coating of
the Aircraft Parts and Details.

In order to prevent damage of protecting coatings during service, repair or storage it is not permitted to step on the respective surface. Neither is permitted to put on the aircraft skin metallic objects, details and tools, and to bring into contact with the aircraft skin unpadded ends of ladders /which have to be either covered with rubber or upholstered./

In order to protect the details and units of the aircraft against damage it is necessary to keep the aircraft in cleanness, removing in time dirt and dust from the skin. Wash periodically the whole surface of the aircraft by warm water / 30 - 40 degr. of Cent./ and then wipe with dry rags.

Do not apply petrol or kerosene for washing of the skin as this would destroy the layer of lacquer.

During each after-flight servicing remove from the aircraft skin oil spots, soot and dirt.

Be careful not to permit electrolyte from the accumulator batteries, fuel or lubricants to get on the aircraft skin during filling of the aircraft.

If by any accident fuel or lubricant will get on the skin it is necessary to wipe dry the respective areas immediately.

The areas which came into contact with electrolyte have to be carefully washed with water and then wiped dry with a clean rag. All cases of the skin contact with electrolyte have to be

inspected in the aircraft log book and the respective areas have to be further on carefully watched. During preventive inspections of the aircraft accomplish careful inspection of the skin in the inner sections of the aircraft. For this purpose it is necessary to uncover beforehand the fuselage flooring and to remove the accumulated dirt and dust.

It is necessary to inspect carefully the condition of the details cast of alloys. If revealing the slightest damage of the protecting coating of such details it is necessary to restore the paint immediately, having previously dressed the respective area to glitter.

Preparation of the Aircraft for Storage.

1. Carry out the inspection of the aircraft, of the engines and of the special equipment in the extent of the after-flight inspection. Remove all revealed defects and carry out the normal periodical servicing procedures to the moment of storage but minimum the 25 hours servicing procedures for aircraft, engines and special equipment.

2. Clean the airframe and engines from dust and oil.

3. Prepare the engine for storage according to "Instruction for the Engine Servicing."

4. Remove the hydraulic units of the automatic pilot and of the landing gear. Put them for storage into a dry room.

The ports of the pipe-lines for the hydraulic units have to be tightly closed with plugs.

5. Remove from the aircraft the telephones and microphones and place them for storage into a dry room.

6. Remove the accumulator batteries and put them for storage, and to the charging station, if necessary.

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8. Place under the wheel of the landing gear main legs chocks from the front and from behind and set the fixator clamp on the rudder. Lock the rudders by the locking handle.

9. Fasten the aircraft on the anchoring place.

10. Cover the engines, propellers, landing gear wheels, the fuselage nose part, wings, the horizontal tail surfaces, the masts of the serials and the pressure heads with covers /figure 11./

The storage of foreign matter in the preserved aircraft is not permitted.

NOTE: When the aircraft is stored with removed engines it is necessary to place under the fuselage tail part a special padded "course" of jack to prevent the possible dropping of the aircraft tail.

Preparation of the Aircraft for a 15 Days

Storage.

1. Carry out the procedure indicated in the section "Preparation of the aircraft for storage".

2. Carry out the treatment for corrosion proofing according to the requirements of "Instruction for servicing of the aircraft".

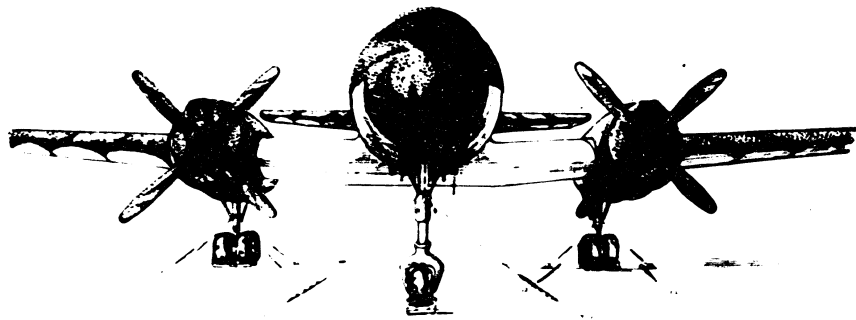


Figure 11. Aircraft Parking on Anchors.

Preparation of the Aircraft for Storage
up to One Month.

1. Carry out the procedures mentioned in the section "Preparation of the Aircraft for Storage".
2. Carry out the corrosion proofing of the engines according to the instructions in "Instruction for the Servicing of Engine".
3. Remove the silk and mesh filters, rinse them with pure petrol, dry and reinstall.
4. Close all cocks of the fuel and oil system.

Preparation of the Aircraft for Storage
up to Two Months.

Carry out the procedures indicated in the section "Preparation of the Aircraft for Storage."

2. Carry out the corrosion proofing of the engines according to requirements of the "Instruction for the Servicing of Engines".

3. Remove the silt and mesh filters, rinse them with pure petrol, dry and reinstall.

4. Close all cocks of the fuel and oil systems.

5. Cover the air intake, the exhaust nozzles, draining and bleeding pipes and all other ports,

6. Inject oil into the lubricating nipples and lubricate all moving joints of the landing gear.

Maintenance of the Corrosion-proof Aircraft.

1. Carry out the maintenance of the corrosion-proofed engine according to requirements of "Instruction for Servicing of the Engine".

2. Remove from the aircraft surface dust and moisture and restore the lubrication of the details which are not provided with anti-corrosion coating.

3. After rain dry the aircraft having previously removed the covers, opened the access doors, windows and doors. Unlock the rudders and ailerons and be sure that there is no moisture in the rudders, ailerons and wing flaps.

4. Carry out periodically the outside inspection of the corrosion proofed aircraft and restore the corrosion proofing of units and assemblies, if necessary.

During this inspect the areas of the fuselage jointing with the centre section and the detachable part of the wing /outer section/, the joints of the stabilizer with the fuselage and the main carrying assemblies of the attachment of engine mounts and of landing gear.

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In case that strapping of bolts of the centre section joints with the wing, noticeable part is revealed it is necessary to replace the bolt together with the nut and do not try to tighten it, as it may after tightening fail in flight. The tightening of the most important joints is subject to regulation and has to be checked by aid of special torque wrenches.

7. After expiration of the period for the aircraft storage remove the corrosion proofing of the aircraft and carry out the servicing procedures in the extent of the after-flight inspection and after storage exceeding 30 days also the 25 hour servicing procedures. All procedures related to the corrosion-proofing of the aircraft and to its maintenance have to be registered in the aircraft log book.

Appendix No. 1.

Instruction for Checking the Fire-extinguishing Equipment of the B - 14 Aircraft.

The system of the engines fire extinguishing consists of four carbonic dioxide fire extinguishers OSU-4 with two shutters UZ-13 on each fire extinguisher,

- four signal discs of the fire extinguishers self-discharge,
- eight UOK - 13 non-return valves,
- two RDU pressure relays,
- pipe-lines,
- four spraying collectors /per two for each engine nacelle/
- 16 pieces of fire detector switches TI /per 8 pieces in each engine nacelle/,

two horns for warning in case of fire; on the former No.8 above the head of the right pilot,

further on the central board of the pilot are in - stalled:

- two red warning lights for signalling the breaking out of fire,
- two green warning lights signalling the discharging of the fire extinguishers,
- four buttons 5k for switching on the fire extinguishers,
- 5k button for checking the warning lights.

I. Checking of the System Operation by Way of Discharging the Bottles.

1. Prior to the test check the weight of the fire extinguishers charging. Each fire extinguisher has to be charged with liquid dehydrated carbon dioxide in the weight of

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1. ... according to the instruction for service and repairing of the fire extinguishers.

2. Prior to the test insure that all procedures of the system mounting, of checking the air-tightness, checking of pyrocartridges, carbon dioxide shutters and checking of the fire warning system have been accomplished and accepted.

3. Insure that the AZS /circuit breaker/ of the fire extinguishing system of the panel of the radio operator is switched on and then carry out the following procedures:

a/ fold off the protecting cap of the right engine and press the button "1 and 2" for simultaneous discharging of the fire extinguishers No. 1 and No.2. After the button has been pressed, the green warning light signalling the discharging of the CO₂ of the right engine should go on.

b/ Follow the discharging of the carbonic dioxide from both spraying collectors on the right engine, checking the intensity of discharging of the gas and covering by some of the engine cylinders and the engine section to the fire-proof bulkhead.

NOTE: The cowl flaps should be in the central position / the shutters along with the flow/.

c/ Measure the time required for the discharging of the two fire extinguishers and note the temperature of the ambient air. For determining the time for discharging of the fire extinguishers install pressure gauges for 150 atm. in the lines near to the spraying collectors. As end of the discharging should be considered the moment when the pointer on the pressure gauge drops to zero.

d/ Carry out the same procedure on the left engine

pressing the button "3" and "4" of the simultaneous discharging of the fire extinguisher "3" and "4".

2. After effecting the test, remove the discharged fire extinguishers and replace them by charged ones. Remove also the pressure gauges with the adapters. Carry out the connection and switching of the system pipe-lines.

3. Weigh the removed fire extinguishers.

4. The results of the tests have to be registered.

II. Checking of the Fire Signal System.

A. Pre-flight Inspection on Ground.

§ 1. Check the correctness of the fire signal system.

1/ For this purpose it is necessary to press the button 5E provided on the pilot's board and marked with the inscription "Checking of the Fire Signal System". At this all lights of the fire signal system should glow: the two red lights and the two green ones, and the horn should sound as well.

2/ In case that lights are defective /do not glow when the button is pressed/ it is necessary to replace the respective lamp and insure repeatedly that all lamps are in correct condition by pressing the checking button. When pressing the switch button of the horn the sound of same should cease.

§ 2.

1/ The switching on of the AZS /circuit breaker/ of the fire extinguishing system, which is installed on the central switch-board of the radio-operator and provided with the inscription "PPO".

2/ The correct condition of the attachment of electric leads to the pyro-heads of the UZP-13 shutters of each fire extinguisher following the inscriptions on the labels beside the fire extin -

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primers and the tallies as the pyro-heads fuses.

3/ The locked position of the levers for manual opening of the fire extinguishers, the sealing of these levers, the correct position with regard to the aircraft, and namely: the lever marked by the letter " " should be on the right side of the fire extinguisher at the view in the flight direction, i.e. from the side of the right board, the lever with the letter " " from the left side of the fire extinguisher, i.e. from the side of the left board.

4/ The correct connection of the plug-and-socket joints to the pressure relay, installed in the fuselage.

5/ The signal discs of the signal equipments of all four fire extinguishers, installed on the right board of the aircraft, should be in their seats. This indicates that the protecting membranes of the fire extinguishers are not torn and the carbon dioxide not let out into the atmosphere.

NOTE: In case that the signal disc in any of the seats is not present it is necessary to replace the fire extinguisher which has been discharged into the atmosphere by a charged one and fit a new disc into the seat of the signal equipment according to the point IV. of the description and instruction of the OSU-4.

6/ The correct connection of the plug-and-socket joints to the fire switches in the right and left engine sections.

E. Periodical Inspection on Ground.

It is to be checked:

a/ The leads for engagement of pyro-heads of the UZF - 13 shutters of the OSU-4 fire extinguishers.

b/ The leads of the signal lights from the fire switches "11".

2/ The leads of the signal lights of RDS pressure relay.

§ 1. Outside Inspection.

1/ Carry out the outside inspection of the condition of electric leads and screening, insulation and attachment.

2/ Check by tightening by hand the reliability of tightening of the plug-and-socket connections nuts.

3/ Inspect to check the condition of the contacts in the connections of the electric leads and the connections to the frame /bonding/ of the aircraft. On the pyrocartridge EP-3 should be a dimple from the contact of the pyrohead ignition.

4/ Check by outside inspection the condition of the signal equipment: the thermostatic indicators, the pressure relay, the pyro-heads of the fire extinguishers shutters, the caps, buttons and signal lights on the pilot's panel.

§ 2. Checking of the Correctness of Leads by Way of Electricity.

a/ Checking of the engagement of pyro-heads.

1/ Disconnect the pyro-head fuses of each UZP-13 shutter on all four fire extinguishers.

2/ Open the caps. Check the engagement of the AZS /circuit breaker/ of the fire extinguisher system and the charging of the aircraft system.

3/ By pressing the corresponding 5K buttons on the pilot's panel the board electric circuit tension s to be engaged into the tested lead.

4/ The tension in the contact of the disconnected fuse of the pyro-head is to be checked by means of the control lamp or by means of voltmeter.

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5/ Before installation of the fuses on the UZF-13 shutters the AZS is to be disengaged, the folding caps of buttons for engagement of fire extinguishers have to be closed and sealed.

6/ The fuses of the pyroheads are to be connected to the UZF - 13 shutters. The contact in the pyro-head is to be checked by ohmmeter according to the point IV and the "Description and Instruction of the OSU-4 Fire Extinguisher".

7/ After finishing all the procedures referring to the checking switch on the AZS of the fire extinguisher system and remove the sealing of the caps.

8/ The leads of the signal lights from the thermostatic indicators.

1/ Check the engagement of the AZS of the fire extinguishing system and the tension in the board circuit of the aircraft.

2/ Check the correct condition of the fire signal system lights by pressing the checking button installed on the pilot's board.

When pressing the checking button all four lights /two red and two green/ on the pilot's board should go on and the horn should sound.

In case that the checking reveals defective lights /which do not glow/, they have to be replaced by correct ones.

3/ Disconnect the plug-and-socket connections of all fire-switches "TI" in the engine sections.

4/ Close subsequently the contacts of all disconnected plug-and-socket connections.

When closing the contacts of plug-and-socket connection of any of the thermostatic indicators of the right engine installation the red signal light with the inscription " Fire - Right Engine"

When closing the contacts of the plug-and-socket connections of the left engine installation, the light with the inscription "Fire - Left Engine" should go on.

In all cases on the glowing of the red lights also the alarm should sound.

NOTE: According to the certificate of the fire switches /see point 5/ the checking of the correct condition of the signal lights leads by way of pressing the contact screw of the frame of the fire switch is strictly forbidden.

Such action would cause loss of elasticity of the fire switch membrane and might result in failure of its action.

6/ The supplier guarantees the faultless operation of the TI thermostatic indicator for two years from the day of their installation on the aircraft.

c/ The leads of the Signal Lights from the Pressure Relay.

1/ The preparation for checking is effected simultaneously with the preparation of the checking of the signal light leads from the thermostatic indicators / see § 2, points 1b and 2b/.

2/ Disconnect the plug-and-socket connections of all RDU pressure relays installed in the fuselage.

3/ Close by turns the contacts of all disconnected plug-and-socket connections.

When closing the contact of the plug-and-socket connection removed from the pressure relay installed on the pipe line running into the right engine nacelle, the green signal light with the inscription "Discharging of the bottle - right engine" should go on, when closing the contact of the plug-and-socket connection of pressure relay on the pipe-line running to the left engine nacelle, the light with the inscription "Discharge"

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2/ The "left origin" should be checked.

In all cases when the pressure is present on the head of the pyro-head.

3/ When finishing the work connect the pyro-head socket connections to the starting timing pressure relay.

The correctness of their connection may be checked according to the marking on the joints and bodies of the pressure relays.

4/ The results of checking of all leads have to be registered in the book of the fire extinguishing equipment.

The revealed defects have to be immediately removed.

5/ Condition of the pyro-cartridges EP-3.

Check by outside inspection the condition of the EP-3 pyro-cartridges installed in the pyro-head of the UZP-13 shutters in the case of the pyro-cartridges, when tightening the nuts of the pyro-head fuse nut, notch should arise from the fuse socket.

3. Checking of the Resistance of Electric Leads Insulation.

1. The measuring of resistance of the insulation is to be effected by megohmmeter up to 250 volts or by voltmeter separately for each lead with the aircraft current switched off or with the AZS of the fire extinguishing equipment AZS / circuit breaker/ on.

2. When effecting the checking of resistance of the insulation the fuses of the pyro-heads have to be disconnected from the shutters UZP - 13 on all fire extinguishers. Remove the signal bulbs from the SLC - 51 lamps.

It is necessary to check the resistance of insulation of the following electric leads:

- a/ the leads for switching on the pyrotechnic devices.
- b/ the leads of the red warning lights from the fire detector switches,
- c/ the leads of the green warning lights from the pressure relay.

The results of all resistance measurements of the insulation have to be registered into the table of the aircraft fire extinguishing system log book.

In case that the insulation resistance drops below the standards provided for the aircraft electric leads, the defective electric leads have to be replaced.

Inspection and Maintenance.

1. Be sure of the correctness of the fire detector switch leads, of their reliable attachment and of the intactness of plug-in-socket connections safetying.

2. Make sure that the fire extinguishers are safely attached, that the safetying of the clamping strips of bracket and fuses is correct and that the discharge handles are sealed. Fire extinguishers with unsealed discharge handles have to be replaced.

CAUTION: Prior to the removing of the fire extinguisher from the aircraft it is necessary to fasten its discharge handles by locking wire and to screw up plug-nuts on the outlet fittings. When this is not effected the discharge handles of the fire extinguishers might be set into working position by an accidental motion which would cause the discharging of the fire extinguisher.

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at the discharging under the reaction of the carbon dioxide gas occurs a strong and irregular motion of the fire extinguisher of which an accident might happen.

3. Be sure of the correct condition of the pressure relays and of the intactness of their safetying.

4. Test the intactness of the signal and check lights, the correct condition of the control buttons and of their protective caps /see section I/.

III/ Sequence for Preparing the Fire Extinguishers into State of Readiness for Action.

The requirements of the service of the fire extinguishers, the rules for the charging of the OSU - 4 have to be met according to the " Instruction for service and charging of the OSU - 3 and OSU - 4 fire extinguishers".

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Annex No. 2.

Instruction for the Use of the Hot Air Warming-up System of the ASh - 82 T Engine.

I. Designation.

The air comes to the engine supercharger, when the engine runs at normal conditions, through the intake nozzle of the cowling upper cover. In probable ice-forming conditions the mesh of the throttle body of ASh-82T may get jammed with ice owing to which the pressure Pk of supercharger and also the power drop. In order to prevent the mentioned phenomenon a warming up system of the air entering into the engine is provided in the aircraft design.

II. Description of Construction.

The warming-up system consists of the flap installed in the rear panel of the cowling upper cover. The opening and closing of the flap is effected by aid of a push-pull rod and of the MG-1m electric mechanism mounted on the rear panel of the intake nozzle of the cowling upper cover. The electric mechanism is provided with a remote control which is effected by means of thumbler located on the vertical panel of the pilots central board.

III. Use of the Warming-up System.

1. The thumbler on the upper panel of the pilot's central board have three positions:

1- st position "Dust filter".

a/ the thumbler is set into upper position,

b/ the warming-up system flap is closed,

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b/ when pressing the thumbler upwards the flap of the dust filter opens and the main channel of the air intake gets opened. The opening of the dust filter flap may be checked by a signal system which lits up the red light on the board panel.

2 - nd position "Intake nozzle".

a/ The thumbler is set into neutral position,

b/ the flap of the warming-up system is closed,

c/ when the thumbler is in neutral position the flap of the dust filter gets closed and the air proceeds into the engine through the main channel of the intake nozzle of cowling upper cover - the lights are out.

3 - rd position "Warming up".

The thumbler is set into the lower position. In the area of the probable ice formation is set into operation the system of warming up of the air entering the engine. When the thumbler is depressed down the electro-mechanism of the dust filter flap control and the electro-mechanism of the warming-up system flap are simultaneously set in operation by aid of the MR-2 relay.

In this case the air entering the engine through the mesh of the dust filter is warmed up by the warm air coming from the engine section through the open flap of the warming-up system.

Checking of effectiveness of the warming-up system operation is accomplished by aid of the TUB-48 temperature gauge mounted on the front panel of the intake nozzle of cowling upper cover.

In ice forming conditions with the warming-up system flap open, the temperature of the warmed-up air in the intake nozzle may be maximum 50 degrees of Centigrade.

The warming-up system has to be used in conditions of probable ice formation and of noticeable drop of supercharging

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a/ when pressing the thumbler upwards the flap of the dust filter opens and the main channel of the air intake gets closed. The opening of the dust filter flap may be checked by a signal system which lits up the red light on the board panel.

2 - nd position "Intake nozzle".

a/ The thumbler is set into neutral position,
 b/ the flap of the warming-up system is closed,
 c/ when the thumbler is in neutral position the flap of the dust filter gets closed and the air proceeds into the engine through the main channel of the intake nozzle of cowling upper cover - the lights are out.

3 - rd position "Warming up".

The thumbler is set into the lower position. In the area of the probable ice formation is set into operation the system of warming up of the air entering the engine. When the thumbler is depressed down the electro-mechanism of the dust filter flap control and the electro-mechanism of the warming-up system flap are simultaneously set in operation by aid of the MR-2 relay.

In this case the air entering the engine through the mesh of the dust filter is warmed up by the warm air coming from the engine section through the open flap of the warming-up system.

Checking of effectiveness of the warming-up system operation is accomplished by aid of the TUB-48 temperature gauge mounted on the front panel of the intake nozzle of cowling upper cover.

In ice forming conditions with the warming-up system flap open, the temperature of the warmed-up air in the intake nozzle may be maximum 50 degrees of Centigrade.

The warming-up system has to be used in conditions of probable ice formation and of noticeable drop of supercharging.

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When the supercharging has been restored to the required value and when leaving the zone of ice formation as well when the temperature of the entering air surpasses 50 degrees of Centigrade it is necessary to switch off the warming-up system by setting the thumbler on the board panel into position " Intake nozzle" - neutral. -

V I E N T S a n d

B A L A N C I N G

o f t h e I I 1 4 - 3 0 D

1 9 5 5 .

- 3.1 -

1. Weights.

Normal take-off weight of the aircraft	16.500 kg
Weight empty	11.720 kg
Five men crew	400 kg
Weight of one transported person with outfit	100 kg
Fuel in tanks at normal version of the aircraft with 30 passengers	1.105 kg
/or 1500 litres at specific gravity 0.735/.	
Service loading	75 kg
Comprising:	
a/ board ladder	13 kg
b/ summer covers for engines	20 kg
c/ antifreeze /alcohol/	22 kg
d/ airborne tools /in service section/ . .	16 kg
e/ rudder fixator clamp	1.5 kg
f/ oil cooler pads	2.5 kg

Weight of the useful loading at normal version
of the aircraft 4.780.- kg

The weight of the useful loading comprises the weight of the crew, petrol, oil, passengers, cargo and service load.

The aircraft tare weight /weight empty/ comprises:
the weight of the airframe with landing facilities, the power plant, the detachable and ground equipment /according to special list/ the undrainable remainder of oil in the engine crankcase 12 kg, in the oil system 8 kg /for both engines/, water in the water closet container, weight of the parachute rockets in aircraft tail section.

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NOTE: The tare weight of the aircraft does not include the service load.

II. Balance of the Aircraft.

Balance of the aircraft with tare weight and full equipment /at the weight of 11,720 kg - c.g. 11.5% MAC
Tolerance of balance at tare weight \pm 0.5% MAC
Safe limits of aircraft centre adjustment:

a/ rear limit 18.6% MAC
b/ front limit 12.0% MAC

Recommended centre adjustment of the aircraft
with normal flight weight /landing gear extended/ 18.6% MAC
/landing gear retracted/ 17.6% MAC

By retracting of the landing gear the centre of gravity of the aircraft moves forward by 1% MAC, which corresponds to reduction of aircraft moment G.X by the value

$$\Delta G.X = 539 \text{ kgm.}$$

Length of MAC 3.412 m
Distance from fuselage nose to the beginning of MAC 7.057 m

When calculating the aircraft balance, the nose of the fuselage is considered as the beginning of the coordinates.

The tanks with fuel and oil are located in the aircraft wing near to its centre of gravity. Owing to this the consumption of fuel and oil affects only insignificantly the balance of the aircraft. The consumption of 1,500 kg fuel shifts the centre of gravity forward by 1.7% MAC /at take off weight of 16,500 kg/. The consumption of 50% oil displaces the centre of gravity by 0.1% MAC rearward.

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When there is no antifreeze fluid on the aircraft the centre of gravity will be by 0.2 % MAC aft.

Below see the determination of the balance at principal versions of the aircraft loading.

In the tables shown below there are stated the balances of the aircraft.

When loading the aircraft it is necessary to use the loading tables of the Il-14-30 D aircraft shown at the end of this instruction.

The loading table is mounted on the board of the aircraft in the service section on the bulkhead of the former 13 /from the left side in flight direction/.

Besides of the loading table provided in the aircraft, in each aircraft log book should be registered the weight empty of the aircraft and the balance of the aircraft at empty weight, derived by way of practice.

It is necessary after repair or new equipment of the aircraft to effect the corresponding registration in the aircraft log book in the part for changes of the aircraft weight empty and for the aircraft balance.

The balance of the aircraft has a direct effect on the longitudinal stability of the aircraft and therefore the correct centre adjustment of the loaded aircraft guarantees the safety of flight. As a rule the aircrew should make sure before flight, that the aircraft balance is in permissible limits. It is necessary to maintain strictly the determined sequence when accomodating passengers /troops/ according to the loading table.

When the aircraft is flown without passengers /troops/

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and cargo, it is necessary to load in the rear cargo compartment a ballast in weight of 400 kg to maintain the balance of the aircraft in service limits.

The ballast should be put into a special case fastened to the floor by means of straps.

In all cases of the aircraft loading it is necessary to keep in mind that the maximum flight weight of the aircraft should not exceed 16.500 kg and the flight centre adjustment should remain in the limits of the range from 12.0 to 18.6% MAC.

CAUTION: The transgression of the instructions for loading of the aircraft is categorically forbidden.

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III. Normal Version

with 30 passengers.

/Take-off/.

No.	Designation	Weight kg 3.	Coordinate m. 4.	Moment kg/m 5.
C r e w				
1	Two pilots	160	1.82	291
2	Radio operator and navigator	160	3,3	527
3	Flight engineer	80	2,44	195
Total 5 men		400		1.013
Fuel and oil				
1	Petrol	1.105	8,3	9.188,5
2	Oil	200	6,9	1.380
Total		1.305		10. 568,5
Commercial loading				
1	Passengers 2 persons in the 1st row	200	5,3	1.006
2	" " " " " " in the 2nd row	200	5,58	1.116
3	" " " " " " in the 3rd row	200	6,13	1.226
4	" " " " " " in the 4th row	200	6,68	1.336
5	" " " " " " in the 5th row	200	7,23	1.446
6	" " " " " " in the 6th row	200	7,78	1.556
7	" " " " " " in the 7th row	200	8,33	1.666
8	" " " " " " in the 8th row	200	8,88	1.776

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	1.	2.	3.	4.	5.
9	Passengers 2 persons in the 9th row	200	9,43	1.886	
10	" " in the 10th row	200	9,98	1.996	
11	" " in the 11th row	200	10,53	2.106	
12	" " in the 12th row	200	11,08	2.216	
13	" " in the 13th row	200	11,63	2.326	
14	" " in the 14th row	200	12,18	2.436	
15	" " in the 15th row	200	12,73	2.546	
Total		3.000		26.640	

Service load.				
1	Board ladder	13	15,5	201,5
2	Engines covers for summer service	20	16,0	320,0
3	Antifreeze /alcohol/	22	3,90	86,0
4	Airborne tools /in ser- vice compartment/	16	4,30	69,0
5	Fixator clamps of rudder	1,5	4,30	7,0
6	Oil cooler pads	2,5	4,30	11,0
Total		75		694

Useful load	4.780	38.915,0
Aircraft weight empty	11.720	87.315,5
Total	16.500	7,650 126.230,5

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The coordinate of the aircraft centre of gravity with extended landing gear / X c.g./ equals:

$$X_{cg} = \frac{\sum GX}{\sum G} = \frac{126.230,5}{16.500} = 7,650 \text{ m.}$$

Centre of gravity position in % of MAC equals:

$$\bar{X}_g = \frac{X_{cg} - L}{b_A} 100 = \frac{7,65 - 7,057}{3,412} 100 = 17,4 \% \text{ MAC}$$

where X c.g. - distance from the fuselage nose to the aircraft centre of gravity in m.

G - weight of component or load in kg

X - distance from the fuselage nose to the centre of gravity of the component or load in m.

X_g - position of the aircraft centre of gravity in % of the mean aerodynamic chord MAC

L=7,057m - distance from the fuselage nose to the begin of MAC

b_A=3,412m - length of the mean aerodynamic chord

By the retraction of the landing gear the moment G X of the aircraft is reduced by ΔGX = 539 kgm.

The coordinate of the aircraft centre of gravity with retracted landing gear X.c.g. equals:

$$X.c.g. = \frac{\sum GX_{ret}}{\sum G} = \frac{125.691,3}{1.650} = 7,62 \text{ m.}$$

Balance of the aircraft with retracted landing gear

\bar{X}_g equals:

$$\bar{X}_g = \frac{X_{cg} - L}{b_A} 100 = \frac{7,62 - 7,057}{3,412} 100 = 16,4 \% \text{ MAC}$$

IV. Loading Balance

No.	Denomination	Weight kg	Coordinate m	Moment kg / m
1.	2.	3.	4.	5.
Crew				
1	Two pilots	160	1,82	291
2	Radio-operator and navigator	160	3,3	527
3	Flight engineer	80	2,44	195
Total 5 persons		400		1.013
Fuel and oil				
1	Petrol	400	8,6	3.440
2	Oil	150	6,9	1.035
Total		550		4.475
Commercial load				
30 passengers on seats from the 1st to the 15th row		3.000		26.640
Service load.				
1	Board ladder	13	15,5	201,5
2	Engine flight covers	20	16,0	320,0
3	Airborne tools /in service section/	16	4,3	69,0
4	Rudder clamp	1,5	4,3	7,0
5	Oil cooler pads	2,5	4,3	11,0
Total		53		607
Useful load		4.003		32.735
Aircraft weight empty		11.720		87.315,5
Total		15.723	7.64	120.050,5

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Coordinate of the aircraft centre of gravity on landing with extended landing gear /X.c.g./ equals:

$$X \text{ c.g.} = \frac{120.050,5}{15.723} = 7,64 \text{ m.}$$

Landing balance of the aircraft with extended landing gear / \bar{X}_g / equals:

$$\bar{X}_g = \frac{7,64 - 1057}{3,412} \quad 100 = 17,2 \% \text{ MAC}$$

Coordinate of aircraft centre of gravity prior to landing with retracted landing gear Xc.g. equals:

$$Xc.g. = \frac{119.511,5}{15.723} = 7,61 \text{ m}$$

Balance of aircraft prior to landing with retracted landing gear \bar{X}_g . equals:

$$\bar{X}_g = \frac{7,61 - 7,057}{3,412} \quad 100 = 16,3 \% \text{ MAC}$$

V.Air transport Version.

/ Flight without passengers /troops//.

No.	Denomination	Weight kg	Coordinate m	Moment kg/m
C r e w				
1	Two pilots	160	1,82	291
2	Radio operator and navigator	160	3,3	527
3	Flight engineer	80	2,44	195
Total 5 pers.		400		1.013

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1.	2.	3.	4.	5.
Fuel and oil				
1	Petrol	2.580	8,3	21.414
2	Oil	200	6,9	1.380
Total		2.780		22,780
Ballast in rear cargo compartment				
		400	15,5	6.200
	Service load	75		695,5
	Useful load	3.655		30.686,5
	Weight empty	11.720		87.315,5
Total		15.375	7,67	118.002,0

The coordinate of the aircraft centre of gravity with extended landing gear /X.c.g./ equals:

$$X_{cg} = \frac{118.002}{15.375} = 7,67 \text{ m}$$

Aircraft balance with the landing gear extended / \bar{X}_g / equals:

$$\bar{X}_g = \frac{7,67 - 7,057}{3,412} \cdot 100 = 17,9 \% \text{ MAC}$$

Coordinate of the aircraft centre of gravity with landing gear retracted /X.c.g./ equals:

$$X_{cg} = \frac{117.463}{15.375} = 7,64 \text{ m}$$

Balance of aircraft with landing gear retracted / \bar{X}_g / equals:

$$\bar{X}_g = \frac{7,64 - 7,057}{3,412} \cdot 100 = 16,9 \% \text{ MAC}$$

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VI. Landing Balance.

No.	Denomination	Weight kg	Coordinate m	Moment kg/m
1	Two pilots	160	1,82	291
2	Radio operator and navigator	160	3,3	527
3	Flight engineer	80	2,44	195
Total 5 persons		400		1.013
Fuel and oil.				
1	Petrol	400	8,3	3.440
2	Oil	150	6,9	1.035
Total		550		4.475
Ballast in the rear cargo compartment		400		6.200
Service load		53		607
Useful load		1.403		12.295
Weight empty		11.720		87.315,5
Total		13.123	7,59	99.610,5

Coordinate of the aircraft centre of gravity with landing gear extended /X.c.g./ equals:

$$X_{cg} = \frac{99.610,5}{13,123} = 7,59 \text{ m}$$

Balance of aircraft with landing gear extended \bar{X}_g /equals:

$$\bar{X}_g = \frac{7,59 - 7,057}{3,412} \cdot 100 = 15,6 \% \text{ MAC}$$

Coordinate of the aircraft centre of gravity with landing gear retracted /X.c.g./ equals:

$$X_{cg} = \frac{995566}{13123} = 7,56 \text{ m}$$

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Balance of aircraft with landing gear retracted \bar{X}_g equals:

$$\bar{X}_g = \frac{7,56 - 7,057}{5,412} \times 100 = 14,9 \% \text{ MAC}$$

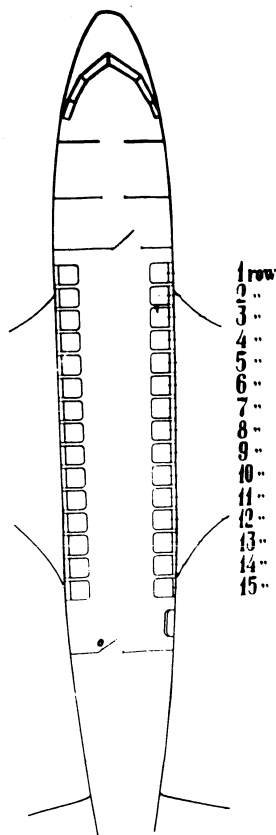


Diagram of Cabin Seats Location.

Type " D "

Loading Table
of the Il 14-30 D Aircraft.

Number of passengers	Location of passengers in rows	Weight of passengers or cargo in kg	Filling with petrol in kg	Flight /grosse/ weight in kg
30	from 1 to 15 incl.	3.000	1.105 x /	16.500
24	" 3 to 14 "	2.400	1.705 x /	16.500
18	" 5 to 13 "	1.800	2.305 x /	16.500
12	" 8 to 13 "	1.200	2.580	16.175
6	" 13 to 15 "	600	2.580	15.575
0	--	400 /in the rear cargo compartment/	2.580	15.375

Balance of this version:

Take-off 17,3 - 180% MAC /landing gear extended/
Landing 14,7 - 17,0 MAC /landing gear extended/

In the calculation is assumed:

- Weight empty 11.720 kg
- Balance of aircraft with weight empty 11.5 % MAC
- Crew 5 persons 400 kg
- Service load 75 kg
- Oil 200 kg
- Airborne troops member with outfit 100 kg

Additionally fill 100 kg /140 litres/ for starting, warming up and test running of the engines and for taxiing to the instant of take-off.

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VIII. Normal Version, with
Load only in Cabin.

Take - off.

No.	Denomination	Weight kg	Coordinate m	Moment kg/m
C r e w .				
1	Two pilots	160	1,82	291
2	Radio operator and navigator	160	3,3	527
3	Flight engineer	80	2,44	195
Total 5 pers.		400		10013
Fuel and oil.				
1.	Petrol	2.580	8,3	21,400
2	Oil	200	6,9	1.380
Total		2.780		22.780
Commercial load				
Load in cabin		1.525	9,95	15,198,5
Service load		75		693,5
Useful load		4.780		39.685
Weight empty		11.720		87,515,5
Total		16.500	7,69	127.000

Aircraft Balance.

$$\bar{X}_g = \frac{7,69 - 7,057}{3,412} \cdot 100 = 18,6\% \text{ MAC /landing gear ex-} \\ \text{tended/} \\ 17,6\% \text{ MAC /landing gear re-} \\ \text{tracted/}$$

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IX. Landing Balance.

No.	Designation	Weight kg	Coordinate m	Moment kg/m
C r e w				
1	Two pilots	160	1,82	291
2	Radio operator and navigator	160	3,3	527
3	Flight engineer	80	2,44	195
Total 5 pers.		400		1,013
Fuel and oil				
1	Petrol	400		3.440
2	Oil	150		1.035
Total		550		4.475
	Load in cabin	1.525	9,95	15.196,5
	Service load	55		657
	Useful load	2.528		21.293
	Weight empty	11.720		87.315,5
Total		14.248	7,64	108.603,5

Aircraft Balance.

$$\bar{x}_{cg} = \frac{7,64 - 7,057}{3,412} \cdot 100 = 17,1\% \text{ MAC /landing gear extended/}$$

$$16,1\% \text{ MAC /landing gear retracted/}$$

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X. Normal Version
with Load in Cabin and Rear Cargo Compartment.

No.	Designation	Weight kg	Coordinate m	Moment kg/m
Crew				
1	2 pilots	160	1,82	291
2	Radio operator and navigator	160	3,3	527
3	Flight engineer	80	2,44	193
Total 5 pers. 400				1.013
Fuel and oil				
1	Petrol	2.580	8,3	21.414
2	Oil	200	6,9	1.380
Total				22,780
Commercial load				
Load in cabin		1.125	7,67	8.628,7
Load in rear cargo compartment		400	15,5	6.200
Total				14.828,7
Service load		75		693,5
Useful load		4.780		39.315,2
Weight empty		11.720		87.315,5
Total				126.630,7

Aircraft Balance.

$$\bar{X}_G = \frac{7,68 - 7,057}{3,412} \cdot 100 = 18,3\% \text{ MAC /landing gear extended/}$$

$$17,3\% \text{ MAC /landing gear retracted/.}$$

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XI. Landing Balance.

No.	Denomination	Weight kg	Coordinate m	Moment kg/m
Crew				
1	Two pilots	160	1,82	291
2	Radio operator and navigator	160	3,3	527
3	Flight engineer	80	2,44	195
Total 5 pers.		400		1.013
Fuel and oil				
1	Petrol	400		3.440
2	Oil	150		1.035
Total		550		4.475
Commercial load				
1	Load in cabin	1.125		8,628,7
2	Load in rear cargo compartment	400		6,200
Total		1.525		14.828,7
Service load		53		607
Useful load		2.528		20.923,7
Weight empty		11.720		87.315,5
Total		14.348	7,62	108.239,2

Aircraft Balance.

$$\bar{x}_G = \frac{7,62 - 7,057}{3,412} \cdot 100 = 16,5\% \text{ MAC /landing gear extended/}$$

$$15,5\% \text{ MAC /landing gear retracted/}$$

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Type "D".

XII. Loading Table
of Il 14-30 D Aircraft.
/transporting cargo/

Quantity of cargo on air- craft in kg	Location of Cargo		Fuel Charging in kg	Flight Weight in kg
	in cargo cabin in kg	in rear cargo com- partment in kg		
1535	1525	0	2580	16500
1535	1125	400	2580	16500
	0	400	2580	15375

Balance of this Version:

Take-off $17,9 + 18,6\%MAC$ /landing gear extended/

Landing $15,8 + 17,1\%MAC$ /landing gear extended/

In calculation is assumed:

Weight empty 11.720 kg
 Balance at weight empty 11,5 % MAC
 Crew 5 persons 400 kg
 Service load 75 kg
 Oil charging 200 kg

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Note: Chapter VI. has been incorporated into other chapters.

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