screw in the bolt and to increase – unscrew the bolt . For a complete rotation of the bolt , the variation is of 1mm .

9.6.6 After measuring the pointer position and the compensatory adjustment screw in and wirelock plug 3 (Fig 11) , the bolt of the aneroid 1(Fig11) with the palnut and wire . This operation shall be specified in the certificate of the carburetor .
Remark : Check the position of the altitude compensatory pointer to the pressure chart at every 100 hours of engine operation . This check shall be made with the engine not running .

9.6.7 When fitting a new carburetor on the engine , it is allowed to adjust the primer by selecting the fuel nozzle . It is allowed to install the nipple of diameter 0.9-1.4 mm . If the nozzle diameter is increased the primer flow increases and if the diameter is reduced , the flow is also reduced . Ton replace the nozzle unscrew the plug 10 (Fig 11) then screw it in and wirelock
Remark : The nozzles necessary for adjustment are included in the spare parts kit of every carburetor .

9.7 Replacement of the compressed –air distributor

9.7.1 Disconnect from the compressed air distributor the 9 air pipes that go to the cylinders and air intake pipe to the distributor .

9.7.2 Unlock and unscrew the 3 retaining nuts of the air distributor cover , remove the cover , then unscrew the body retaining nuts . Remove the body and the cover from the engine .

9.7.3 Return the new distributor to service from storage as follows :
a) dismantle the protection covers;
b) remove the cover of the distributor , by sustaining the thrust bearing ;
c) remove the thrust bearing bracket from the cover , the adjustment socket , the axial bearing and the spring slide valve .

Clean all dismantled parts and the cover of the distributor body with gasoline , and blow out with compressed air and lubricate them with a thin layer of engine oil .

9.7.4 Refit the spring slide valve , the axial bearing and the adjustment socket into the body cover .

9.7.5 Install the air distributor body on the engine , after the seal lubricated with compound has been installed . Tighten and wirelock the fastening nuts on the engine . Adjust the distributor before installing the body cover (see par. 9.8) .

9.8 *Setting the compressed air distributor*

9.8.1 Fit a pointer below the nut of the propeller shaft .

9.8.2 Remove one spark plug from each cylinder .

9.8.3 Screw the device defining the position of the piston inside the cylinder . Turn in the direction of rotation so that No.4 will exactly at top center on the compression stroke . Set the arrow on 0 (zero) . Further on , rotate the propeller shaft in the direction of rotation up to 8° PSR(Propeller Shaft Rotation) during the detent stroke . 8°PSR correspond to a 12 ° rotation of the crankshaft .

9.8.4 Install the slide valve in the distributor cover so that the hole of the central slide valve open the air intake port to cylinder No.4 max. 1 mm , in the slide valve rotation direction . (The second port of the slide valve is used for the compressed air intake to cylinders 4,5,and 7 and for blowing the excess fuel and oil) .

9.8.5 By means of the adjustment socket overlap the grooves of the socket with those of the leading axle , without moving the slide valve .

9.8.6 Install the body cover on the distributor housing by placing a paronite seal and a rubber seal , lubricated with compound before hand

9.8.7 Install safety devices , screw in and wirelock the retaining nuts of the distributor cover .

9.8.8 Connect the air lines to the distributor .
9.8.9 Dismantle the pointer .
9.8.10 Dismantle the device from the spark plug seat and refit all spark plugs .
9.8.11 Check the correctness of the assembly and the setting of the compressed air distributor , by rotating the propeller shaft by means of the compressed air .

9.9 *Replacing the air compressor*

The air compressor is installed on the rear cover and provides the filling with air of the compressed air tank on board , necessary to start the engine and operate the devices of the airplane . The air compressor is replaced in the following sequence :

9.9.1 Disconnect the compressed air line , unscrew the nuts fastening the air compressor and remove the air compressor and the seal from the engine .
9.9.2 Return the new air compressor to service from storage as follows :
a) unpack the air compressor ;
b) remove the external lock , the sieve , the filter cell , the second sieve and the cover of the discharge valve ;
c) wipe the external surface and the flange of the air compressor with a clean cloth , soaked in clean gasoline ;
d) rotate the eccentric of the air compressor by 15-17 complete rotations in order to remove the storage grease from the internal cavity of the cylinder .
e) Clean the filter cell with gasoline and blow out with compressed air .
9.9.3 Refit the sieve , the filter cell , the second sieve and lock them with circlip. Install the filter cell inside the filter body on the same filtering surface occupied before cleaning Install the filter lock with its middle section bent towards the sieve .
9.9.4 Carefully wipe the flange and the rod of the new compressor and remove the potential impact marks . Clean the oil inlet channel and blow out it with compressed air .
9.9.5 Install a new seal lubricated with compound and provide its correct installation, to the holes of the oil channels . Install the air compressor on the gear so that the oil ports be overlapped and the socket grooves match freely with those from the air compressor axle .Install the circlips , screw and tighten the nuts .
9.9.6 Connect the compressed air line to the compressor by providing the tightness of the joints .
Caution : Remove the cover of the discharge valve before returning to service from storage of the new air compressor .

9.10 *Replacing the generator*

9.10.1 Disconnect the wires , unscrew the fastening nuts of the generator's adaptor and dismantle them together with the nuts from the gear body .
9.10.2 Remove the adapter from the generator .
9.10.3 Take out the adapter socket from the generator 's gear .
9.10.4 Return the new generator to service from storage :
a) remove the storage grease from its body ;
b) wipe with a clean and dry cloth .
9.10.5 Visually inspect the generator and check the smooth travel of the brushes in the bracket .
9.10.6 Wipe and check the generator's surfaces , those of the joint , socket and gear in order to detect the impact marks ; if there are any , the surface shall be repaired .
9.10.7 Install the seal lubricated with compound on the generator's flange .
9.10.8 Install the adapter on the generator , 6 bolts with washers and nuts ; tighten and wirelock the nuts .
9.10.9 Install the seal lubricated with compound and the socket on the generator's gear .

9.10.10 Install the generator on the engine so that the generator's fastening bolt would be located between the fastening studs of the adapter to the gear , on the right hand magneto side and the axle would mesh with the grooves of the socket .

9.10.11 Install the locks , tighten the nuts and wire lock them .

9.10.12 Connect the wires and the generator's air blowing device .

9.10.13 Start the engine and check the operation of the generator .

Remarks:

a) the friction socket of the generator is calibrated to 3±0.2 kgm. It is not allowed to calibrate the socket during service .

b) When installing the generator , connect the air blast house ; cold air should be blown through the internal cavity of the generator at air pressure and with a flow of min 35l/s(corresponding to a pressure of 150mm w.g.)

c) It is allowed to assembly the generator with the gear and then , its installation on the engine .

9.11 *Replacing the R-2 propeller speed governor*

The propeller speed governor is used to automatically maintain the speed set by the pilot . The governor has a simple action , it is installed on the reducer aside cylinders 8 and 9 .In order to dismantle the governor unscrew the nut and remove the control roll, unscrew the fastening nuts to the engine . The speed governor is installed in reverse order .

9.11.1 Check the existence of seals and locks on the speed governor .

9.11.2 Unscrew and dismantle the nuts , the transportation plugs and the bracket from the governor .

9.11.3 Check in the governor certificate if the direction of rotation is the same with engine direction of rotation .

9.11.4 Return the speed governor to service from storage :

a) remove the storage grease from the external surfaces ;

b) wipe the external surfaces with a dry and clean cloth .

9.11.5 Visually inspect the locating/alignment surfaces from the speed governor and engine , the grooves of the socket and governor's axle .

9.11.6 Check the smooth rotation of the leading axle rotating by hand the gear socket at min. 8°C . If the leading axle of the governor is hardly or unevenly rotated , then the governor will not be installed on the engine .

9.11.7 Install the speed governor on the gear studs without seals and check if the lower front surface hangs on the gear surface without any clearance . Place on the engine gear a seal greased with compound by corectly locating the holes of the oil grooves .

9.11.8 Install the governor on the engine so that the grooves of the rod would enter freely in the gear socket by slightly rotating the propeller . Install the washers, screw in and tighten the retaining nuts of the governor . Tighten the nuts evenly and moderately (in order to avoid the jamming of the leading axle of the governor) .

9.12 *Adjusting the propeller speed governor on the engine*

9.12.1 Set the control rod or roll of the propeller governor in the cockpit on the high pitch position .

9.12.2 Rotate the governor control axle clockwise up to max. position (the spring is completely loose) .

9.12.3 Set a roller on the hexagon of the control axle .

9.12.4 Adjust the cable length and place it on the governor roller without any clearances in the control system .

9.12.5 Test the control system operation ; rotate the governor control axle by a complete angle (160°) without any clearances (jamming and dead angles) .

9.12.6 Start and warm up the engine ,then check the operation of the propeller speed governor and the speed governor control mechanism by setting the propeller from “Low pitch” to “High pitch” , and test the propeller operation by setting the governor at different speeds .The setting is considered as complete if the throttle is on complete open position , upon setting the propeller governor lever to the Low pitch limiter the take off speed of the engine is 99% (2900 r.p.m.) When setting the lever o High pitch from NOMINAL II 70%(2050 r.p.m.) , the speed shall drop suddenly to 53% (1550 r.p.m.) .

On an intermediate position (close to Low pitch) , for a short displacement of the throttle control lever on both sides the speed shall be steady , corresponding to the position of the propeller governor control lever .

9.12.7 Install the Low pitch limiter stop in the propeller governor control system in order to limit the drop of the take off speed 99%(2900 r.p.m.) in the following sequence :

a) fly and maintain at the same time the crankshaft speed to max. 99% (2900 ±1% r.p.m.)
b) measure the position of the propeller governor control lever with the throttle on open position corresponding to a speed of 99% (2900±1% r.p.m.) .
c) after landing and stopping the engine , set the lever on the position recorded during the flight . Set the Low pitch limiter on this position .

Remarks :

1. *When setting the lever or control roller of the propeller governor in the cockpit at the maximum speed , the roller of the governor shall not reach the limit position by ~5°. When fastening the limiter no clearance is allowed between the teeth of the gear rack and the control axle .*
2. *When the propeller cylinder is damaged during flight , in order to prevent oil leakage it is necessary to immediately set the propeller control rod on high pitch position .*

10. Engine troubleshooting ,causes and remedies

Failure description	Cause of failure	Remedy
1. Difficult rotation of the crankshaft.	a) Oil has accumulated inside the lower cylinders during long parking or as a result of an incomplete storage of the engine .	e) Unscrew spark plugs from cylinders 4 and 5 and drain plugs of the inlet pipes of the cylinders and the exhaust plugs ; drain oil , refit the spark plugs , turn propeller over by hand 3-5 times ,with ignition switch “off” . Check the complete oil drain .Install and wirelock the plugs ;
	b) Insufficiently warmed up engine in winter .	f) Warm up the engine and pour 1-3 l of warm oil in the crankcase ;
2. The engine is not turned over by compressed air at starting .	a) air pressure in the tank is low ;	a) fill the tank with air up to 50 kgf/cm^2 ;
	b) air leaks in compressed air system ;	b) inspect for leaks at all compressed air system connections;
	c) compressed air distributor slide valve is installed unproperly ;	c) install the compressed air distributor slide valve properly;
	d) the starting ducts are reversed ;	d) install the starting ducts properly ;
	e) scratches on the active surfaces of the compressed air distributor .	e) dismantle the compressed air distributor and correct the working surface .
	Remark : The jobs of item 2e shall be performed by the representatives of the manufacturing plant .	
3. Lack of compression in the cylinders .	a) the valves are not completely closing ;	a) check for correct valve clearance ;
	b) leakiness between the spark plugs and the cylinders or between the cylinders and valves ;	b) tighten more the spark plugs and check all valves ;
	c) burnt or damaged piston segments ;	c) dismantle the cylinder and repair the failure ;
	d) burnt valve .	d) replace the valve .
4. Engine refuse to start .	a) unproperly throttle operating ;	a) the engine will start more readily with throttle cracked open about 28-38% (800-1100 r.p.m.);

	b) inadequate fuel supply ;	b) ascertain that gasoline is turned “on” ; that there is a sufficient amount in the tank to permit flow to the carburetor ; that there is a definite gasoline flow at the carburetor ; and that the carburetor float is not stuck ;
	c) engine is overprimed ;	c) turn the main gasoline supply off ; turn the magneto switch off ; open the throttle wide , and turn the propeller 3-5 revolutions as rapidly as possible to the direction of rotation .
	d) the spark plugs are fouled by oil or carbon ;	d) unscrew the spark plugs ,clean and dry them ;
	e) low compression ;	e) pour 30-40 g of oil into the cylinders through the spark plugs holes and turn the propeller over by hand ;if the failure was not corrected , check the conditions of the piston rings and the surface of the cylinders and carry out the works set forth in item 3 ;
	f) starting coil is not operating ;	f) replace the coil , check wire connection ;
	g) the engine is insufficiently preheated (in winter) ;	g) it may be necessary to warm the engine with an engine heater ;
	h) poorly loaded accumulator ;	h) replace the accumulator ;
	i) defective ignition ;	i) examine the ignition wiring for continuity and for leaks resulting from breaks in the insulation ;
	j) improper clearance between the breaker points ;	j) check breaker points for proper gap clearance or adjustment , a possible pitted condition, or evidence that the condenser has burned .
	k) magneto breaker points are lubricated with oil or burnt . *Remark ; The work specified in item 4e shall be performed by the representatives of the manufacturing plant .*	k) clean the magneto breaker points with alcohol .
5. The engine starts but dies after a few explosions .	a) the fire cock is closed ;	a) open the fire cock ;
	b) obstruction of fuel flow due to dirty strainers or water in line or carburetor bowl ;	b) check if there is fuel in the carburetor ; check the absence of the air intake in the fuel inlet line ;drain the fuel strainer ;
	c) fuel has no pressure at the carburetor inlet ;	c) check the condition of the fuel pump by disconnecting of the fuel line from the screen ; turn the propeller over

		by hand ; the pump is in good condition if there is a definite gasoline flow ;
	d) carburetor jets are plugged ;	d) unscrew the jets ,clean and blow out with compressed air ;
	e) fine fuel screen is plugged ;	e) replace the filter cell ;
	f) ground wire insulation is damaged so as to permit a contact with the metal of the airplane ;	f) make sure that the ground wire insulation is not damaged and check possibility of magneto ground wire swinging and periodically grounding ; correct the failure;
	g) improper clearance between the magneto breaker points ;	g) adjust the clearance within 0.25-0.35 mm ;
	h) magneto breaker points are lubricated with oil or they are not returned to service from storage ;	h) remove oil and other impurities from the breaker points;
	i) magneto wires were not properly connected ;	i) check the correct connection of the wire to the spark plugs ;
	j) obstruction of the fuel flow due to the dirty strainers ;	j) blow out with compressed air the fuel line ;
	k) air leaks at all induction system connections ;	k) examine intake pipes for cracks and inspect for leaks at all induction system connections ;air leaks sometimes cause a sharp high-pitched whistling noise that is particularly audible at or near idling speeds when the intake manifold vacuum is greatest ;
	l) the engine is insufficiently preheated (in winter).	l) it may be necessary to warm the engine with an engine heater ;
6. When starting the engine the propeller is going back by few turns .	a) the magneto is not timed correctly ;	a) check the ignition timing ; be sure magnetos are in full advance ;
	b) improperly installed air distributor ;	b) adjust the compressed air distributor ;
	c) the engine is overheated ;	c) if the engine is hot , turn the main gasoline supply “off”; open the throttle wide ; turn ignition switch “off” ; and allow the engine to cool for 10 or 15 minutes .
7. Speed of engine drop over 3% when test	a) defective spark plugs ;	a) repair as in item 8 ;
	b) defective magneto ;	b) open the magneto covers and check breaker points for proper gap clearance (0.25-0.35mm) or adjustment , a

magnetos separately for proper firing .		possible pitted condition , or evidence that the condenser has burned .Check the condition of the high voltage contact spring from the cover . Make sure that the ignition switch is not defective or that the ground wire insulation is not damaged so as to permit a contact with the metal of the airplane somewhere between the switch and magneto ground terminals .
	c) defective ignition wiring ;	c) replace the damaged wires ; examine the ignition wiring for continuity and for leaks resulting from breaks in the insulation ;
	d) the magneto is not timed correctly ;	d) check magneto breaker points for proper timing as described in paragraphs 9.4.2 ;
8. Rough running of the engine .	a) damaged ignition cables ; b) improper contact with the spark plugs central electrode; c) the spark plugs are fouled by oil or carbon;	a) replace the damaged cables ; b) check the fastening of elbows to the spark plugs ; c) check the spark plugs under pressure ; replace the defective spark plugs ; If the spark plugs are fouled by oil , check the compression of the cylinders . Visually inspect the cylinders ,the pistons and the segments in case the compression is low . Replace the defective parts.
	d) improper valve operation ;	d) Check for correct valve clearance ;check valve operation , especially for evidence of sticking or lag in valve operating mechanism ;If necessary , adjust the clearance between push rod and rocker arm as per par.8.9.2 .
	e) obstruction of fuel flow due to dirty strainers or water in line or carburetor bowl ; f) air leaks at all induction system connections; g) lean or rich mixture ;	e) drain the fuel strainer ; f) examine intake pipes for cracks and inspect for leaks at all induction system connections ; g) check for lean or rich mixture in any or all cylinders ; This could result from improper setting of the carburetor, air leaks in the induction system , loose carburetor bolts or bent carburetor mounting pad flange.