Main Directorate of the Engineering-Aviation Service
Red Army Air Force

FLIGHT MANUAL
IL-2 AIRPLANE
with AM-38 ENGINE

People Comissariat of Defense
MILITARY PUBLISHING HOUSE
Moscow - 1942

MAIN DIRECTORATE OF THE ENGINEERING-AVIATION SERVICE
RED ARMY AIR FORCE

All pilots, flying on Il-2 airplanes, are to carefully acquire and precisely carry out all sections of the current manual in specified sequence.

Fly schools and reserve regiments are to provide development of solid skills and automatism in operating Il-2 according this manual.

Chief engineer of the Red Army Air Force
General-lieutenant of the Engineering-Aviation Service
A. Repin

FLIGHT MANUAL IL-2 AIRPLANE with AM-38 ENGINE

Approved:

Chief Designer of the IL-2 Airplane
Hero of the Socialist Labour
S. Ilyushin

VOENIZDAT

People Comissariat of Defense
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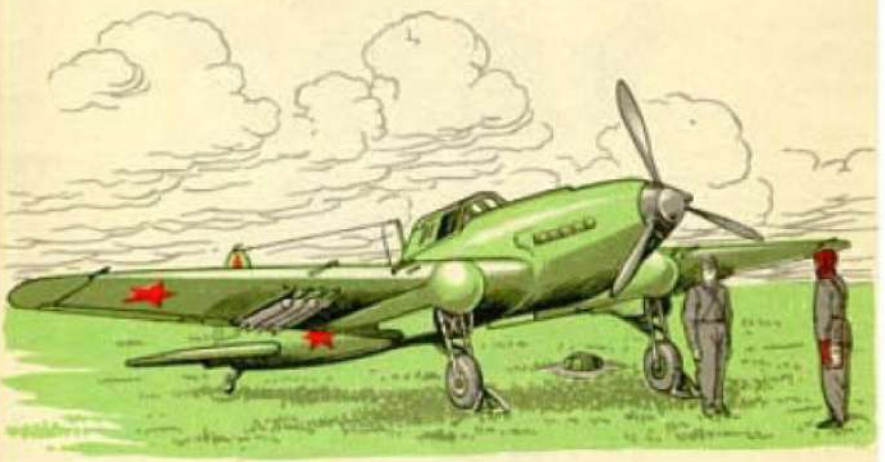
I
PRE-FLIGHT INSPECTION



1. Before the flight take readiness report from the airplane mechanic.

2. Make external inspection of the airplane

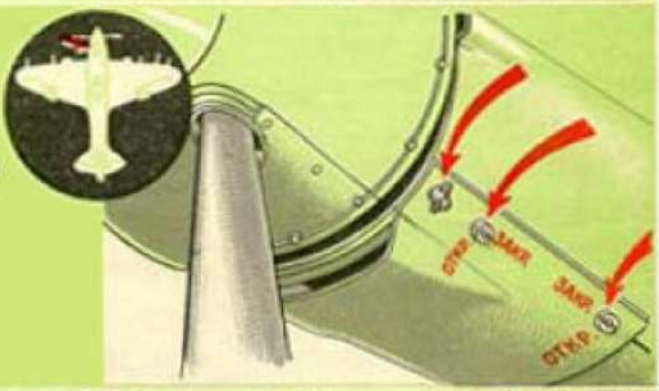
Inspect:

the propeller -

if there is any external damage (holes, scratches) on blades and the boss, check for the blade's visible bending;

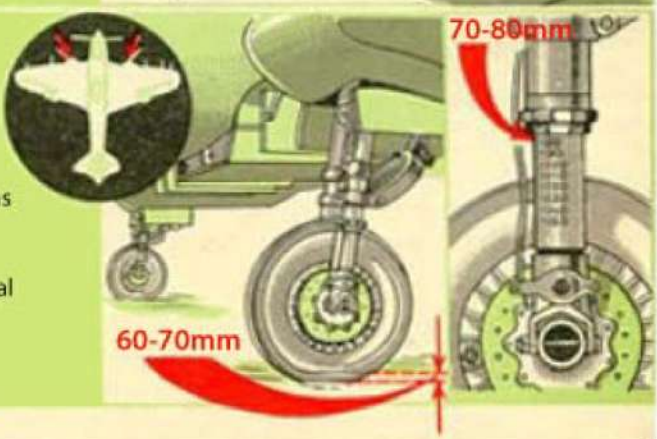
engine hatches -

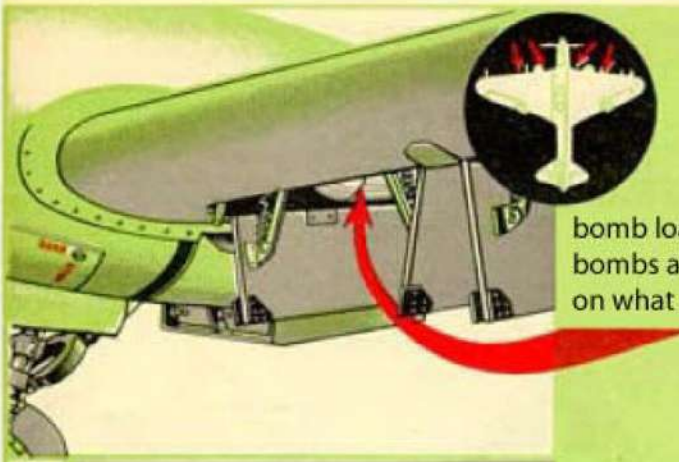
check if the bottom engine hatches are locked, if there is safety-lock pin on the cover of the forward hatch.



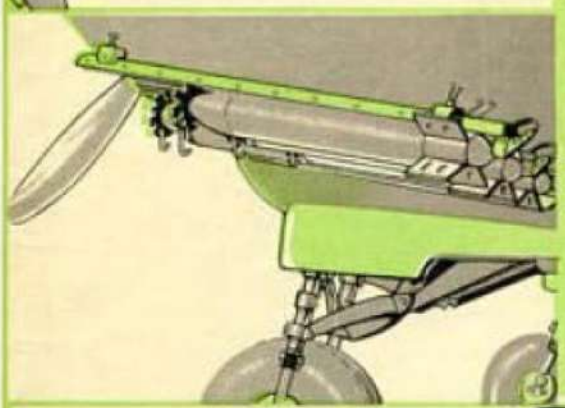
landing gear -

if tires has normal pressure, if positions of both shock absorbers are normal and identical

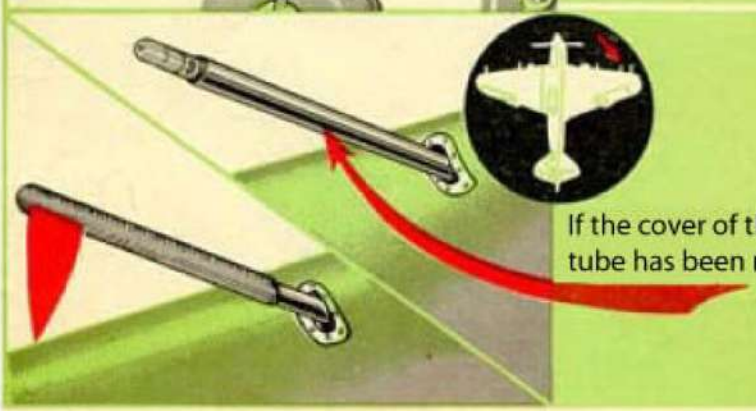




bomb load - what bombs are loaded and on what suspension



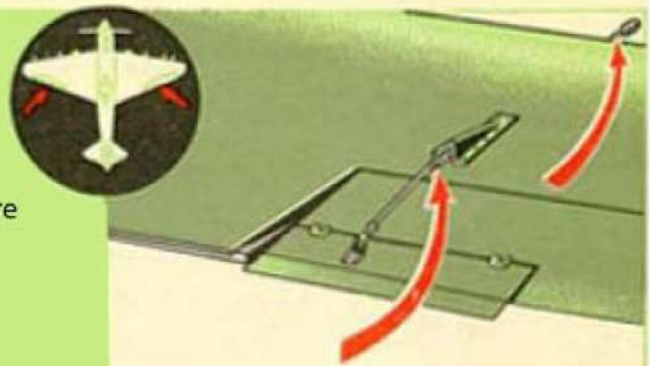
How many rockets and what fuses are installed



If the cover of the Pitot tube has been removed

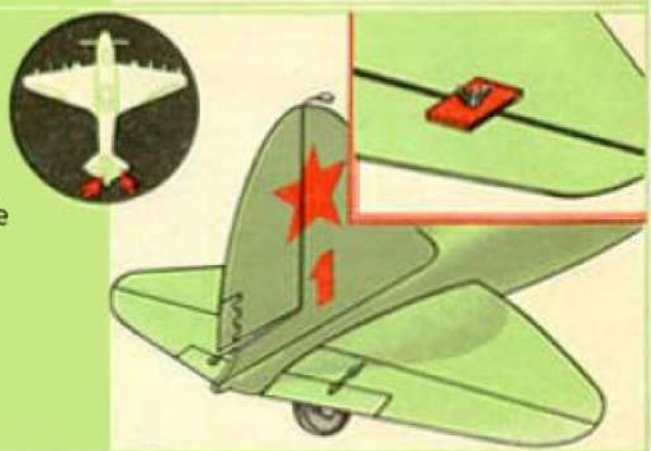
ailerons -

if there is any damage, if there is backlash in pin-joints



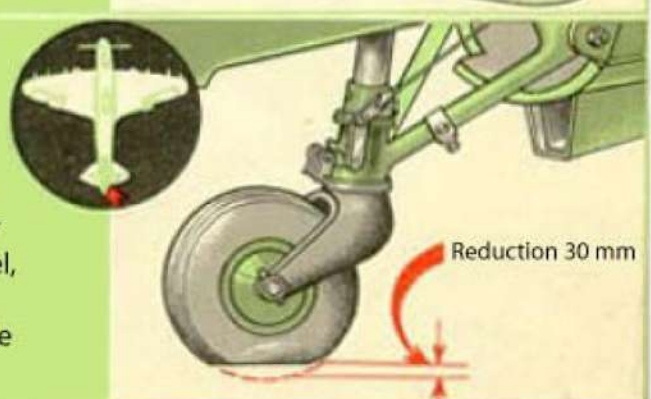
tail damage -

if there is any, if clamps on the rudder were removed

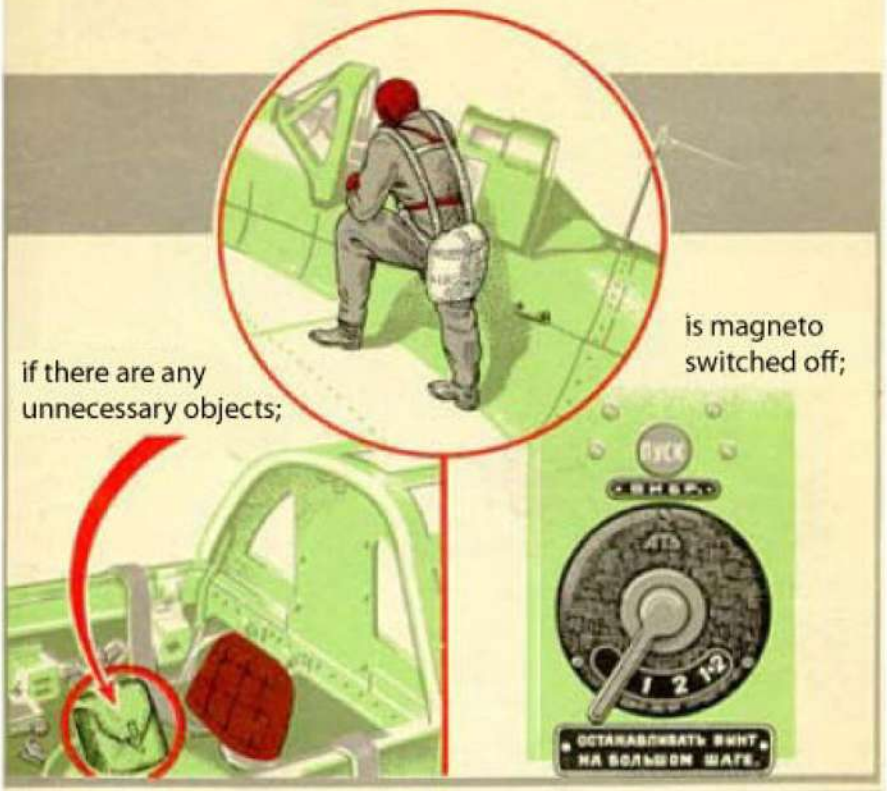


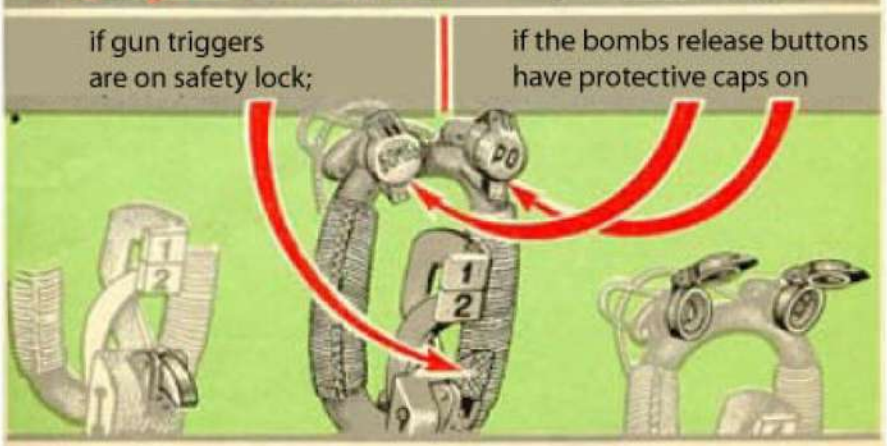
skid -

if there is air in shock absorber of the tail wheel, is the tire has normal pressure

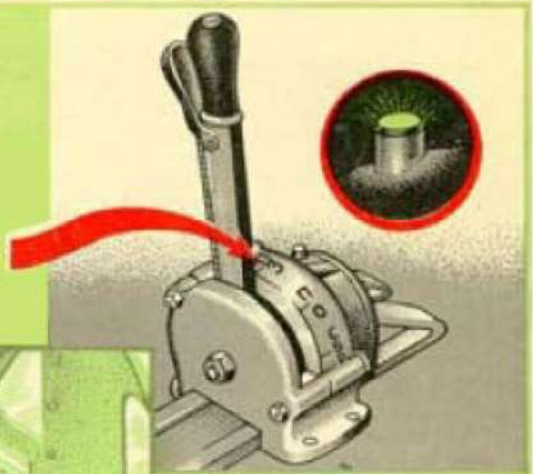


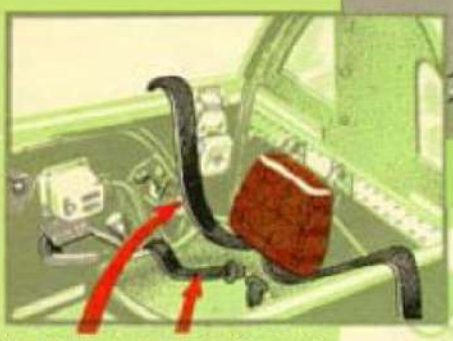
3. Before entering airplane cockpit, check:





if ASSH is in "SO"
(Safety On) position

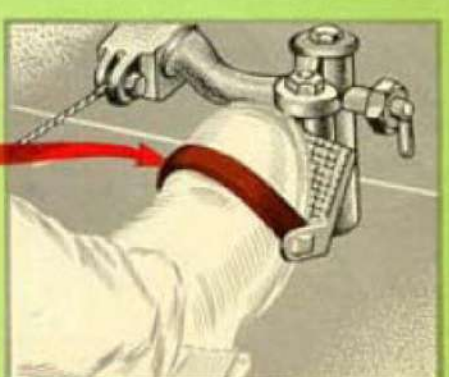




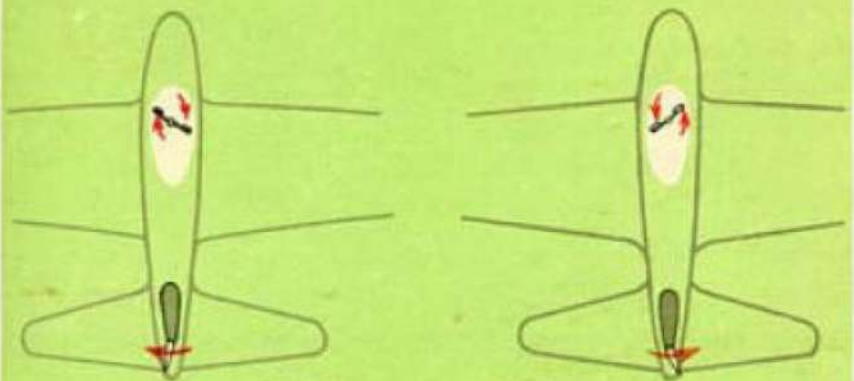
if the belts are straightened

if the panel deflector
is clean and undamaged

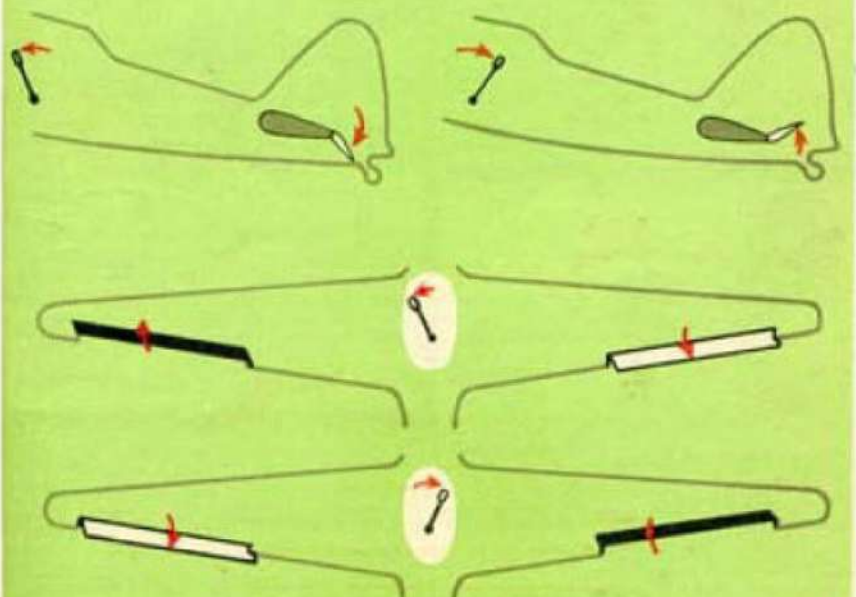
4. Put feet on the pedals
under the fasteners

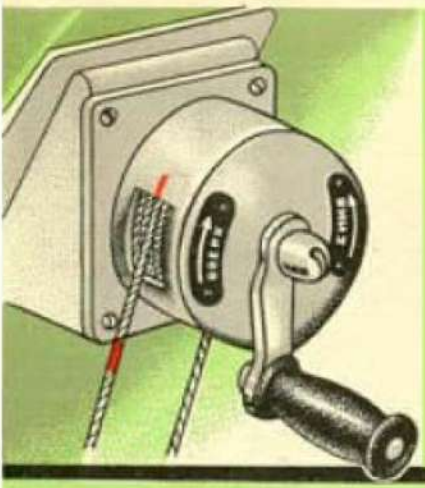


5. Check if the control stick and pedals move easily.



if the elevators and ailerons work correctly

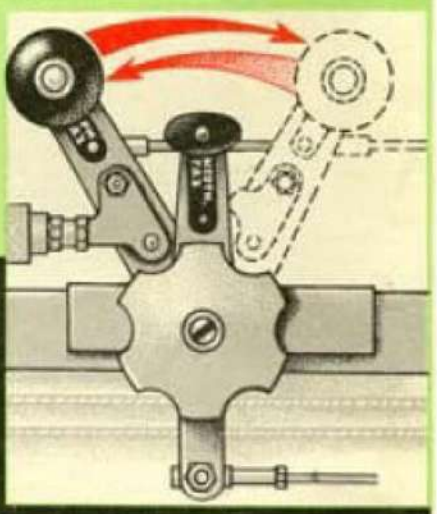


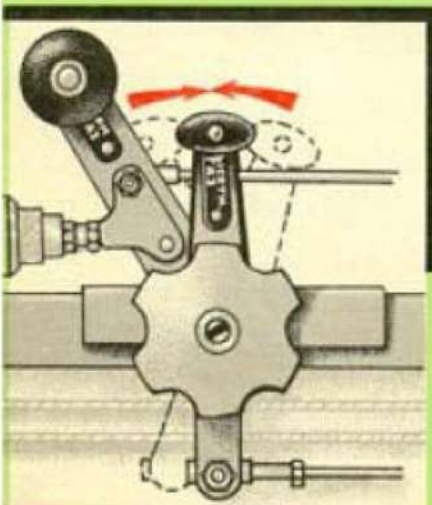


6. Check the elevator trim control handle and set it into take-off position

7. Check throttle controls:

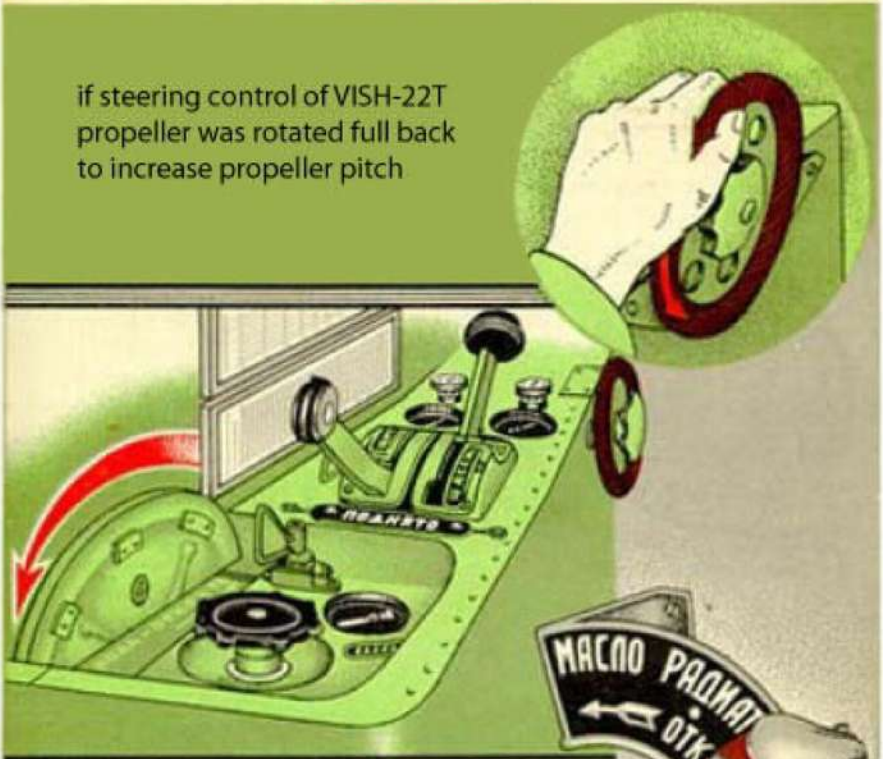
throttle connector





settings of the high-altitude corrector - afterburner

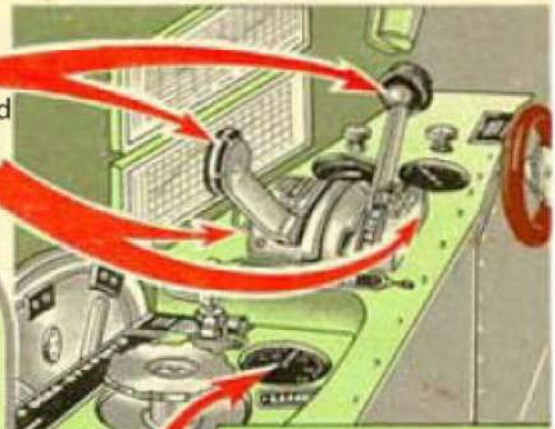
if steering control of VISH-22T propeller was rotated full back to increase propeller pitch



if the water and oil radiators' shutters are closed

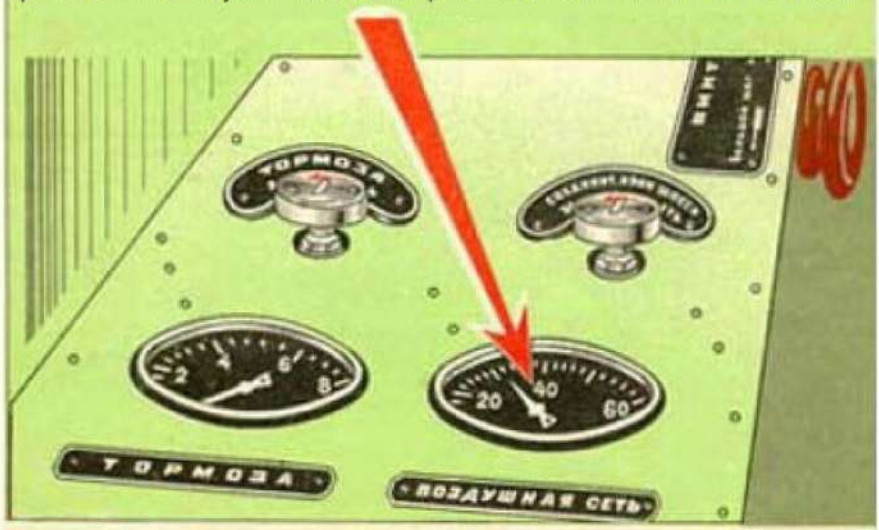
if the fire-cock is opened (in full forward position)

8. Check position of landing gear and flaps control handles and check if they are secured with safety-lock pins.

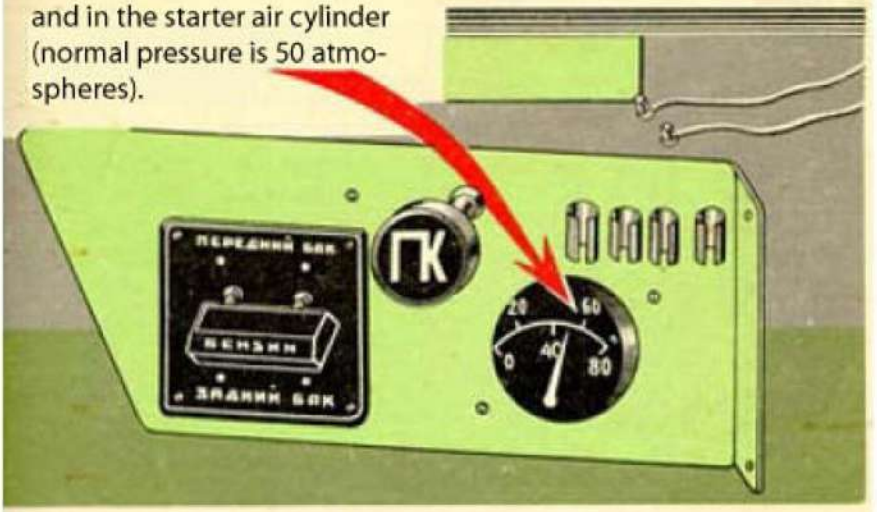


9. Check the air pressure in the on-board air cylinder (100-150 atmospheres) and switch on air systems:

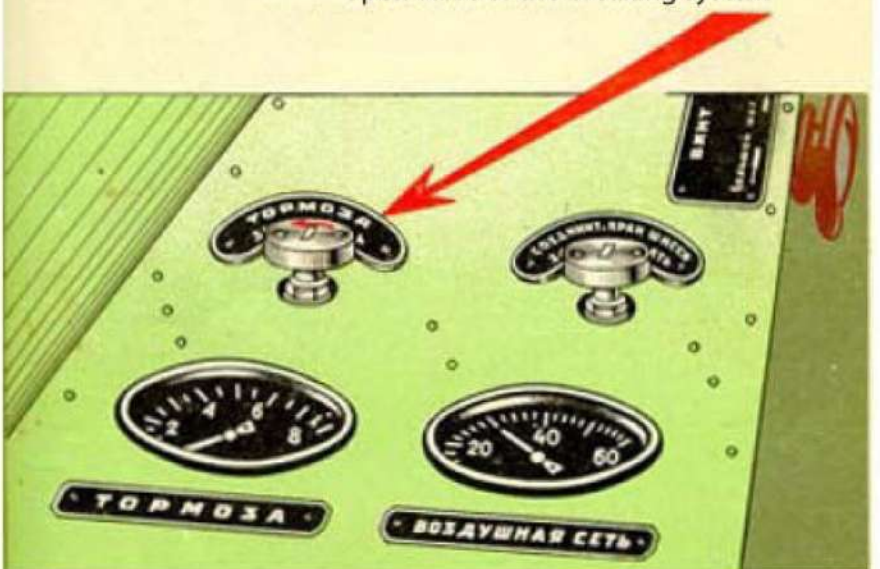
open control of the landing gear/starter system and check air pressure in the system (35 atmospheres is normal) with manometer.



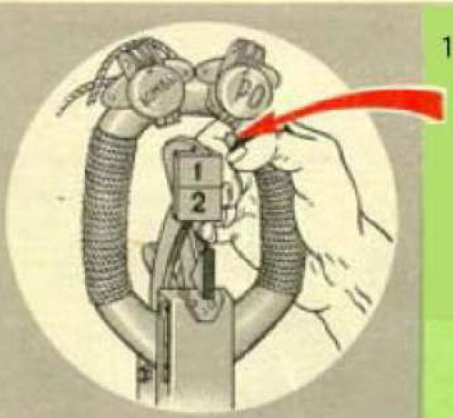
and in the starter air cylinder (normal pressure is 50 atmospheres).



open valve of the breaking system

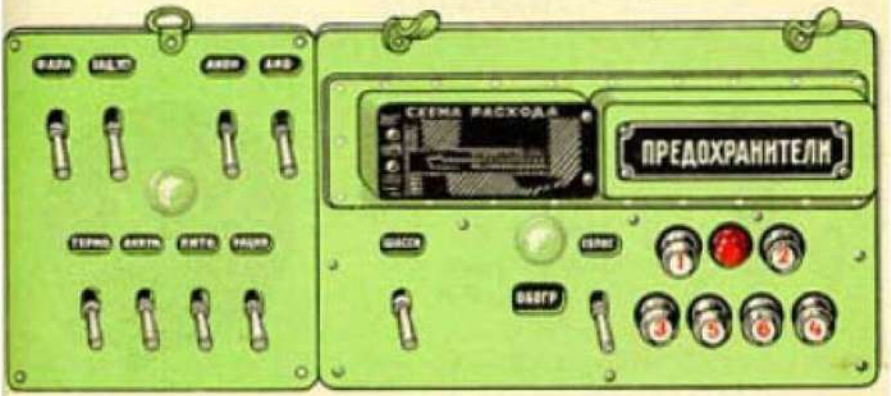


open valve of the weapons air recharger system

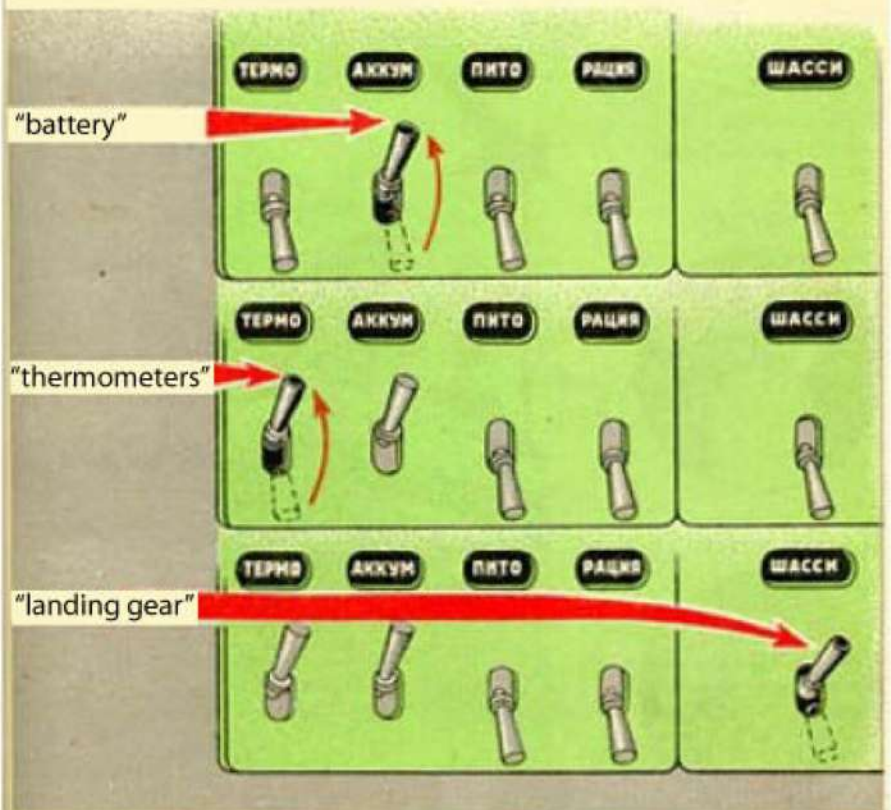


10. Check braking system with two-arrows manometer by simultaneous and separate braking of the both wheels.

11. Switch on and check electrical system.



Switch on:



Check:
battery closed circuit voltage

by switching on
Pitot tube heating
for 2-3 sec.

voltage should be not less than 24 V

check
temperature of:

water

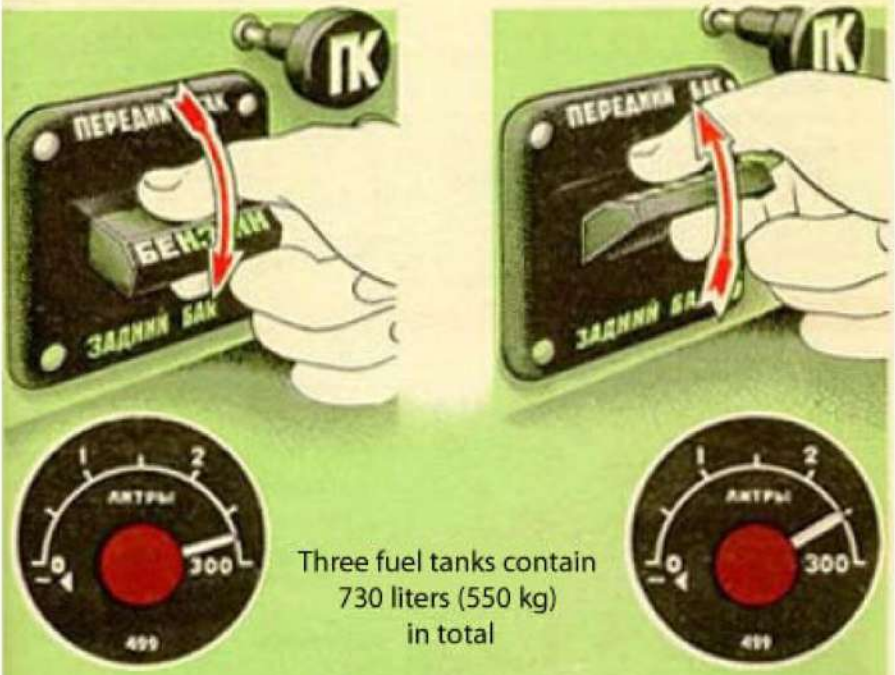
and oil

signal system of the landing gear -

using control lights...

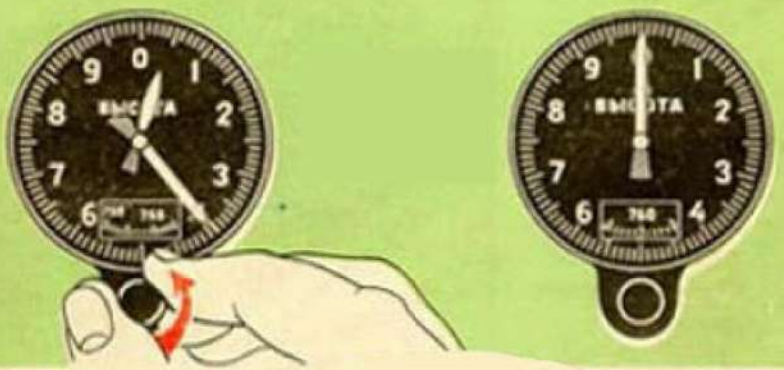
and, simultaneously, mechanical indicators ("soldiers").

12. Check fuel in the fuel tanks, switching fuel selector valve.



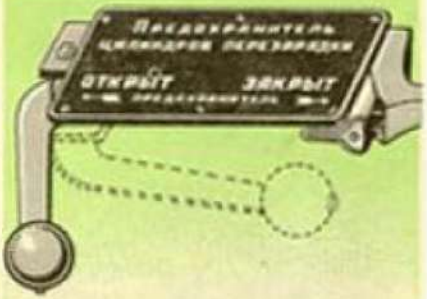
Three fuel tanks contain
730 liters (550 kg)
in total

13. Set altimeter to zero.

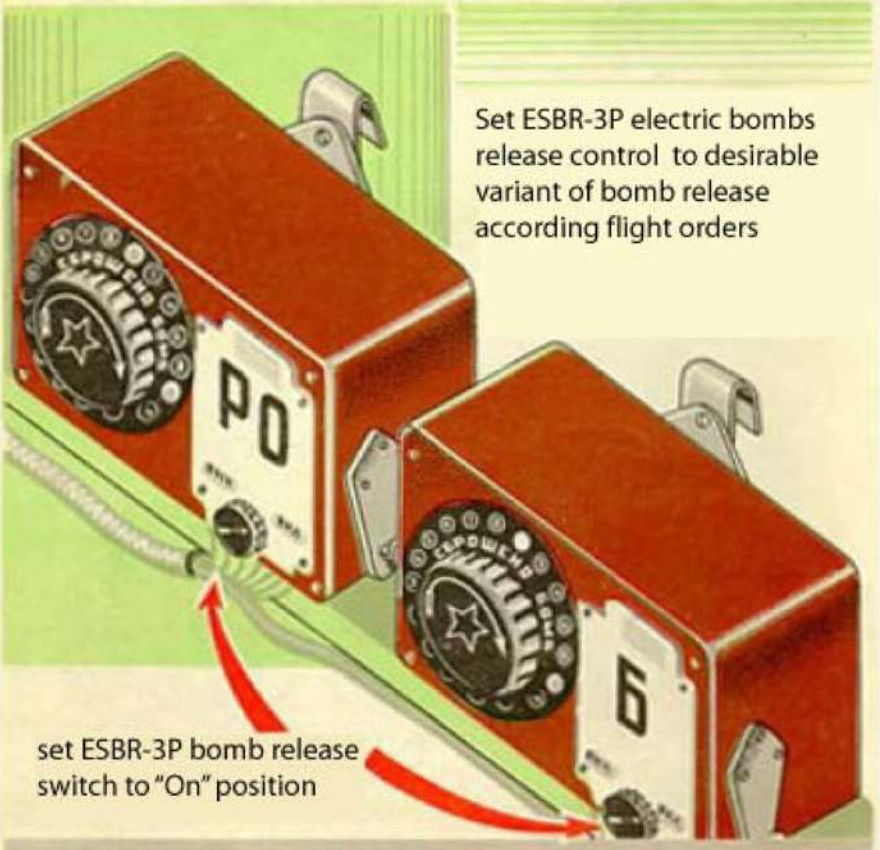


14. Check and prepare weapons:

put safety lock of the guns pneumatic re-charger in "Open" position (push handle full forward).

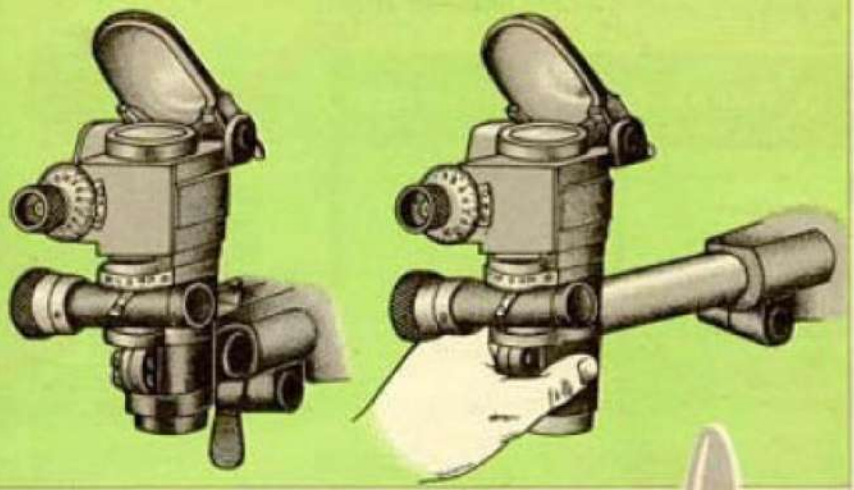


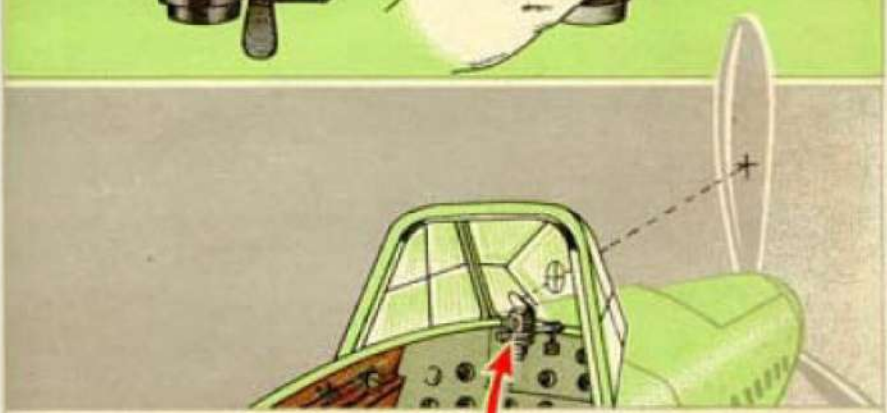
Set ESBR-3P electric bombs release control to desirable variant of bomb release according flight orders

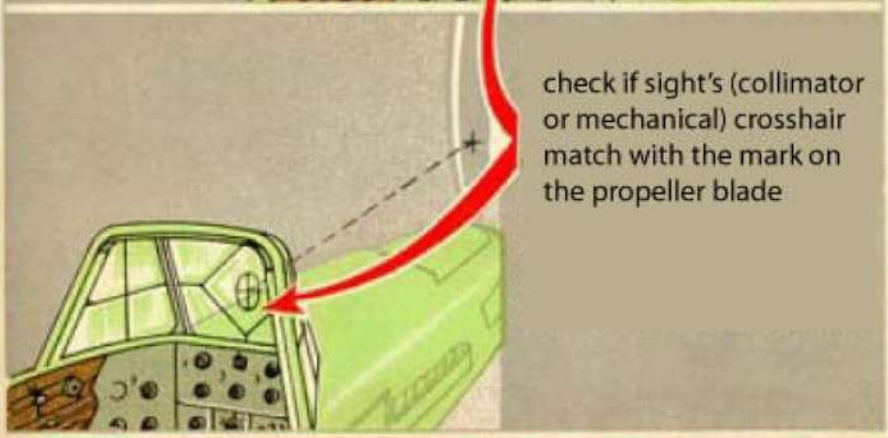


set ESBR-3P bomb release switch to "On" position

set PBP-1 sight in firing position







check if sight's (collimator or mechanical) crosshair match with the mark on the propeller blade

In poor light conditions switch on
PBP-1 sight backlighting

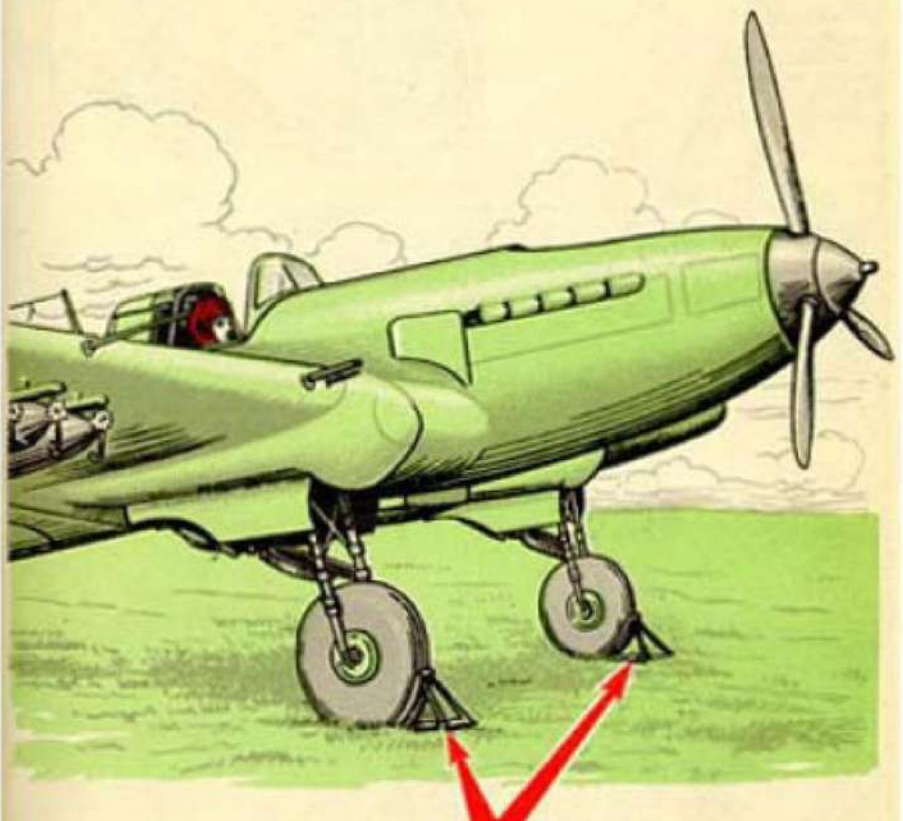
15. Before the night flight:

check headlight and its angle,
cabin and instruments panel lighting

have a flashlight onboard

II

CHECKING ENGINE BEFORE TAKE OFF



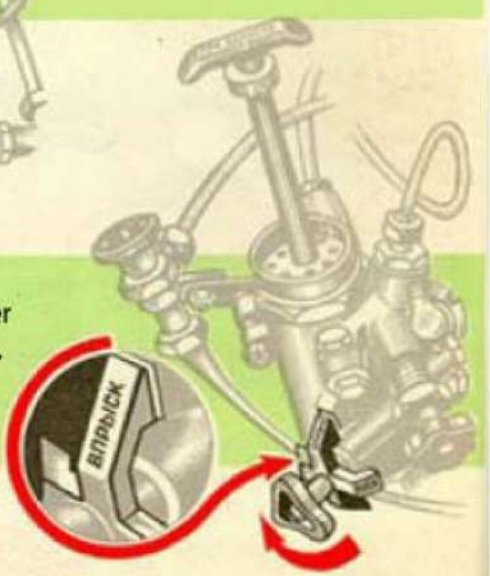
Check brake blocks under the wheels

Fueling

1. Set valve of the booster pump in "intake" position.

2. Lift the plunger of the booster pump upward.

3. Re-set valve of the booster pump in "intake" position.



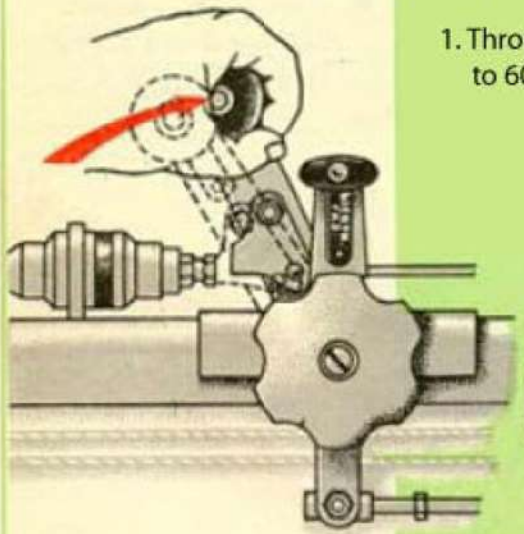
4. Push plunger of the booster pump down

REPEAT OPERATIONS 1,2,3, and 4: 3-4 times in summer, 5-6 times in winter.

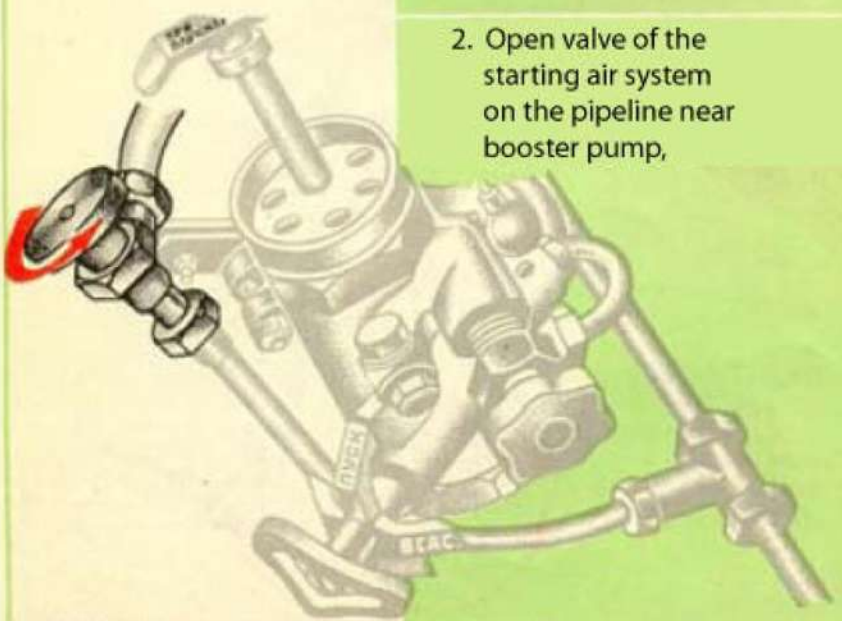
5. Lift the plunger of the booster pump upward and re-set cock of the booster pump in "intake" position.

START

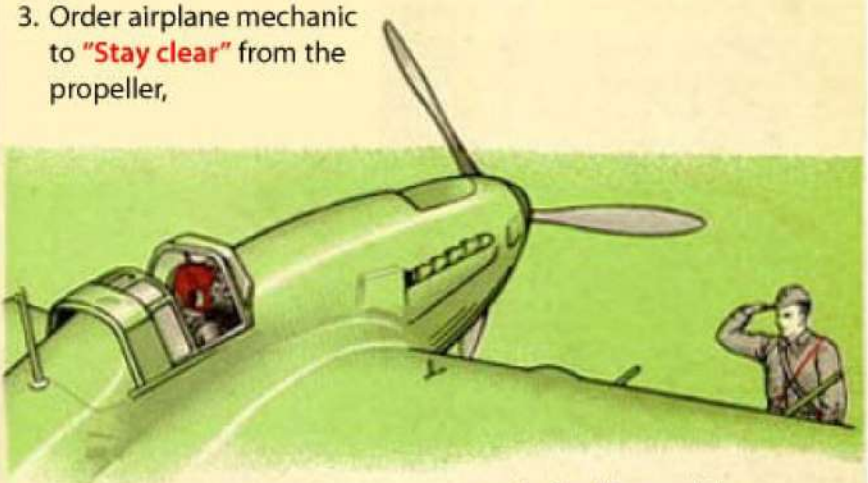
1. Throttle engine up to 600-700 rpm.



2. Open valve of the starting air system on the pipeline near booster pump,



3. Order airplane mechanic to **"Stay clear"** from the propeller,



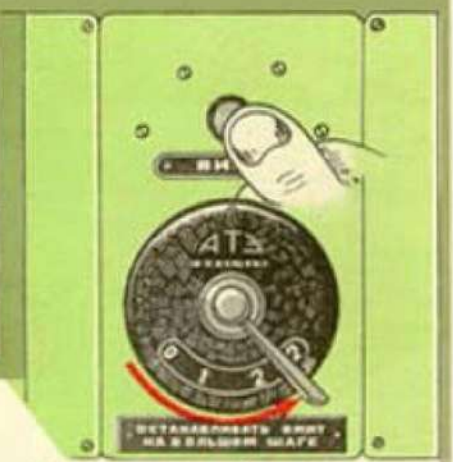
and, after his receiving confirmation **"Cleared"**,

switch on magneto

and vibrator.

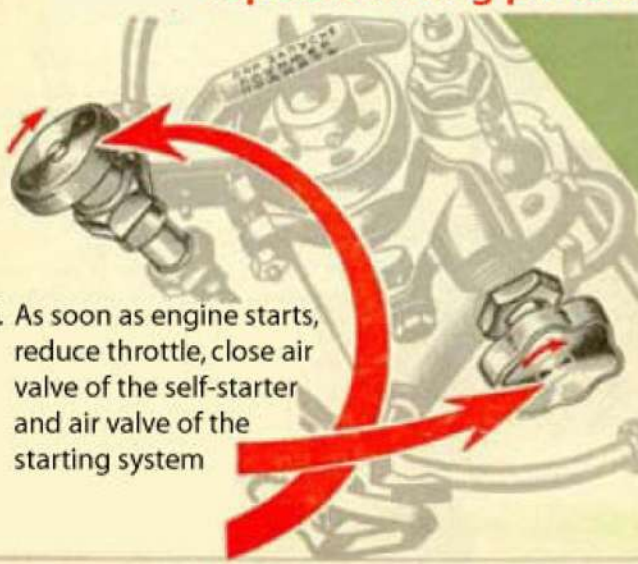
4. Open air valve of the self-starter, and after one full turn of the propeller,

press vibrator button
(keep button pressed for
5 sec or less)



If engine didn't start,

repeat starting procedure



5. As soon as engine starts, reduce throttle, close air valve of the self-starter and air valve of the starting system

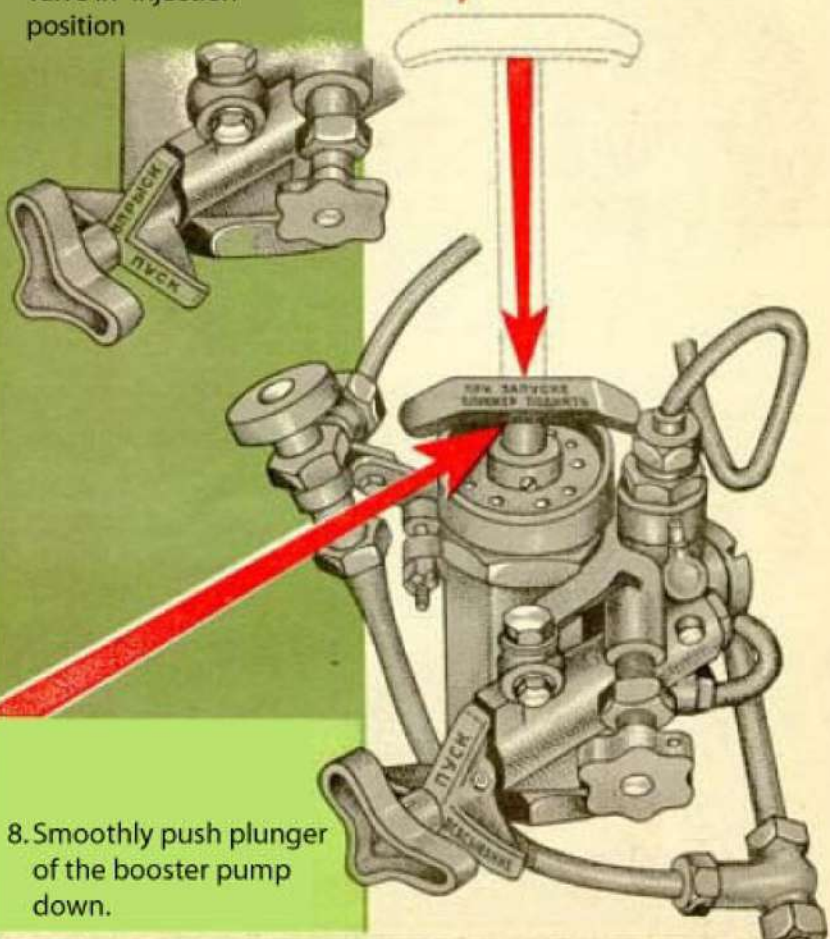
6. Check instruments data:

oil pressure should be no less than 3 atmospheres

fuel pressure - 0.1 - 0.2 atmospheres

If within 5-10 seconds oil pressure will not increase up to 3 atmospheres, switch off the engine for fixing low oil pressure problem.

7. Set distributing valve in "injection" position



8. Smoothly push plunger of the booster pump down.

WARMING UP

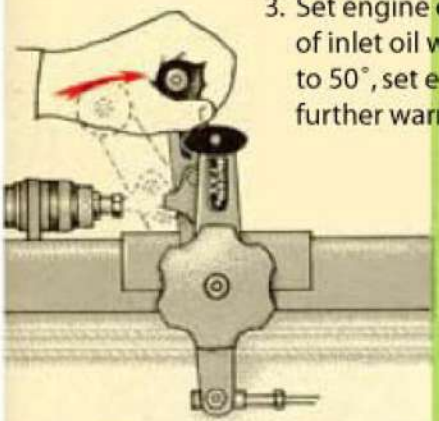
Throttle engine up to 700-800 rpm.

And continue to warm up engine until the temperatures will be:

water - 60°

2. Rotate steering control of VISH-22T forward to decrease propeller pitch and lock it up

outlet oil - 40°



3. Set engine on 1200 rpm and after temperature of inlet oil will increase up to 25° or outlet oil - to 50°, set engine on 1500 rpm for further warming up.

4. The engine is considered warmed up if the temperatures are:

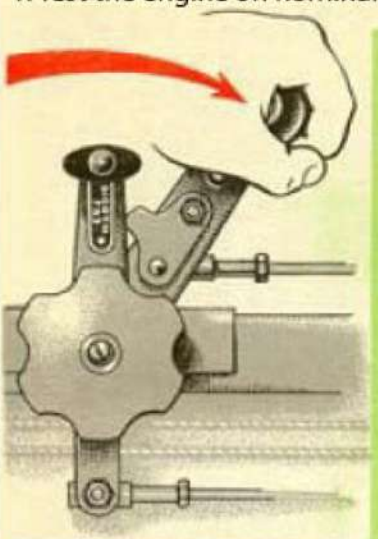
water - 80° and up

outlet oil is 70°and up

inlet oil - 40° and up

TESTING THE ENGINE

1. Test the engine on nominal power.



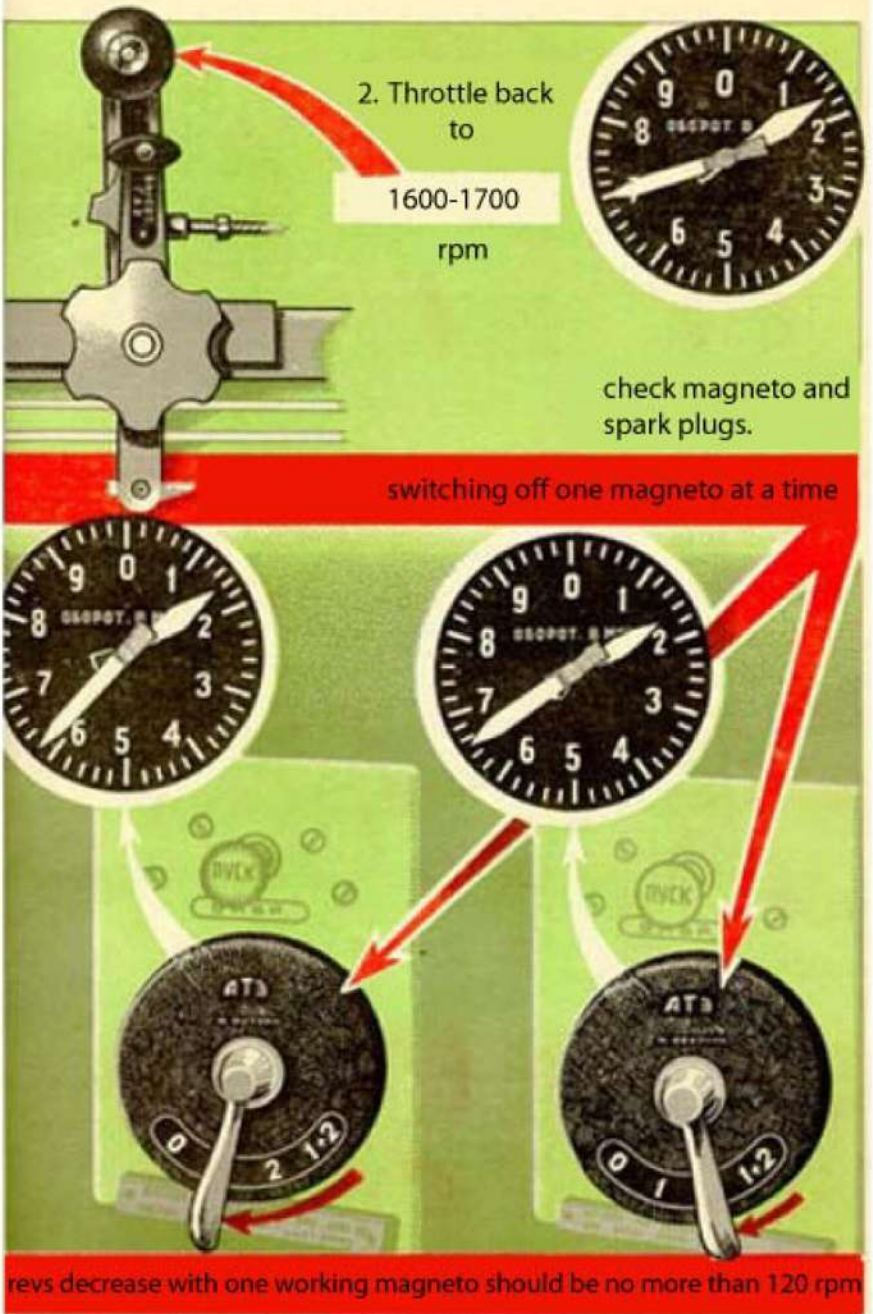
During the normal functioning of the engine settings should be:

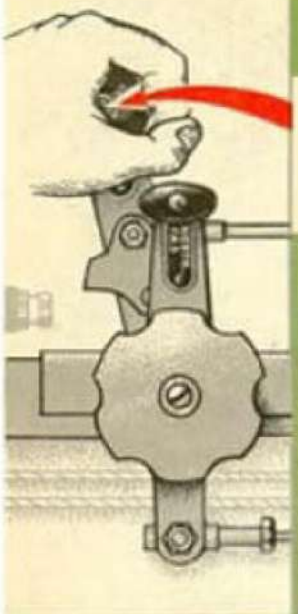
supercharger 1180 +/-25 mm

water temperature: 80° - 110°

revs - 2050 rpm

outlet oil temperature: 70°-115°,
oil pressure: 7 - 8/5 atmospheres,
gas pressure 0.3 - 0.35 atmospheres

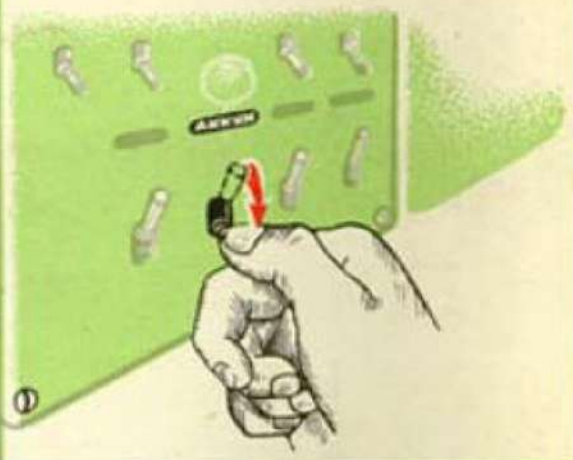

2. Throttle back to
1600-1700
rpm
check magneto and spark plugs.
switching off one magneto at a time
revs decrease with one working magneto should be no more than 120 rpm

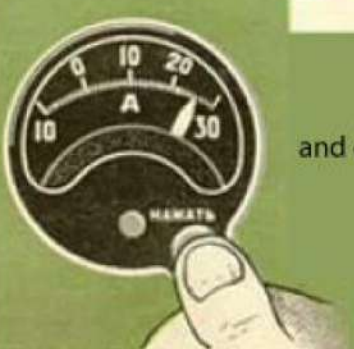


3. Throttle down

to
1200 - 1300
rpm

switch off the battery



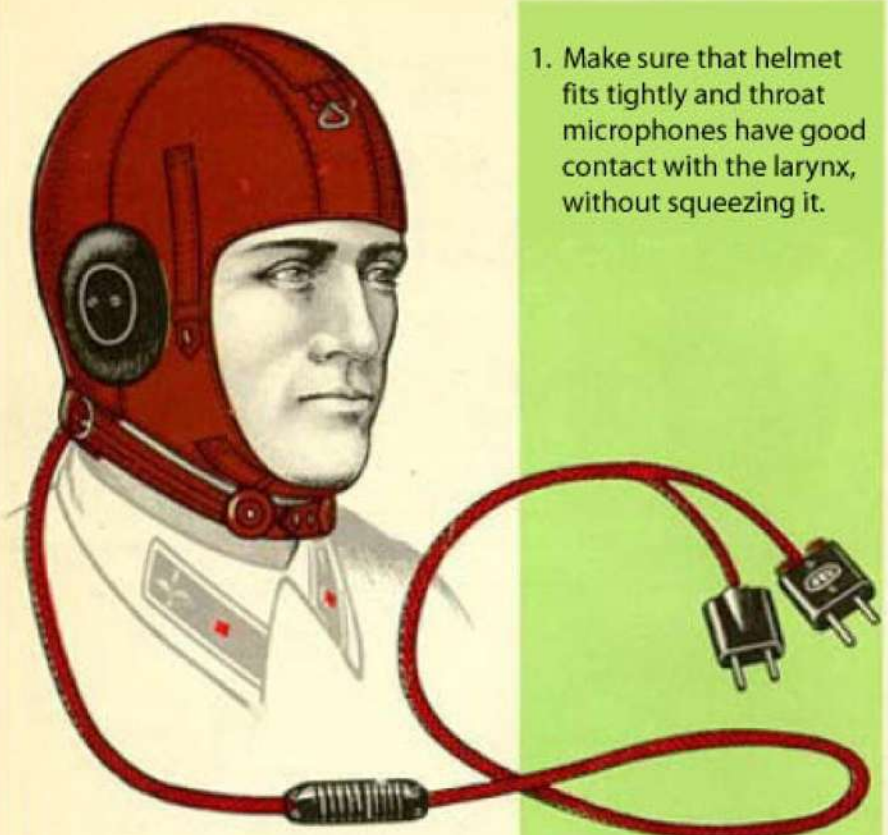


and check generator output with voltmeter

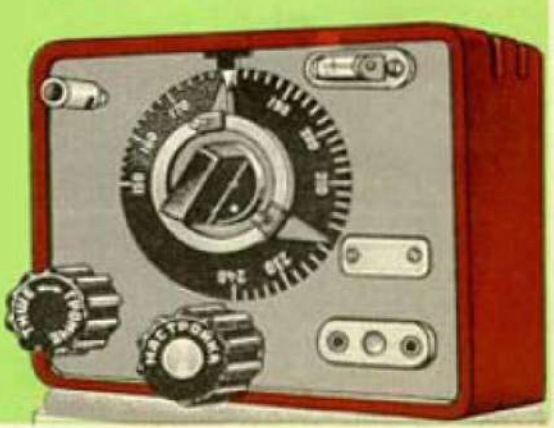
Normal voltage is 26 - 27 V

III
CHECK AND PREPARATION OF THE RADIO TRANSMITTER

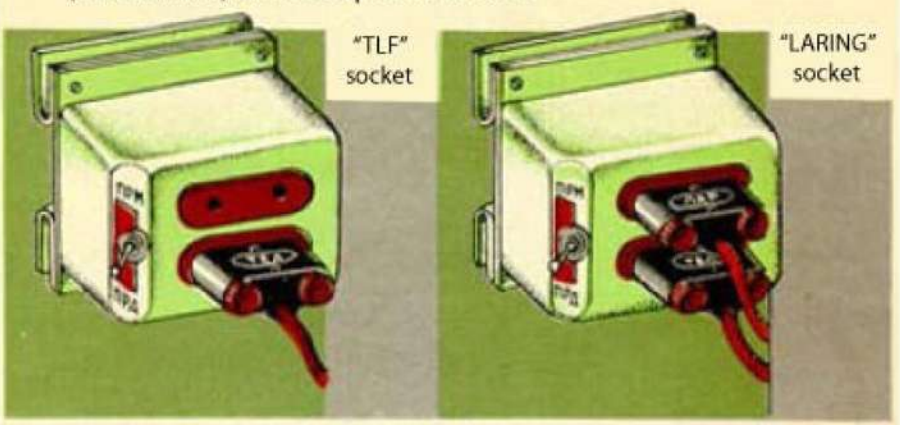
1. Make sure that helmet fits tightly and throat microphones have good contact with the larynx, without squeezing it.



2. Check main and backup frequency of the radio set

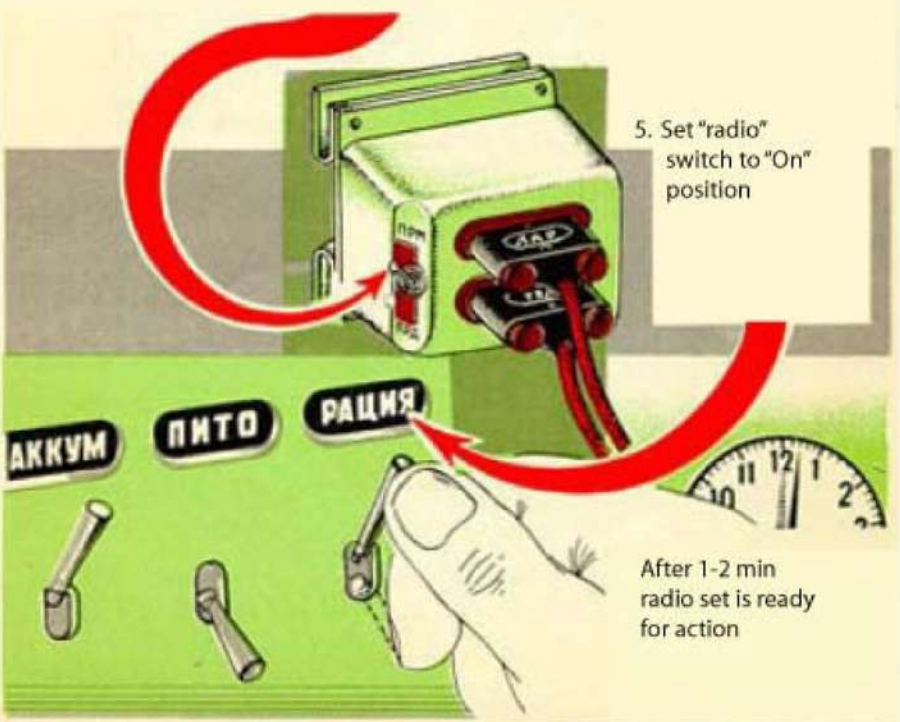


3. Connect earphone helmet with "TLF" (telephone) and "LARING" (throat mike) microtelephone sockets



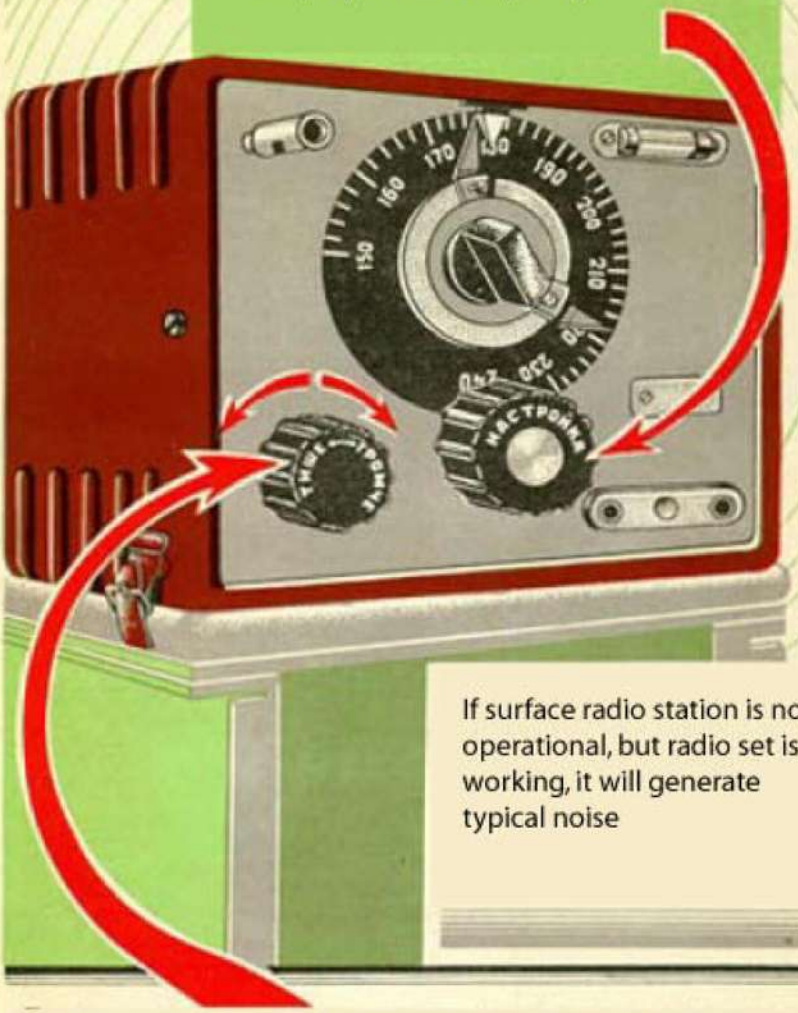
4. Set switch of the microtelephone to the "PRM" position

5. Set "radio" switch to "On" position



After 1-2 min radio set is ready for action

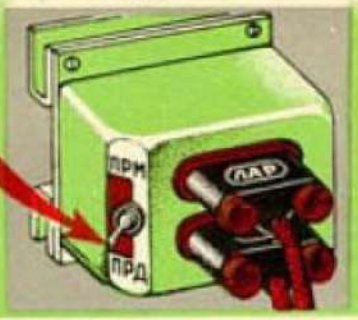
6. Slowly rotating adjustment handle, set proper radio frequency.



If surface radio station is not operational, but radio set is working, it will generate typical noise

7. For normal sound volume rotate volume control knob clockwise ("louder") or counter-closckwise ("quieter").

8. To establish radio connection on the ground switch microtelephone to "PRD" position



approximately after 1-2 min call radio station according arranged call signs and establish connection

Speak normally, don't shout or whisper

9. After checking radio set, turn "radio" switch off

"Our aviation has better quality than German aviation, and our glorious pilots earned for themselves proud reputation of the fearless fighters."

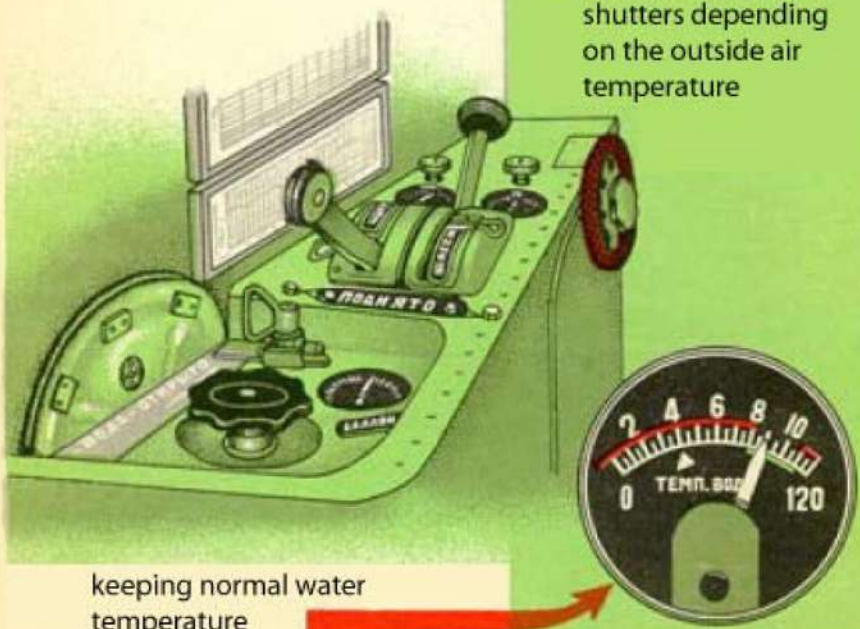
I. Stalin

IV
PREPARATIONS FOR TAKE-OFF AND TAKE-OFF

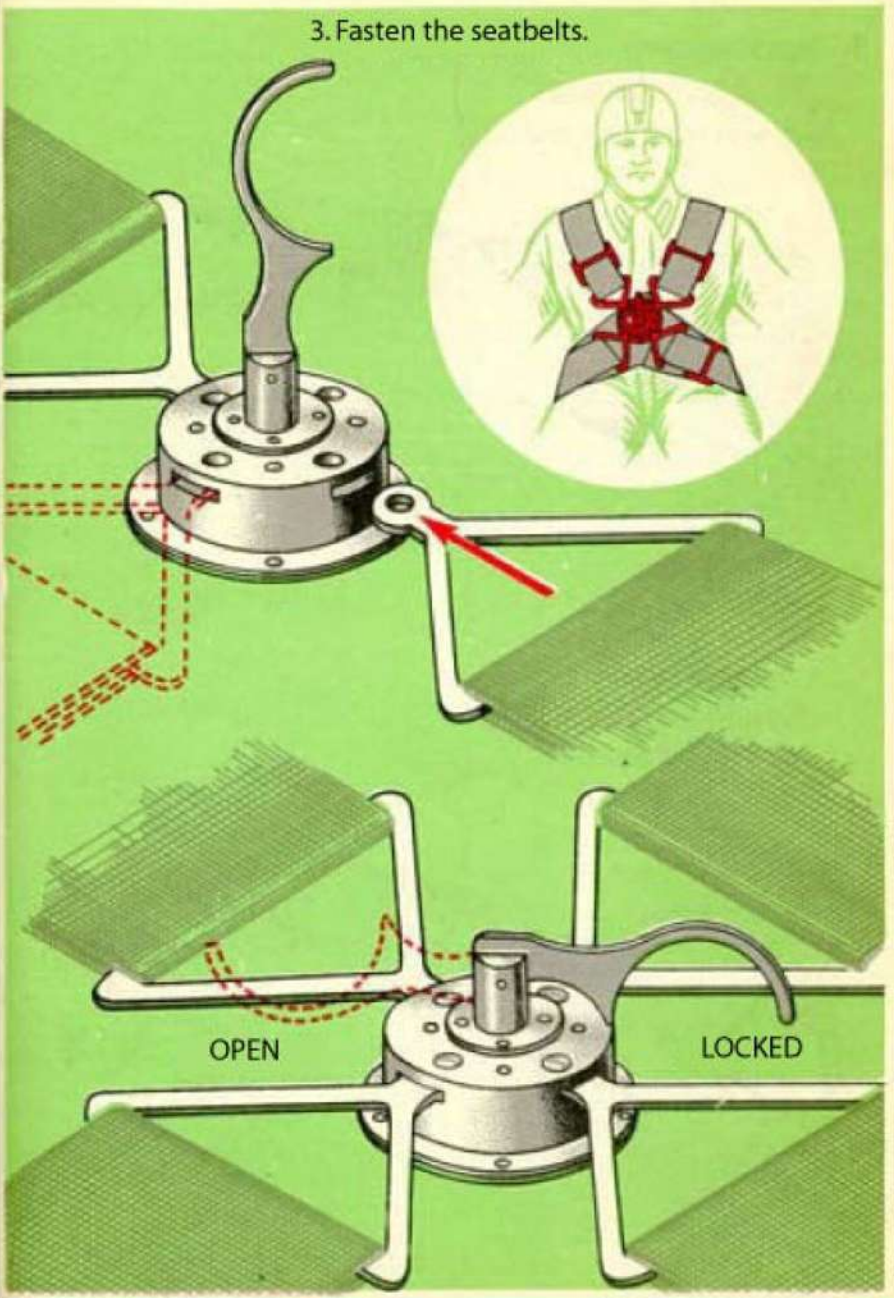
TAXIING

1. Open oil radiator shutters

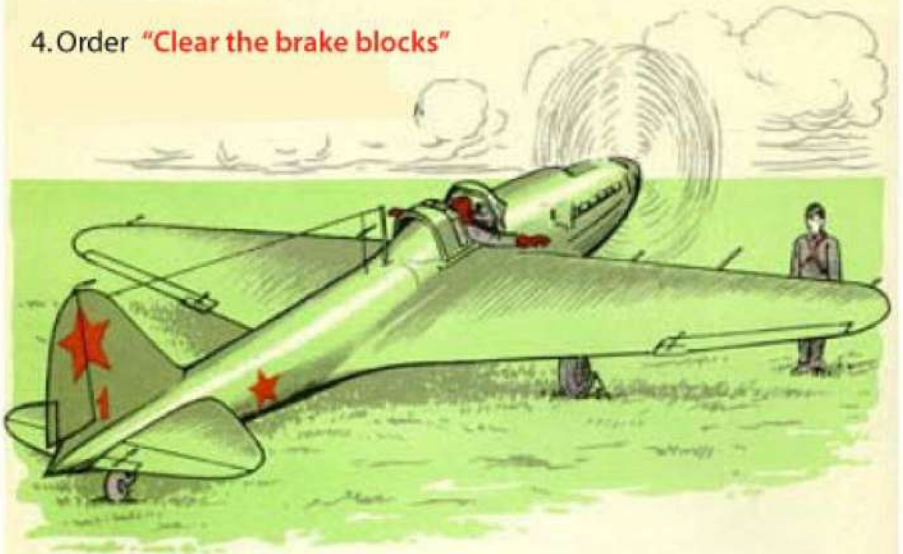
2. Open water radiator shutters depending on the outside air temperature



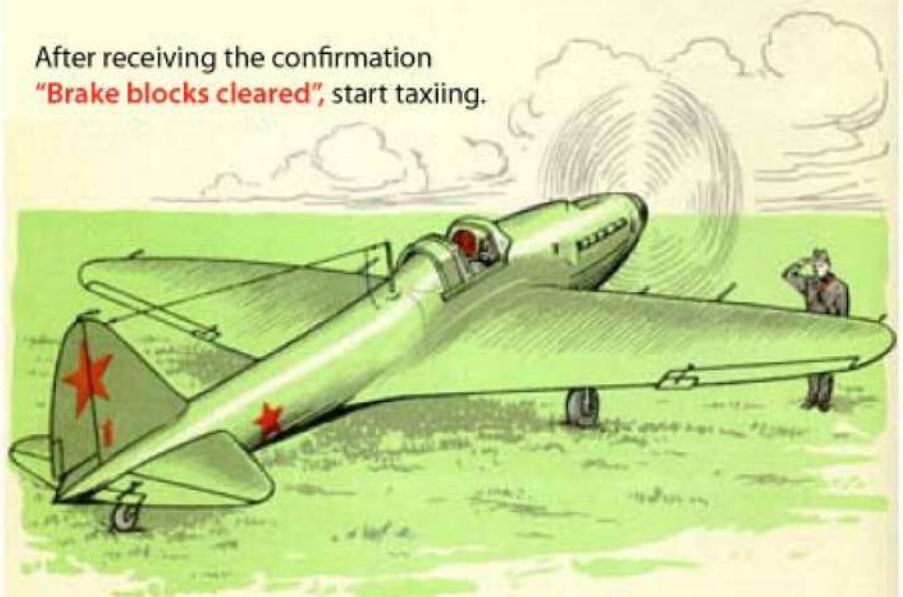
keeping normal water temperature

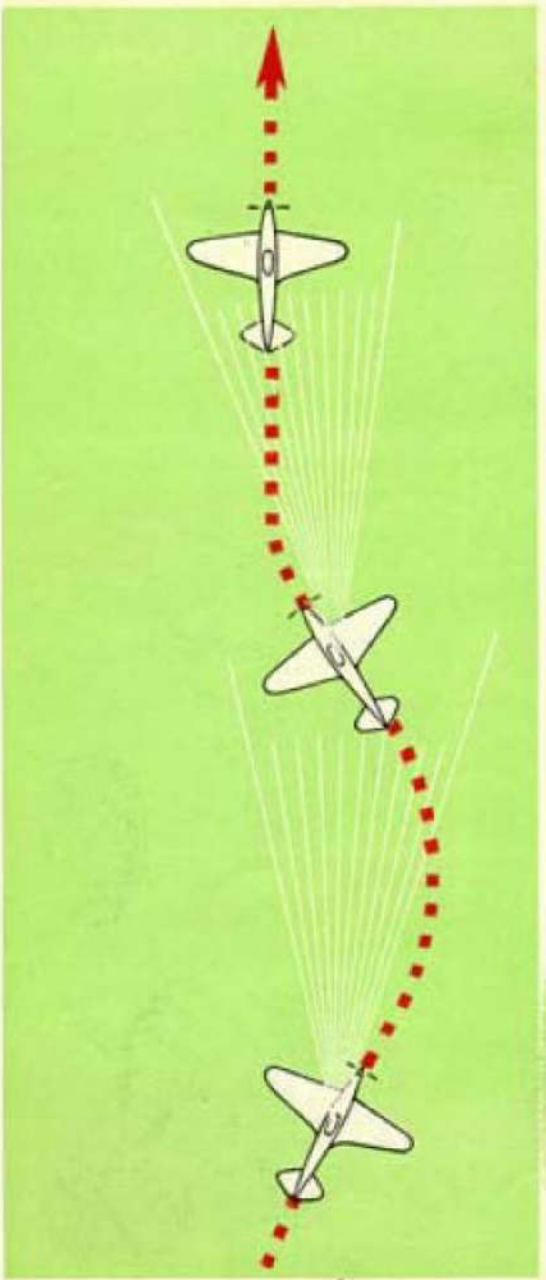

3. Fasten the seatbelts.
OPEN
LOCKED

4. Order **"Clear the brake blocks"**

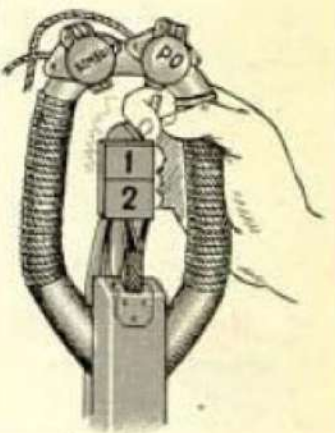


After receiving the confirmation **"Brake blocks cleared"**, start taxiing.





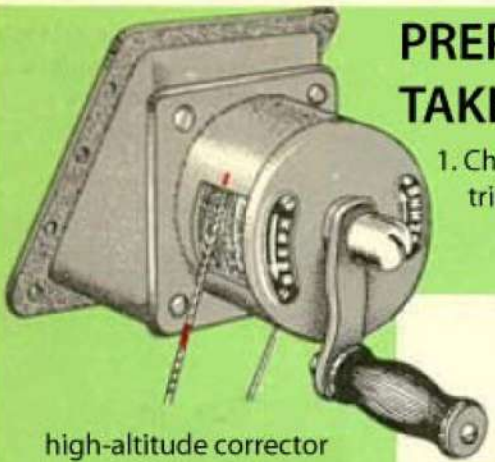
5. For the best view forward make "S-turns" when taxiing.



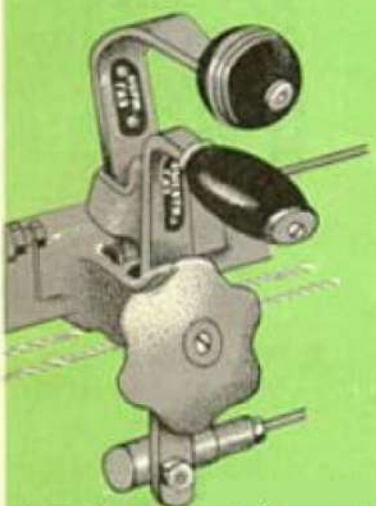
6. Check brakes on taxiing,

PREPARATION FOR TAKE-OFF

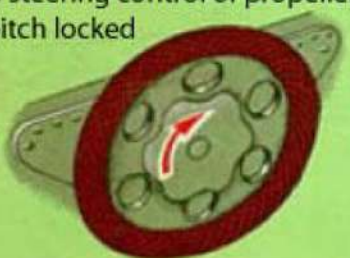
1. Check position of the elevator trimmer control



high-altitude corrector



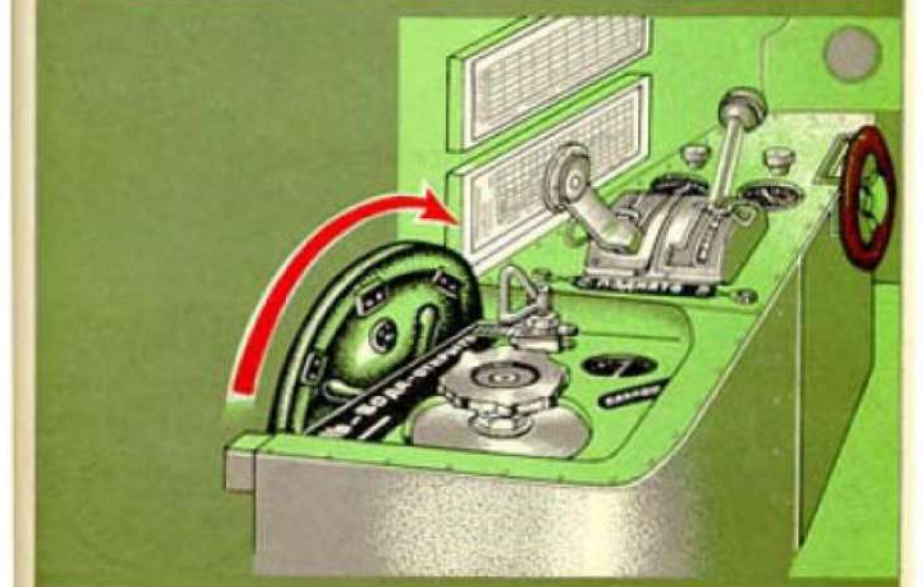
is steering control of propeller pitch locked



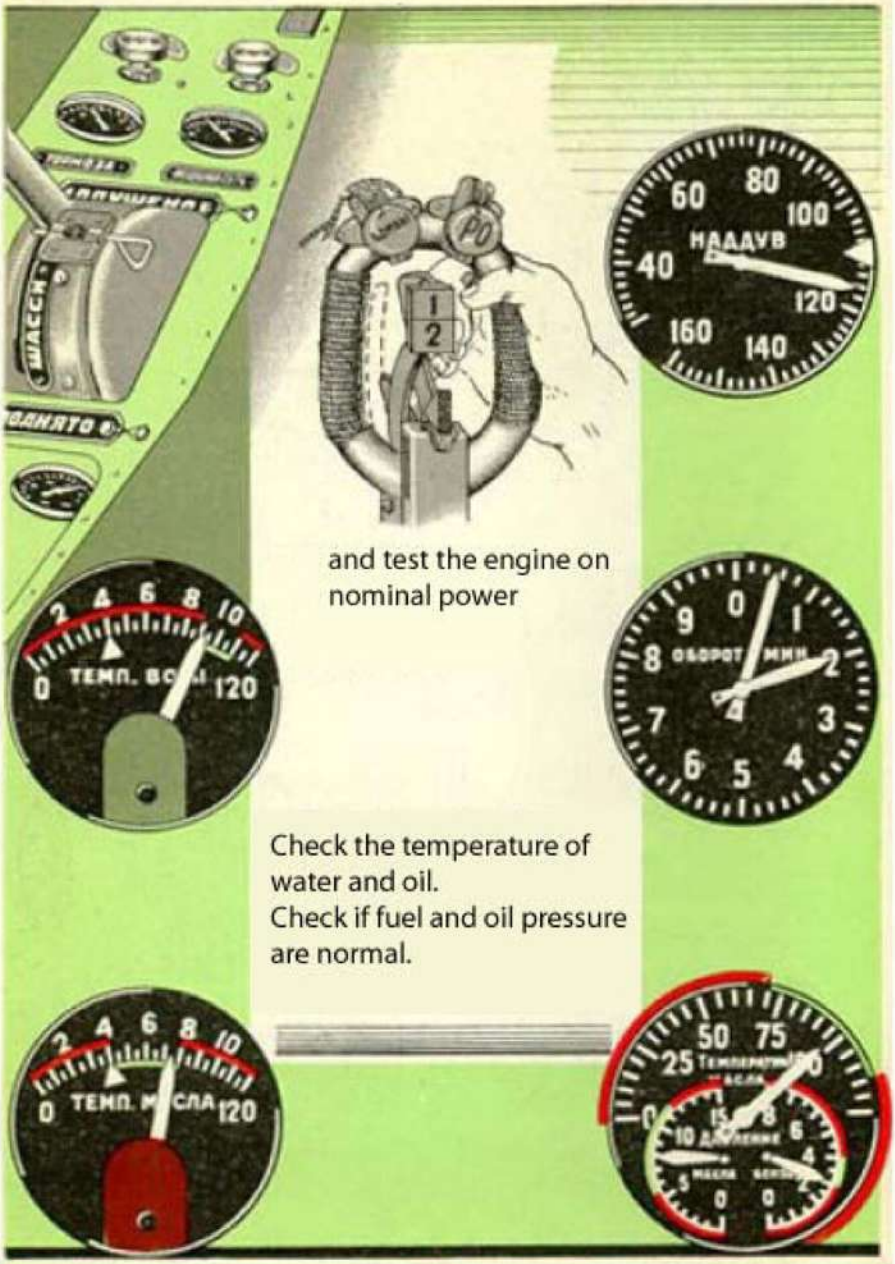
position of the fire-cock

2. Lock the skid.

3. Open shutters of water- and oil radiators



4. Apply breaks,



and test the engine on nominal power

Check the temperature of water and oil.
Check if fuel and oil pressure are normal.

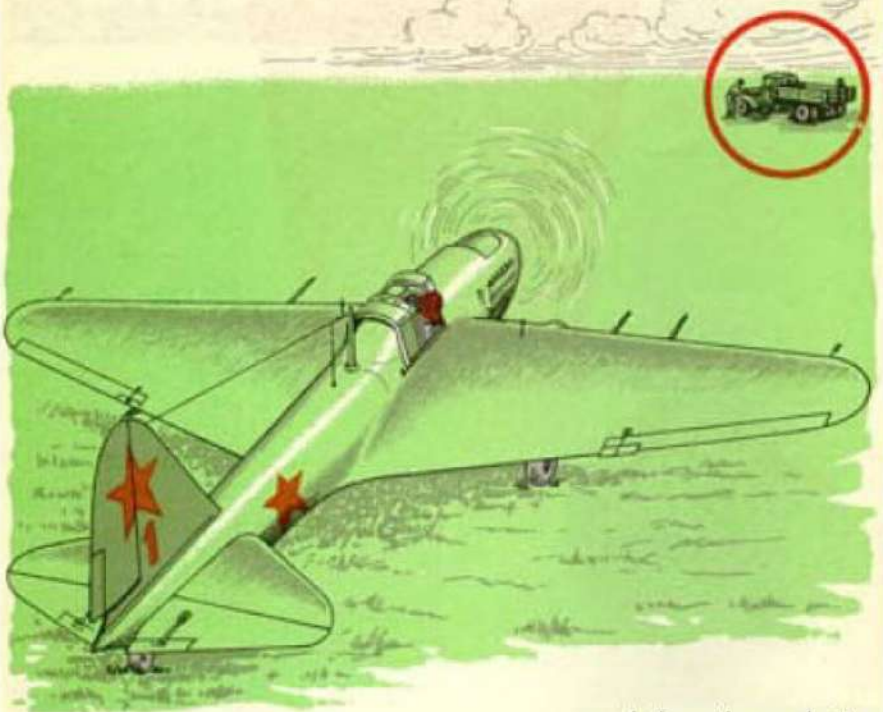
STRICTLY FORBIDDEN TO TAKE OFF:

If water temperature is less than 90°

inlet oil temperature is less than 40°

outlet oil temperature is less than 70° or above 115°

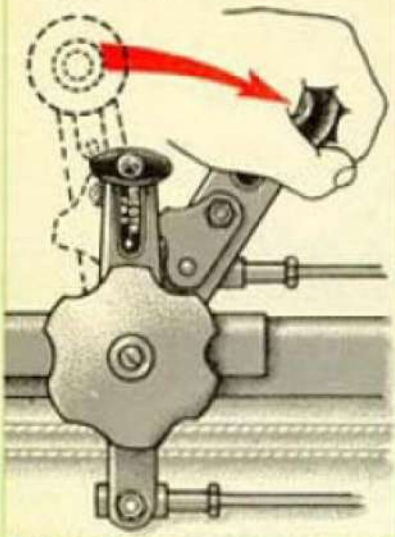
Check if there are any obstacles on the runway,



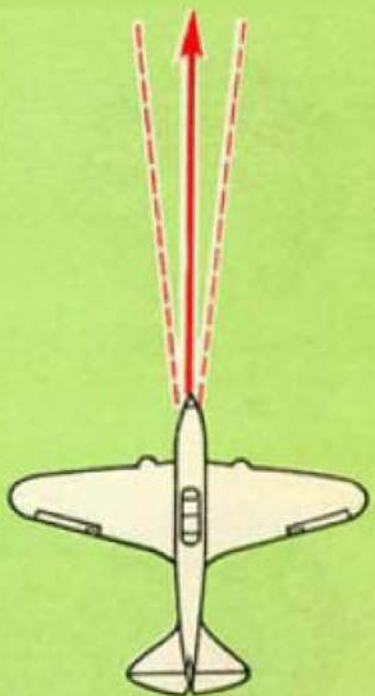
and close the cockpit.

TAKE OFF AND CLIMBING

1. Full throttle



2. During the take-off maintain direction, smoothly apply left pedal to compensate airplane torque to the right and avoid sharp rudder movements.



Strictly forbidden to use brakes in order to compensate airplane's right torque.

3. After lift-off hold the airplane steady until airspeed 240-250 km/hour is reached, then start climbing.

4. Check instruments data, which should be:

engine revs - 2150 rpm

water temperature - 90 - 115°

outlet oil temperature - 80 - 120°

oil pressure - not less than 5.5 atmospheres

fuel pressure - 0.3 - 0.35 atmospheres

5. Retract landing gear.

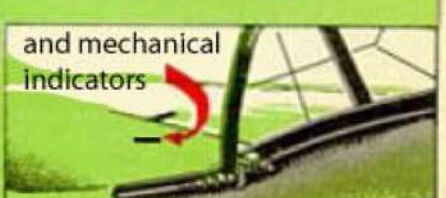
check if the landing gear was retracted

using signal lights

landing gear lowered

landing gear retracted

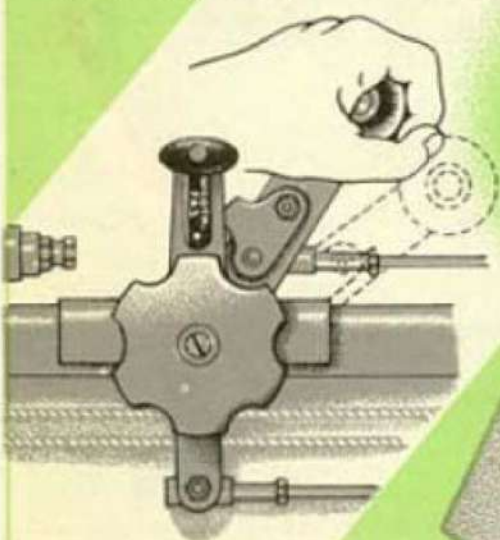
intermediate position



and mechanical indicators

6. Decrease pressure on the stick using elevator trimmer control.
7. Set climbing airspeed 240 - 250 km/hour.

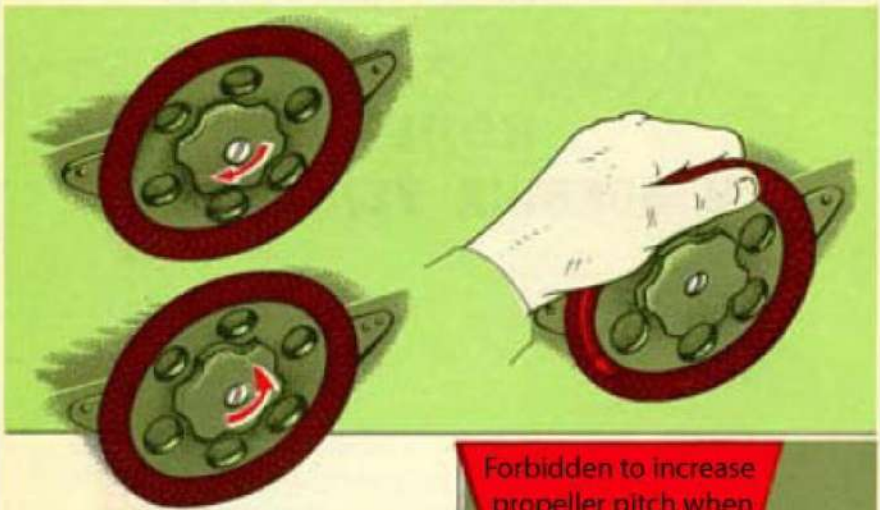
8. After the proper height is reached, continue horizontal fligh. Throttle engine back to maintain supercharging level at 950 mm Hg or less.



decrease stick pressure
adjusting trimmer control

V.
FLIGHT IN BATTLEFIELD CONDITIONS

IN FRIENDLY AIRSPACE



1. To maximize flight range lower propeller pitch to 1850 rpm

Forbidden to increase propeller pitch when supercharging level is more than 950 mm Hg

2. Throttle up to the best cruising airspeed 250-270 km/hour

3. Adjust water and oil temperature. Perodically check out instruments, monitoring engine performance.

Instruments data should be:

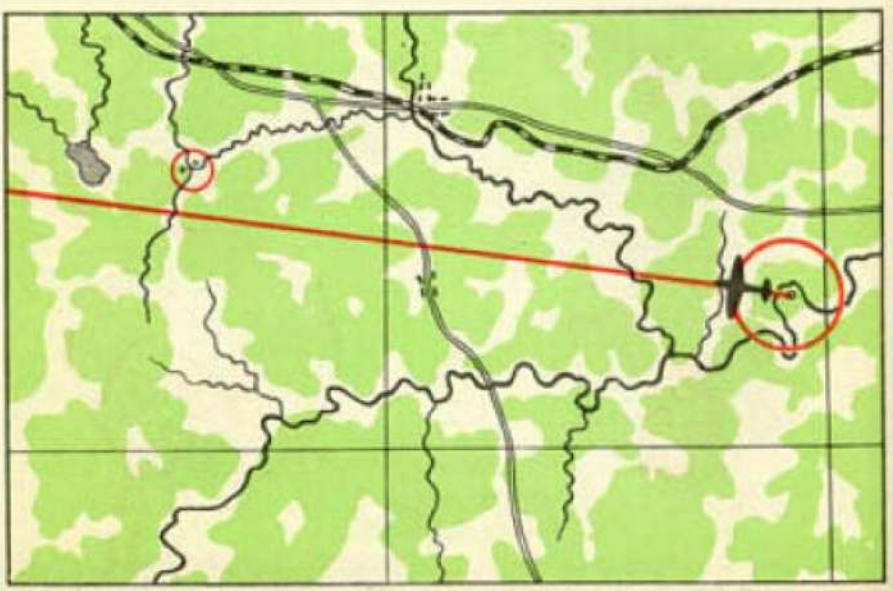
water temperature
80° - 110°

inlet oil
temperature
40° - 80°

outlet oil
temperature
70° - 115°

pressure:
oil - not less than 5.5 atmospheres
fuel - 0.3 - 0.35 atmospheres

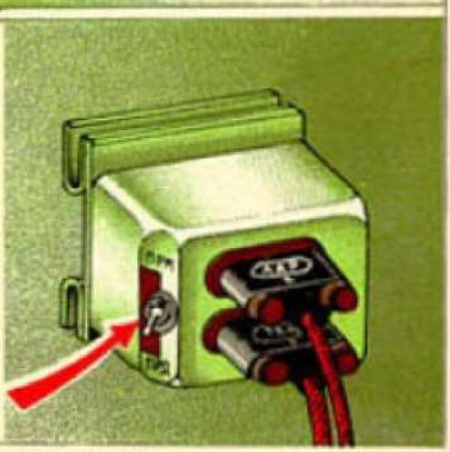
4. When flying over the starting point of the route (SPR) write down the time.



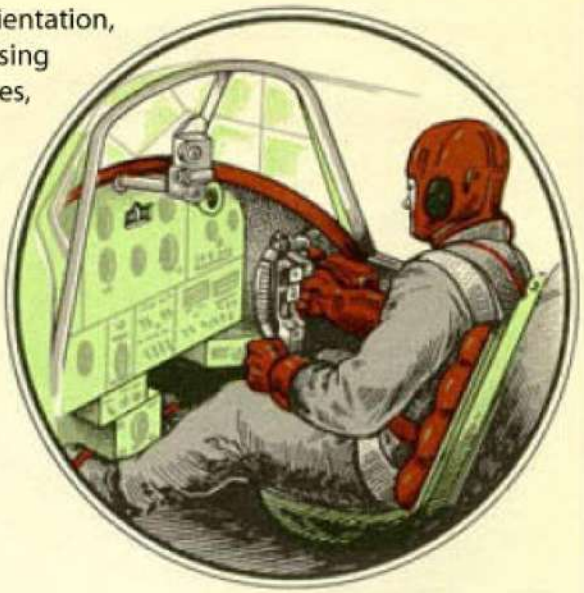
5. Unlock gun triggers.

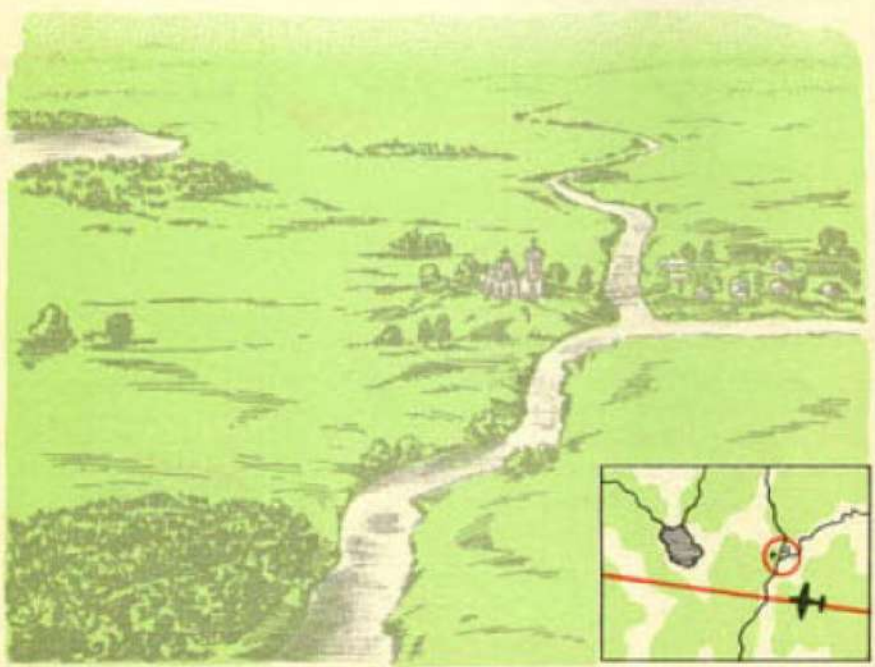
6. Switch on the radio

7. Set microtelephone switch to the "PRD" position and after 1-2 min call radio station and establish connection.

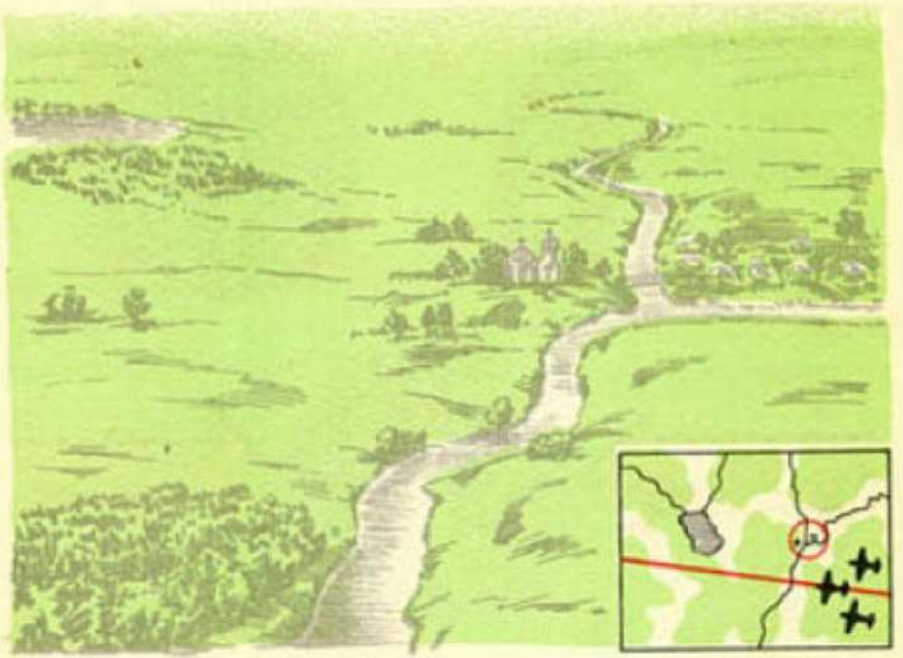


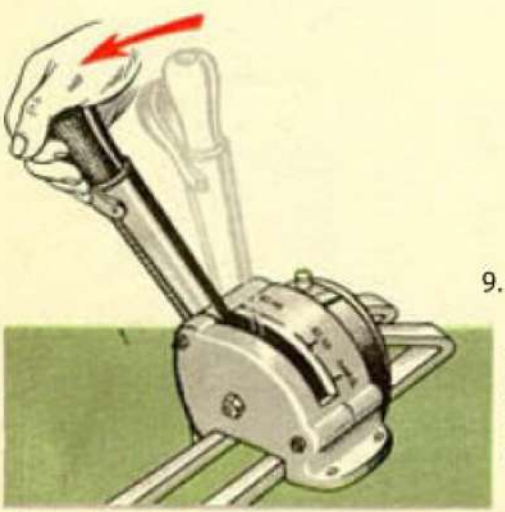
8. Maintain general orientation, follow flight route using compass and watches, and control actual airplane position using landmarks





Every pilot of the flight should maintain general orientation

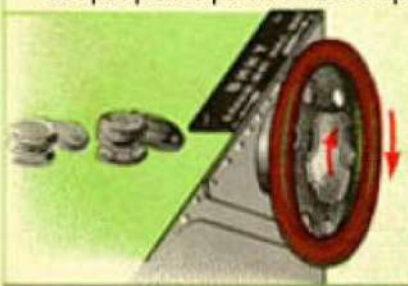




9. If it's necessary to drop bombs in "passive" (unarmed) mode while in friendly airspace, push ASSH lever in forward position, pressing steel lock handle to the lever.

IN ENEMY'S AIRSPACE

1. Before approaching frontline, increase set propeller pitch to 2050 rpm



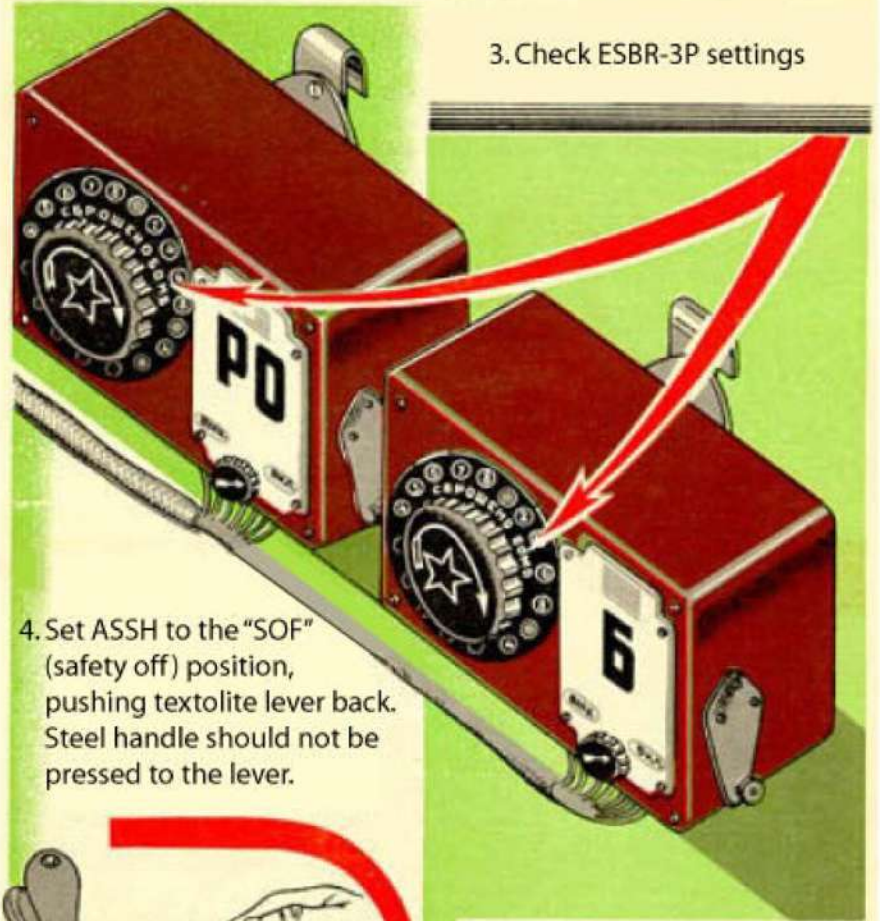
and increase airspeed

according flight plan

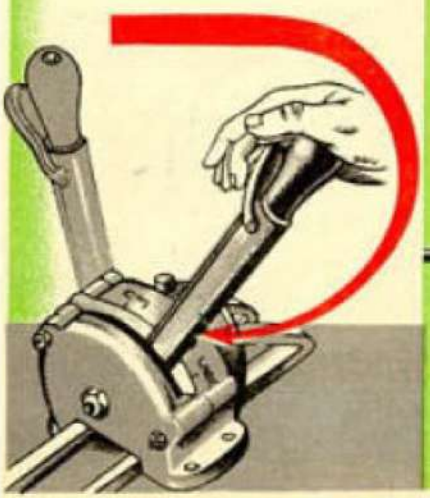
2. Check if the safety lock of the guns pneumatic re-charger in "Open" position.

and check if the guns trigger is unlocked

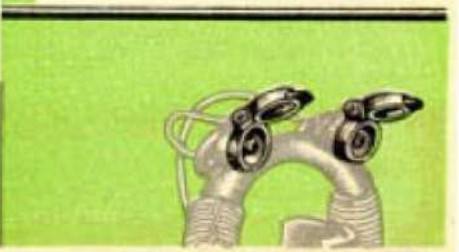
3. Check ESBR-3P settings



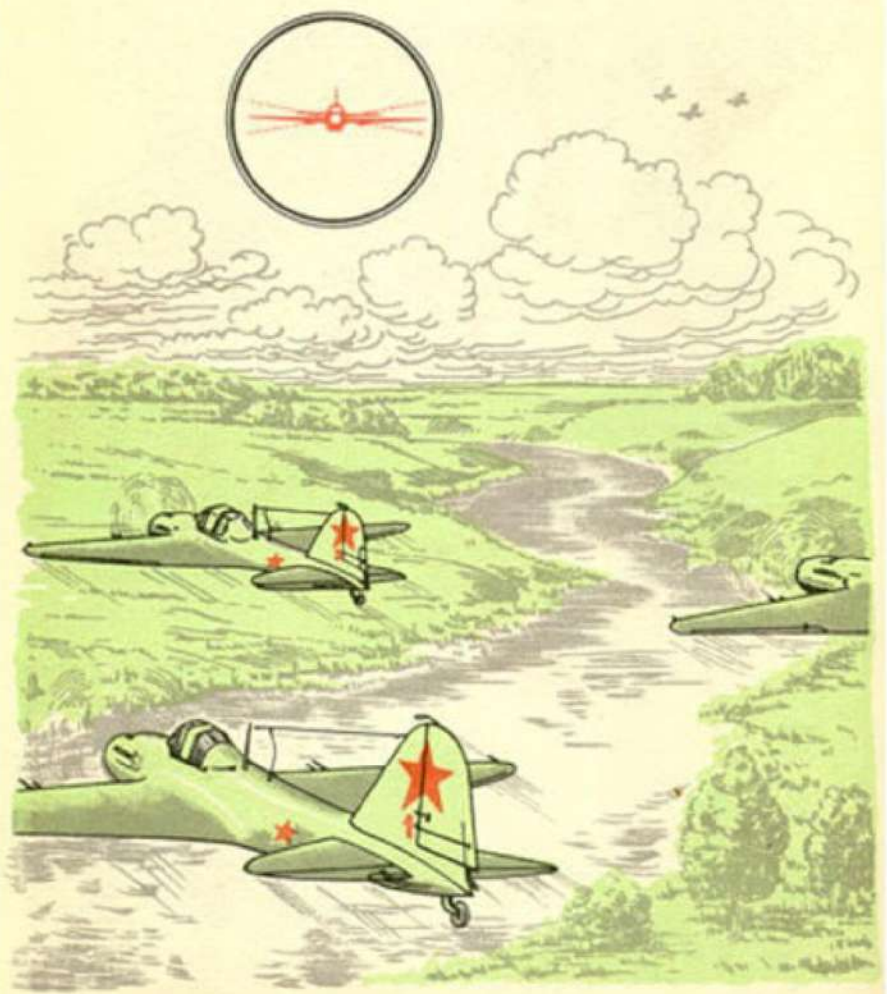
4. Set ASSH to the "SOF" (safety off) position, pushing textolite lever back. Steel handle should not be pressed to the lever.



5. Open safety caps of the electric bomb-release gear.



6. Carefully observe airspace, terrain, and signals of the flight leader.



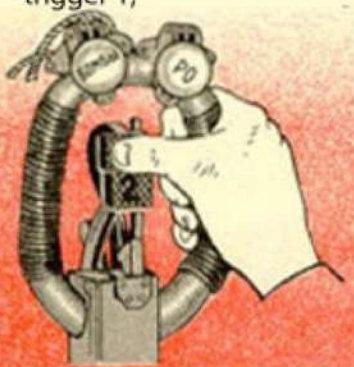
7. Before approaching target area

close oil radiator shutters

and adjust airspeed to 300 - 320 km/hour

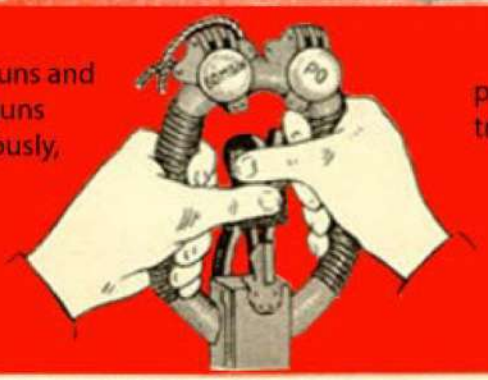
FIRING THE GUNS

1. For gunfire press trigger 1,



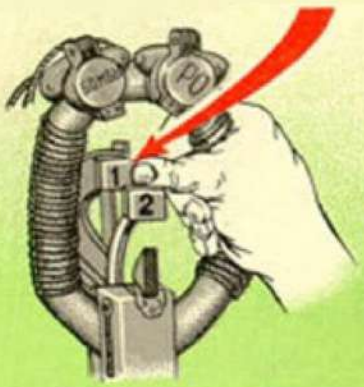
1. For machine-guns fire press trigger 2,

for firing guns and machine-guns simultaneously,



press both triggers.

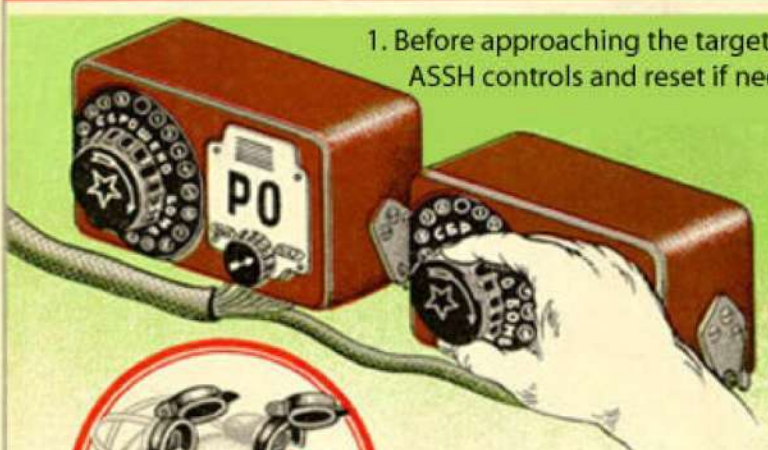
2. If gun stoppage occurs, press corresponding trigger full forward

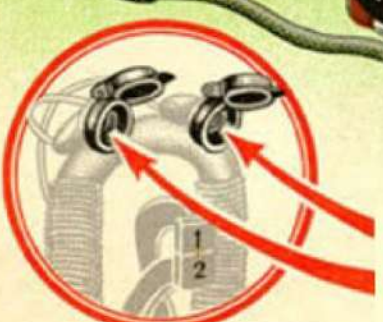


3. If firing was not resumed, release the trigger and reload.

BOMBS AND ROCKETS RELEASE

1. Before approaching the target, check ASSH controls and reset if necessary.

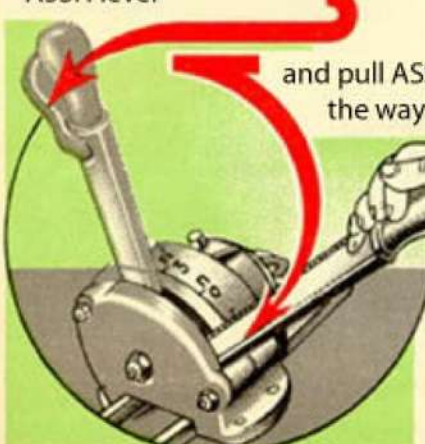




2. Press corresponding button to release bombs or rockets.

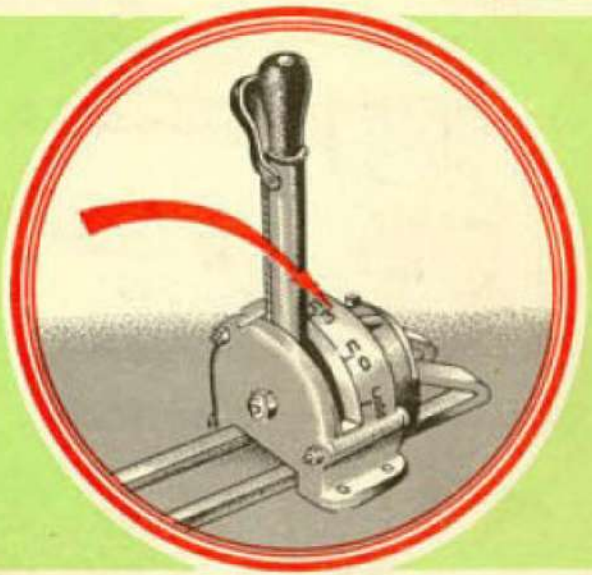
3. After bombs were released press signal button and check the number of the released bombs.

4. If not all bombs were released, duplicate release using ASSH controls. To release bombs with ASSH, press steel handle to the ASSH lever and pull ASSH all the way back.



5. After all bombs were released, duplicate release using ASSH controls.

6. After all bombs were released, set ASSH in "SO" (Safety On) position.



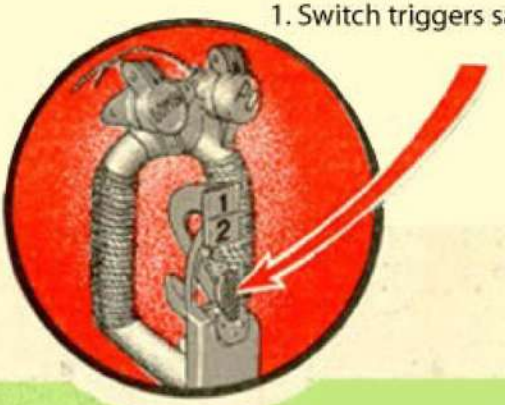
7. Leaving target area, open oil radiator shutters,

and set airspeed according flight plan.

VI
FLIGHT COMPLETION

APPROACHING YOUR AIRFIELD:

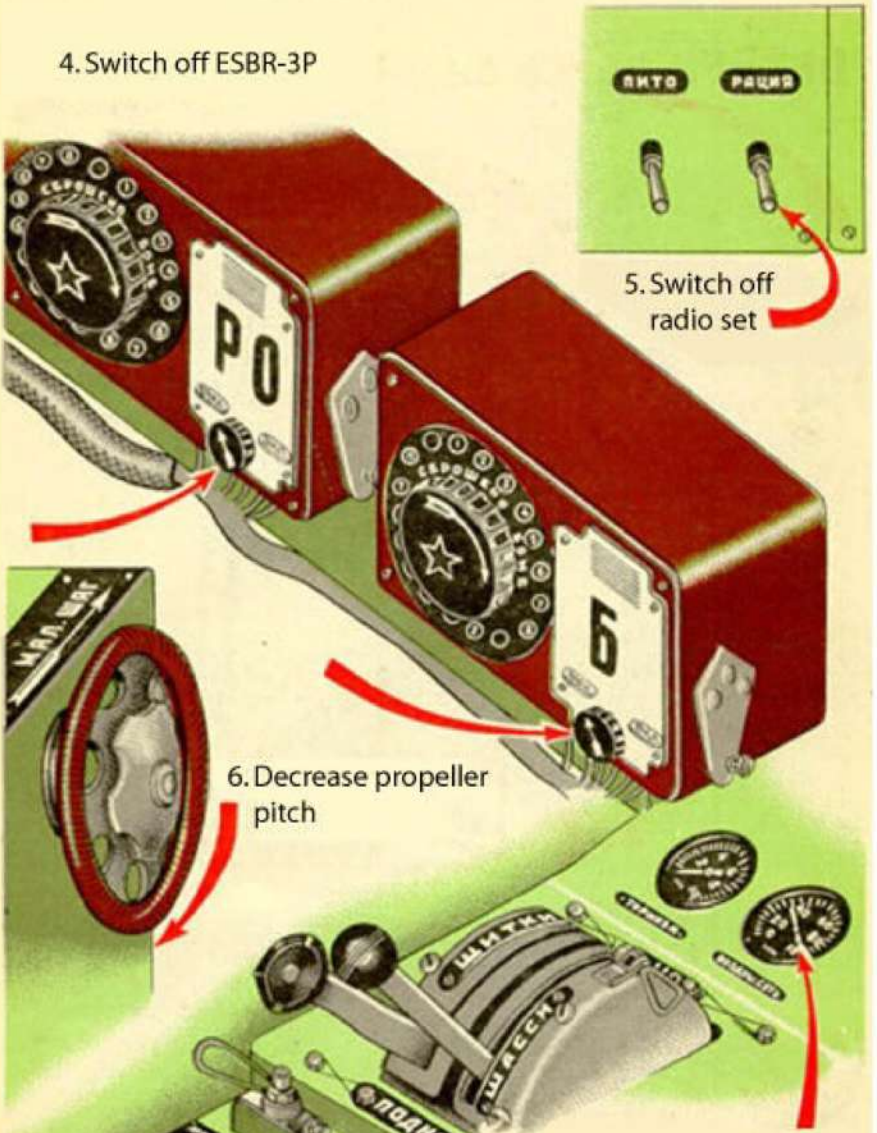
1. Switch triggers safety on



2. Set safety lock of the guns pneumatic recharger in "On" position (pull safety handle full back).

3. Press guns and machine-guns pneumatic recharger handles.

4. Switch off ESBR-3P



5. Switch off radio set

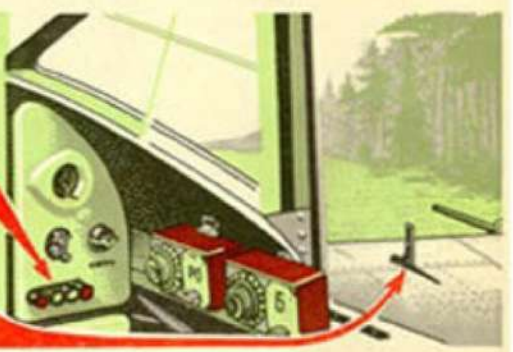
6. Decrease propeller pitch

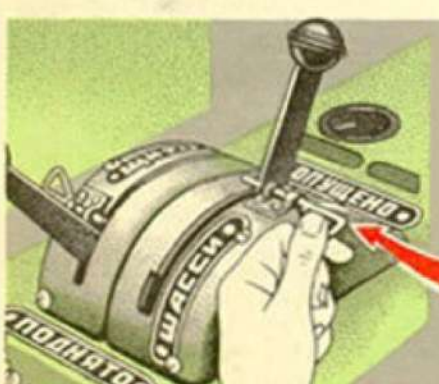
7. Check the air pressure in the air system, which should be 30 - 35 atmospheres. If air pressure is lower, open on-board air cylinder:

8. Lower landing gear only if the airspeed is 240-250 km/hour or less

Push landing gear handle forward in "down" position.

9. Check if the landing gear is lowered using control lights and position of the mechanical indicators.



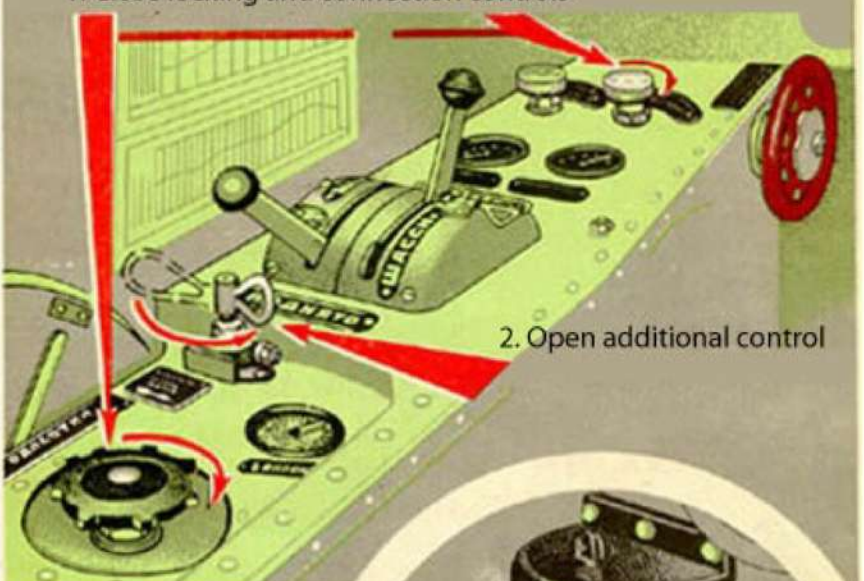


10. Lock landing gear release handle in "down" position using safety-lock pin.

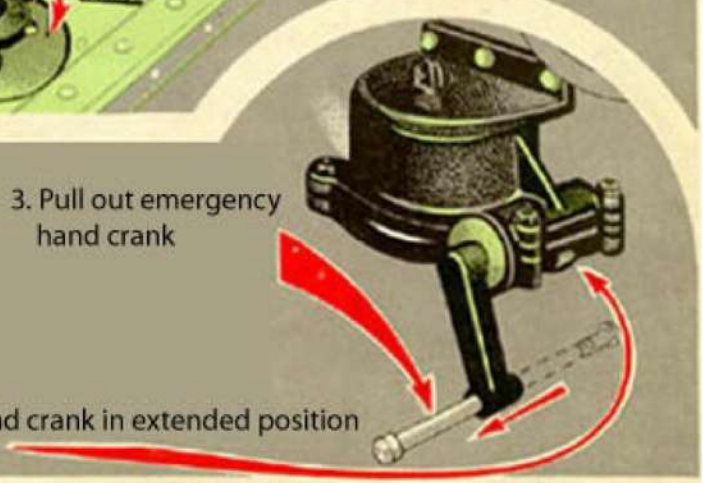
EMERGENCY LOWERING OF THE LANDING GEAR

If the landing gear wasn't lowered normally, apply emergency procedure:

1. Close locking and connection controls

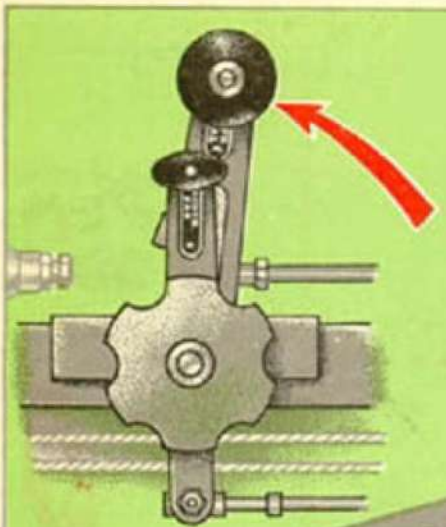


2. Open additional control



3. Pull out emergency hand crank

4. Lock hand crank in extended position



5. Reduce air speed to 220-230 km/hour

6. Rotate the emergency hand crank counter-clockwise.

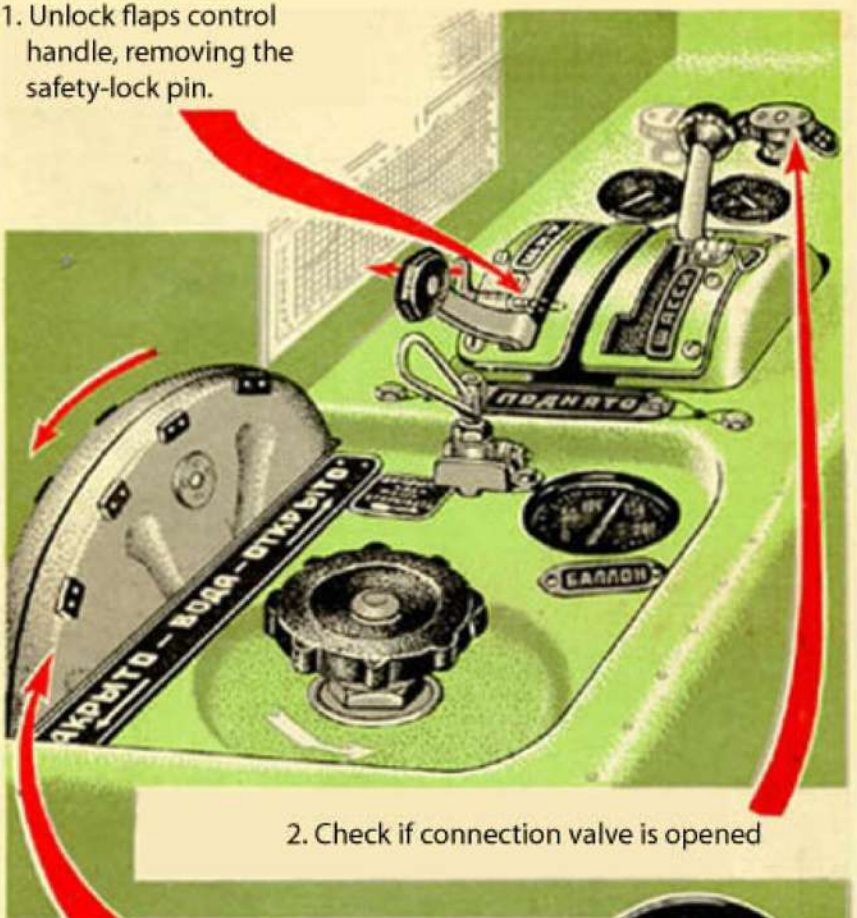
Check landing gear position using control lights

and mechanical indicators

8. Shift hand crank in the regular position.

GLIDING

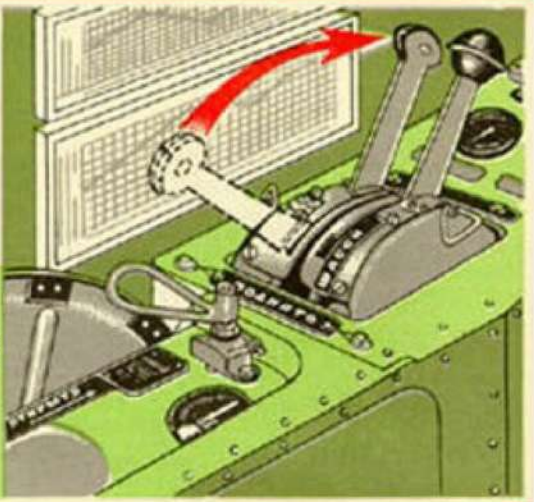
1. Unlock flaps control handle, removing the safety-lock pin.



2. Check if connection valve is opened

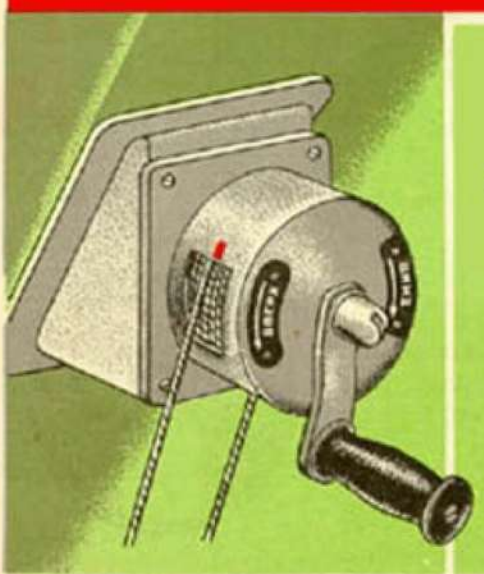
3. Close water radiator shutters (to maintain temperature 90° or higher).

4. While gliding on a straight line to the landing point at the airspeed of 210-220 km/hour,

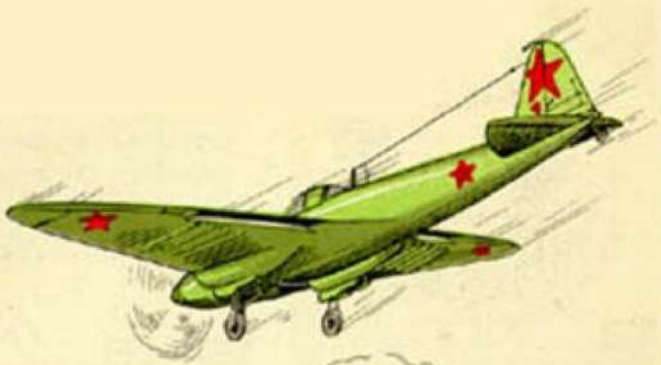


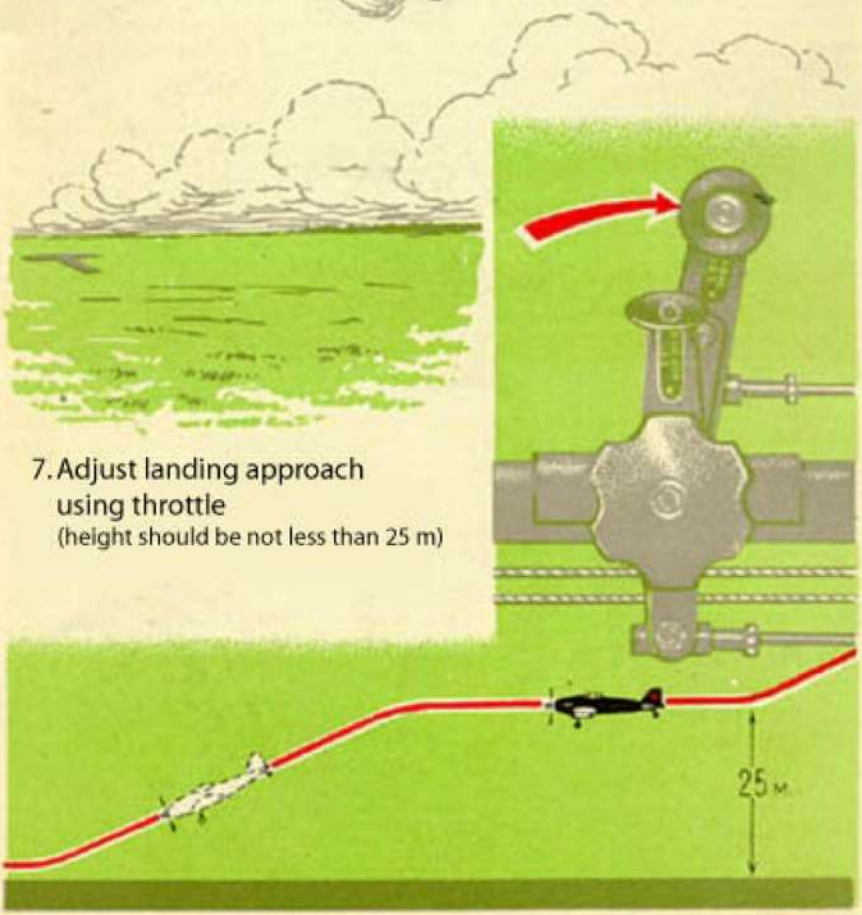
lower the flaps by pushing control handle forward to the "flaps down" position

5. Decrease pressure on the stick by the elevator trimmer control.



6. Maintain gliding airspeed at 185-190 km/hour

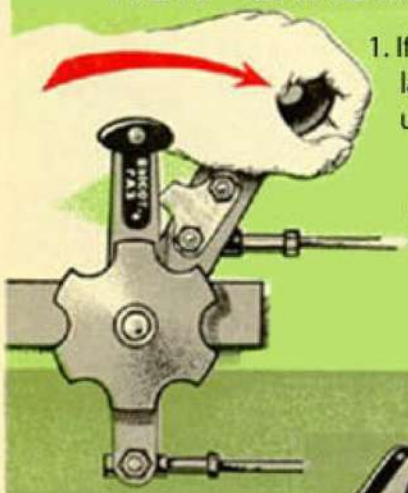




7. Adjust landing approach using throttle
(height should be not less than 25 m)

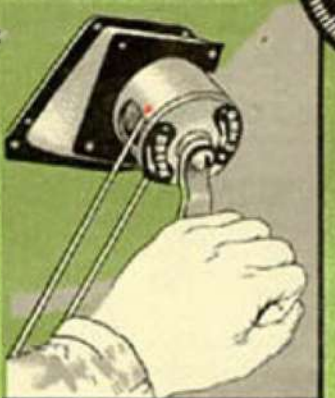
NEW LANDING APPROACH

1. If it's necessary to make another landing approach, throttle engine up and increase airspeed.

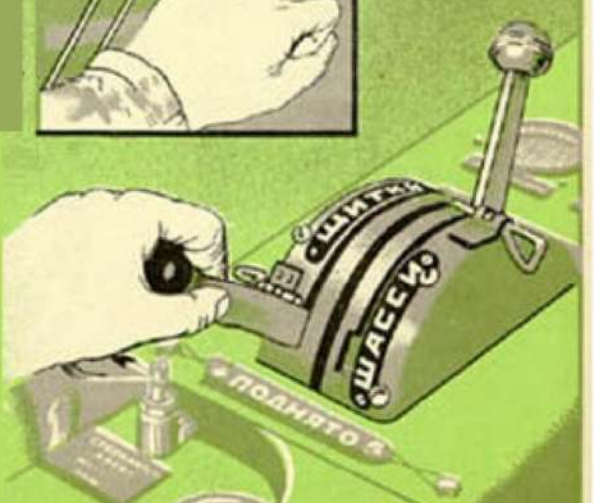


Increase airspeed to 210-220 km/hour

3. Remove pressure on the stick by the elevator trimmer control and start climbing



4. Reaching 100 m height, and at airspeed not less than 220 km/hour, retract flaps

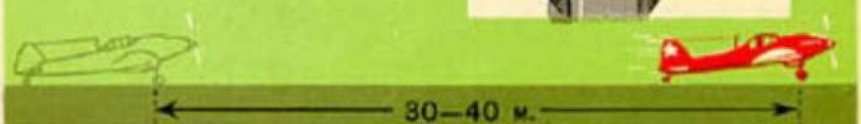


LANDING

1. During the landing with extended flaps pull the control stick full back.

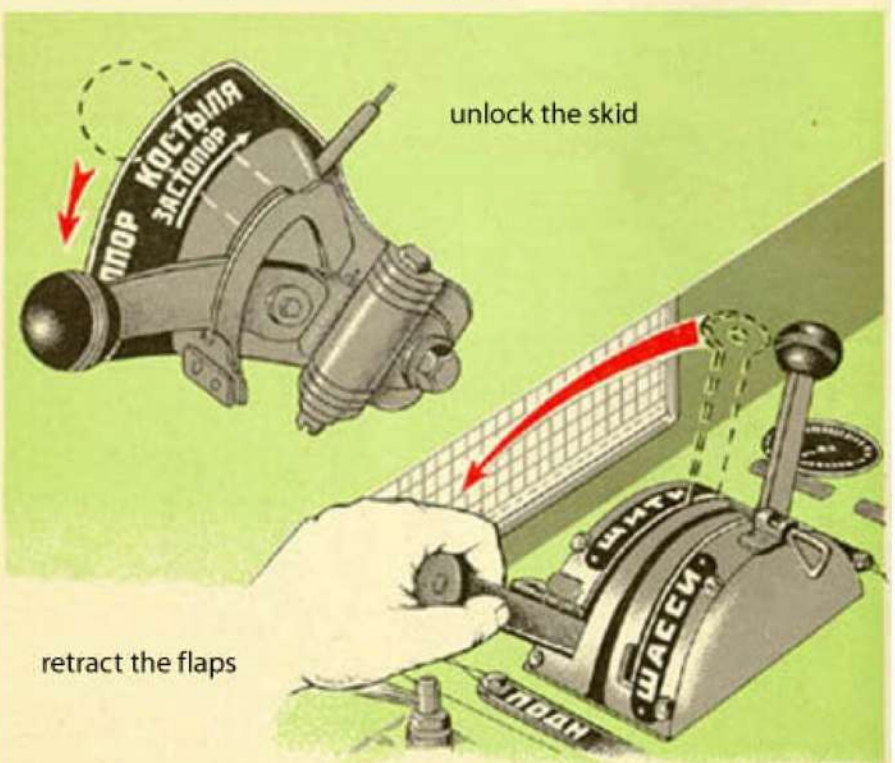
2. During the landing with retracted flaps don't pull the control stick full back.

3. Use brakes on the runway smoothly, apply brakes with caution and after landing run of 30-40 m.

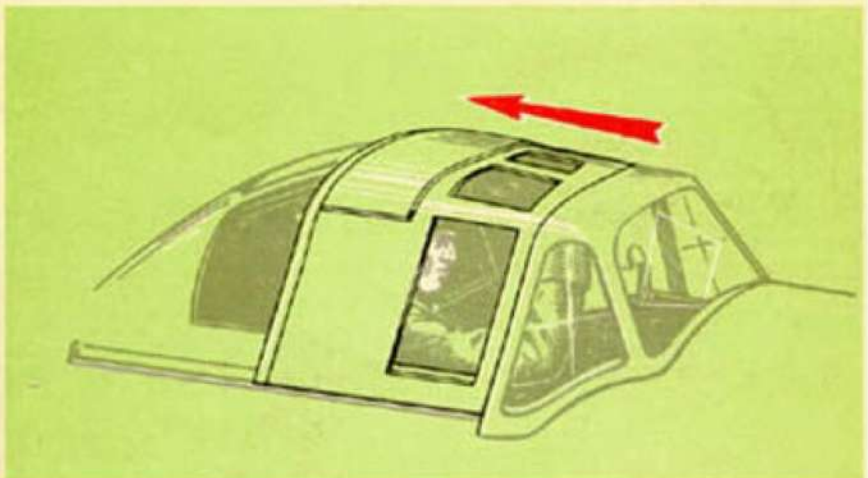


4. Maintain control stick full back until landing run speed is reduced.

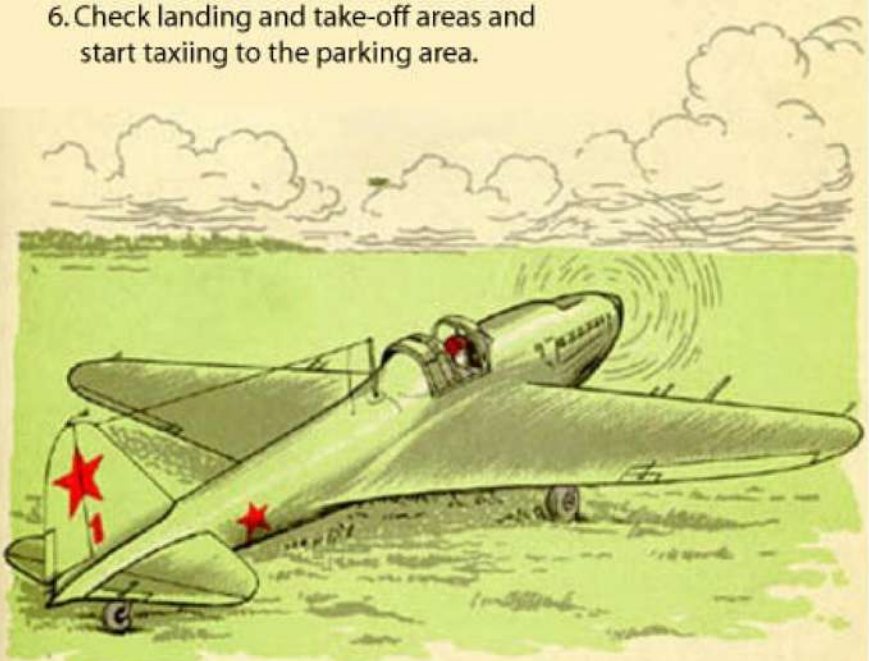
5. After complete stop of the airplane



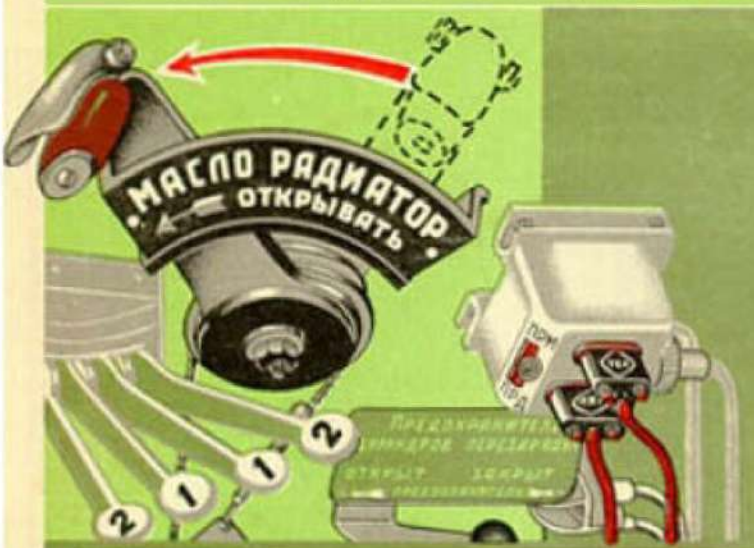
and open the cockpit



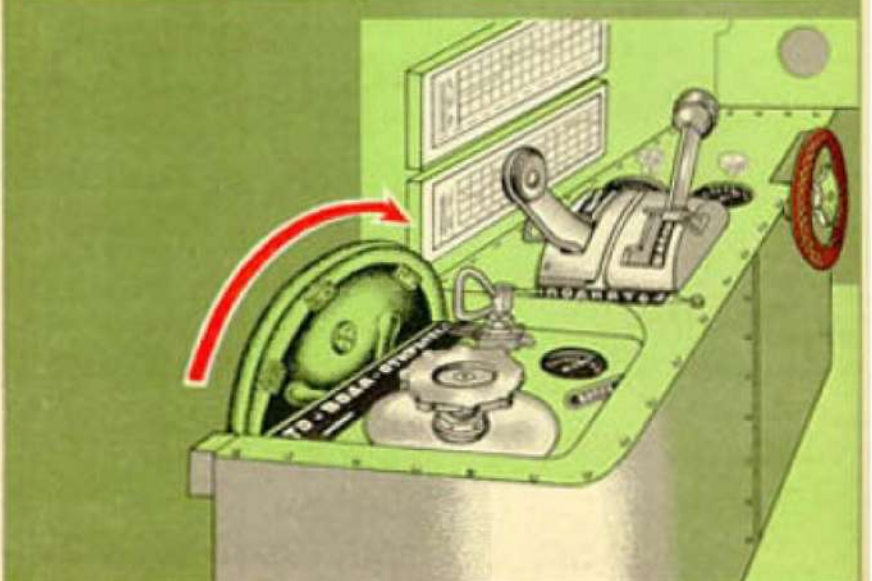
6. Check landing and take-off areas and start taxiing to the parking area.



STOPPING THE ENGINE

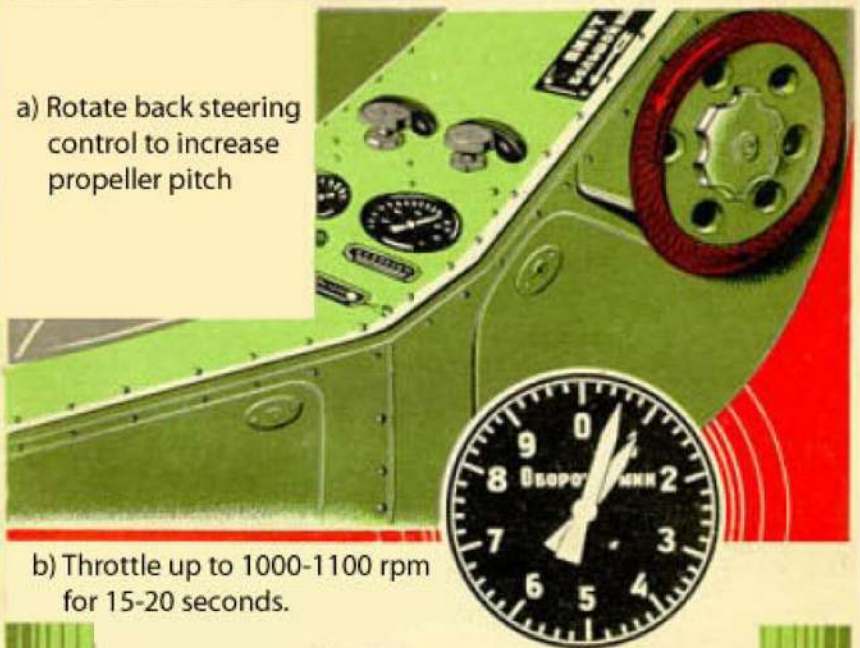


1. Open the water radiator shutters.

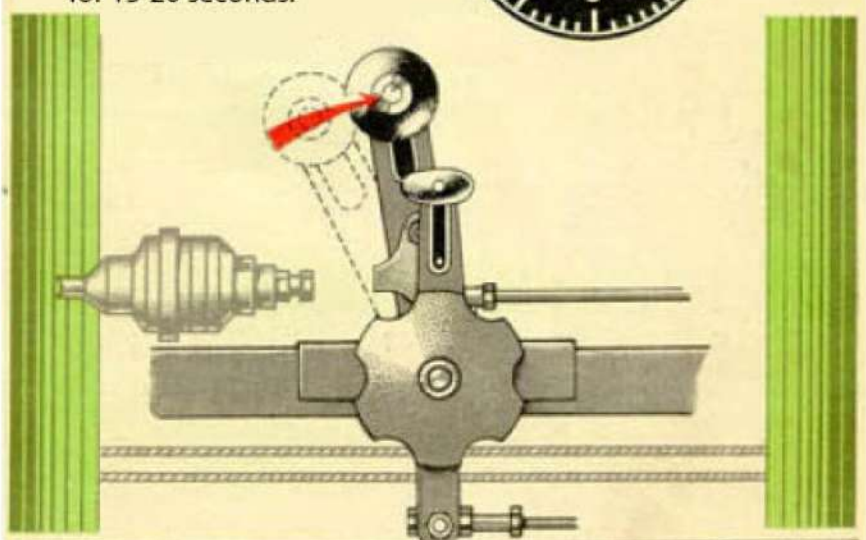


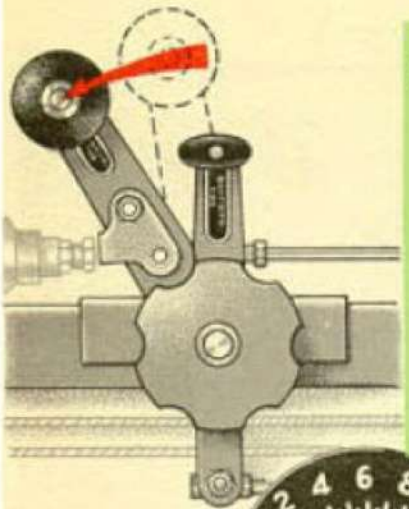
2. Set propeller on the higher pitch.

a) Rotate back steering control to increase propeller pitch



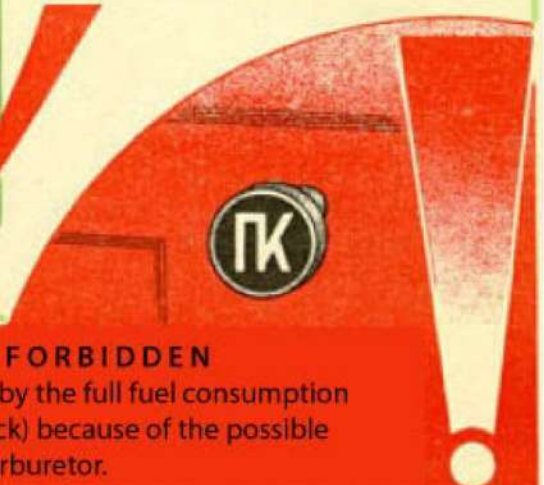
b) Throttle up to 1000-1100 rpm for 15-20 seconds.



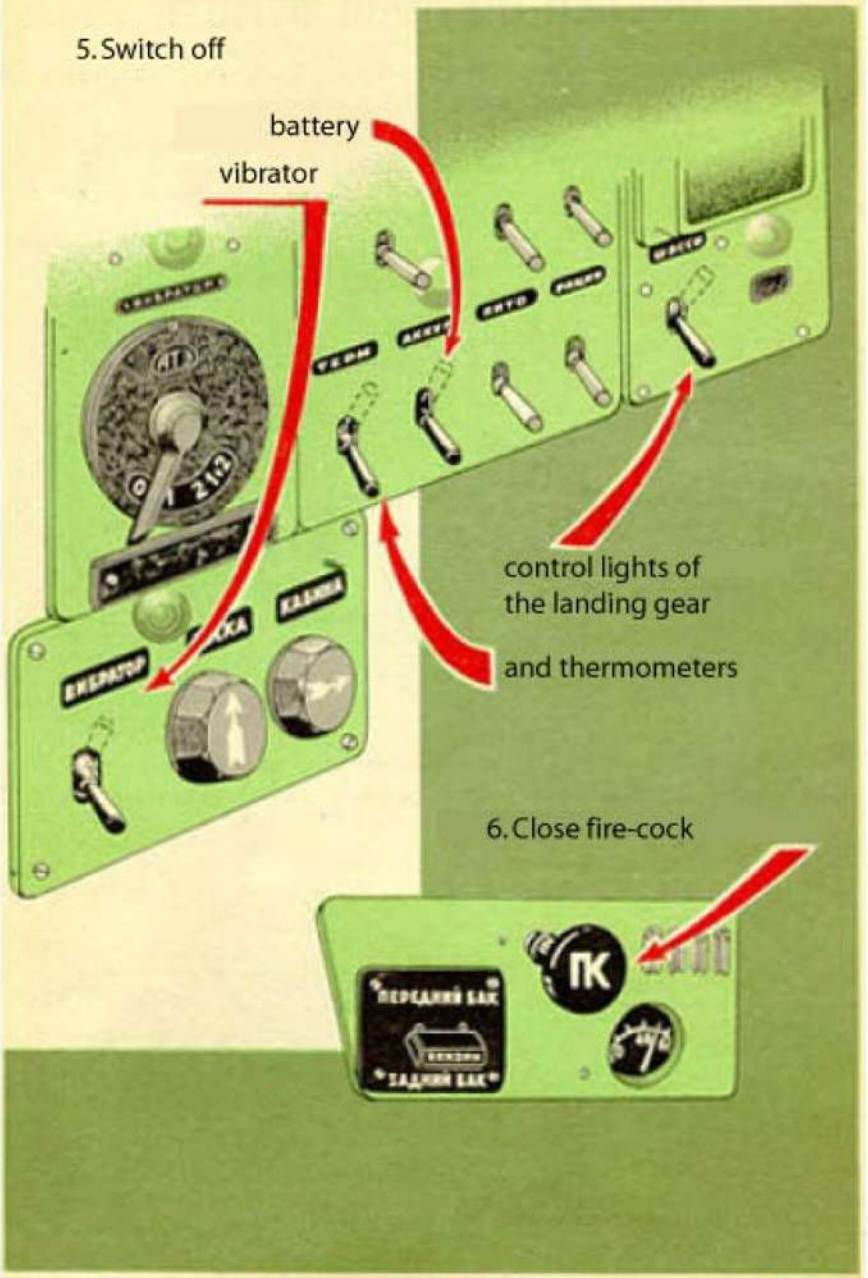


3. Throttle back to 400-450 rpm and maintain revs (not more than for 3-4 min) until tempearture drops to 90°

4. Switch off ignition.



ABSOLUTELY FORBIDDEN
to stop the engine by the full fuel consumption (closing the fire-cock) because of the possible exhaust into the carburetor.


5. Switch off
battery
vibrator
control lights of
the landing gear
and thermometers
6. Close fire-cock
ПК

AFTER FLIGHT INSPECTION

1. Open armored hatches and check if there is any leaks in water, oil, or fuel systems.

3. Report flight engineer about engine, airplane, weapons and special equipment functioning during the flight.

4. Instruct airplane mechanic to fix known malfunctions.