

FACTS AND FIGURES

The retractable mechanism to pull the turret up into the belly of the bomber is simple. The big hydraulic cylinder is secured to a supporting beam in the top of the plane and the turret is suspended from a piston riding within the cylinder. A hand pump mounted on a fuselage wall supplies hydraulic pressure to force the piston up and raise the turret, which can be locked in place with safety hooks on the upper trunnion housing. A valve on the fuselage releases the hydraulic pressure and permits the piston and turret to slide down.

POWER

The Sperry Lower Ball operates hydraulically on pressure built up by a hydraulic pump driven by constant speed electric motor.

SIGHT

Its sight is the K-4 Sperry automatic computing sight, described in the Sights and Sighting section of this manual.



AZIMUTH

The turret can turn 360 degrees—a full circle—in azimuth.

ELEVATION

In elevation, the turret guns can be lowered and raised from level (0 degrees) to straight down (-90 degrees).



ARMOR

An armor plate panel forms the bottom of the seat and extends up to the hinge of the door, protecting the gunner's trunk in battle position.

The stowing position for the turret and guns after they have been retracted is 180 degrees azimuth and -22 degrees elevation.



STOWING POSITION



6

Still keep your grip on the hand crank. Reach down inside the turret, forward and behind the big elevation gear housing on the left, and move the inside elevation power clutch lever up to engage it. You will have to rock the elevation hand crank back and forth as you push the clutch in place. This re-engages the elevation power bearing, locking the turret firmly in gear.

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Move the outside elevation hand clutch to *OUT*. Remove the hand crank and outside power clutch handle and replace in their clips.

8

Close the turret entrance door and prepare to lower the turret by closing the hydraulic valve.

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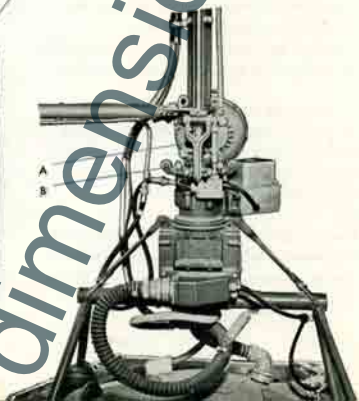
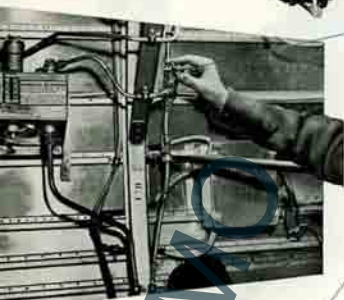
Work the hand pump to lift the turret just enough to release the safety hooks.

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Open the safety hooks (A) to disengage them from the upper trunnion housing (B).

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Open the hydraulic valve slowly, letting the turret ease down. Don't open the valve too fast.



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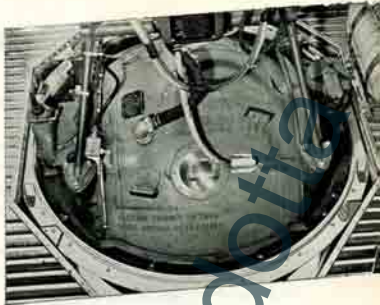
Make sure that the turret is properly seated at its lowest position. Tapered bushings, mounted on the azimuth ring of the turret, should sit squarely in holes provided for them in the plane's floor ring. If they don't, jockey the turret until they do.

13

Make sure the master switch on the support beam is on.

14

Open the turret entrance door. Test the turret by grasping the supporting structure and putting your right foot on the seat. Try to work the turret with the pressure of your foot. There should be no movement. If there is movement, the elevation gearing is not engaged.

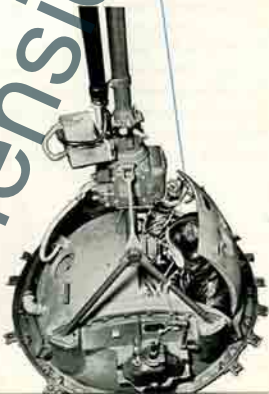


15

Lower yourself into the turret by grasping and swinging down on the support frame. Put your right heel on the right foot rest, then your left heel in the range pedal—being careful not to throw your whole weight on the range pedal.

16

Fasten the safety belt. Close and fasten the entrance door. Make sure that the door latches are securely closed. Then you are ready to go.



Operating the Turret ... Where to Find the Controls ... How to Use Them

- 1 Make sure the **azimuth power clutch** is engaged—the lever at the upper right should be down.
- 2 Flip on the **main power switch**—a toggle switch under a wire guard on the junction box beside your left knee.
- 3 Right beside the power switch are two **gun selector switches** for firing the guns separately or together. Flip both of them on.
- 4 Turn on the **sight switch** directly in front of your nose on the sight. Turn the sight rheostat beside it to adjust the brightness of the light. **Never operate the turret under power with the sight switch off.**

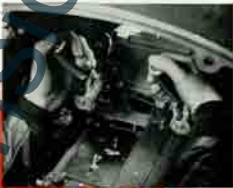
5 Finally, grasp the two handgrips. Don't worry about safety switches—the turret has none. But, notice that in azimuth the controls work exactly opposite to all other turrets. To move the turret **right**, swing the handgrips to the left; to turn **left**, swing them to the right. Pull back on them to tilt the turret and guns up, and press forward to turn the turret and guns down. Don't jerk. Steady, smooth tracking is especially important in using the Sperry sight.

The other controls you will use in combat are right at hand. On the top of each handgrip, under your thumbs, are **firing buttons**, used instead of triggers on the Sperry Ball.

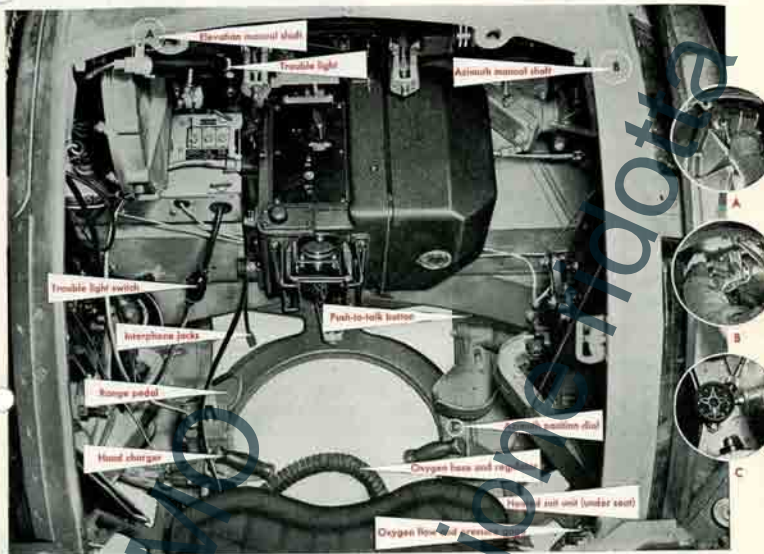
The fuses which protect the Sperry's electrical circuits are in the junction box beside your left knee, where you found the main power switch.

For charging the guns, you will find two handles next to your feet. Reach down to the floor, arms crossed, and pull the handles up carefully until the slack is out of the cables. Then pull them up sharply all the way. Don't ride the cables on the return action; allow them to go back under their own power, still keeping your hands on the handles.

Once you are seated, the controls and switches of the turret are spread before you. Check clutches and turn on the switches in exactly the order shown here.



Using the Auxiliary Units

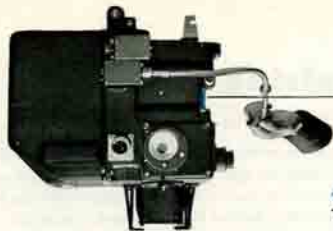


You will find a demand type regulator with a hose connection for your oxygen mask right under your seat. Alongside your right ear is the flow and pressure gage. The oxygen is drawn from the plane's central tanks in most models. The heated suit plug-in is also under your seat. The interphone jacks for your headphone and throat microphone lead out of the junction box. A trouble light is clamped in a clip just under top rim of the ball to the left of your head. By your right foot is a new azimuth turret position dial, in which a cut-out of your guns rotates

upon a clock face and shows you your azimuth position at all times. For manual operation of the turret in emergencies, shafts designed for use with removable hand cranks are on the right and left side of the turret—right for azimuth, left for elevation. The hand cranks are stored in clips above your head.

To change to manual operation:

- 1 Turn off the main power switch.
- 2 Remove the hand cranks from their clips and place them on the shafts.
- 3 Disengage azimuth and elevation clutches.



4 Then set both deflection dials to zero, using a piece of flexible shaft, or the range shaft, in the elevation input, and the azimuth shaft already in the azimuth input, to rotate the dials.

5 Sighting through the optic head, use a screwdriver to turn the thumbscrews on the azimuth and elevation deflection dial shafts until the reticles are exactly centered on the same object the guns are boresighted on. If daylight shining through the lamp aperture is not sufficient to light up the optic head and reticles, use a flashlight or your trouble light.

6 Check the deflection dials to make sure they have not been moved off zero in this operation. If they have, return them to zero and then center the reticles on the object again. Replace the deflection dial cover.



7 Move the turret by handcrank to zero azimuth and zero elevation and lock by reengaging the azimuth and elevation power clutches.

8 Remove the sight from its mounting bracket by unlocking and withdrawing the long mounting pin. Handle the sight carefully.

9

Set the azimuth and elevation position dials to zero, using the azimuth shaft to rotate the azimuth dial and a piece of flexible shaft to turn the elevation dial.

10

Connect the electric cable and install the sight in the turret.

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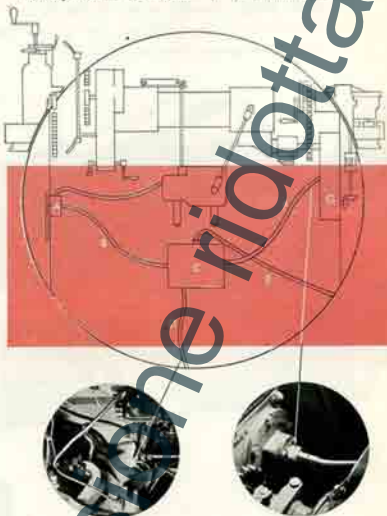
Connect the elevation shaft to the elevation input on the sight—and the azimuth shaft, which was left connected to the sight, to the turret. Make sure you do not move the azimuth and elevation dials off zero in doing this, and make certain all connections are secure.

12

Connect the range shaft to the sight's range input and disconnect it from the range pedal. Rotating the shaft with your fingers, turn the range dial as far past zero as it will go, then back it off a quarter turn of the flexible shaft. With the range pedal all the way up, connect the range shaft to the range pedal again.

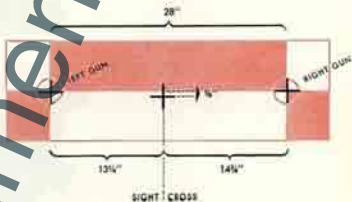
Flexible Shaft Connections

- | | |
|------------------------------|----------------------------|
| A Elevation gear unit | E Electric cable |
| B Elevation rate input shaft | F Azimuth rate input shaft |
| C Sight | G Azimuth gear unit |
| D Range shaft to range pedal | |



Another method

Another method of harmonizing the Sperry Ball is to line up the guns and sight on a special pattern stand, such as the one illustrated here. Set up the stand as level as possible at least 50 yards from the plane. Then boresight each gun on the pattern and line up the sight on the sight cross, using the same procedure as outlined above.



Loading Ammunition

Two ammunition cans, which are a permanent part of the turret ball, one for each gun, hold approximately 500 rounds of belted ammunition apiece.

In some late modifications of the turret the ammunition cans are placed outside the turret, mounted to the hanger assembly, to give the gunner more room; flexible chutes carry the ammunition belts from the cans to the turret and guns. But most Sperry Ball turrets still have cans installed right in front of the gunner. They cannot be removed from the turret and must be loaded from the outside.



First remove the ammunition can cover—a plate in the turret surface

The method:

held by four Dzus fasteners, or by two cover latch screws in later models.

Note that the cans are equipped with baffle plates to insure positive feeding and to keep the ammunition from tumbling about.

