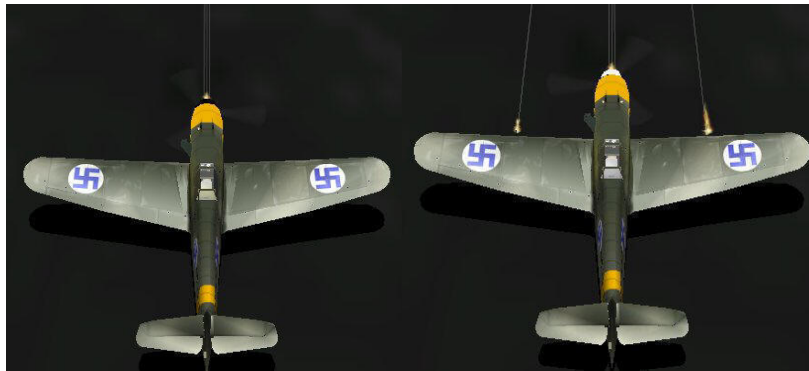


Setting Convergence

by Soda

Weapons on aircraft are mounted in many locations, often wherever there was space. Designers often modified designs as aircraft grew in size and firepower, weapons being inserted, moved to new locations or upgraded in size/weight. Typically, they come in a couple of different styles, cowl mounted (i.e... on the fuselage) and wing mounted.

The main issue at hand though is whenever you have more than one gun though you likely want them all to meet up at some point where they can inflict damage on the same area of an enemy aircraft. Shooting one hole in the enemy aircraft's tail, one in the wingtip, and another in the opposite landing-gear, isn't likely to be nearly as successful as putting all 3 rounds into one location.



Cowl mounted weapons would include anything that exists within the main part of the fuselage of your aircraft. It would include weapons that are on the upper deck above the engine (such as in the 109 or Zero). It also includes some aircraft which had a gun actually shoot through the center of the propeller (Yak9 or 109). Some aircraft, like the P-

38 and Bf-110, had engines on pylons to the sides so the whole nose area could be filled with guns. Convergence of cowl mounted guns is not really an issue considering that the average nose of a plane was only 2-3 feet across and any package of guns in that space would place a lot of bullets close together naturally. Shown are two example 109's the left one with only standard cowl weapons, while the right picture has gondolas attached, an option which introduces convergence issues since the wing guns are mounted mid-wing.



Wing mounted weapons configurations were much more variable in layout because of a number of factors. Weapons placed near the fuselage often had problems with having to fire through the propeller arc. This required those guns to be synchronized so that they didn't hit the propeller and thus took a penalty in their

rate of fire. Weapons that were placed outside of the propeller arc had other issues in terms of the limited space available as you moved out the wing, the weight of guns/ammunition, and even aiming problems with the flexing of the wings under load. One of the main issues though was with convergence, as it gets worse as you mount guns further apart on opposite wings. The left example shows an Fw190, with a pair of guns in the cowl, a pair shooting through the propeller, and a set that are mid-wing. The right example shows a Spitfire, with 4 guns in each wing, the outer most are almost near the wing tip, quite a convergence issue indeed.

This made for a nightmare situation where you could have two guns that were 20ft or more apart from each other. Often, like in the Spitfire you've been flying, there were not just two weapons that far out, but many, all at different distances from the center of your aircraft (though matched on each wing). There were issues though that influenced the placement, which included the fact that weapons required to fire through the propeller arc.

Each plane, because of the layout of the guns, has different convergence issues. There are also all kinds of different opinions on how best to set up convergence, but in my mind there are a couple of reasonable policies you can follow until you find something that you specifically like.

Point Convergence vs. Zone Convergence

Just as the name implies, point convergence is exactly that, setting all guns to pass through a single point at a specific distance. Zone convergence is designed to not have all guns concentrated at a single point, but to spread them out over a small range, applying a zone where lots of bullets are expected to pass. The point convergence tends to favor smaller caliber, or when there are fewer weapons because it focuses the firepower the best. Zone convergence is best when you have more, and more significant, weapons that you can afford to spread over a small zone (usually no more than D100 long). The Point convergence will always give you the best performance at the range point you set, but tend to become noticeably less effective as soon as the ranges strays more than a little bit outside that range. Zone convergence tends to give a bit better blanket coverage over a range.

As your skills develop, and depending on how you like to fight, you can adjust your convergence to best suit your style.

My personal preference (and reasoning) runs something like this for newer players:

- For guns that are cowl mounted, I always set them out to D650, even if I know that I can't reasonably take shots out that far (because of poor ballistics).

- For aircraft with wing mounted weapons, if:

The guns are of small caliber (.303 or 7.7mm types) and four or fewer, then I try and give a point convergence. Guns this light are not terribly effective so concentrating them is very important. They also rely heavily on kinetic energy (i.e., they aren't exploding shells), so setting the convergence point too far out will make them less effective since the bullets tend to lose kinetic energy before too long. Therefore, I tend to set the convergence point to somewhere closer than D350. This takes away an element of long range shooting because by twice the point convergence range the bullets will be passing at the same width apart as when they were fired.

If you have eight weapons of the .303 or 7.7mm type, then you can likely afford to make a zone convergence as the pure number of bullets will make up for some of the concentration you lose by not having a point convergence. Again, don't set the point out terribly far, although you can likely afford to set it further out if the 4 guns are closely spaced on each wing. Example, the Hurricane I has 8 .303's, 4 in each wing, and they are packed very closely in each wing, giving a natural convergence of those 4 guns as long as

they are all lined up in relatively in parallel. The Spitfire I has the same 8 guns, though they are spread out over the length of the wing, necessitating a little more concentration.

If I have four .50 or fewer (12.7mm) weapons, I tend to still go for a point convergence, though it can be a little further out (D350-D400), or could be a very small zone (setting the two banks of guns not more than about D50 apart).

If you have six or more .50's, you have to make a decision since you can go either point, or zone. Also consider whether you are going to be strafing, for which a further convergence is better. I tend to place six guns into a zone, though more distant than in the case of .303's. I tend to place eight guns at a point convergence at D650 since having four weapons in parallel trajectory gives sufficient natural concentration of fire.

- For cannons I tend to set them to D650, or if the ballistics are really poor, then at a convergence point slightly longer than what I feel my normal engagement ranges are (D350). Cannons rely on less kinetic energy and more explosive energy, thus you just want to land hits and concentration is slightly less of an issue.

These are all just personal preferences though, but it does help me keep a fairly consistent feel between different aircraft so I don't need to check each aircraft each time I fly it to remember what I set the convergence to. You will find over time though that you can get better performance by matching your convergence to a small zone, or point, at which you find you are typically able to saddle up enemy aircraft (which tends to get shorter with more experience).