**Training: Bob Juncosa**

**"Looping-the-Loop"**

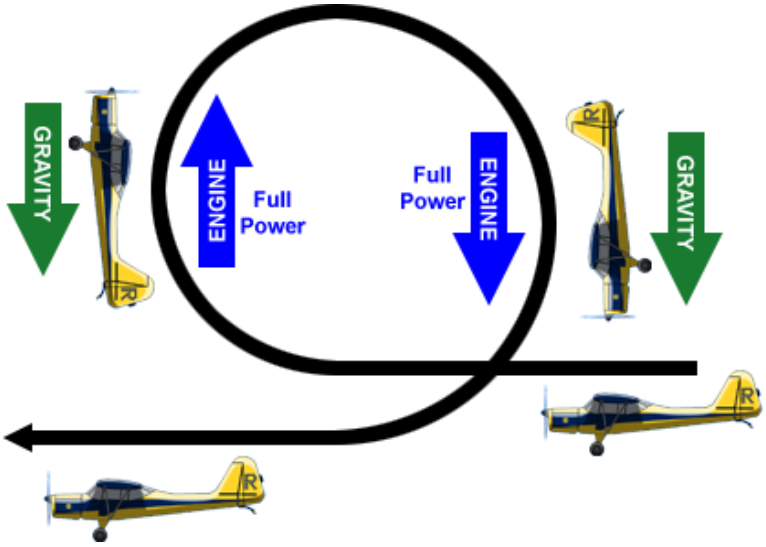
The date was September 9th, 1913. The place was Kiev, Russia. The plane was a Russian Army Nieuport IV monoplane and the pilot was Pyotr Nesterov. It wasn't an accident. He knew exactly what he was doing. He put his plane into a shallow dive to pick up all the speed he could, pulled back on the stick and kept pulling back, hoping the 70hp motor would get the job done. He kept his cool and over he went. The first loop. For his courage, he was placed under arrest for risking Army property. When he got out, he was hailed a hero and promoted to Captain.

The loop is considered one of the easiest R/C maneuvers to do which is why it is usually the first one attempted by new pilots. In many ways it is the easiest to perform but that doesn't mean it can't be performed badly.

The ideal simple loop is when the plane starts on a horizontal heading, climbs until inverted, descends, and levels out on the same heading and altitude as when the loop started. The path taken is a perfectly round circle.

The first time an R/C pilot does a loop, they usually start out level, give the plane full throttle, pull back on the right stick and keep pulling until the plane goes all the way around and is flying level again. Some pilots will perform loops that way for their entire R/C career. Certainly that is a loop but most likely one of very non-circular shape and one that probably ended at some other altitude than when it started.

The loop, just like everything in flying, is all about energy management. Let's look at the role of energy when a loop is done like I just described.




At the beginning of the loop, everything is in equilibrium. The plane has enough energy as provided by the engine to create enough lift to keep the plane flying level. The plane also has a significant amount of kinetic energy that is provided by the momentum of the plane moving forward.

As the plane enters the loop and to climb, the wings are no longer providing vertical lift. The momentum of the plane starts to dissipate. The engine now has to provide all the energy to compensate for loss of momentum and the forces of gravity in order for the plane to complete the first half of the loop.

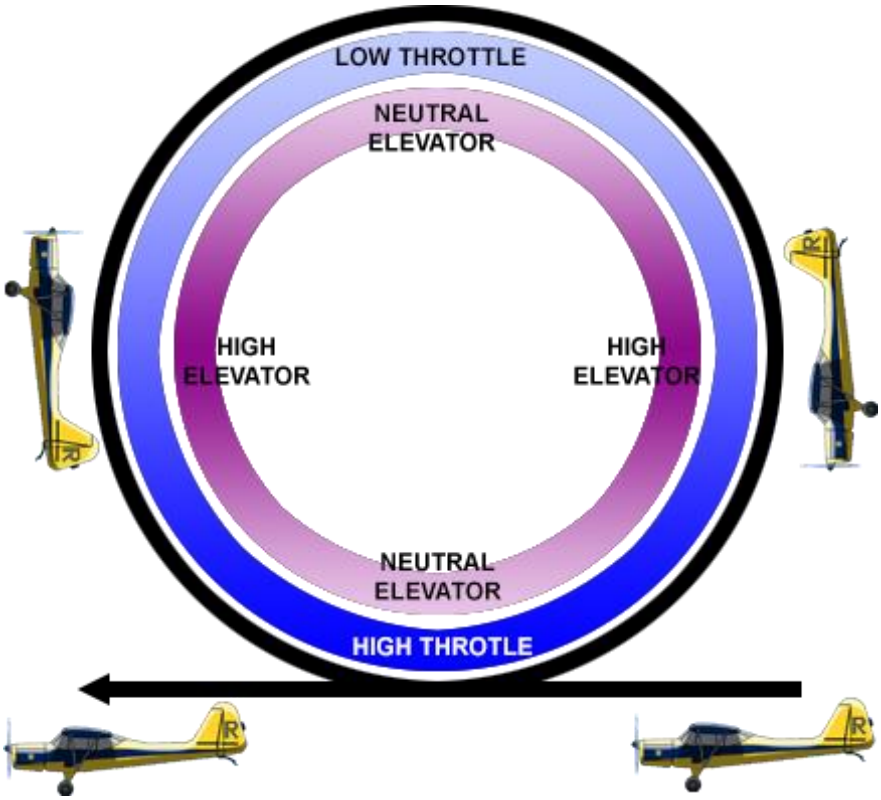
Things change once the plane reaches the top of the loop. The stored potential energy in the plane now starts to contribute to its downward trajectory. Gravity is now working the planes favor along with the engine. If the engine power did not change, the plane will be coming down much faster than it when up. If the pilot is not completely up to their game, it is very difficult to maintain a circular pattern and invariably the plane will exit the loop at a lower altitude than when it started.

The shape of the loop will be distorted further if no change had been made to the elevator. Unless the elevator was reduced as the plane entered the inverted state, the nose of the plane will quickly fall, causing the back half of the loop to be considerably less round then the first half.

So how can the shape and exit altitude be better controlled? I'm glad you asked. (Now what kind of article would this be if this question wasn't answered?)

The type of plane will depend on how you enter the loop. Got plenty of power? Enter the loop at with a horizontal attitude and medium throttle. If your plane is modestly powered or a very draggy WWI bi/triplane? You'll need to rely on momentum more than just engine power. In this case, enter a shallow dive with full throttle.

No matter how you started, when you enter the loop, you should be in level flight with plenty of airspeed. You now have lots of kinetic energy. Begin to apply elevator. The amount will determine the diameter of your loop. The more elevator, the tighter the loop. (By the way, big round loops are harder to do than smaller tighter loops.)




As the plane enters the vertical, adjust your elevator to maintain the circular shape. It is very likely that you will have to back off the elevator a little. As the plane starts to transition into horizontal flight (10 o'clock to 12 o'clock), begin to ease back on the throttle. This will slow the plane down and make it easier to maintain the shape of the loop. When inverted, you should be at medium to low throttle and with little to no elevator.

During the 12 to 3 o'clock portion of the loop, add elevator back in so that you can mirror the speed, altitude, and ground position when the plane went from 9 to 12 o'clock. Because of the conversion of potential energy back into kinetic energy, don't be surprised if you end up with your engine at idle.

To finish the loop, use the elevator to maintain the shape and get you in position to level out to the starting altitude. With the potential energy almost gone, adding back throttle will be required.

If done perfectly:

- The starting and ending points of the loop relative to the ground will be exactly the same
- The starting and ending altitudes of the plane will be exactly the same
- The starting and ending airspeeds of the plane will be exactly the same
- The loop path of the plane will be a perfect circle

I've seen amazingly good loops. Maybe even some perfect ones but all I know is that I have never done one. Mine are more like fingerprints and snowflakes. No two are identical. Some are very good, plenty are not so good. No matter. It's all part of the fun.

On a side note, I used to fly with a buddy in Rochester. We both had smoke in our planes. His was a WACO and mine was the big Aeromaster. After he had done a loop with the smoke on, someone yelled out, "Hey Lee! Spell your name." To which Lee quickly responded, "I just did, 'O'"

Happy Landings

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