Warbird Flying Tips

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Warbird Take-off:

- P-Factor: plane tendency to pull to the left.
- Spiraling Slip Stream: plane tendency to pull to the left.
- Engine Right/Down thrust: to correct above factors.
- Weathervaning/Weathercocking: plane tendency to point toward the wind.

Understanding of these factors will be of vital importance to help you during take-off.

Ideal set up and Take-Off protocol:

1) 3 degrees of down and right thrust. More will help with upright flight but sacrifice inverted flight tracking.

2) At Alvadore field, take off from Right to Left. Use weathervane effect to counter P-factor.

3) Get the tailwheel up asap, but not airborne until reaching speed. This will help minimize P-factor.

4) Throttle up smoothly and quickly. This will help minimize Weathervane effect.

5) Release elevator from full up smoothly with throttle up movement.

6) Avoid excessive use of rudder, unless required to use full rudder to counter P-factor. Remember that rudder will be more effective when tailwheel is up.

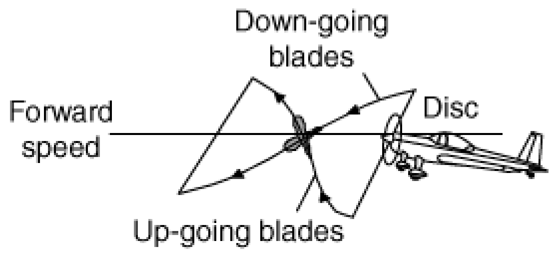
7) Ease in UP elevator when plane reaches flying speed. Most warbirds need only slight UP elevator if any for a smooth climb out. Premature take off will result in the plane nosing up and snap roll to the left (Remember high AOA and P-Factor???).

8) Noseover tendency? Usually due to improper CG balance or main wheel hubs not in line with wings LE.

Detailed Explanations of factors involved:

P-Factor explanation:

One of the “left-turning tendencies” of aircraft with a propeller, in which the loading of a propeller disc produces more thrust on one side than the other. If the nose of the aircraft points up relative to the oncoming wind, the downward-moving blade creates greater thrust than the upward-going blade, as the former is at a higher angle of attack than the latter. Assuming that the engine is turning clockwise as viewed from the rear (as is the case in the majority of single-engine propeller aircraft), the aircraft will tend to turn left. Also known as *asymmetric propeller loading*.



As the tail of aircraft is down, the axis of rotation is inclined. The down-going blade produces greater thrust as it is at higher angle of attack than the up-going blade. This causes asymmetric loading and aircraft making the aircraft tending to yaw.

Spiraling Slip Stream explanation:

The imbalanced vertical area in the back is what causes the yaw problems. A slight yaw is produced from the vertical fin because it only sticks out on the top side. A right rotating prop slip stream pushes top mounted fin right causing some left yaw. An equal sized sub fin is what would eliminate this. Sub fins aren't popular because of ground clearance during takeoff and landing. Full size single engine plane designs often mount the vertical fin offset left slightly for this reason. A small amount of right engine thrust can help with this, and works when flying inverted too. Thrust points the other way but vertical fin is inverted and getting pushed the other way too. Note that multiengine planes with wing mounted engines do not yaw in reaction to spiraling prop wash. Area getting torqued on is balanced.

Engine Right Thrust rationale:

Bottom line is this. A larger amount of right thrust improves upright handling at the expense of inverted handling. A smaller amount of right thrust benefits upright and inverted handling equally, only for designs that have imbalanced vertical fin area. An equal sized sub vertical fin will eliminate the need for any right thrust compensation of spiral slip stream. Right thrust remains useful to compensate for positive P factor, at the expense of all situations that generate negative P factor. Because our planes don’t have large sub fins at the tail, about 1 or 2 degrees of right thrust is optimum for aerobatic/pattern design in order to preserve upright and inverted handling equality. When around 3 degrees or more is used, the up lines become easier, but a tracking difference between inside and outside loops starts to develop. Also a tracking difference between upright and inverted 45 degree climb lines begins to develop. Airplanes that will fly right side up only benefit from larger amounts of right thrust. With lesser right thrust, planes yaw left during steep climb and straighten out at faster speed. With larger right thrust, planes can be made to fly straight during steep climbs and yaw right at faster speeds. About 4 to 6 degrees of right thrust produces a good compromise.

Weathervaning/Weathercocking explanation:

Wind will push the tail of the plane to swing the nose around and line up with the wind. The taller/wider vertical fins and cross winds will have greater impact on weathervaning.

Warbird Landing:

Downwind Leg: Reduce throttle from half down to 1/3 and maintain that throttle through the turn. Deploy full flaps and reduce throttle to 1/4 if plane pitches up. Pull up flap if plane still pitching up and wait until final approach to deploy again.

Final Turn: ideally maintain level flight through the turn. Gentle down slope is acceptable. Avoid hard banking and sharp/narrow turn, which will cause a stall and snap roll into the ground.

Final Approach: Maintain 1/4-1/3 throttle coming out of the turn and then slowly 1 click at a time reduction as the plane approaches the runway. Watch for a gradual descent and increase throttle to 1/4 if descent is steep. Rudder correction as needed to maintain heading. Avoid using ailerons to change heading. Avoid elevator input until plane is a couple feet above ground. Ease in elevator input to flare and reduce engine to idle at this point. More rudder input here if crosswind is blowing to crab back to centerline. Add short bursts of throttle if needed to avoid stalling when plane is close to the ground.

There you have it. Nothing but net !!!