Performance Tuning Your Sailplane Launch

How many times have you heard comments about another pilot who seems to get a much better launch than everyone else? Well, if you're the "Joe Average" pilot, you may have heard this more than a few times, if not found yourself watching that other guy perform his launch. Face it; you know of those comments because some pilots get better launch height than others. In this discussion, we are going to show you ways to get the most of the launch from your aircraft so that you can be just as good at getting maximum altitude and a better chance of finding the lift early, just like the other guys.

There are several main factors that affect the launch to make it only "so-so" versus getting maximum performance. To me the most important factors are the aircraft itself, and the person launching the plane. There are others, like the launch equipment, winch battery, tension on line, wind speed, etc. But to me it all starts with the aircraft and the launch person. Obviously, if the plane is not set up well, it simply will not launch well. And if the person who is launching the plane doesn't have the correct technique, it could result in a catastrophic landing that occurs immediately upon launch. So, let's look at these two main factors first, and you may find that most of the other factors you might have thought of are included within them.

Aircraft Set-Up

Aircraft set-up is absolutely necessary to get any kind of launch at all. Remember that the idea behind this part of the discussion is to get the aircraft to perform its' best despite the techniques used by the person launching the model. When the aircraft is properly set-up, the launch person has less workload on him, allowing him to concentrate more on his job of throwing.

Let's start with the aircraft balance. This is not only critical to best flight handling, but to the launch as well. It doesn't matter if you like a nose heavy model or tail heavy model. Just get it to where you like it. From here, we are going to tune the tow hook position. Up until this point, you have managed to get the model into the air and balanced it out for your liking. Now, let's work on the tow hook position by using the help of another person. Have this person stand behind you and the plane and watch the plane go up the line when you launch.

Note the people in the background, who are critiquing the launch for the pilot. Also notice this launch is being done from behind the wing. The nose angle is fairly low, but the plane appears stable.

What you see and what this other person may see is probably going to be a bit different. What we are looking for is the model to climb steeply, but also maintaining

a stable condition on the way up. He should also be looking for any corrections made by the pilot, and about when the model begins to arc over the top. This will take a critical eye and a merciless opinion to be of benefit, so choose a person who knows a good launch, and is not afraid to tell you where you are making mistakes.

This shot is taken from the side and shows a mass launch in F3J competition. Notice how all planes are at a steep angle of attack, or climb. This side angle is the easiest way to critique the launch angle the plane is attaining during launch and can help determine the best towhook position.

What is a steep climb angle and how do we attain this? A steep angle of climb is one that is virtually straight up as it leaves your hand. In order to get to this angle, the plane will do one of two things; it will either "rotate" to a natural climb angle from the throw, or you throw into this climb angle. Rotation is that portion of the flight where the plane transitions from almost level flight to a high Angle of Attack (AOA) climb. It occurs when the launchman throws the plane pretty much straight ahead of himself, and the aircraft flies forward for a short distance.

In this shot, the pilot has just launched his model. Note that his hand was holding the plane behind the wing and did not get the nose to aim up. So, the plane is going straight ahead and must now rotate up to gain altitude. It is not the best way to get a great launch.

But, because of the towhook position, the speed of the model, and the lift of the wing, the nose wants to rotate upward and begins to "kite" upward, assuming the high AOA climb. This consumes towline space, which equals potential height at the top of the tow. It is also quite stressful on the airframe, which may be harmful to those planes that are not as strong as needed to withstand the stress. Think built-up balsa birds like the entry level Gentle Lady, Aspire, Spirit 2M and others.

This is the very best method of launch. The hand was holding the plane just ahead of the wing, held at a high AOA, and thrown into the climb. This is Larry Jolly at the F3J World Champs in Turkey.

When the launchman throws the plane into a high AOA, the plane will not have to transition through rotation and instead is already kiting itself on up the line. The climb is automatically better by not going through rotation, resulting in a potentially higher altitude at the top of the tow, but not necessarily a faster launch speed. Just a more efficient speed. Knowing this, we need to study how to get this type of launch down pat. We are going to start talking about the towhook first, so let's get into that.

Once you have figured out the correct balance position for your aircraft, take a launch and watch how the plane goes up the line. Is the climb angle too flat or does it go up so steeply that you are popping off the line often? If the plane could use a steeper climb angle, move the towhook back 1/16th to 1/8th-inch at a time. If it is already launching too steeply, move the hook forward a bit. I suggest you start out with a tow hook position at ¼-inch forward of the balance point. This is a safe starting point for most planes. If the launch is a bit flat keep moving the tow hook back not more than 1/8-inch at a time until the plane begins to get a bit unstable on tow. Then move it forward just a hair and that should do it. You want to be at the point where you have adequate stability for you to control the model, but not so far back that you have to "fly" the model to get a successful tow every time. Don't worry that the climb is not as steep as it could be yet. Concentrate on the tow hook position.

Now that we have the tow hook position set, it's time to work on other factors. If you are flying a RES type bird, about the only thing you can do is to add some up elevator trim to the launch to get a steeper climb. If you have a computer radio with a "Launch" mode, you can use that to add just a bit of elevator trim. Use just enough elevator to get that high AOA attitude and leave it alone after that. For those flying a full house model with flaps, it's time to start working on that launch mode. This will be a condition with a bit of flaps and ailerons being down during launch to add lift. How much to add varies with each model, but I normally start out with ¼-inch of down flaps, and matching aileron drop. Matching means that the ailerons match the angle of the flaps, such that the entire trailing edge (TE) moves down uniformly. Many pilots only drop the flaps, and for the average winch launch, this works fine. But you will get a more uniform distribution of lift over the entire wing when the entire TE is dropped. You will use less TE deflection, meaning less drag and more efficiency. Also, when you use a very strong winch or launch using an F3J type hand tow, dropping only the flaps may result in the model being unstable during tow. Using the entire TE will cure this problem.

Here is the trailing edge of a molded, composite structured wing. This shows the "launch-mode" of the model, with flaps partially deflected to increase lift on launch. Ailerons should match this angle as well for best performance.

How do you determine how much TE deflection to set for the optimum launch angle? This is another "try and see" effort, similar to the tow hook adjustment. Again, keep increasing the TE deflection until the model begins to get unstable on tow or you see no improvement in the launch angle and climb. When you reach this point, back off a bit and that should be the setting. And for the record, what is "unstable"? It is the condition where the plane will not hold a steady and straight AOA and direction. If the plane is waving back and forth, side to side while you wrestle with the sticks to maintain control, then that model is not stable. An ideal situation is have the plane assume a steep AOA and stay straight with a virtual hands-off condition for the pilot. That is what tow hook position, balance and TE position is all trying to achieve for the aircraft launch attitude. If you have trimmed the model to achieve this condition, then we are ready for the next step, the launch itself.

This is confidence! The pilot of the airborne plane is the man on the right. Note he is looking at his radio and not the plane he just released. This is a great example of a stable launch, or a guy who may be about to crash! Nionetheless, the plane is on its' way up the line and is virtually hands-off.

The launch is very important to not only achieving the best performance, but also to simple success of the launch. More launch mishaps occur when the person launching the plane is trying too hard to get a high energy launch. The plane is not released in a straight line, too much tension on the line, maybe not enough tension, too much speed on the way up the line, and more. It does take an astute eye and "feel" for the aircraft to get the most from the launch, but let's concentrate on the throw to begin with.

Launch people all have their own way of holding a plane when launching. The most common ways of holding the plane is:

a. Holding the plane by the fuselage just under the towhook or balance spot.
b. Holding the plane by the fuselage just behind the wing saddle.
c. Holding the plane by the fuselage just ahead of the wing saddle.
d. Two handed hold with one hand just under the towhook and one on the nose.

Example of Launch method A.

You get a good feel for the plane but not a lot of grip for tension. On this RES model, tension is not a problem. On a heavier Unlimited ship, it could be. Also, modern Unlimited ships may not provide as much grip area at this location, making grip a problem.

Example of Launch method B.

Notice how the plane is forced to fly directly forward and must go into rotation to climb upwards.

Example of Launch method C.

Example of Launch method D.

Note here that the launchman cannot hold the plane back behind him, nor can he aim the nose into a high launch angle. The plane is forced into a forward flight followed by rotation.

Let's look at each of the methods above for some pro and con points.

A. Holding the plane by the fuselage just under the towhook or balance spot.

In this grip method, the grip is fairly comfortable and controllable. This gives good control of the model for the throw. However, with most modern models, there is not a lot of grip area on the model. Wing position on the fuselage and the narrow

fuselage profile does not provide much in the way of grip area, and so the amount of grip you can get from this position may be very limited. When this is the case, you may not be able to hold much tension on the line before the model begins to slip away, forcing a launch. Worse yet, should the model begin to slip, the launchman will feel compelled to throw very quickly before the model gets away from him, meaning the launch will not be as efficient as it might have been or the throw is not straight up the line. There are some models which have a high mounted wing and provides a lot of grip area to hold, and that helps out a lot. But the current majority of designs do not feature the high mounted wing planform.

B. Holding the plane by the fuselage just behind the wing saddle.

This grip position gives the launchman a lot of grip as he can wrap his fingers around the fuselage and hold back a lot of pressure. It is also fairly stable and comfortable. However, this position has a distinct disadvantage in that the plane cannot be pulled back very far nor can you hold the nose upward to take advantage of throwing the plane into the high AOA attitude. With the towhook being forward of the grip, the plane will be pulled straight towards the winch line in a more level attitude when the line is tensioned. (Yes, there are some people who have the wrist muscles to hold a good angle, but not many people). Lastly, when using this grip, the plane is normally held high, but this places the launchman into a position where he cannot hold a lot of tension. The body is upright and being pulled forward, while the arm cannot be locked back. The wrist will not bend enough to allow for the body to take the stress, and the result is that the arm and shoulders must absorb the line tension plus maintain body balance, lest you fall forward. This position most commonly finds the plane flying forward from the throw and going through rotation to achieve the high AOA attitude.

D. Two handed hold with one hand just under the towhook and one on the nose.

I have skipped to this grip as it is a strong grip for most, but not one the pilot himself is going to use, due to his need to keep a hand on the transmitter. With the combined strength of both hands, a launchman can get plenty of grip, control and line tension. There is a limiting factor in this style in that the launchman can only pull back as far as the forward arm will stretch, and because this also places the plane in a fairly low position behind the launchman, there is a higher risk of the plane striking the launchman during the throw. However, with good technique, this launch can get the plane into the high AOA attitude without rotation.

C. Holding the plane by the fuselage just ahead of the wing saddle

This is the preferred grip style by those pilots who manage to get the highest performance launches. The launchman can get a solid grip around the fuselage as he can wrap his fingers around it completely. The plane is also held a bit further back behind the launchman, giving more grip time on the plane through the throw and this provides longer guidance time. The towline is normally placed between the hand and the fuselage, and despite the tension on the line, the hand can easily contain this pressure even when

holding the plane into the high AOA attitude behind them. Using this grip, the launchman can hold back a tremendous amount of line pressure by locking the elbow, and leaning the weight of his body against the line for maximum tension. The pressure is held by the body and not the arm. This grip also allows for good stability of the model, giving a greater margin of success for a straight throw. With all of this going for the launchman, he can throw this model directly into the high AOA attitude. When he does this, the model will rarely encounter a condition where it may hit the launchman, as the model goes straight up, rather than over the top of the launchman.

Obviously, the last type of grip holds a distinct advantage over the other styles with better grip strength, longer throwing stroke, the ability to hold more tension and the ability to throw directly into the high AOA attitude.

This last grip style is probably the most difficult method of grip to learn, in that it does not lend itself to being a natural style when you first try it. I recommend learning this grip on light and slower sport planes to get the feel and technique down pat. Once you get the technique down, you will find you can toss most planes using this grip with relative ease. Remember to bring the arm fully behind you and lock the elbow. Your stance will be more of facing sideways to the line rather than directly at the turn-around end of the line. *(Go back and look at our example photo)* The towline will come across the chest as you pull back, and you lean back towards the arm holding the plane to gain and hold line tension. Finally, the throw finds you throwing overhead, grenade style with the elbow remaining in a locked position. The plane will naturally go nose up into the high AOA attitude from your toss, and away you go.

Our discussion ends here for now. There are other factors affecting the launch and how high you can get with the model, some of which include how much winch speed to use, when to push the nose forward or haul back on the stick and pull the nose back, what line strength to use, when to dismount from the line, to ping or not to ping, and how much climb to carry before topping out. Those are discussion within themselves, but for now, concentrate on the proper, or optimized, set-up of the model and throwing technique. This is the start of achieving those sky high launches you are looking to get. Pretty soon, you'll be the guy that the other pilots will be watching!