

# “Two Finger Solution”

Transmitter Handling Tips to Maximize Flying Consistency and Proficiency

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## Introduction

Opinions vary regarding the “best” transmitter handling techniques, but if you could compare them all based on the results obtained within a one week time period, you would quickly discover that certain techniques promote faster rates of learning better than others. This article features the transmitter handling techniques that have proven during 1<sup>st</sup> U.S. R/C Flight School's 4 & 5-day primary solo and aerobatic courses to produce flying consistency and proficiency in the shortest amount of time.

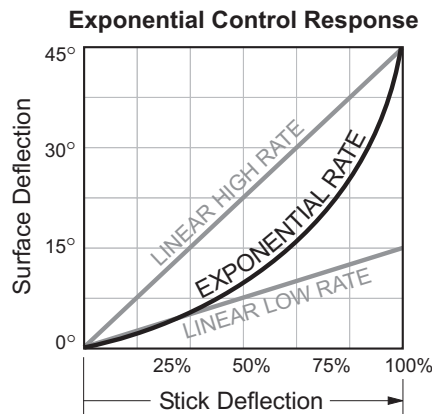
Note: The techniques presented here apply to “precision” flying, e.g., takeoff, procedure turns, landing, precision aerobatics. Understand that 3D stunt flying involves entirely different approaches to transmitter handling, flying technique, as well as airplane and radio setup.

## Cause and Effect

Most people learn to fly at the side of a recreational instructor with minimal pre-flight preparation. As a result, the majority of pilots in the sport base their flying primarily on “reacting” to the airplane (rather than pro-actively controlling what the plane does). Consequently, most pilots think that getting better at making corrections, fast reflexes, and large amounts of stick-time are the keys to better flying, so little thought is given to how they fly, or whether they are flying correctly.

As a result, most flyers make 3 to 4 times more control inputs than what the maneuvers require when flown optimally. The problem with that is learning slows dramatically when pilots reach their saturation point from having to make thousands of split-second decisions reacting to what the plane happens to be doing. A higher quantity of inputs also increases the likelihood of errors and a different result each time a maneuver is performed. These issues tend to be greater for pilots who fly with only their thumbs on top of the control sticks due to the unsupported thumb's natural tendency to jerk or snap the controls (especially when the pilot is excited or anxious, e.g., flying a new model, when it's windy, etc.).

Reactive thumbs-only flyers' skills often plateau because they remain too busy responding to deviations to learn how they might be prevented in the first place, and their lack of consistency prevents them from making the connections between their inputs and the responses of the plane that is so important to securing a solid foundation on which to build. Consequently, like the golfer who looks to buy new clubs in the hope that they will improve his game (actually, correct for his faulty technique), many pilots end up looking to equipment to improve their flying. Specifically, they often employ large amounts of radio exponential (expo) in an attempt to dampen the consequences of making too many inputs and jerking the sticks.



Dave Scott is a winning full-scale aerobatic competitor, founder of 1st U.S. R/C Flight School, and author of several training manuals. His books and articles feature the accelerated training techniques that he developed instructing over 1300 R/C pilots during his school's 4 & 5-day courses. More information about his books and flight school can be found at [www.rcflightschool.com](http://www.rcflightschool.com)

## Exponential Tradeoff

While it's true that large amounts of expo has the potential to make flying smoother, it doesn't address poor technique and consistency and precision control are sacrificed. For example, among other things, large amounts of expo makes it more difficult to fly well in wind. Explained: Despite what many people think, wind does not cause nearly as many deviations as it seems. See for yourself; the next time it feels like you're fighting the wind, stop making corrections for 3 seconds and you'll be amazed by how the wind will suddenly seem to all but disappear. The principle effect of wind is that it tends to exaggerate the deviations and improper techniques that pilots can otherwise get away with in more benign calmer conditions.

Skilfully flying in wind is a lot like precision driving, in that the earlier a deviation is corrected, the smaller the correction input is and consequently the fewer corrections the driver needs to make overall, a.k.a., “the good guys make it look easy!” Conversely, if the deviation is allowed to become larger, a larger correction input is required, which itself will need to be corrected at some point. The main reason why a good driver can keep a car going precisely where he wants with minimal effort is his inputs have an immediate effect on correcting deviations while they are still minute because the steering wheel corresponds directly to the response of the car.

On the other hand, anyone who has ever driven an older car with slop/play in the steering knows how hard one has to work just to keep the car going straight. That's because the slop or lag in the steering response makes it more difficult to correct deviations while they are yet small -- prompting the operator to make larger corrections that often result in getting more response than what he was expecting or needed.

Pilots who attempt to mask their over-controlling tendencies or poor technique with large amounts of expo run into the same problems as the operator of an old car with an irregular control response, except flyers have to contend with the wind further exaggerating the deviations due to the delayed or sluggish control response and the pilot's subsequent larger corrections. Of course, there are people that fly very well with lots of expo, but it usually takes them many hours of practice before doing so.

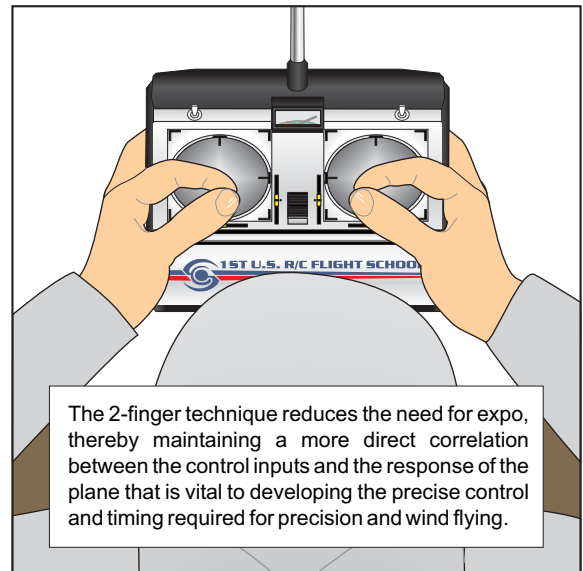
If you pay close attention to magazine content, you may have noticed how the average recommended low rate expo value these days is down around 20%, even though the same authors were recommending 40%+ just a few years ago. That's because pilots are rediscovering that while good equipment and a reasonable 10-20% expo is helpful, nothing has as great an impact on flying as much as a pilot's flying skills. I.e., there's no substitute for applying the proper control inputs in the first place!

## 2-Finger Advantage

More than 1400 pilots of all skill levels have attended 1st U.S. R/C Flight School. During that time, a comprehensive system of accelerated flight training has been developed resulting in a 98% solo success rate and more than half of the solo students returning the following season for aerobatic training. However, even if everything else remained the same, the flight school would not be here today if not for utilizing the technique of pilots placing the tips of their index fingers on the side of the control sticks for additional support (figure 2).

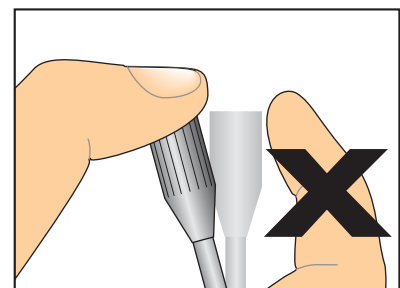
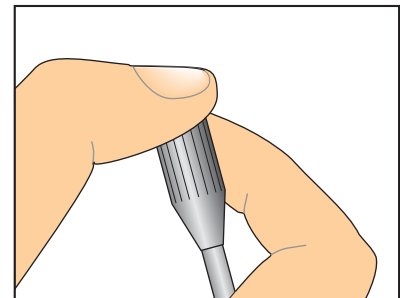
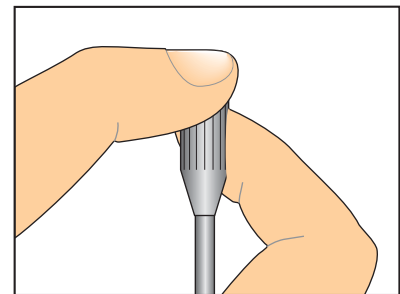
In the same way that two hands on a steering wheel improves control,

To more precisely control the size and pace of your inputs and reduce over-controlling, place your thumb-prints on top of the control sticks and the tips of your index fingers on the side of the sticks near your thumbs for added support. To further improve your ability to feel the neutral stick position, the type of control inputs you make, and reduce the likelihood of applying unintentional inputs, increase the stick tension in your transmitter as high as possible.



supporting the thumb and the stick with your index finger naturally causes pilots to apply smoother inputs, resulting in greater consistency / proficiency and less over-controlling, especially during pressure situations.

Most importantly, utilizing the thumb and index finger, a.k.a., 2-finger technique, enables pilots to precisely manage the size and pace of their control inputs, thereby reducing the need for expo (figure 3). Consequently, pilots are able to maintain the direct correlation between their control inputs and the response of the plane that is so vital to developing the precise control and timing required for precision flying and wind proficiency. Pilots using the 2-finger technique also feel more connected to the airplane, that is, rather than the airplane just responding to inputs, there's the sense that it's responding in ways that more closely match your exact inputs and intentions--thus making correct inputs easier to repeat, and incorrect inputs easier to modify correctly (figure 4).



### Typical Precision Flying Expo:

Aileron	5-10-15%
Elevator	5-10-15%
Rudder	10-15-20%

Add 5% for planes featuring grossly oversized 3D surfaces

Taking one or both fingers off the stick results in jerking or taking jabs at the stick, thereby making impossible to fly with consistency or precision. By keeping both your thumbs and index fingers on the sticks you will feel more connected to the plane.

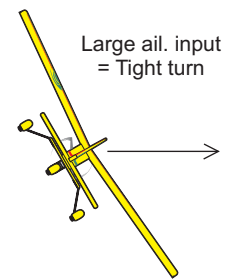
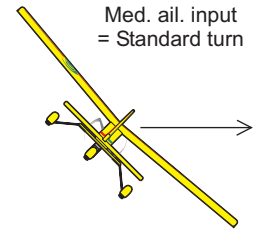
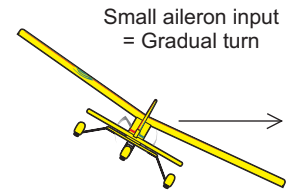
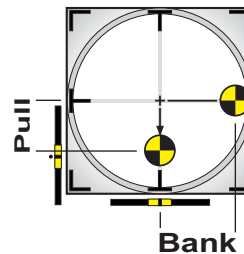
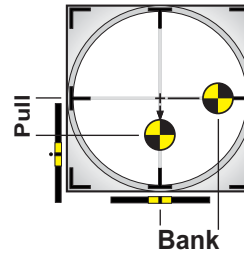
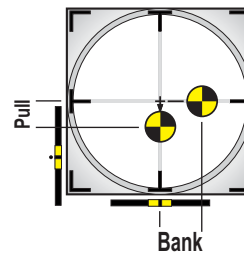
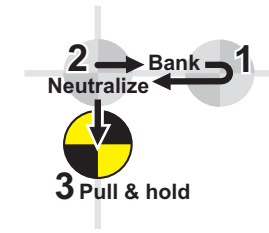
**Turn Example:**

Since most pilots do not make or utilize the connection between their actions and the responses of the plane, the typical reactive pilot's approach to turning is to enter the turn applying aileron and elevator and then start adjusting the bank angle in response to seeing the turn becoming too wide or tight. Since the amount of elevator required to keep a turn level varies with bank angle, the elevator must be constantly adjusted throughout the turns as well. When variables such as different planes, setups, wind, etc., are introduced into a reactive flyer's busy turn technique, consistency is difficult to achieve.

A proficient 2-finger pilot uses his ability to precisely manage his inputs to pinpoint the aileron input that results in the bank/turn that he's comfortable with. He then pinpoints the exact amount of elevator that keeps his standard turn level with little or no additional adjustments needed (figure 5). After repeating the favorable inputs a few times, he's able to consistently perform level turns without even thinking. And when a situation calls for a wider or tighter turn than standard, he simply changes the size of the inputs that he initiates the turn with.

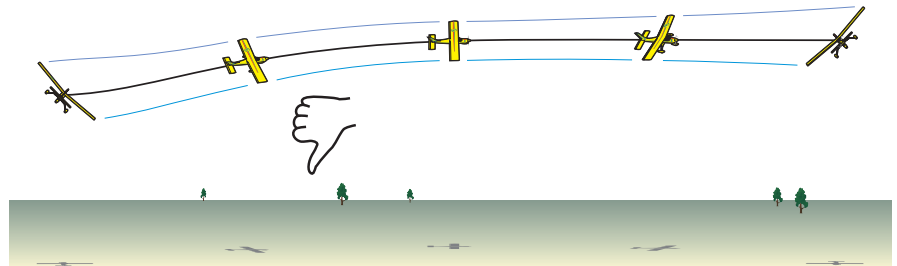
Thanks to this foundation, when a proficient pilot flies a new airplane for the first time, he intuitively knows immediately after takeoff whether to use more or less aileron during the first turn based on whether the ailerons seem more or less responsive than what he's used to. Thus, he's still able to achieve his efficient standard turn despite the different control response. If his first turn with a new airplane climbs, instead of trying to react faster to altitude changes for the remainder of the flight, he simply changes the amount of elevator that he inputs at the start of the next turn and he's rewarded with a level turn on only his second try (figure 6).

Standard turn procedure:  
"Set the bank (neutral) and pull"

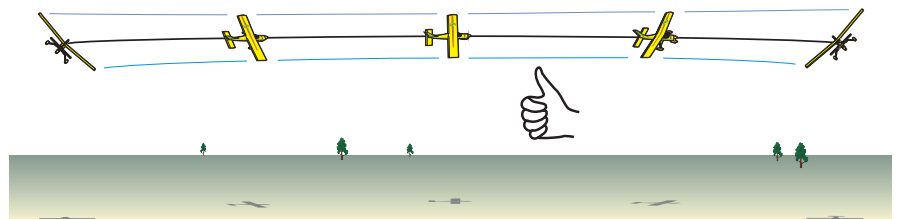


A proficient 2-finger pilot's consistent turn inputs reinforce the muscle-memory that enables him to perform consistent turns without thinking. When a wider or tighter turn is required, rather than relying on adjustments and reflexes, he pro-actively changes the size of the inputs he initiates the turn with.

**Exhibit A:** Climbing start to the turn.



**Exhibit B:** When a proficient 2-finger flyer experiences a climbing turn, rather than trying to react faster to altitude changes during subsequent turns, he repeats the same aileron input (and bank) but inputs less elevator to start with, and from that point he's able to achieve level turns with little or no further adjustments needed.



### Loop Example:

Whereas a reactive flyer will typically enter a loop and immediately start adjusting the size and shape, a proficient (efficient) pilot has learned that the amount of elevator he applies at the start predetermines the size of the loop, and thus he targets the specific amount of elevator to pull at the start that corresponds to the size of the loop he wishes to fly (figure 7).

Since he's not preoccupied with making constant adjustments, he's able to see that holding a fixed amount of elevator results in a round loop up until it becomes tighter or "pinched" as the airplane loses speed approaching the top due to gravity. Aware that he'll have to reduce his elevator input over the top of the loop to keep it round, he's able to closely predict how much elevator he needs to take out next time based on the severity of the pinch, e.g., tiny pinch = tiny elevator reduction, etc. (figure 8).

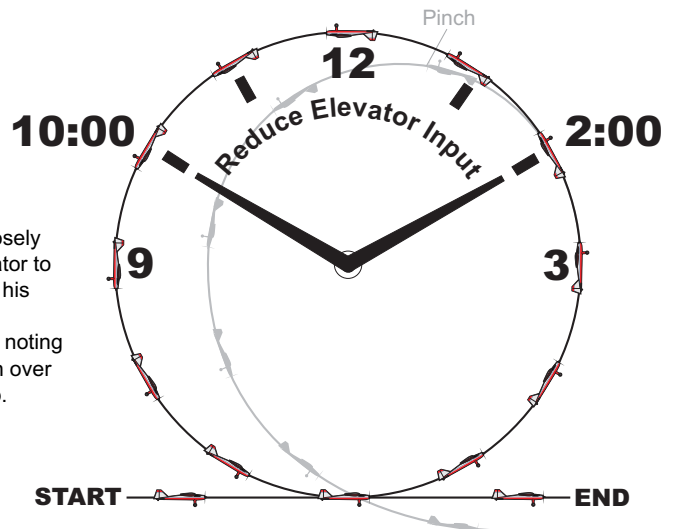
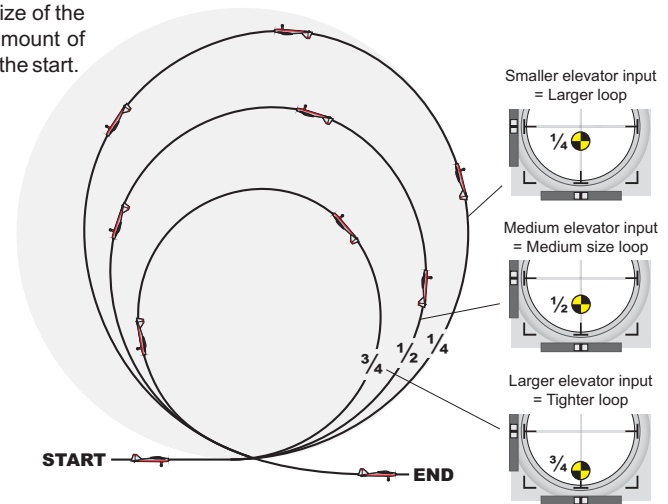
Altogether, thanks to his 2-finger proficiency, he's able to consistently perform round loops by pulling a fixed amount of elevator at the start (the amount determined by how large he wants the loop to be), smoothly reducing the elevator input over the top between 10:00 and 2:00, and then smoothly returning the elevator to its original position to match the back side radius to the front side. The result is a round loop requiring minimal effort and without any visible signs of when the elevator adjustments were made.

Note: The reason why reactive flyers continually "hunt" with the elevator and end up performing irregular "segmented" radius loops is the same reason pilots over-control at all skill level; they want to see their inputs doing something. Often complicated by a lack of correlation between their inputs and the plane response due to excess expo, many pilots remain too busy making adjustments to realize that they are actually correcting many of their own corrections!

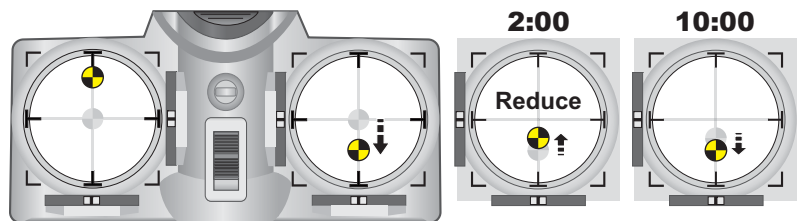
### Enhancing Feedback

Increasing the stick tension in your radio as high as possible will further help to minimize over-controlling and improve consistency by improving your feel for the types of control

A proficient 2-finger pilot is able to predetermine the size of the loop by the precise amount of elevator he applies at the start.



A proficient pilot can closely predict how much elevator to take out over the top of his loops to keep them consistently round after noting the severity of the pinch over the top of his initial loop.



inputs you apply. Increased spring tension also reduces the likelihood of accidentally applying unwanted inputs along with your intended inputs. In fact, 1st U.S. R/C Flight School found these benefits to be so substantial that it installs stiffer after-market springs into all of its radios.

### Straps, Trays, or Free-hold?

Pilots must guard against developing the bad habit of taking their fingers off of the control sticks, resulting in a tendency to take jabs at the controls and therefore making it impossible to fly with consistency or precision. This habit is especially common when using

a transmitter strap or tray. True, they look really cool, but when the transmitter is supported by a strap or tray, the pilot's grip on the transmitter will tend to move around as he's applying inputs, thus making it harder to determine where the sticks are positioned since there's no consistent grip-point to gauge his movements from. Furthermore, there's nothing holding you back from transferring the weight of your hand and/or any tension you're feeling directly to the controls. Consequently, over-controlling and inadvertently applying unwanted inputs along with the intended inputs (typically blamed on wind) occurs more frequently when using a strap and especially when using a tray. These tendencies often cause pilots to develop

the unconscious habit of letting go of the controls in order to "reset" things or buy a moment to catch up with where things are at. Of course, if a pilot was able to remain relaxed in all situations, these issues would not be quite as critical, but that usually doesn't occur until after achieving consistent success.

A fixed grip on the transmitter naturally provides a base from which to better gauge the size/position of the controls, while also helping to steady your inputs and therefore reduce over-controlling, especially when excited. Free-holding the transmitter also enables a pilot to use some transmitter-english in pressure situations to prevent all his stress from transferring directly to the sticks.

## **Conclusion**

"Practice makes perfect" applies only when it's correct practice. The 2-finger technique, increased stick tension, maintaining a fixed grip on the transmitter, and not getting carried away with exponential, enables a pilot to make the correlation between his actions and the response of the airplane that leads to a solid understanding of proper control. Consider that, not unlike driving a car, when the control inputs are applied correctly to start with, the need for additional corrections may not even exist. That is when a pilot is able to stay ahead of the airplane and thereby join the elite ranks of flyers that efficiently and confidently control what a plane does rather than reacting to it. Good luck!