

Transmitter Handling Tips to Maximize Proficiency

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2-fingers on the control stick (thumb on top, index finger on the side for support) naturally enables a pilot to more precisely control his or her inputs.



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Introduction

Drivers naturally put both hands on a steering wheel whenever a situation demands greater control and driving accuracy. Pilots that use both their thumbs and index fingers on the control sticks are similarly able to more precisely control their inputs and thus their flying.

While individual opinions often vary regarding the "best" transmitter handling techniques, it's safe to say that few people have objectively compared them all. Rather, most pilots simply continue to use (and promote) whichever techniques they've become accustomed to.

However, if you could compare all the different transmitter handling techniques, you would quickly discover that certain methods promote greater consistency and therefore faster learning.

Like the example of using 2-fingers on the sticks, the following transmitter handling techniques are those that have proved during 1st U.S. R/C Flight School's week-long primary solo and aerobatic courses to universally produce the best results in the shortest amount of time.

Note that the techniques presented here apply specifically to "precision" flying, e.g., takeoff, procedure turns,

precision aerobatics, landing, etc.. Understand that 3D stunt flying involves entirely different approaches to transmitter handling, not to mention flying techniques and equipment setups.

While some of these techniques will no doubt feel strange at first if you did not start out this way, know that most pilots find them relatively easy to adopt when they prove to help get the job done with a lot less effort.

Cause and Effect

Traditionally, most people learned to fly R/C at the side of a recreational flyer/instructor usually with very little pre-flight preparation. As a result, most pilots are conditioned to "reacting" to what the airplane does (as opposed to having a plan and proactively controlling the plane). Consequently, most pilots naturally think that getting better at making corrections, fast reflexes, and large amounts of stick-time are the keys to better flying. Hence, 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 additional split-second decisions during their flights. 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 magnified 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 anxious or excited, e.g., when flying a new and/or expensive model, flying in windy conditions, landing, etc.).

Furthermore, 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. Their lack of consistency can also prevent them from making the correlation between their inputs and the responses of the plane needed to cement a solid foundation on which to build.

Consequently, like the golfer who can't keep his head down during his swing but fantasizes that the new clubs he's ordered will improve his game, many pilots end up looking to equipment to try to improve their flying. Specifically, they will often employ large amounts of radio *exponential* (expo) in an attempt to dampen the consequences of making too many inputs and jerking the sticks.

The 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 some predictability and therefore consistency are sacrificed (figure 1).

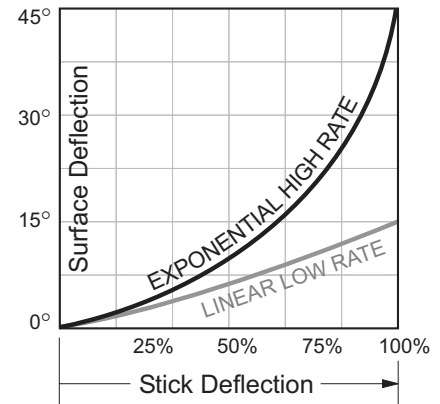
Explained: Anyone who has ever driven an older car with slop/play in the steering knows how much harder one has to work just to keep the car going straight. That's because the slop or lag in the steering response makes it more difficult to correct deviations while they are yet small -- prompting the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

Pilots who attempt to mask poor technique with large amounts of expo run into the same problems as the operator of an old car with an irregular control response. I.e., In addition to sacrificing a direct correlation between control inputs and flight response and thus predictability, the sluggish control response enables deviations to become larger before the corrections take effect, thereby prompting larger correction inputs and thus increasing the potential for over-controlling and needing additional corrections. Of course, there are people that learn to fly very well with lots of expo, but it takes tremendous amounts of practice to do so.

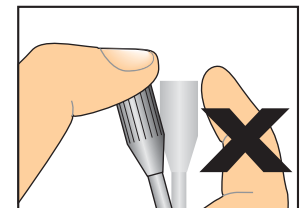
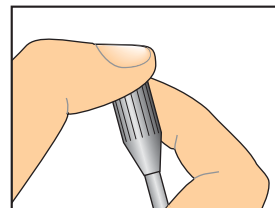
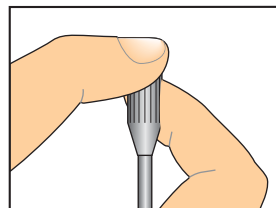
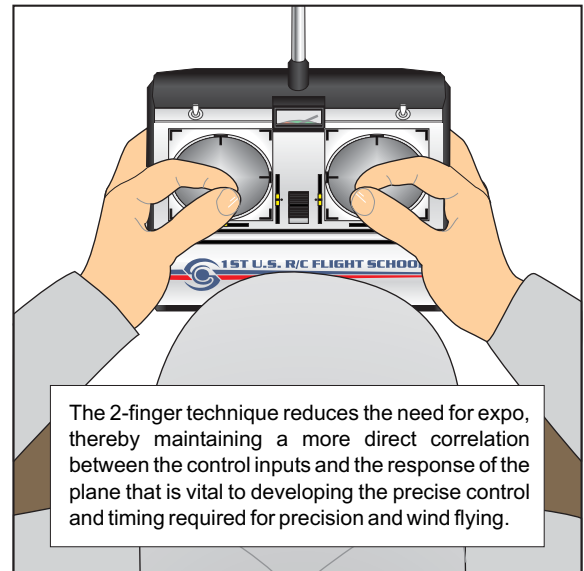
Flying with less expo, on the other hand, is more comparable to driving a newer car with tighter steering. I.e., It's easier to keep the car going precisely where you want because the steering wheel corresponds directly to the response of the car and thus your inputs have an immediate effect on correcting deviations while they are still minute. Furthermore, the direct correlation between the steering wheel and the response of the car is more predictable and thus enables driving to become routine and eventually automatic.

Similarly, pilots flying with less expo experience a more direct correlation between their intentions/inputs and the response of the airplane, a.k.a., an "honest" flying airplane that enables them to fly with greater precision and consistency. Thus, while good equipment and a reasonable amount of

Significant expo (e.g., 30-50%) is required to make an airplane easier to fly on high 3D rates. On normal rates, less expo (e.g., 5-15%) results in a more predictable linear response better suited to consistent precision flying. The tradeoff for maintaining a more direct correlation between the control inputs and the response of the plane with less expo is the pilot must be able to precisely control the size and pace of his inputs.



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 to reduce the likelihood of applying unintentional inputs, increase the stick tension in your transmitter as high as possible.



Keeping both your thumb and index finger on the stick will help you to feel more connected to the plane. Guard against taking one or both fingers off of the stick leading to jerking or jabbing the stick and thus making it impossible to fly with consistency or precision.

expo are certainly helpful, nothing works as effectively as flying an honest airplane and applying the proper control inputs in the first place!

2-Finger Advantage

More than 1500 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 99% solo success rate and more than 3/4 of the aerobic students returning for more advanced training. However, even if everything else remained the same, the flight

school wouldn't be here today if wasn't for the 2-finger technique in which pilots place the tips of their index fingers on the side of the control sticks to help steady their thumbs positioned on the tops of the sticks (figure 2).

In the same way that two hands on a steering wheel improves control, supporting your thumb and the stick with your index finger will naturally enable you to apply smoother inputs, resulting in greater consistency and less over-controlling, especially in pressure situations.

Most importantly, utilizing both thumb and index finger enables pilots to precisely manage the size and pace of their control inputs, thereby reducing the need for lots of 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 inputs and timing required for precision flying.

Furthermore, pilots using the 2-finger technique enjoy the additional confidence that comes from feeling 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.

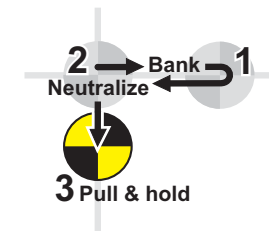
Turn Example:

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 and elevator in response to seeing the turn becoming too wide or tight, climb or descend. When variables such as different planes, setups, wind, etc., are introduced into this already busy turn technique, consistency is difficult to achieve.

A proficient 2-finger pilot, on the other hand, uses his ability to precisely manage his inputs to pinpoint the aileron input that results in the bank/turn that he's comfortable with (figure 3). He then pinpoints the exact amount of elevator that keeps his standard turn level with little or no additional adjustments needed. 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 proactive 2-finger pilot flies a new airplane for the first time, he can sense immediately after takeoff whether to use more or less aileron during the first

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.

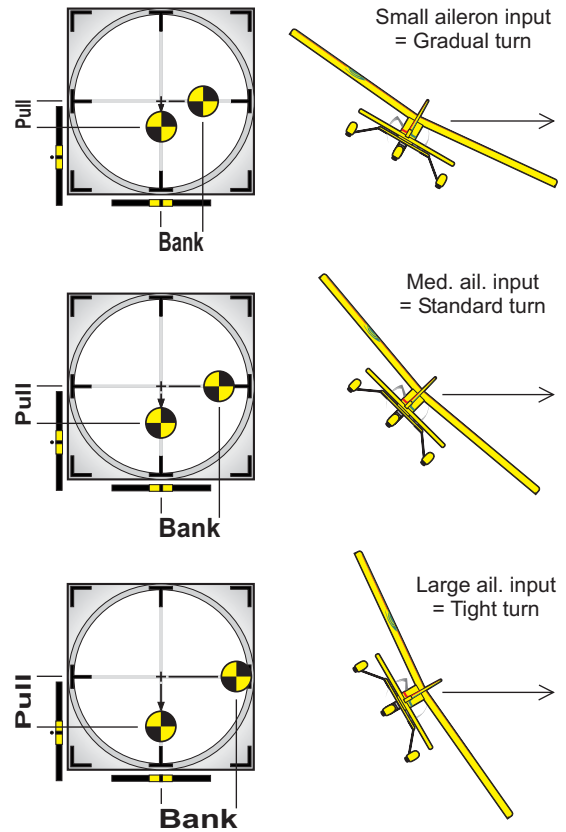


Exhibit A: Climbing start to the turn.

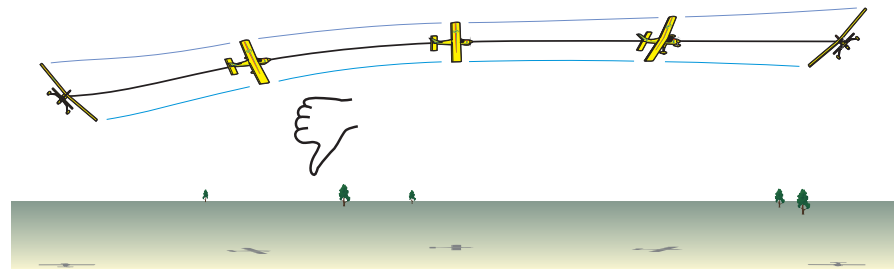
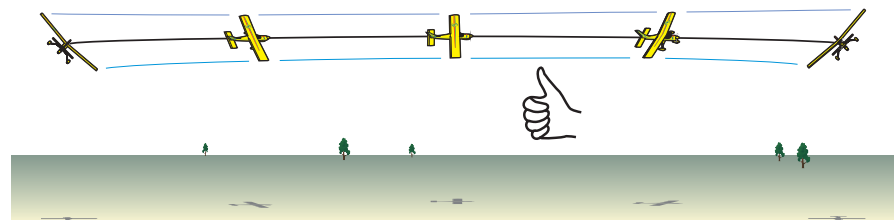


Exhibit B: When a proficient 2-finger flyer experiences a climbing turn, rather than trying to react faster to altitude changes during subsequent turns, he repeats the same aileron input (and bank) but inputs less elevator to start with, and from that point he's able to achieve level turns with little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



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. Furthermore, if his first turn with a new airplane climbs or descends, 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 and is rewarded with level turns for the remainder of the flight (figure 4).

This efficient process applies to loops, rolls, landings, etc., as well. In other words, not only does using 2-fingers make good inputs easier to repeat, mistakes are also more consistent and therefore easier to diagnose to affect a better outcome.

Note: Some people initially find it difficult to use the 2-finger technique because they go about it backwards by first placing their thumb and index finger on the sticks, but then finding it difficult to grip the transmitter. Instead, you should first get a comfortable grip on the transmitter, then place your thumbs on top of the sticks, then without any tension in your fingers or hands, bring the tips of your index fingers to the side of the sticks near your thumbs while allowing the remaining fingers to naturally come to rest in the positions that are comfortable.

Most importantly, always keep your thumb prints on top of the sticks, versus "pinching" the sticks, in order to maintain a better feel for where the sticks are positioned. Note that those who pinch the sticks are more prone to using either their thumb or index finger (one or the other) to jerk the stick. Rather, the objective is to control the inputs with the thumb on top of the stick and use the index finger on the side merely for support.

Enhancing Feedback

Increasing the stick tension in your radio as high as possible will significantly help to minimize over-controlling and improve consistency by improving your feel for the types of control inputs you apply. Furthermore, increasing spring tension reduces the likelihood of you accidentally applying unintended 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 always 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 thus making it impossible to fly with consistency or precision. Note that this bad habit happens to be far more common when using a transmitter strap or tray.

While they look really cool, when the transmitter is supported by a strap or tray, the pilot's grip on the transmitter will tend to move around when applying inputs, thus making it harder to determine where the sticks are positioned since there's no consistent grip-point to gauge the 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 applying unintended inputs (typically blamed on wind) occurs more frequently when using a strap and especially when using a tray. I.e., The only thing keeping a pilot from overpowering the stick is the constant awareness not to do so, but if his attention becomes divided by an unexpected occurrence, wind, changing power settings, etc., that's when mistakes happen. Of course, this is less of a problem for pilots who are able to remain relaxed, hence the reason why some veteran pilots who use trays and remain within their comfort zone by flying the same maneuvers with type of plane would differ with this critique.

On the other hand, 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 tense or excited. Free-holding the transmitter also enables a pilot to use some transmitter-english during pressure situations to prevent his anxiety from transferring directly to the sticks.

If you must use a transmitter tray, still try to maintain a fixed grip on the transmitter for the reasons stated. And, if over-controlling and making accidental inputs causes you to start using so much expo that you start to question whether you have control of the airplane, you may want to give free-holding the transmitter a second try to see if there's an immediate reduction in over-controlling and greater consistency.

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 pilots to quickly make the correlation between their actions and the response of the airplane that leads to a better understanding of proper control and a solid foundation on which to continue to build. 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 ranks of elite flyers that proficiently control what a plane does rather than merely reacting to it. Good luck!

In the event increasing stick tension proves insufficient, Spektrum Radios may require part # 80078S from Century Spring Corp. <https://www.centuryspring.com/catalog/extension-regular?page=product&cid=extension-regular&id=80078SCS> (Installing stiffer springs may void the Radio warranty)