Help Stamp Out HFAS

by King Povenmire, DPE

One of the most insidious and pervasive anomalies in aviation today is the HFAS (High Frequency Aileron Syndrome). It is most noticeable in rough air. The pilot tries to keep the wings level by quick, jerky aileron movements – responding to the slightest disturbance. This actually makes the air seem rougher due to the introduction of adverse aileron drag.

The HFAS is a negative transfer from driving a car, where continuous attention to the steering wheel is an ingrained reaction. It must be stamped out early in pilot training. The **Law of Primacy** states that whatever is first learned in often unshakable, and even if "unlearned" will recur in times of stress. Many aviation accidents have been traced back to mistakes learned early in training that had been suppressed by "unlearning" in later refinement. Student pilots must learn to use the rudder correctly before they solo. Once a student solos, he or she has "learned to fly."

The HFAS is related to, and often accompanied by the BHOTWC ("Both Hands On The Wheel" Compulsion) which was driven home by mommy or daddy or whoever taught the pilot to drive. Both of these afflictions are often accompanied by a third negative transference, the WKC (White Knuckle Contraction). As seen in Figure 1.

Figure 1. HFAS combined with BHOTWC and the WKC.

The Proper response to wing-rocking during turbulence is to use the rudder to keep the nose pointed at a dot on the far horizon. If a wing drops and the nose doesn't turn, it will come back up in a second. By using the HFAS the pilot brings into play – even slightly – the adverse aileron yaw caused by the increased lift/drag of the lowered aileron. Raising the dropping wing will cause the nose to turn – sometimes imperceptibly in the other direction. Passengers are much less comfortable if the airplane is bouncing around all three axes.

By nailing the longitudinal axis to the far horizon (or to a specific heading) the ride becomes demonstrably smoother. OK, if the wing stays down for an uncomfortable period the ailerons can be used, but this should be Low Frequency. The only time HFAS should be used is during gusty or crosswind landings – or to control a tailwheel airplane during the ground roll.

Try it. Next time you encounter bumpy air, let go of the ailerons and use the rudder to keep your heading. You might need to adjust the elevator to maintain your altitude, but don't move the ailerons. After you get some proficiency at it, then try going back to "white-knuckling" the ailerons to keep as level as you can without the rudder. You will notice that the air gets rougher. When I demonstrate this, I have been accused of waiting until just before the turbulence stops to use the rudder, and switching to the aileron demo just as we approach another bumpy spot – which can only be seen by CFIs (Certified Flight Instructors).

The HFAS should be avoided in turns. The rudder should be basically neutral after the bank is established, but can smooth out the air even during a turn. While turning in rough air the rudder should be used to keep the rate of turn constant.

The HFAS can be the symptom of several more insidious diseases such as: RWLOTOG, ITRAN, and the deadly AWWTRFS Sometimes the instructor thinks that these can be cleaned up later, just before the Practical Test. Unfortunately by this time the Law of Primacy has assured that these habits will be carried through to the student's ATP (Airline Transport Pilot) check if not caught before the first solo.

The **RWLOTOG** (Right-Wing-Low-On-Take-Off Giveaway) is the first indication to the examiner that this might be an unsuccessful ride. The pilot uses a slight right bank to keep the airplane going straight on the initial climb out. The Left Turning Tendencies Associated with Power (LTTAP) – torque, P-factor and spiral slipstream require right rudder to keep the ball centered. It is too easy to get by with a little right aileron rather than use your "accelerator foot" as shown in Figure 2. This pilot's instructor didn't notice, or didn't emphasize the importance avoiding a slip when trying to climb out over an obstacle.

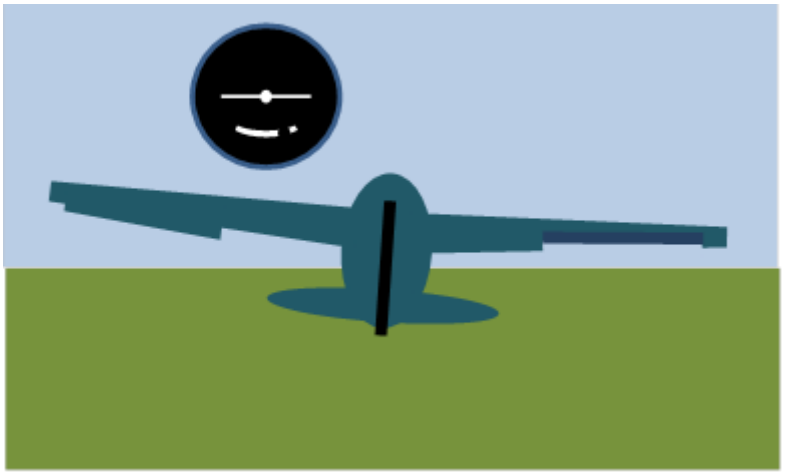

Figure 2. The RWLOTOG

ITRAN (Ignoring-The-Rudder-All-Together Neglectation*) is the full-blown disease which includes all these symptoms. As shown in Figure 3, neglecting the rudder is very comfortable, at least for the pilot. The passengers feel thrown from side to side as in a car. If the pilot was allowed to slip to the right during takeoff, the next indication will be the first turn. The nose will either turn the other way as the bank is initiated or at least stand still. Remember – with as little as five-degrees of bank, there is a horizontal component of lift which should be turning the airplane. The rudder should be used with the aileron to start the nose in that direction. Whenever ailerons are used, rudder must be used to counteract the adverse yaw. Once the turn is established, the ailerons and rudder should be neutralized. The rudder doesn't turn the aircraft - the horizontal component of lift turns the aircraft.

** Not actually a word – until now.*

Figure 3. ITRAN in action

AWWTRFS: The worst side-effect of the HFAS it its relationship to the AWWTRFS (Absolute Wrong Way To Recover From Spins). Unless you have actually been taught to correctly recover from a wing-drop during a stall by shoving in enough rudder to stop the rotation, the normal reaction will be to try to raise the dropping wing with aileron alone. The aileron increases the angle of attack on the dropping wing – deepening the stall, and deepening the spin. This is the easiest way to fail a Private Pilot check ride.

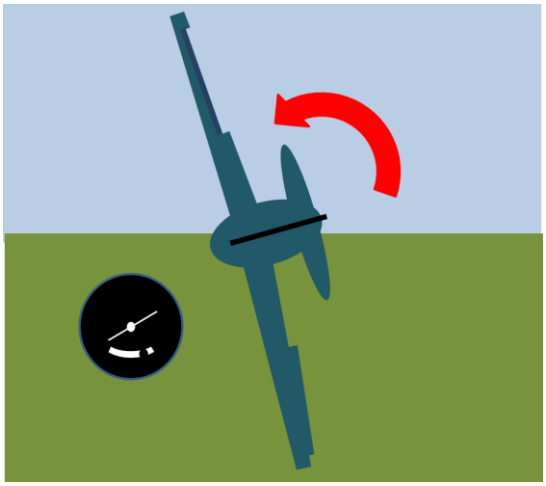

Figure 4. Wrong way to recover from a spin.

Examiners are required to test knowledge and understanding of spin recognition and recovery without actually doing a spin. The first indication of a spin is a wing drop during a stall. One wing stalls slightly before the other. The rudder's main purpose in stall control is to keep the nose from turning. No turn, no spin. If rudder is not used to counter a wing drop, the ride is over.

SUMMARY: In summary, my credibility on the topic of rudder coordination goes back to my Private Pilot Check Ride. I'll never forget that after the engine was stopped in the tiedown place, the examiner, Fred Breise, spent the next 15-minutes taking advantage of the most intense learning event in aviation – the time before you know if you have passed. Fred sat in the front seat of the Cub and turned his head to the right and gestured through the open clamshell door and said:

"You did pretty well today, but there is one thing that you need to improve - your use of the rudder." (Yes, but did I pass?) "The rudder isn't just for taxiing. Whenever you start a turn, the nose should start to turn in the same direction. It shouldn't stand still, or turn the other way. There is a horizontal component of lift with as little as two-degrees of bank, which should pull the nose in the direction of the turn. We know that by increasing lift we will increase drag, and it will pull the rising wing back. Any time you use the aileron you must use the rudder"

"When you are flying in turbulence you don't need to use the ailerons to keep the wings level. You should use the rudder instead to keep the nose straight. If you try to raise a dropping wing with aileron, the adverse yaw will move the nose in the other direction and the plane will wallow back and forth in addition to the effect of the turbulence. Passengers don't like that. Look out at the far horizon and find a point which represents your longitudinal axis. Keep the nose on that point with the rudder. In the Cub, that point is just above the compass. In a side-by-side airplane it is in line with the yoke - well to the left of the spinner. Find that gun-sight on the windshield and use the rudder to keep it on a point on the far horizon. If you are drifting with reference to your track, your horizon reference will drift slowly as well, and you will need to adjust your horizon target accordingly."

"The main purpose of the rudder is to keep the ball centered, or for a purposeful slip. It is required to counteract two destabilizing effects: First, torque effects during high power and low airspeed climbs, and the opposite effect when you are descending at low power and higher speed; And second, adverse aileron yaw. We already talked about the third – to keep the nose straight in turbulence."

This was the essence of his lecture. There were several illustrating examples – some from my performance and some from accident history. It lasted at least 15-minutes, but I have reviewed it thousands of times while flying. At last he finished, and as he got out of the Cub, he said "Congratulations, you passed, but you've got a lot to learn. Are you going to go on for your commercial?"